

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Water Resource Management

NORTHEAST DISTRICT • GROUP 1 BASIN • NOVEMBER 2001

Basin Status Report



Suwannee

**(Including Aucilla, Coastal, Suwannee,
and Waccasassa Basins in Florida)**





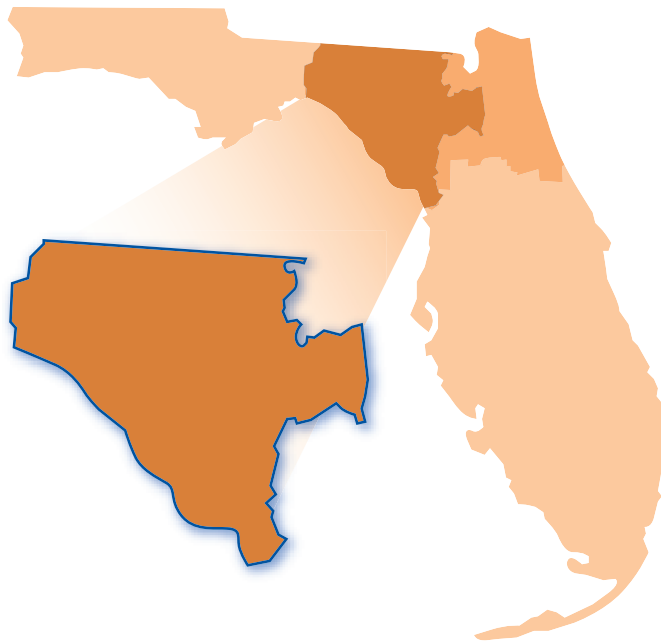
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Acknowledgments

Suwannee Basin Status Report was prepared by the Suwannee Basin Team, Florida Department of Environmental Protection, as part of a five-year cycle to restore and protect Florida's water quality. Team members include the following:

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Preface

Content Features

- **Executive Summary:** Appears at the beginning of every report and provides an overarching view of the watershed management approach, its implementation, and how this approach will be used to establish a process for identifying impaired waters.
- **Chapter Summary:** Appears at the beginning of every chapter and provides an overview of the chapter, which includes specific problems addressed in that particular basin.
- **Sidebar:** Appears throughout the report and provides additional information pertinent to the text on that page.
- **Noteworthy:** Appears on pages near text that needs additional information but is too lengthy to fit in a sidebar.
- **Definitions:** Appear at the side of pages where scientific terms occur that may not be familiar to laypeople. The word being defined is bold-faced in the text.
- **References:** Appear at the end of every chapter and provides a complete listing of all sources used within the text.
- **Appendices:** Appear at the end of each report and provide additional information on subjects, such as bioassessment methodology, rainfall and stream flow, types of natural communities, STORET stations, water quality statistics, land use, and permitted facilities.



Executive Summary

Suwannee

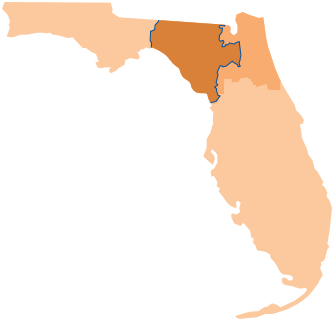
The Suwannee Basin Status Report is part of the first phase of the state-wide, watershed management approach of the Florida Department of Environmental Protection (Department). This report, which contains maps, charts, graphs, tables, and a set of appendices, provides a preliminary evaluation of the status of water quality and associated biological resources in the Suwannee Basin. In addition, it identifies known and suspected water quality impairments and water quality monitoring needs, and summarizes existing and planned water quality restoration plans and projects.

Through its watershed management activities, the Department will work with local interests to support local actions and supplement strong existing programs to improve water quality and restore and protect ecological resources in the basin.

For the purposes of this report, the area identified as the Suwannee Basin or the Suwannee Group 1 Basin encompasses most but not all of the area within the Suwannee River Water Management District. The Suwannee Group 1 Basin includes the watersheds of the following river basins, as identified by their eight-digit hydrologic unit code: Aucilla, Econfina-Steinhatchee, Alapaha, Withlacoochee, Upper Suwannee, Lower Suwannee, Santa Fe, and Waccasassa.

This report marks a beginning for implementing the Department's watershed approach for restoring and protecting water resources and addressing total maximum daily load (TMDL) requirements in the Suwannee Basin. (TMDL represents the maximum amount of a pollutant that a waterbody can assimilate without exceeding the quality standards.) During the next few years, considerable data collection and analysis will be done to establish TMDLs for impaired waters. A watershed management plan to reduce the amount of pollutants also will be produced. Subsequent activities will depend heavily upon the active participation of local governments, businesses, and other watershed stakeholders. In particular, the Department will need commitments from these groups and individuals to undertake activities that will reduce the amount of pollutants from point and nonpoint sources and achieve the established TMDLs for individual impaired waterbodies.

This Status Report describes how the watershed management approach will be used to establish a process for identifying impaired waters in the Suwannee Basin and for limiting pollution in those waters by adopting TMDLs. The process described here provides a framework for implementing the requirements of the 1999 Florida Watershed Restoration Act and Section 303(d) of the federal Clean Water Act. The report broadly characterizes the basin's hydrologic, ecological, and socioeconomic setting, as well as historical, current, and proposed watershed management activities and processes. In addition, it describes the status of surface water and ground water resources and ecological resources. The report also contains a



planning list of potentially impaired waterbodies, as well as a list of waters proposed to be removed from the 1998 planning list.

As a next step, the data used as a basis for placing waters on the planning list will be reexamined and verified, and additional data will be collected through strategic monitoring. The Suwannee Basin Status Report will be used to identify information gaps for the verification of water quality impairment and TMDL development and will drive the development of strategic monitoring plans. The Department will then develop a verified list of impaired waters for which TMDLs will be developed. The list will be adopted by Secretarial Order. Once adopted, the list will be submitted to the U.S. Environmental Protection Agency (EPA) as the state's Section 303(d) list for the basin.

Summary of Potentially Impaired Waters in the Suwannee Group 1 Basin

Impaired Waterbody Types

The Suwannee Group 1 Basin contains 530 individual waterbody segments that have defined areas of drainage associated with them. Each segment is classified based on its waterbody type: blackwater, estuary, lake, spring, or stream. The following summarizes potential water quality impairment by waterbody type, for waters with sufficient data under the impaired waters rule:

- Of 19 waterbody segments classified as blackwater, 17 had sufficient water quality data to be assessed. Of the 17, 11 were placed on the planning list of potentially impaired waterbodies—10 listed for dissolved oxygen (DO) and 1 for mercury fish consumption advisory.
- Of 11 waterbody segments classified as estuaries, 4 had sufficient water quality data to be assessed. One was placed on the planning list for nutrients.
- Of 43 lakes in the basin, only 11 had sufficient water quality data to be assessed. Seven of these were placed on the planning list—3 listed for nutrients and DO, 3 listed for just nutrients, and 1 listed for DO and mercury fish consumption advisory.
- Of 40 waterbody segments classified as springs, 26 had sufficient water quality data to be assessed. Of these, 25 were placed on the planning list—23 listed for DO, 1 listed for DO and mercury fish consumption advisory, and 2 listed for DO and nutrients.
- Of 417 waterbody segments classified as streams, 82 had sufficient water quality data to be assessed. Of the 82, 43 were placed on the planning list—22 listed for DO; 5 listed for DO and mercury fish consumption advisory; 3 listed for biology; 3 listed for DO and biology; 3 listed for DO and TC; 2 listed for TC; 1 listed for DO and FC; 1 listed for fish and total coliform; 1 listed for DO, TC, and FC; 1 listed for DO, biology, and nutrients; and 1 listed for fish consumption advisory. In addition, 6 segments were included on the planning list for nutrients based on the presence of algal mats.

In summary, of the 530 waterbody segments, only 140 had sufficient water quality data to be assessed. Of these, 87 were placed on the planning list of potentially impaired waterbodies.

Impairments by Parameters of Concern

Nutrients

Based on the criteria in the impaired waters rule, 7 lakes (Cherry, Alligator, Crosby, Rowell, Sampson, Santa Fe, and Hampton), 1 stream segment in Swift Creek, several segments of the Santa Fe River, the Middle and Lower Suwannee Rivers, and its estuary are potentially impaired because of excess nutrient concentrations.

Water Quality Standard Exceedances

Seventy-five waterbody segments in the basin were potentially impaired because they had DO concentrations less than the 5 milligrams per liter (mg/L) standard. This included 10 blackwaters, 4 lakes, 25 springs, and 36 stream segments. However, it should be noted that blackwater and spring discharges are naturally low in DO. A DO of less than 5 mg/L does not necessarily represent actual impairment.

Eight waterbody segments were potentially impaired because they had total coliform or fecal coliform counts in excess of standards. The standard for total coliform is 2,400 per 100 milliliters (mL), and for fecal coliform, 800 per 100 mL. Seven streams and 1 blackwater segment were identified.

Metals

One stream segment on the Steinhatchee River was potentially impaired because of a metals violation for iron.

Biology

Ten waterbody segments in the basin were potentially impaired for biology. Nine of these are classified as stream segments. They include portions of the Alapaha River, Swift Creek, Econfinia River, Fenholloway River, Weaver Warrior Creek, Spring Warrior Creek, Bevins (Boggy) Creek, Fishbone Creek, and Airport Canal. A portion of the Upper Suwannee River, a blackwater, was also potentially impaired for biology.

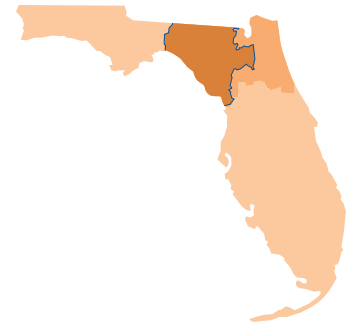




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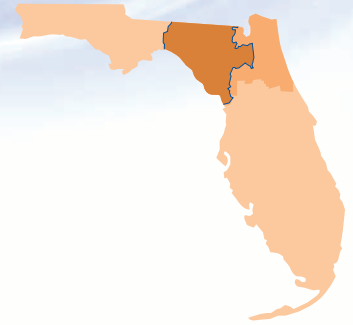
Chapter 1: Florida's Watershed Management Approach and the Suwannee Basin Status Report

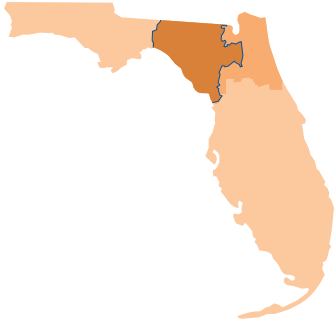
Chapter Summary

The Status Report identifies the Suwannee Basin's potential water quality impairments and water quality monitoring needs, and summarizes existing plans and projects for restoring and protecting water quality. An assessment report to be published in 18 months will include the collection of additional monitoring information.

This preliminary report, addressed to a broad audience of potential stakeholders in the basin, initiates the watershed management cycle in the Suwannee Basin as part of the statewide, watershed-based approach to water resource management that has been developed by the Florida Department of Environmental Protection (Department). Under the watershed management approach, Florida's water resources are managed on the basis of natural boundaries such as river basins, rather than political or regulatory boundaries. The approach is implemented by means of a cyclical management process in which diverse stakeholders in each of the state's river basins work cooperatively to identify and solve water resource problems.

This introductory chapter describes the purpose and content of the report and explains the watershed management approach. It then details how the approach will be used to establish a process for identifying impaired waters in the Suwannee Basin and for limiting pollution in those waters through the adoption of total maximum daily loads (TMDLs). The process provides a framework for implementing the requirements of the 1999 Florida Watershed Restoration Act and Section 303(d) of the federal Clean Water Act.





Total Maximum Daily Load

The maximum amount of a given pollutant that a waterbody can assimilate without exceeding applicable water quality standards.

Purposes and Content of the Report

This Status Report provides a preliminary identification of the Suwannee Basin's water quality impairments in order to assess water quality monitoring needs and summarize existing water quality restoration and preservation plans and projects. The report is addressed to a broad audience of potential stakeholders, including decision makers from federal, state, regional, tribal, and local governments; public and private interests; and individual citizens.

The report is the first of several steps to be taken in this basin to implement the Department's statewide, watershed management approach for restoring and protecting water quality and addressing **total maximum daily load** (TMDL) requirements. In approximately 18 months, the Department will release an assessment report that will include additional data, a more complete evaluation of surface water and ground water quality and biological resources, and a list of waterbodies that will be included on the verified list of impaired waters to be adopted by the Department. During this intervening period, Department staff will work cooperatively with local government and stakeholders to collect additional information and to identify water quality restoration and protection needs. This work will supplement existing programs to improve water quality and protect and restore ecological resources.

Chapter 2 characterizes the basin's hydrologic, ecological, and socio-economic setting as well as historical, current, and proposed watershed management activities and processes. Chapter 3 presents assessment results for surface water and ground water quality, as well as an evaluation of ecological resources. For surface water, it includes an analysis of major water quality parameters, water quality issues by planning unit, and trends in water quality and pollutant loadings. For ground water, the chapter describes the water quality status of confined and unconfined resources. For ecological resources, it summarizes ecological protection priorities and major ecological indicators potentially related to water quality problems in the basin. Chapter 4 contains a planning list of potentially impaired waterbodies for which additional data and information will be gathered. It also describes the relationship between the planning list and subsequent verified and Section 303(d) lists and provides a list of waters proposed for delisting.

The Watershed Management Approach, Total Maximum Daily Loads, and Florida Watershed Restoration Act

This report supports the first phase of the Department's watershed management approach. Under this approach, water resources are managed on the basis of natural boundaries, such as river basins, rather than political or regulatory boundaries; emphasis is placed on public involvement in decision making. Instead of focusing only on individual sources of pollution, water resources are assessed from a basinwide perspective that considers the cumulative effects of human activities. The approach is not new, nor does it compete with or replace existing programs. Rather than relying on

single solutions to address aquatic resource issues, it is intended to improve the health of surface water and ground water resources by strengthening coordination among such activities as monitoring, stormwater management, wastewater treatment, wetland restoration, land acquisition, and public involvement.

The watershed management approach is the framework for implementing TMDLs as required by Section 303(d) of the federal Clean Water Act and the Florida Watershed Restoration Act (see **Noteworthy** on pages 25–26). TMDLs must be developed for all waters not meeting applicable water quality standards and are thus defined as “impaired waters.”

TMDLs will be developed, and the corresponding load reductions allocated, as part of the Department’s watershed management approach, which rotates through the state’s 52 basins over a five-year cycle (see **Figure 1.1**). Extensive public participation will be crucial throughout the cycle’s five phases that follow.

- **Phase 1: Watershed Evaluation.** The Department will conduct preliminary evaluations of the status of the quality of surface water and ground water. This information will be used to generate a planning list of potentially impaired waters for which TMDLs may be needed. At the end of Phase 1, a Basin Status Report, identical to this report, will be produced and a strategic monitoring plan will be developed.
- **Phase 2: Strategic Monitoring.** Monitoring will be conducted to help verify whether waters are, in fact, impaired and to collect the data needed to calibrate and verify models for TMDL development. At the end of the second phase, an Assessment Report will be produced. This report will contain an updated and more thorough assessment of water quality, a citation of associated biological resources, and current restoration plans and projects. Waters that are verified as being impaired will be placed on a basin-specific list of impaired waters that will be adopted by the Department through a Secretarial Order. This verified list will be submitted to the U.S. Environmental Protection Agency as the state’s Section 303(d) list of impaired waters for the basin.
- **Phase 3: Developing and Adopting TMDLs.** TMDLs for priority impaired waters in the watershed will be developed and adopted by rule. Because TMDLs cannot be developed for all listed waters during a single watershed management cycle, due to fiscal and technical limitations, waterbodies will be prioritized according to the criteria in the Identification of Impaired Surface Waters Rule, Section 62-303, Florida Administrative Code.
- **Phase 4: Developing Watershed Management Plans.** A watershed management plan, including TMDL implementation plans specifying how pollutant loadings from point and nonpoint sources of pollu-



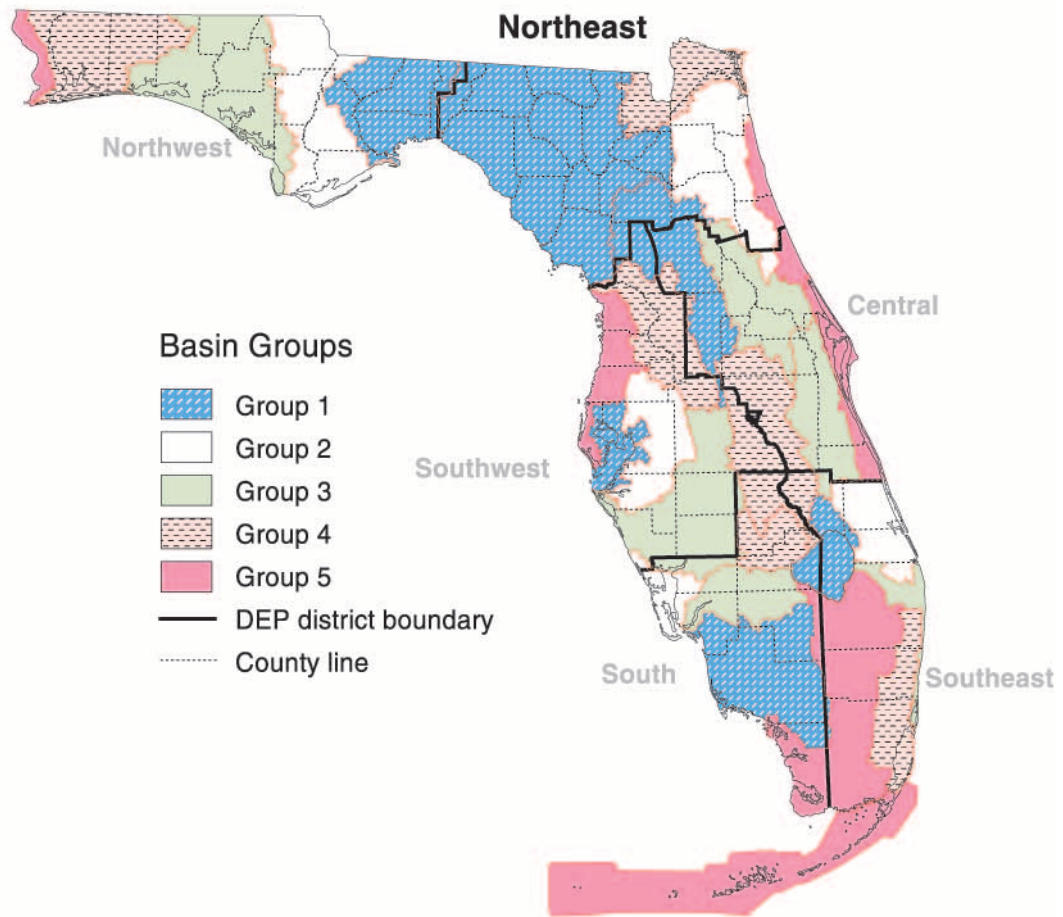


Figure 1.1: The Watershed Management Schedule for the State's Basins

tion will be allocated and reduced, will be developed. The plans will include regulatory and nonregulatory (i.e., voluntary), structural and nonstructural improvements. The involvement of affected stakeholders in this phase will be especially critical.

- **Phase 5: Implementing Watershed Management Plans.** Implementation of the activities specified in the watershed management plan will begin.

The watershed management approach is an iterative process. One of its key components is that the effectiveness of management activities (TMDL implementation) will be monitored in successive cycles. Monitoring conducted in Phase 2 of subsequent cycles will be targeted at evaluating whether water quality objectives are being met and whether individual waters are no longer impaired. The Department also will track the implementation of scheduled restoration activities, whether required or voluntary, to ensure continued progress towards meeting the TMDLs.

This approach is intended to protect and enhance the ecological structure, function, and integrity of Florida's watersheds by promoting the management of entire natural systems and addressing the cumulative effects of

human activities on a watershed basis. The approach provides a framework for setting priorities and focusing the Department's resources on protecting and restoring water quality, and aims to increase cooperation among state, regional, local, and federal interests. By emphasizing public involvement, the approach encourages stewardship by all Floridians to preserve water resources for future generations.

The watershed approach is intended to speed up projects by focusing funding and other resources on priority water quality problems, strengthening public support, establishing agreements, and funding multiagency projects. It avoids duplication by building on existing assessments and restoration activities and promotes cooperative monitoring programs. It also encourages accountability for achieving water quality improvements through improved monitoring and establishing TMDLs.

The Watershed Management Cycle in the Florida Department of Environmental Protection's Northeast District

Figure 1.2 shows the order in which the watershed management cycle will be implemented in the Department's Northeast District basin groups. The basin groups were developed from the U.S. Geological Survey's hydrologic unit codes (see **Noteworthy** on pages 25–26). The Suwannee Basin, which is the Group 1 basin and the first to be assessed, is the subject of this Status Report. The lower portion of the Lower St. Johns River is the Group 2 basin, to be assessed beginning in 2001. The Group 3 basin, the upper portion of the Lower St. Johns River, will be assessed in 2002. The Group 4 basin, the Nassau–St. Mary's River, will be assessed in 2003, and the Group 5 basin, East Coast Indian River, will be assessed in 2004. In 2005, the cycle will begin again for the Group 1 basin, Suwannee.

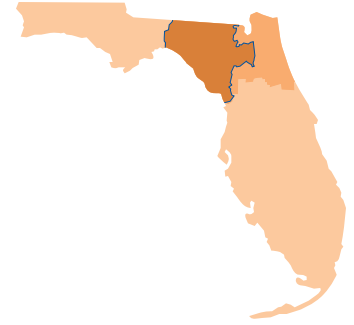




Figure 1.2: Schedule for Implementing the Watershed Management Cycle in the Department's Northeast District, Basin Groups 1 through 5

The Watershed Classification System

All watersheds in the United States are classified and organized on the basis of a nationwide system developed by the United States Geological Survey (USGS). The USGS delineates watersheds based on surface hydrologic features. This system divides the country into a hierarchy of 21 regions, 222 subregions, 352 accounting units, and 2,149 cataloging units. An eight-digit hydrologic unit code (HUC) consisting of two digits for each level in the hydrologic unit system is used to identify major river basins. In the Florida Department of Environmental Protection's Northeast District, the USGS has identified 8 HUCs that collectively comprise the Suwannee Group 1 Basin—Aucilla (03110103), Econfina-Steinhatchee (03110102), Alapaha (03110202), Withlacoochee (03110203), Upper Suwannee (03110201), Lower Suwannee (03110205), Santa Fe (03110206), and Waccasassa (03110101).

Summary Of Clean Water Act Requirements Related to the TMDL Program

Congress enacted the Clean Water Act in 1972 with the goal of restoring and maintaining the "chemical, physical, and biological integrity of the nation's waters"—33 U.S.C. § 1251(a). The ultimate goal of the act is to eliminate the "discharge of [all] pollutants into navigable waters"—33 U.S.C. § 1251(a)(1). The TMDL program is an important step towards cleaning up our rivers. The Clean Water Act sets out the federal requirements that Florida must follow in implementing its TMDL program under the Florida Watershed Restoration Act. The Clean Water Act and the federal TMDL program include the following provisions:

- Requires states to establish water quality standards that will protect the public health and welfare—33 U.S.C. § 1313(c)(2).
- Requires states to identify waters that do not meet applicable water quality standards (Water Quality Limited Segments, or WQLSs) and identify the pollutants causing the water quality threats—33 U.S.C. § 1313(d)(1)(A–B).
- Requires the states to establish for each WQLS the TMDL for each pollutant that can be introduced into that waterbody without violating water quality standards—33 U.S.C. § 1313(d)(1)(C).

- Requires that each TMDL be established "at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality"—33 U.S.C. § 1313(d)(1)(C).
- Requires states to update their 303(d) list of impaired waters (WQLSs) every two years or else the U.S. Environmental Protection Agency (EPA) will be required to develop a complete WQLS list and/or TMDLs for the impaired waters on behalf of the state—33 U.S.C. § 1313(d)(2).
- Requires EPA approval or disapproval within 30 days, once the WQLS list and TMDLs are submitted. If approved, the list and TMDLs are to be incorporated into the state's water quality management plan—33 U.S.C. § 1313(d)(2).

The Florida Watershed Restoration Act

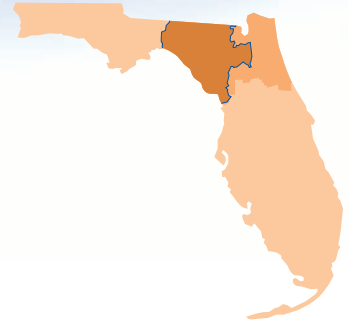
In recognition of the important role that TMDLs play in restoring state waters, the 1999 Florida Legislature enacted the Florida Watershed Restoration Act. In addition to clarifying the Department's statutory authority to establish TMDLs, the act established a process for identifying and listing impaired waters and for developing TMDLs and the associated watershed management plans needed to allocate and achieve the needed pollutant load reductions. The legislation contains the following provisions:

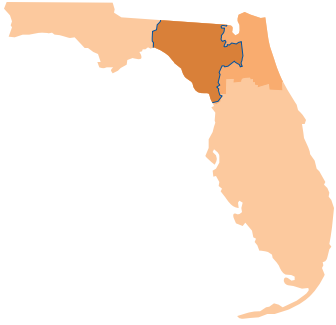
- Establishes that the 303(d) list submitted to the EPA in 1998 is for planning purposes only.
- Requires the Department to adopt 303(d) listing criteria (that is, the methodology used to define impaired waters) by rule.
- Requires the Department to verify impairment and then establish basin-specific verified lists. The Department must also evaluate whether proposed pollution control programs are sufficient to meet water quality standards, list the specific pollutant(s) and concentration(s) causing impairment, and adopt the basin-specific 303(d) list by Secretarial Order.
- Requires the Department's Secretary to adopt TMDL allocations by rule. The legislation requires the Department to establish "reasonable and equitable" allocations of TMDLs, but does not mandate how allocations will be made among individual sources.
- Requires that TMDL allocations consider existing treatment levels and management practices; the differing impacts that pollutant sources may have; the availability of treatment technologies, best management practices (BMPs), or other pollutant reduction measures; the feasibility, costs, and benefits of achieving the allocation; reasonable time frames for implementation; the potential applicability of moderating provisions; and the extent that nonattainment is caused by pollution from outside Florida, discharges that have ceased, or alteration to a waterbody.
- Required a report to the legislature by February 2001 addressing the allocation process.
- Authorizes the Department to develop basin plans to implement TMDLs, coordinating with the water management districts, the Florida Department of Agriculture and Consumer Services, the Soil and Water Conservation Districts, regulated parties, and environmental groups in assessing waterbodies for impairment, collecting data for TMDLs, developing TMDLs, and conducting at least one public meeting in the watershed. Implementation is voluntary if not covered by regulatory programs.
- Authorizes the Department and the Florida Department of Agriculture and Consumer Services to develop interim measures and BMPs to address nonpoint sources. While BMPs would be adopted by rule, they will be voluntary if not covered by regulatory programs. If they are adopted by rule and the Department verifies their effectiveness, then implementation will provide a presumption of compliance with water quality standards.
- Directs the Department to document the effectiveness of the combined regulatory/voluntary approach and report to the legislature by January 1, 2005. The report will include participation rates and recommendations for statutory changes.

Chapter 2: Basin Overview

Chapter Summary

Water quality issues cannot be understood without a general understanding of the entire Suwannee Group 1 Basin. This chapter characterizes the basin's hydrologic setting—including climate, physiography, and surface water and ground water resources—as well as its ecological and socioeconomic setting. The chapter also summarizes historical, current, and proposed watershed management issues and activities in the basin.





Sources of Information

A substantial portion of the information in this chapter has been adapted from the Suwannee River Water Management District's Surface Water Improvement and Management (SWIM) Plans for the Suwannee River, Aucilla River, Coastal Rivers, Santa Fe River, Waccasassa River and Alligator Lake, the Suwannee River Water Management District Web site, and the Water Resource Atlas of Florida. The References section lists all the sources used in creating this report.

Basin Setting

The Suwannee Group 1 Basin covers 7,702 square miles in north central Florida within all or part of 14 counties (see **Figure 2.1**). Portions of the basin in several watersheds also extend into southern Georgia. The basin area discussed in this report encompasses most, but not all, of the area within the Suwannee River Water Management District (SRWMD). The Suwannee Group 1 Basin includes the watersheds of the following river basins, as identified by their eight-digit hydrologic unit code—Aucilla, Econfina-Steinhatchee, Alapaha, Withlacoochee, Upper Suwannee, Lower Suwannee, Santa Fe, and Waccasassa. This area is one of the least populated areas in the state of Florida, helping to keep the region's natural resources healthy. The basin contains a rich assortment of surface waters—rivers and streams, springs, cypress ponds, swamps, and estuaries. A major feature of the basin is its many protected natural areas, which include 3 national wildlife refuges, 10 state parks or preserves, other public lands, and the Big Bend Seagrasses Aquatic Preserve. This report will focus solely on the Florida portion of the basin.



Figure 2.1: Geopolitical Map of the Department's Northeast District

Clastic

Fragments of rock or other organic material that have been individually moved from their place of origin.

Escarpment

A steep face abruptly terminating high lands.

Hydrologic Setting

Physiography

The SRWMD contains two major physiographic regions, the Northern Highlands and the Gulf Coastal Lowlands (**Figure 2.2**). The Northern Highlands consist of a topographically high set of Miocene age **clastic** sediments that are interfingered with carbonates. In the western portion of the highlands are the Tallahassee Hills. This subdivision of the Northern Highlands is characterized by red clay hills. In the highlands in the eastern portion of the District, the rolling topography is generally absent.

Separating the Northern Highlands and the Gulf Coastal Lowlands is the Cody Scarp. This **escarpment** is the most prominent topographic feature in the state. It can be traced throughout the District and extends westward to Pensacola.

The lowlands consist of a flat veneer of Pleistocene age sand that directly overlies a thick sequence of Oligocene and Eocene age carbonate rocks. Much of the lowlands make up a karst plain where sinkholes form and natural limestone springs occur (see **Figure 2.3**). Although the highlands contain some springs, most of the basin's more than 250 springs are in the lowlands. Springs are especially abundant along the Suwannee River where the river has cut into the upper portion of the limestone bedrock. Occasionally, paleo-sand dune ridges are found within the lowlands. The two major ones are the Brooksville Ridge and the Bell Ridge (**Figure 2.2**). Marshes and swamps are typically found along the Gulf Coast.



Figure 2.2: Major Physiographic Regions within the Suwannee River Water Management District

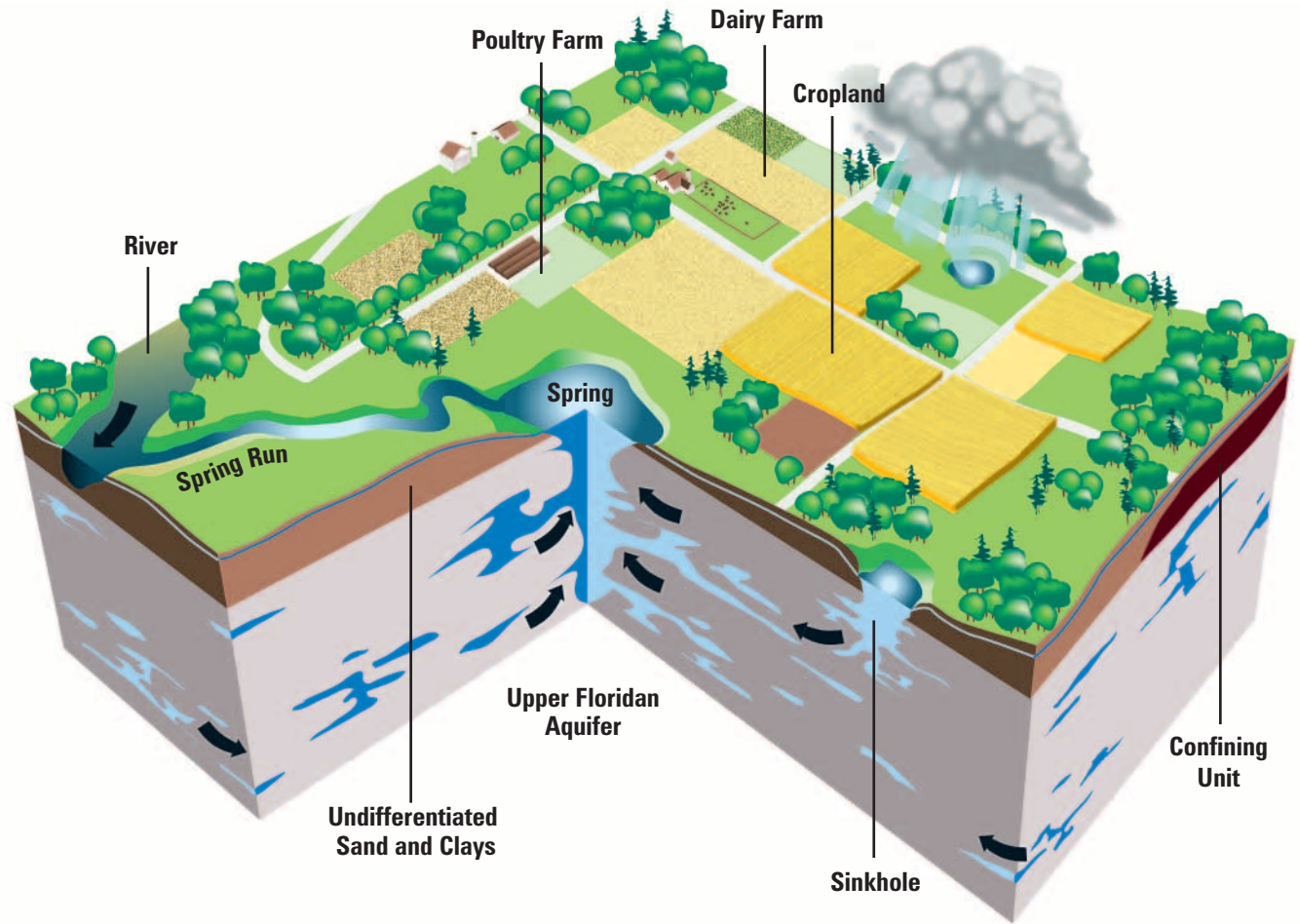


Figure 2.3: General Cross-Section and Surface Features (modified from Katz et al., 1999)

Surface Water Resources

The Suwannee Group 1 Basin contains abundant surface water resources, including nine rivers, hundreds of springs, lakes, and extensive wetlands and estuaries (see **Figure 2.4**).

The Suwannee River and its tributaries—the Alapaha, Withlacoochee, and Santa Fe Rivers—drain approximately half of the land area in the basin and an equally large area in Georgia. The other five river systems—the Aucilla, Econfina, Fenholloway, Steinhatchee, and Waccasassa—drain the rest of the Group 1 basin, except for some coastal areas that drain directly to the Gulf of Mexico via a network of tidal and nontidal creeks.

This region has the highest density of springs of anywhere in the world with 250 springs currently cataloged by SRWMD personnel. The combined discharge of all of the springs is more than 7,200 ft.³/sec. or more than 4.65 billion gallons/day. The Suwannee and the Santa Fe (includes the Ichetucknee River Basin) River basins contain the bulk of the springs as well as the largest amount of ground water discharge. Besides supplementing flow to the rivers, lakes, and wetlands of the district, the springs are internationally famous recreational sites for swimming, snorkeling, and cave

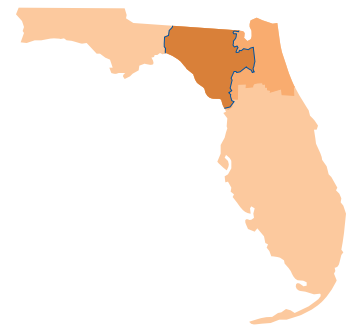




Figure 2.4: Basin Hydrography, Including Water Use Classifications, Outstanding Florida Waters, and Springs

diving. The area is considered the “Cave Diving Capital of the World” by the underwater explorers of cave and caverns. The Ichetucknee Springs Group, Peacock Springs, Troy Spring, Ginnie Springs, Fanning Springs, and Manatee Spring are some of the more well-known springs.

Lakes are scattered throughout the district; however, relative to other areas of the state, there are fewer lakes in this region. The lakes occur as either **perched** systems or as depressions that extend below the surface of the aquifer, i.e., water table lakes.

Extensive wetlands occur in all quadrants of the district. As with the lakes, some of the wetlands are perched on less permeable soils while others occur because the surface of the water table is at or very near the land surface. During wet weather, these wetland areas become vast, very shallow waterbodies.

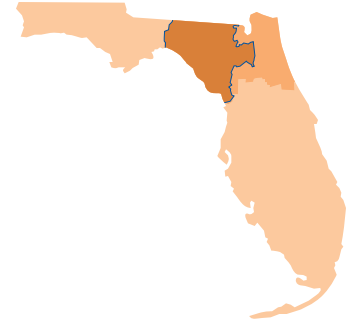
The Gulf of Mexico is the southwestern boundary for the district. Due to the flat topography of the area, the entire shoreline is one large estuarine complex composed of river and tidal systems. Extensive seagrass beds extend from these estuaries for miles into the open gulf. These estuaries and seagrass beds provide important nursery areas for sea life and are one of the largest expanses of healthy, relatively undisturbed coastlines in the entire state.

Rivers

Suwannee River

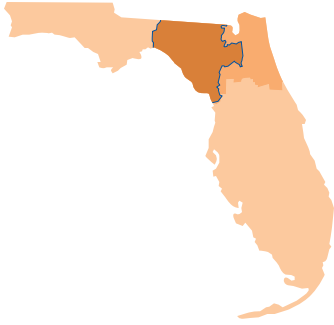
The Suwannee River Basin drains approximately 10,000 square miles of south Georgia and north Florida, discharging an annual average of approximately 10,000 cubic feet per second. The Suwannee River is the second largest river in the state in terms of flow. Within the Suwannee Basin, the Alapaha, Withlacoochee, and Upper Suwannee watersheds lie almost entirely in Georgia. These are dominated by surface water runoff, as are the Florida portions of the basin in the Northern Highlands region. After crossing the Cody Scarp, ground water discharge from springs and diffuse seepage strongly influences the Suwannee River and makes up the baseflow of the river.

Most of the streams in the Upper Suwannee and Santa Fe watersheds are blackwater. With their low dissolved oxygen (DO) concentrations and acidic, highly colored water, these streams are less biologically productive than downstream stretches of the river. In the lower third of the basin, surface waterbodies are relatively absent because recharge flows directly to the aquifer through karst features. Along the coast, there are extensive tidal salt marshes, with hardwood swamps lying at slightly higher elevations just inland. Although the coastline has no barrier islands, much of this stretch is estuarine in nature, due to the low-energy wave action, shallow water, and freshwater inflows. Seagrass beds are healthy and abundant, except at the mouths of the rivers where seagrasses are sparse or absent due to the dark color of the river discharges that limit light in the area.



Perched

A system above the water table.



Spring-fed Rivers and Streams

Spring-fed rivers and streams, found throughout the Suwannee Basin, are fed primarily by Floridan aquifer springs. Typically, their channels follow fracture patterns in the limestone, and may disappear back underground. The water is clear and similar to ground water in chemical composition, with a neutral pH because it is highly buffered by the limestone. In areas near spring vents, dissolved oxygen levels may be low because of ground water contributions.

Alapaha and Withlacoochee Rivers

The Alapaha River drains an area of approximately 1,800 square miles in Georgia and Florida and joins the Suwannee southwest of Jasper, Florida. The Alapaha River flows through karst terrain with numerous sinkholes, stream sinks, and springs. At times, sinkholes in the streambed capture the river's entire flow. Once underground, the river flows through solution channels in the limestone for approximately 19 miles and is presumed to emerge at two springs: Alapaha Rise and Holton Creek. The Withlacoochee River, which drains an area of approximately 1,500 square miles in Georgia and Florida, originates near Tifton, Georgia, and flows south past Valdosta, Georgia, to join the Suwannee River at Ellaville. The flow in the Withlacoochee River is highly variable, reflecting the river's response to rainfall in the watershed. The river is affected by wastewater treatment plant discharges in Tifton and Valdosta and pulp mill discharge in Jumping Gully Creek at the state line.

Santa Fe River

The Santa Fe River, a tributary to the Suwannee River, is in some respects a smaller version of the Suwannee. This river system drains about 1,400 square miles of north Florida, discharging an annual average of more than 1,600 cubic feet per second. The Santa Fe River flows west from its headwaters in the Santa Fe Lakes area, in the easternmost portion of the watershed, joining the Suwannee near Branford. Its two important tributaries, New River and Olustee Creek, have their headwaters in southern Baker County. A third tributary, the Ichetucknee River, is a clear, spring-fed stream and a very popular recreational site.

The Upper Santa Fe watershed, in the Northern Highlands, is dominated by surface water runoff. At the Cody Scarp, the river goes underground and reemerges supplemented by ground water flow. As the Santa Fe flows across the Gulf Coastal Lowlands, it gains significant flow from numerous springs, including the Ichetucknee River. Because ground water dominates its flow, the lower Santa Fe is for the most part a spring-fed river.

The eastern two-thirds of the Santa Fe watershed has surface drainage features, including lakes, streams, and wetlands. The western third lacks surface drainage, except for the Santa Fe and Ichetucknee Rivers and Cow Creek. The upper watershed is characterized by nearly level pine flatwoods with gently rolling hills. Tributary streams are fairly well incised into the landscape, which occasionally opens into broad forested floodplains. In the middle portion of the watershed, moderate to gently rolling hills with areas of prominent karstic features, such as sink depressions and captured streams, create surface relief. The lower watershed is primarily a broad, slightly undulating karst plain with interspersed wetlands.

Waccasassa River

The Waccasassa River and its small tributary system form the major drainage system in a 936-square-mile area along the Big Bend Coast in Levy, Gilchrist, and Alachua Counties, discharging an annual average of 293 cubic feet per second to the Gulf of Mexico. The Waccasassa begins as a poorly defined watercourse connecting swamps and ponds along the border of Gilchrist and Levy Counties. Moving southward through Levy County, the river is augmented by discharge from Blue and Wekiva Springs, which help maintain flow during the drier times of the year. The upper reaches of the river and its tributaries are tannin stained and acidic—typical of swamp drainage. Ground water input from springs and seepage buffer the acidic swamp water in the middle reaches, creating many different ecological communities in and around the river. The lower reaches are tidally influenced and estuarine, with salinity levels increasing farther into the bay. Because the upper half of the watershed drains to the Floridan aquifer system and the lower half is surface drained, the interaction of surface water and ground water plays a large role in defining the ecology and health of aquatic resources throughout the watershed.

Aucilla and Wacissa Rivers

The Aucilla River, the westernmost river system in the basin, drains approximately 850 square miles in south Georgia and north Florida (about 731 square miles in Florida), discharging an annual average of more than 550 cubic feet per second to the Gulf. The spring-fed Wacissa River, its primary tributary, joins the Aucilla in the lower coastal plain. The two rivers exhibit quite different characteristics. The Aucilla is a blackwater river, except during periods of drought when it becomes clear from ground water baseflow. The Wacissa, which is entirely spring fed, has clear water. Near the coast, the Aucilla goes underground and can be viewed in a series of sinkholes before it reemerges in the vicinity of Nutall Rise. The Wacissa enters the Aucilla at two places—at Half Mile Rise and just above Highway 98.

Coastal Rivers

Southeast of the Aucilla watershed lies the Coastal Rivers watershed, a generally poorly drained region in Taylor, Dixie, and Lafayette Counties with numerous lakes, ponds, swamps, and creeks. The Econfinia, Fenholloway, and Steinhatchee Rivers provide the principal drainage from this area to the Gulf of Mexico.

The Econfinia, a blackwater river, drains about 250 square miles in the southwest portion of the Suwannee Group 1 Basin, discharging an annual average of approximately 80 cubic feet per second. Because of its proximity to the coast, the Econfinia is referred to as a coastal river. It drains a portion of a wetland called San Pedro Bay in the Gulf Coastal Lowlands. Like the Aucilla, during periods of drought, the Econfinia receives ground water baseflow, thus becoming clear.



Blackwater Rivers

Originating in acidic swamps and flatwoods, blackwater rivers are named for their dark brown waters, which are stained by tannic and humic acids and are highly acidic (low pH) from decaying plant materials. These rivers are typically slow and meandering and exist as their own distinctive ecosystem, characterized by low biological diversity.



The Fenholloway River drains about 300 square miles adjacent to the Econfinia River, discharging an annual average of about 250 cubic feet per second. Like the Econfinia, the Fenholloway is a coastal river whose headwaters begin in San Pedro Bay. Historically, the Fenholloway was a spring-fed river with additional inputs from San Pedro Bay Swamp. The upper portion of the river is a small, winding, blackwater stream with little or no flow during dry periods due to the extensive drainage of the wetlands. The lower portion receives spring discharge as well as treated effluent from the pulp mill at Foley (Buckeye Cellulose) and the Perry Wastewater Treatment Plant. At times, the river's entire flow at the discharge point is effluent from the mill.

The Steinhatchee River drains approximately 560 square miles of the Suwannee Basin near the coast and discharges an annual average of about 300 cubic feet per second. This coastal river derives its flow from wetlands. During droughts, it receives ground water baseflow, becoming clear. Like the Aucilla River, the Steinhatchee goes underground above U.S. 98 and reemerges below U.S. 98.

Springs

The Suwannee Basin has the highest density of springs in the world, with 253 springs currently cataloged by SWRMD staff (see **Figure 2.4**). In the Suwannee River system alone, 197 springs have been located and identified. In the remainder of the basin, 56 springs have been located and identified in the Aucilla/Wacissa, Econfinia, Fenholloway, Steinhatchee, and Waccasassa watersheds or in areas of coastal drainage. An accurate survey and count of all the springs would be difficult, since some are in the streambeds and visible only during very low flows. Twenty-one first magnitude springs (with discharges greater than one hundred cubic feet per second) are located in the basin. The combined discharge of all of the springs is more than 7,200 cubic feet per second, or more than 4.65 billion gallons a day. The Suwannee and the Santa Fe River Basins contain the bulk of the springs as well as the largest amount of ground water discharge.

Lakes

Although lakes are scattered throughout the Suwannee Basin, the region contains fewer lakes than other areas of the state. **Figure 2.1** shows the basin's larger lakes. Lake types range from landlocked to those with streams running in and out of them. Most are shallow and small in surface area, although a few are large, such as the Santa Fe Lakes (5,856 acres) and Lake Sampson (2,042 acres). Madison County has the most lakes and ponds in the region, although most are small, shallow, and ephemeral. Numerous small lakes and ponds are present in the Waccasassa Flats area and to the west of the Suwannee River in Lafayette and Dixie Counties.

The basin's lakes occur either as perched systems underlain by less permeable soils and rock, or as depressions that extend below the surface of the surficial and upper Floridan aquifers, i.e., water table lakes. Lakes in the Northern Highlands—such as Santa Fe, Hampton, Butler, and Sampala—are generally perched lakes maintained by runoff and seepage from the surficial or intermediate aquifers. Lakes in the Gulf Coastal

Lowlands—such as Waters, Governor Hill, Pickett, and Andrews—generally occur where water has dissolved the limestone, creating depressions that are lower than the **potentiometric surface** of the surficial or upper Floridan aquifers.

Alligator Lake, in Columbia County, is an important habitat for fish and wildlife as well as a resource for the residents of Lake City and Columbia County. The lake periodically drains to the Floridan aquifer system through a series of sinkholes.

Wetlands

Wetlands comprise approximately 19 percent of the basin's land area, and extensive wetlands are found in all quadrants of the basin. Like the basin's lakes, some of its wetlands are perched, while others occur because the surface of the water table is at or near the land surface. During wet weather, these wetlands become vast, shallow waterbodies.

In the northeastern portion of the basin, the large Okefenokee–Pinhook Swamp occurs on the less permeable soils of the Northern Highlands. South and west of the Suwannee River are several large wetlands, including San Pedro Bay, Everett Pond, and Mallory Swamp. Hixtown Swamp, a mixture of marsh grasses and cypress domes in Madison County, is one of the largest remaining transitional cypress/marsh wetlands in the Southeast. It includes northern wetland species and more tropical species found farther south. Waccasassa Flats—a large complex of flatwoods, lakes, ponds, and sandhill communities—covers portions of Gilchrist and Levy Counties. Santa Fe Swamp, to the east, is a large, densely forested wetland at the headwaters of the Santa Fe River. Along the coast, the upper Floridan aquifer intersects the land surface, resulting in diffuse discharge over broad areas that generally contain very wet hardwood and sabal palm hammocks interspersed with pine flatwoods. Representative wetlands in this area include California, Pumpkin, and Tide Swamps. Wetland areas in the basin are shown in **Figures 1.2 and 3.1**.

Estuaries/Seagrass Beds

The Gulf of Mexico lies along the southwestern edge of the basin. Because of the region's flat topography, the entire low-energy shoreline is one large estuarine complex composed of river and tidal systems. Extensive seagrass beds extend from these estuaries for miles into the open Gulf. The estuaries and seagrass beds provide important nursery areas for sea life and are one of the largest expanses of healthy, relatively undisturbed coastline in the state. The Big Bend Seagrasses Aquatic Preserve, the largest aquatic preserve in Florida, includes about 450,000 acres of seagrass beds and salt marsh that extends southward and eastward from the St. Marks River to the South Withlacoochee River (see **Figure 2.4**).

The Suwannee River estuary is a complex of diverse natural communities and a major nursery for commercially important fish and invertebrates. It is an important area for several rare and endangered species, including the manatee, bald eagle, and Gulf sturgeon.

Potentiometric Surface

The level in confined aquifers to which water will rise in a cased well.

Forested Wetlands in River Floodplains

Extensive areas of forested wetlands are found within the river floodplains of the Suwannee Group 1 Basin.

Approximately 35,000 acres of forested wetlands have been mapped in the Lower Suwannee River floodplain alone, the largest concentration of floodplain wetlands in the basin.

The other rivers have floodplain wetlands as well:

Aucilla/Wacissa–25,577 ac.; Santa Fe–16,452 ac.; Waccasassa–8,941 ac.; Steinhatchee–7,290 ac.; Econfinia–5,149 ac.; Middle and Upper Suwannee, Withlacoochee, Alapaha, and Fenholloway–forested wetlands are present but area not known.

Surface Water Quality Classifications and Special Designations

Florida’s water quality classification program, the foundation of Florida’s program of water quality management, designates the “present and future most beneficial uses” of the waters of the state (Chapter 403.061[10], Florida Statutes). Water quality standards set the regulatory limits that are intended to maintain these uses for surface water and ground water. Florida’s surface water is protected for five designated use classifications, as follows:

Class I	Potable water supplies
Class II	Shellfish propagation or harvesting
Class III	Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife
Class IV	Agricultural water supplies
Class V	Navigation, utility, and industrial use (there are no state waters currently in this category)

All of the Suwannee Basin’s waters are designated as Class III, except for most tidal creeks and coastal waters, which are Class II (see **Figure 2.4**). There are no Class I waters in the basin. Until 1997, the Fenholloway River was the only waterbody in the state designated as Class V. The river was redesignated as a Class III water in 1997. To meet Class III standards for salinity in the river, the Buckeye Cellulose pulp mill’s effluent will have to be modified, and the U.S. Environmental Protection Agency is currently working with the Department and Buckeye Cellulose to address this issue.

The Outstanding Florida Water (OFW) designation is given to waters that are “worthy of special protection due to their natural attributes” (Chapter 403.061, Florida Statutes). These waters are listed in Section 62-302.700, Florida Administrative Code (see **Figure 2.4**). The OFW designation affords the highest protection possible under state water quality rules by prohibiting the degradation of water quality from conditions existing at the time of designation from activities regulated by the Department. **Appendix A** lists OFWs in the Suwannee Basin. These include six state parks and an aquatic preserve.

Ground Water Resources

The basin contains three different aquifers: the Floridan system, the intermediate system and confining unit, and the surficial system. The Floridan system underlies the entire Suwannee Basin. The top of the upper Floridan ranges from more than 100 feet above sea level in Jefferson County to more than 300 feet below sea level in Bradford County (Scott, 1991). It ranges in thickness from approximately 100 to 2,200 feet. Where overlaid by the intermediate system, the Floridan contains water under confined conditions. Where the surficial aquifer directly overlies the Floridan, water in the Floridan is under semiconfined conditions. Where the Floridan is either at the land surface or only covered by a veneer of sand, its ground water is under unconfined or water table conditions (see **Figure 2.5**).

The intermediate aquifer system, which contains water under confined conditions, includes all rocks that lie between, and collectively retard the exchange of water between, the overlying surficial system and the underlying Floridan. The intermediate system is generally restricted to the Northern Highlands portion of the basin. The surficial aquifer system, which ranges from 10 to 60 feet in thickness, is a permeable hydrologic unit present in several areas of the basin.

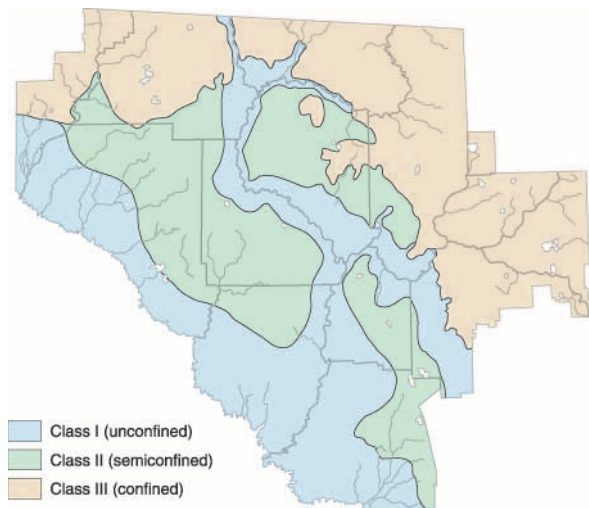


Figure 2.5: Floridan Aquifer Conditions within the Suwannee River Water Management District

The Floridan aquifer system is the major source of ground water supplies in the Suwannee Basin. Most aquifer recharge occurs in an area running from northwest to southeast throughout the central portion of the basin (see **Figure 2.6**). **Figure 2.7** illustrates how ground water travels perpendicular to the contours shown on the map, from areas of high ground water potential to areas of low potential. It shows that the basin's two major discharge regions are along the Suwannee River and along the coast (see also **Figure 2.6**). Most of the time, ground water discharges from the upper Floridan into the Suwannee River. In fact, during dry periods, the water in the river is supplied exclusively from ground water (baseflow). During wet periods when the river level is high, however, the river reverses flow of springs or ground water and actually recharges local ground water for a few miles on each side of the river corridor. These interactions between ground water and surface water can be significant.



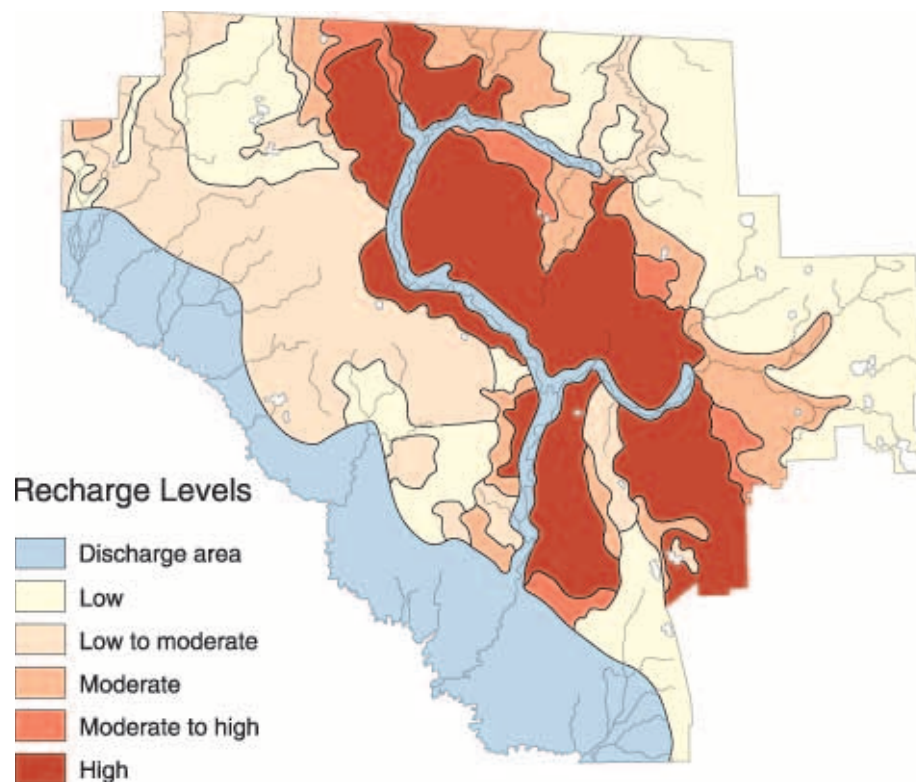


Figure 2.6: Recharge Potential of the Floridan Aquifer within the Suwannee River Water Management District

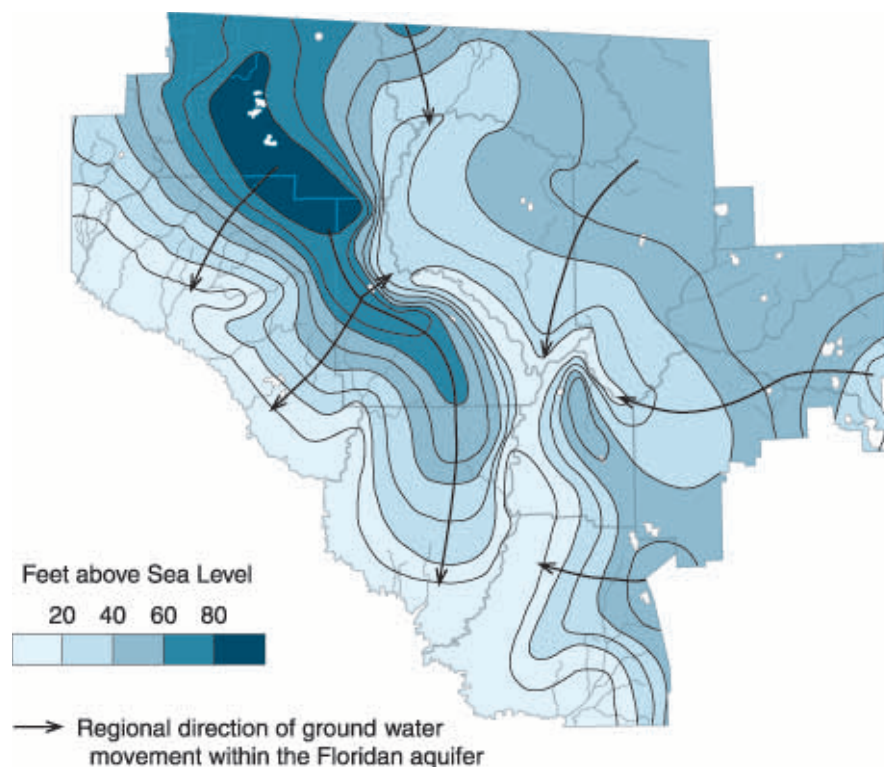


Figure 2.7: Potentiometric Surface of the Floridan Aquifer within the Suwannee River Water Management District, 1985

Ecological Setting

Ecoregions

The northern, upland parts of the Suwannee Basin lie in the Southeastern Plains ecoregion (**Figure 2.8**), which in its natural state contains mixed hardwood and pine forests growing on smooth to irregular plains, with well-drained loamy and sandy soils. Within this large ecoregion, the Suwannee Basin lies in the Tifton Upland/Tallahassee Hills subecoregion. The Southern Coastal Plain ecoregion contains the southern part of the Suwannee Basin. It mainly comprises flat plains that are often covered with standing water; mixed forests of beech, sweetgum, magnolia, pine, and oak; and southern floodplain forests of oak, tupelo, and bald cypress. It also contains highlands with many lakes. Within the large Southern Coastal Plain, the Suwannee Basin encompasses five subecoregions: the Gulf Coastal Flatwoods, Central Florida Ridges and Uplands, Eastern Florida Flatwoods, Sea Island Flatwoods, and Okefenokee Swamps and Plains.

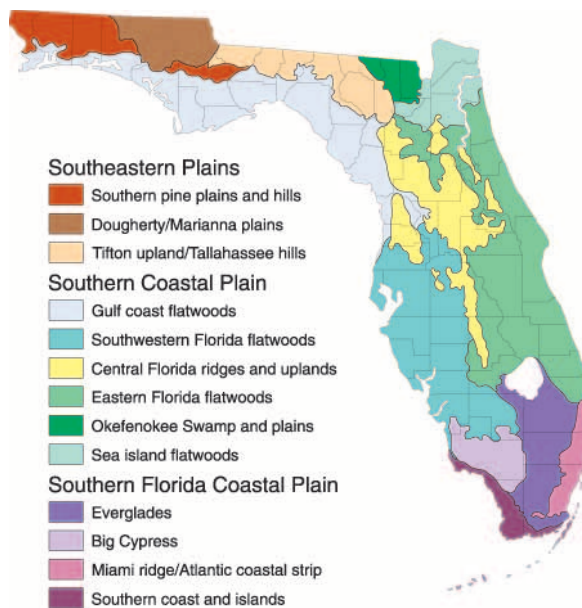
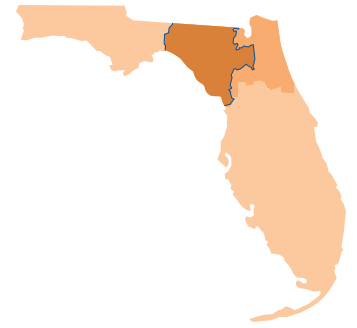


Figure 2.8: Ecoregions and Subecoregions within Florida



Natural Communities

In spite of human impacts, the Suwannee Basin still supports many diverse natural communities and species. For this report, land cover maps were used to identify potential natural communities in the basin. The maps identify different land cover classifications, classes of natural vegetation, aquatic class, and classes of disturbed land (**Appendix B**). Although not completely accurate, these classifications do provide a relative picture of the type and spatial importance of natural communities in the basin.

Of almost 5 million acres in the basin, disturbed community types cover more than 1.8 million acres, or 37 percent, and natural communities occupy more than 3.1 million acres, or 63 percent. Of the disturbed communities, shrub and brush occupy the largest area (about 970,000 acres), followed by grass and agricultural land (more than 483,000 acres) and barren land (361,000 acres).

Uplands comprise 2.13 million acres, or 43 percent of the basin's total area. Predominant upland types are pinelands (more than 1.5 million acres), hardwood hammock (more than 480,000 acres), sandhill (more than 60,000 acres), and mixed hardwood pine (almost 43,000 acres). Other upland communities such as oak scrub, sand pine scrub, dry prairie, and coastal strand occupy a total of about 2,100 acres.

Wetlands comprise almost 950,000 acres, or 19 percent of the basin. Major wetland types include hardwood swamp (about 446,000 acres), cypress swamp (304,000 acres), coastal salt marsh (more than 81,000 acres), and freshwater marsh (more than 65,000 acres). Shrub swamp (with about 32,000 acres) and bay swamp (with about 20,000 acres) are the smallest wetland types.

Upland communities contribute organic matter and nutrients to surface waters, supporting the microorganisms that form the base of the food web. They buffer surface waters from the effects of human activities, such as contaminated urban and agricultural runoff. Many of the animal species that live in coastal wetlands or along the shore hunt for food in upland forests and fields. Similarly, many upland species depend on adjacent wetlands for survival.

Open water occupies more than 57,000 acres of the basin, or 1 percent. It includes inland freshwater lakes, ponds, rivers, creeks, and estuarine waters.

Species

Threatened and Endangered Species

A number of species in the Suwannee Basin are federally or state listed as threatened, endangered, or of special concern. Some species are only on the federal list and others are only on the state list. These listed species are also ranked globally or statewide as rare or unique by the Florida Natural Areas Inventory (FNAI). A recent inventory of the basin included 2 fish, 9 amphibians and reptiles, 19 birds, 4 mammals, 2 invertebrates, and 29 plant species that are on one or more of these lists. Of these species, almost two-thirds, or 63 percent, use or live in the basin's various freshwater, saltwater, and/or wetland communities. **Appendix C** identifies these listed species.

Nonlisted Species

A number of other species in the Suwannee Basin, while not officially listed, are important because they ranked globally or statewide as rare or unique by the FNAI. Of these species, almost three-fourths, or 74 percent, use or live in the basin's various freshwater, saltwater, and/or wetland communities. One species of mollusk, the Ichetucknee siltsnail, is endemic to the Ichetucknee River. **Appendix D** identifies these nonlisted species.

Socioeconomic Setting

The Suwannee Basin's socioeconomic setting includes human influences, such as population and its distribution, point and nonpoint pollution, and resource use. These affect the basin's biological resources and the quality and quantity of surface water and ground water.

Population

The Suwannee Basin is one of the most sparsely populated areas of the state. In 2000, population density was about 38 people per square mile within the boundaries of the SRWMD, compared with the statewide average of 286 people per square mile. The region contains 6 of Florida's least densely populated counties.

Topography and land use patterns influence population distribution in the region. Most of the population is concentrated in the higher, drier counties east of the Suwannee River, around Lake City and Live Oak and along the northern and western edge of Gainesville. Other population centers are Starke, Alachua, and Chiefland east of the river, and Madison and Perry west of the river. Along the Suwannee River, the largest incorporated towns are White Springs, Branford, and Fanning Springs. Growth and development along the basin's rivers, especially the Suwannee, has been limited, largely because of floodplain management ordinances, land use plans, and land acquisition programs at state, regional, and local levels. **Table 2.1** summarizes population statistics for counties in the basin.

The Santa Fe watershed is more developed than most of the basin and is the fastest growing because of its proximity to Gainesville and several other incorporated areas. The Waccasassa River watershed is relatively undeveloped, and its developed areas are few and far between, consisting primarily of Bronson, Cedar Key, Newberry, and Otter Creek.

Land Use

Development in north central Florida historically occurred along a distinct northwest-southeast corridor roughly parallel to Interstate 75, in areas with better-drained and more productive soils. Nearly all cities and towns in the region today lie within this belt, and urbanized areas are primarily found east of the Suwannee River. **Figure 2.9** shows land use in the basin and the Department's larger Northeast District.

To the west of the Suwannee River, the dominant land uses are **silviculture** and agriculture. To the east of the river, these continue to



Silviculture

The care and cultivation of forest trees.

Table 2.1: Population Summary Statistics for Counties in the Suwannee Basin

COUNTY	POPULATION IN 1990 CENSUS	POPULATION IN 2000 CENSUS	PERCENT CHANGE
Alachua*	181,596	217,955	+20
Baker*	18,486	22,259	+20
Bradford*	22,515	26,088	+16
Columbia	42,613	56,513	+33
Dixie	10,585	13,827	+31
Gilchrist	9,667	14,437	+49
Hamilton	10,930	13,327	+22
Jefferson*	11,296	12,902	+14
Lafayette	5,578	7,022	+26
Levy*	25,923	34,450	+33
Madison	16,569	18,733	+13
Suwannee	26,780	34,844	+30
Taylor	17,111	19,256	+12.5
Union	10,252	13,442	+31

*—Denotes counties partially in the Suwannee Basin.

Source: U.S. Census Bureau, <http://www.census.gov>.

dominate, but the amount of urbanized land is markedly greater than west of the river. The region still has small farms that combine row crops with livestock, as well as large corporate dairies and irrigated row crop and forage operations.

Timber companies hold most of the coastal lowlands in large tracts. Large plantations of intensively managed, planted pine have replaced the native forest. Vast tracts of timber are also found in the wet flatwoods to the east of the Alapaha River and uppermost Suwannee River.

Phosphate mining in southeastern Hamilton County has altered a large part of the original landscape. Mineral rights donations to the SRWMD; an agreement not to mine in the floodplain of the Suwannee and its tributaries; and the combination of state, regional, and local regulations and land use controls now limit future mining operations.

Aquaculture is increasing along the coast, particularly in Levy County (Cedar Key area). This increase in aquaculture has developed following a reduction in other fisheries resulting from the constitutional net ban amendment passed in 1994. Historically, oystering was an important fishery, but its future is uncertain because many harvesting areas have closed. Submerged leases offshore from Cedar Key are used to raise littleneck clams for local, national, and international markets.

Approximately 18 percent of the total land area in the Suwannee Basin is publicly or privately owned as conservation lands. The remaining 82 percent is privately owned.

Point Sources of Pollution

Point sources contributing pollution to surface water or ground water originate from discrete, well-defined areas such as a facility discharge from the end of a pipe, a disposal well, or a wastewater sprayfield. Point sources

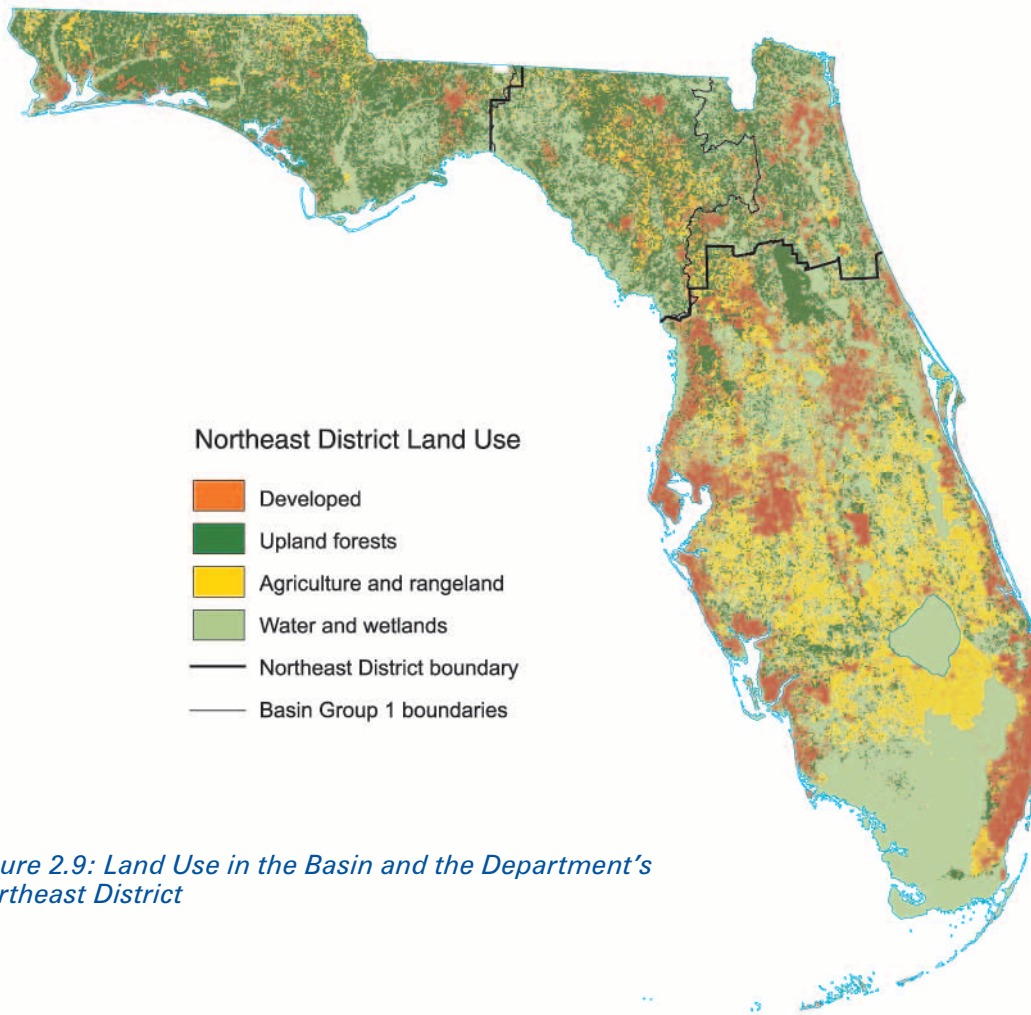


Figure 2.9: Land Use in the Basin and the Department's Northeast District

generally fall into two major types: domestic wastewater (sewage from homes, businesses, and institutions) and industrial wastewater (wastewater, runoff, and leachate from industrial or commercial storage, handling, or processing facilities).

Of approximately 249 permitted point sources in the Suwannee Basin (see **Figure 2.10**), 106 are domestic waste facilities and 143 are industrial facilities.

Wastewater Discharge

Eight domestic wastewater treatment plants discharge to surface waters and are permitted under the National Pollutant Discharge Elimination System (NPDES) Program. Only six exceed a permitted capacity of 100,000 gallons per day (gpd), and only two, Starke and Perry, exceed 1 million gallons per day (mgd).

The remaining non-NPDES permitted wastewater plants discharge to sprayfields, percolation ponds, or evaporation basins. Nineteen plants are rated at 100,000 gpd or more. Only the cities of Lake City and Live Oak and the Florida State Prison at Raiford exceed a permitted capacity of 1 mgd, while Madison, Alachua, and Lake Butler exceed 500,000 gpd.



Figure 2.10: Permitted Domestic and Industrial Facilities Regulated by State and Federal Agencies in the Department's Northeast District

Seven industrial NPDES permittees discharge more than 1 mgd, 6 of which exceed 25 mgd. The largest, the Suwannee generating plant at Ellaville, uses 342 mgd for cooling water. PCS, a phosphate mine in the White Springs area, recirculates 200 mgd of process water back into its mining operation. Sixteen others discharge lesser amounts. Most of these small systems treat effluent from ground water remediation systems at petroleum sites. Buckeye, a cellulose pulp mill, discharges 58 mgd of treated effluent to the Fenholloway River. At times, the entire flow of the river at the discharge point is effluent from the mill.

Only 1 of the basin's 120 non-NPDES industrial waste facilities exceeds 1 mgd, Moltech Power Systems, Inc., near Hague. The western coastal area from Horseshoe Beach to Cedar Key has a large number of aquaculture operations and several permitted dairies.

The basin contains one thermal discharge site, the Ellaville Power plant, which discharges into the Suwannee River. This plant operates a once-through cooling system that uses water from the Suwannee River. Drainage wells are significant point sources in the Lake City and Live Oak areas, receiving stormwater runoff from urban development and roadways.

Solid Waste Disposal Sites

Figure 2.11 shows landfills and hazardous waste sites in the Department's Northeast District. There are four active Class I landfills in the

SRWMD, at Winfield, Greenville, Live Oak, and Raiford. Class I landfills receive an average of 20 tons or more of solid waste per day.

There are also three active Class III landfills, at Lake City, Greenville, and Raiford. Class III landfills receive yard trash, construction and demolition debris, waste tires, asbestos, carpet, cardboard, paper, glass, plastic, furniture other than appliances, or other materials approved by the Department that are not expected to produce leachate that threatens public health or the environment.

Cross City, Live Oak, Mayo, Greenville, and Perry also have construction and demolition debris landfills. A landfill for land-clearing debris is located at High Springs, and Gold Kist operates a sludge disposal facility at Live Oak.

Remediation Activities

Environmental remediation activities cover a broad spectrum of cleanup programs. These include state-managed hazardous waste, dry-cleaning, and petroleum cleanup programs; as well as the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—commonly known as Superfund—and Resource Conservation and Recovery Act (RCRA) programs. These programs are designed to remediate ground water and soil contamination that poses a threat to public health and the environment. Site location information for petroleum cleanup and other waste cleanup activities is currently being updated.

The National Priorities List (NPL) is a comprehensive list of the uncontrolled hazardous waste sites that pose the greatest threat to human health or the environment. Sites are listed on the NPL upon completion of a preliminary assessment, site inspection, and hazardous ranking system evaluation to determine their potential for adverse impacts and priority for corrective action. The U.S. Environmental Protection Agency (EPA) Superfund Program administers the cleanup of NPL sites.

The Suwannee Basin has one active and one delisted NPL site, and two delisted state-funded sites. The location of the active site is shown on **Figure 2.11**. The active NPL site is undergoing assessment and remediation. A site is delisted when remediation is complete. No ground water basin issues are identified with these sites.

Delineated Ground Water Contamination Areas

The Florida Department of Environmental Protection (FDEP) Delineation Program was established in 1988 in response to the discovery of ground water contaminated by ethylene dibromide (EDB), a soil fumigant used in 38 counties to control nematodes in citrus groves and row crops. The program has since expanded to include ground water contaminated by other pesticides, industrial solvents, and nutrients. The coverage of delineated areas within this program does not include, nor is it intended to include, all sources of contaminated ground water in Florida. The Delineation Program is designed to ensure the protection of public health when consuming potable ground water supplies and to minimize the potential



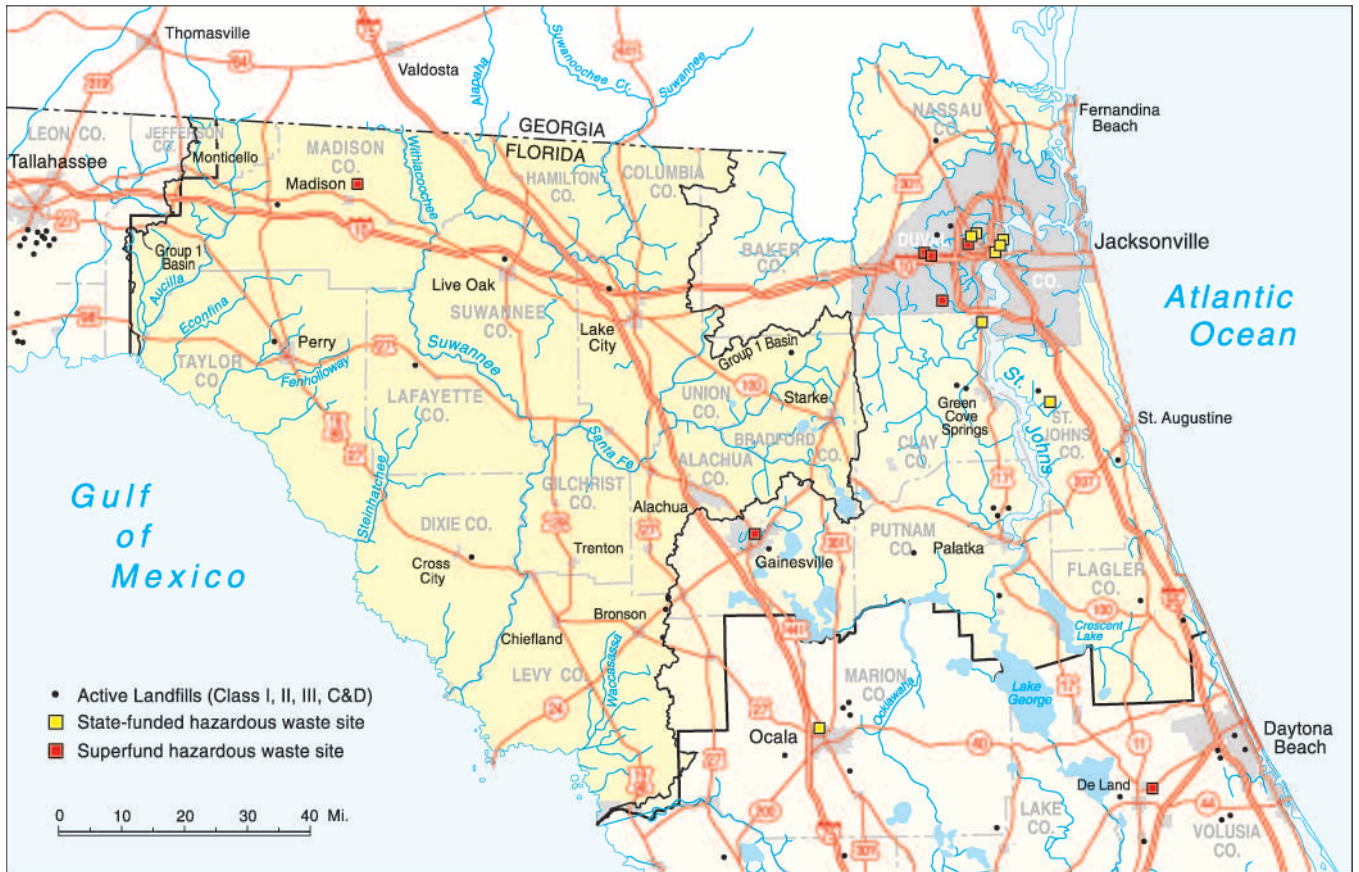


Figure 2.11: Landfills and Hazardous Waste Sites in the Department's Northeast District

for cross-contamination of adjacent ground water resources. The program is regulated under Chapter 62-524, Florida Administrative Code, New Potable Well Permitting in Delineated Areas.

The Delineation Program's primary responsibilities are to

- delineate areas of known ground water contamination;
- develop corresponding maps identifying these areas;
- implement a water well construction permitting/application process that requires stringent water well construction standards; and
- require well water testing after completion of the water well to ensure the potable quality of the water source.

Any newly constructed water wells in delineated areas and existing water wells found to be contaminated are remediated by installing granular activated carbon filters or by connecting the user to a public water supply system.

The Suwannee Basin contains a total of 2,270 delineated acres. EDB ground water contamination accounts for 1,997 delineated acres. An additional 273 acres are delineated for metals and volatile and semivolatile organic contaminants that exceed Florida ground water standards. These

delineated areas include the following facilities: Fort White Petroleum Storage Tank Facility, Fort White and Newberry Landfill, Newberry.

All of these sites have gone through an environmental assessment evaluation and have either been cleaned up or are undergoing remediation.

Nonpoint Sources of Pollution

Rainfall transports pollutants placed on the landscape by human activities and natural sources, such as nutrients, heavy metals, and sediments, within the basin. Some of the rain that falls on land becomes stormwater runoff, which flows over the land surface and through the ground, carrying nonpoint source pollution from many different sources to surface water or ground water.

Nonpoint sources include atmospheric deposition and runoff or leaching from agricultural lands, urban areas, and unvegetated lands. Pollutant loadings from nonpoint sources are the major cause of surface water pollution. The types of pollutants in stormwater runoff vary depending on land use activities. Stormwater in urban areas typically contains fertilizers (nutrients), metals, sediments, and petroleum compounds. In agricultural areas, the major contaminants are fertilizers, bacteria, sediments, and occasionally metals.

Stormwater Runoff

Rural road runoff is often a problem at stream crossings and culverts, near wetlands and sinkholes, and in karst regions where pollutants can leach into the unconfined aquifer. Pollutants can include oils and greases, metals, combustion products, debris and other materials from roads, and nutrients.

Rural industrial/commercial activities may become local sources of pollution if not properly designed and maintained, but these facilities are usually permitted by the SRWMD and should have adequate stormwater systems in place. Intentional or accidental illicit discharges to sinkholes, ditches, or waterbodies, as well as a few older “grandfathered” facilities that are exempt from permitting, are the most significant and likely contributors to stormwater pollution.

The Suwannee Basin contains little high-density development; where it exists, however, urban runoff can be difficult to address. There are no centralized municipal storm sewer systems in the basin, although developments built after 1982 have been required to install individual stormwater collection and treatment systems. In some areas, such as at Cannon Creek Sink near Highway 47 and Interstate 75, stormwater from urban activities can drain directly into the aquifer.

Pollutants can be transported to surface waters in several ways, including direct runoff to surface water and infiltration to the aquifer. Groundwater flow may then mix with surface water.

Agricultural Water Quality Impacts

Agriculture and silviculture are the dominant land uses in the basin. Agriculture dominates primarily along a north-south line between the Suwannee River on the west and Interstate 75 on the east. Forested wet-



Dendritic*Branching like a tree or shrub.*

lands predominate to the west of the Suwannee, except in a narrow band along the river north of Branford, through Madison, and up into Georgia. Forestry also dominates in the northeastern part of the basin.

The most intensive agricultural activity occurs in the Middle Suwannee Basin. This is not a true hydrologic unit, but consists approximately of that portion of the Lower Suwannee hydrologic unit code (HUC) north of the Santa Fe River (see **Figure 3.1**).

In water year 1998 (October 1, 1997–September 30, 1998), this area between the Santa Fe and the Withlacoochee Rivers contributed approximately 60 percent of the entire nitrate load (but only 23 percent of the phosphorus) carried by the Suwannee River system to the Gulf. The Middle Suwannee watershed contains approximately 44 dairies, 130 poultry farms, and hundreds of agronomic, forage grass, and row-crop operations. Slightly less than half of the total nitrogen input to the Middle Suwannee Basin is in the form of inorganic fertilizer, and about one-third is attributed to poultry operations. Dairy and cattle operations account for about 15 percent, atmospheric deposition about 5 percent, and direct human influences about 1 percent of the nitrogen sources. There is almost no surface water drainage in the area, as evidenced by the lack of **dendritic** streams, and all of the pollutants of concern are thought to be leaching through soils into ground water.

In the last several years, considerable research has been done in the Middle Suwannee Basin to develop and evaluate best management practices (BMPs) for agricultural operations. As a result, interim measures and BMPs for forage grasses have been adopted under Chapter 576.045, Florida Statutes. In the last two years, more than 90 percent of the dairies have signed up for federal and state cost-sharing programs to install improved nutrient management practices, and about two-thirds of the poultry operations have applied for similar programs. Most of the remaining operations will follow suit as money becomes available. As these practices are put into place, the leaching of nutrients to ground water is expected to decrease.

Silviculture operations may also affect surface water quality through sedimentation and erosion from clear-cutting or hydrologic modifications from draining wetland forests to enhance the growth of pine trees.

Onsite Sewage Disposal

The use of septic tanks is the predominant method of domestic wastewater disposal in the basin. Because the population density is low, septic tanks are not a significant area of concern, except in a few high-density subdivisions (less than five acres per homesite) along the edge of certain rivers and springs. When systems are not maintained or are located in unsuitable soils, contamination of ground water or surface waters is probable, and public health concerns exist.

Other Nonpoint Sources

The Upper Suwannee Basin contributes only 3 percent of the total nitrate load to the Gulf but supplies 43 percent of the phosphate load as it flows through an area of phosphate deposits and a phosphate-mining area near White Springs. The preceding section on point sources discusses

municipal sprayfields, percolation ponds, and other domestic waste sources, which are not a significant source in this sparsely populated region.

Air Emissions

Air pollution not only affects human health but can also affect water quality. Atmospheric deposition on land or water, through “wet” or “dry” processes, is an important nonpoint source. Wet deposition occurs when pollutants are bound in water droplets and fall out in rain or fog. Dry deposition occurs as particles settle from the air onto land and water. Both forms of deposition contribute large quantities of nutrients, heavy metals, and other chemicals to coastal waters. In Florida, most air pollutants are from fossil fuel combustion, mainly power plants and motor vehicles. Waste incineration, sulfuric acid production, cement manufacturing, pulp and paper production, and the combustion of plant and animal biomass are a few of the other significant sources of air pollutants. Natural processes such as volcanic eruptions, forest fires, and the suspension of eroded soil particles may add to the effects of air pollution.

The air pollutants of most concern in Florida are sulfur dioxide, nitrogen compounds, and mercury compounds. Sulfur dioxide has a role in forming acid rain, which contributes to the lowering of pH in waterbodies. The EPA has identified **eutrophication** as one of the most serious pollution problems facing estuarine waters in the United States. Nitrogen compounds, acting as a nutrient, can cause eutrophication in nitrogen-limited waters and also contribute to acid rain. Mercury compounds cause fish contamination and bioaccumulation up the food chain. Other air pollutants such as cadmium and lead, polycyclic organic compounds, polychlorinated biphenyls, and dioxins are also of concern. Because atmospheric pollutants can travel hundreds or thousands of miles before settling on land or water, their sources may be global as well as regional and local.

Historical, Current, and Proposed Watershed Management Activities and Processes

This section characterizes historical and current planning issues and management activities to improve water quality in the Suwannee Basin. **Table 2.2** provides a summary. Based on a strong commitment by local, state, regional, and federal stakeholders, significant progress has been made toward the goal of restoring and preserving water resources, primarily through voluntary, incentive-based programs.

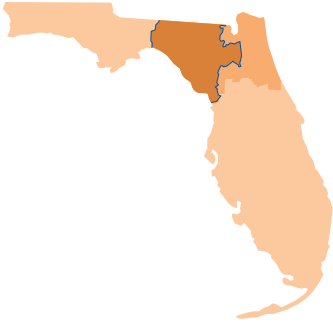
Suwannee River Water Management District (SRWMD) Programs

With the passage of the landmark 1987 Surface Water Improvement and Management (SWIM) Act, the Florida Legislature recognized that many surface waters in the state were polluted or threatened by pollution. The SWIM program focuses on issues of water quality and water resource preservation. In the Suwannee Basin, SWIM is implemented by the SRWMD in cooperation with the Department and with assistance from several other state agencies and local governments. The water management



Eutrophication

A process by which a waterbody becomes rich in dissolved nutrients, often leading to algal blooms, low dissolved oxygen, and changes in community composition. Eutrophication occurs naturally, but can be accelerated by human activities that increase nutrient inputs to the waterbody.



district has identified six SWIM waterbodies, which include essentially all of the land area within the district's boundaries (see the sidebar on SWIM waterbodies in the Suwannee Basin).

SWIM management plans have been developed for each watershed, outlining a wide range of scientific and planning programs. Preservation is emphasized for most of the waterbodies on the SWIM priority list, so that water quality problems can be anticipated and prevented. Alligator Lake, the only SWIM waterbody for which restoration is an emphasis, already suffers from degraded water quality and habitat.

The SRWMD's Water Management Plan, adopted by the governing board in 1994 and revised in 2000, identifies water management issues and

Table 2.2: Summary of Planning Issues and Management Activities

Year	Planning/Management Activity
1929	Cedar Keys National Wildlife Refuge established.
1931	St. Marks National Wildlife Refuge established.
1937	Okefenokee National Wildlife Refuge established.
1957	Suwannee River Authority (SRA) organized by state legislature.
early 1960s	Suwannee River proposed for federal National River designation.
late 1960s	Suwannee River proposed for federal Wild and Scenic Rivers designation.
1979	Lower Suwannee River National Wildlife Refuge established.
1980	Suwannee River Resource Planning and Management Committee formed by Governor Bob Graham—committee adopts Suwannee River Management Plan in 1981.
1985	Big Bend Seagrasses Aquatic Preserve established.
1987	Surface Water Improvement and Management (SWIM) Act enacted by Florida Legislature.
1988	SWIM plans developed for Suwannee River, Santa Fe River, Alligator Lake, Coastal Rivers, Aucilla River, and Waccasassa River.
1988	Suwannee River Task Force created by Governor Bob Martinez.
1989	Ambient surface water quality monitoring network is established to determine water quality status of SWIM priority waterbodies and to provide early warning system for identifying water quality changes. A report is prepared annually.
1990	Suwannee River Coordination Committee (SRCC) established by Suwannee River Water Management District (SRWMD).
1991	Suwannee River, Aucilla River, Waccasassa River, and Coastal Rivers SWIM Plans revised.
1991	U.S. Geological Survey initiates National Water Quality Assessment (NAWQA) Program in the Georgia-Florida Coastal Plain.
1994	SRWMD Water Management Plan adopted.
1995	Ichetucknee Springs Water Quality Working Group formed.
1996	Suwannee Basin Interagency Alliance formed.
1996	Cost-sharing agreement between SRWMD and Natural Resources Conservation Service to establish PL-566 Small Watershed Program for Middle Suwannee area is implemented.

Table 2.2 continued

Year	Planning/Management Activity
1997	Fenholloway River reclassified from Class V waterbody (Navigation, Utility, and Industrial Use) to Class III waterbody (Recreation, Propagation, and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife).
1997	Suwannee River Basin Nutrient Management Working Group forms in response to increased awareness of nitrate concentration in ground water, springs, and drinking wells in the basin. The group was formalized with a multiagency agreement in 1999.
1998	Santa Fe Springs Water Quality Working Group formed. This group is not currently active.
1999	Florida Springs Task Force formed.
1999–2001	U.S. Fish and Wildlife Service begins effort to develop comprehensive conservation plan for Lower Suwannee River, Cedar Keys, St. Marks, and Okefenokee National Wildlife Refuges.

suggested actions. The 2000 update includes a preliminary identification of issues and actions for individual watersheds and will be further amended to include more detailed watershed planning information.

The water management district has actively acquired lands for water management purposes under the Save Our Rivers program since 1983, focusing on acquiring the most environmentally sensitive areas in the Suwannee River's hundred-year floodplain.

The water management district provides technical and financial assistance to minimize urban stormwater pollution through several programs, including the Quality Communities Program, which helps communities identify and solve their stormwater drainage, wastewater, and potable water needs. It includes techniques to minimize nonpoint sources. In July 1998, the district completed a report that identified and prioritized community needs and estimated the costs of implementing and maintaining these improvements. The district also will help municipalities identify possible sources of funding and assistance and will aid local, regional, and state planners in their budgeting and planning processes.

Suwannee Basin Interagency Alliance

The Suwannee River basin stretches from Cordele, Georgia, south to the Gulf of Mexico near Cedar Key, Florida. The Suwannee Basin Interagency Alliance promotes communication and cooperation between Georgia and Florida in protecting the water resources of the basin. The Interagency Alliance consists of a coalition of representatives from regional, state, and federal agencies. Leading the effort are the SRWMD, Georgia Environmental Protection Division, U.S. Fish and Wildlife Service (Okefenokee National Wildlife Refuge), and the Department. The alliance does not have the authority to formulate policy or form interstate compacts, but operates in a planning and advisory capacity. It provides a forum to share information and resources, reducing duplicated effort and costs.

SWIM Waterbodies in the Suwannee Basin

- *Suwannee River, including its two major tributaries, the Withlacoochee and Alapaha Rivers, and all of its minor tributary creeks*
- *Santa Fe River, the third major tributary of the Suwannee River*
- *Coastal Rivers Basin, including the Steinhatchee, Fenholloway, and Econfina Rivers and numerous smaller coastal creeks*
- *Alligator Lake*
- *Waccasassa River*
- *Aucilla River, including its tributary, the Wacissa River*

Suwannee River Partnership

In recent years, nitrate levels in the Middle Suwannee Basin have been increasing. Elevated nitrate levels can cause a variety of health problems in humans and also affect water resources.

In 1997, the Suwannee River Partnership (Suwannee River Basin Nutrient Management Working Group) was established in response to the increased awareness of nitrate concentrations in ground water, springs, and drinking wells in the basin (see the sidebar on page 55 for a list of Suwannee River Partnership signatories). The partnership is a coalition of state, federal, and regional agencies; local governments; and private industry representatives working together to reduce nitrate levels in surface waters and ground water.

The group's primary goal is to determine the sources of the nutrient loads to the basin and to work with local land users to minimize future nutrient loading through an emphasis on voluntary, incentive-based programs. Technical committees address specific issues, including the management of fertilizers, animal waste, and human waste; monitoring; and education and outreach.

The partnership's accomplishments include continued technical assistance and incentives for farmers to implement BMPs through the U.S. Department of Agriculture's PL-566 Small Watershed Program and Environmental Quality Incentive Program (EQIP). The partnership also developed a BMP Quality Assurance Program that includes tracking, quality assurance checks, and technical assistance associated with implementation of dairy and poultry BMP.

U.S. Department of Agriculture Programs

In 1996, the U.S. Department of Agriculture's Natural Resources Conservation Service and the SRWMD agreed to a cost-sharing arrangement to help dairy farmers in Suwannee and Lafayette Counties design and implement farm-specific BMPs to improve animal waste management. Animal waste is a potential source of the nitrates detected around dairies in ground water and in a number of springs in the Middle Suwannee Basin. Other nitrate sources include inadequate or leaking septic tanks and leaching from fertilizers applied to crops, gardens, and yards. When properly installed and maintained, BMPs should significantly reduce the potential for contamination of surface water and ground water.

The PL-566 Small Watershed Program for both dairies and poultry farms has been highly successful based on the level of participation. To date, 33 of 44 dairies and 75 of 141 poultry farms have developed waste management conservation plans and have started implementing BMPs. The program will be fully implemented by 2008.

Primary BMPs for dairies include waste collection, transport, storage, and use (such as using lined storage structures and waste irrigation systems, and eliminating high-intensity areas). For poultry farmers, these primary practices include proper disposal of dead birds and waste storage and use.

The U.S. Department of Agriculture also administers the EQIP, which works primarily in locally identified priority areas with significant natural resource concerns. Priority is given to areas where state or local govern-

ments offer financial, technical, or educational assistance, and to areas where agricultural improvements will help meet water quality objectives. EQIP provides cost sharing to farmers implementing whole farm conservation plans that address nutrient management in row and forage crops. The Suwannee River Basin Priority Area has been established for several years.

Ichetucknee Springs Water Quality Working Group

The Ichetucknee Springs Water Quality Working Group is composed of geologists, hydrologists, cave divers, water quality specialists, and land use planners from federal, state, and local agencies. Its function is to enhance interagency communication, coordination, and cooperation to increase the protection of water flowing to the springs of Ichetucknee Springs State Park. The group has supported a number of activities in the watershed related to education, research, monitoring, land use planning and development, land acquisition, regulation, mapping, and restoration and protection.

Florida Springs Task Force

In 1999, the Secretary of the Department formed a multiagency Florida Springs Task Force to recommend strategies for protecting and restoring Florida's springs. The task force comprised a group of 16 that included scientists, planners, and other citizens. Its recommendations included action steps for research and monitoring, education, and assistance with BMPs for landowners.

National Wildlife Refuges

Four national wildlife refuges are wholly or partially within the Suwannee Basin: St. Marks, Lower Suwannee, and Cedar Keys National Wildlife Refuges in Florida and Okefenokee National Wildlife Refuge in Georgia. All of these are in the process of developing comprehensive conservation plans to define their management objectives.

Georgia River Basin Planning

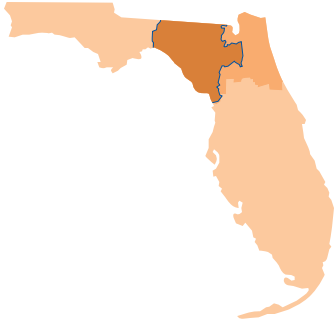
Like Florida, the state of Georgia has also adopted a rotating river basin management planning approach to watershed protection. The plan for the Georgia portion of the Suwannee River will be completed in 2002.

Upper Suwannee River Watershed Initiative

The National Wildlife Federation and U.S. Department of Agriculture's Natural Resources Conservation Service started the Upper Suwannee River Watershed Initiative in 1999. The initiative, a citizen-led coalition in partnership with public and private agencies, brings together residents of the basin to identify and solve problems that affect their water, soil, and forests, as well as their quality of life.

Suwannee River Partnership Signatories

Florida Department of Agriculture and Consumer Services, Florida Department of Environmental Protection; Florida Department of Health; Florida Department of Community Affairs; U.S. Environmental Protection Agency; U.S. Department of Agriculture, Natural Resources Conservation Service; U.S. Geological Survey; Suwannee River Water Management District; Suwannee River Resource Conservation and Development Council, Inc.; Lafayette and Suwannee River Soil and Water Conservation Districts; Lafayette and Suwannee county commissions; University of Florida Institute of Food and Agricultural Sciences, Extension and Research; Florida A&M University, College of Engineering Sciences, Technology and Agriculture; Florida Rural Water Association; Florida Cattlemen's Association; Florida Poultry Federation; Florida Farm Bureau; Florida Forestry Association; Florida Fertilizer and Agrichemical Association; Florida Septic Tank Association; Gold Kist; and Sunshine State Milk Producers.



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Chapter 3: Status of Water Quality and Ecological Resources

Chapter Summary

This chapter summarizes the current status of surface water and ground water quality and ecological resources in the Suwannee Basin.

The primary purpose of evaluating the status of surface water quality is to determine if individual waterbodies or smaller drainage basins identified with a unique waterbody identification (WBID) number are potentially impaired. These waters, which must meet specific thresholds and data sufficiency and data quality requirements in the Identification of Impaired Surface Waters Rule (Section 62-303, Florida Administrative Code), will be listed on the state's planning list of impaired waters. Where sufficient data are available, the assessment also addresses temporal and spatial trends in water quality.

The ground water quality assessment identifies ground water inputs and the water quality status of confined and unconfined supplies in the basin.

The ecological resources evaluation discusses protection and preservation priorities, including Strategic Habitat Conservation Areas that are important to preserving biological diversity in the region. It also describes major ecological indicators in the form of species and natural communities that are potentially related to water quality problems, as well as other ecological issues and problems.



Impaired Waters Rule

Section 62-303 of the Florida Administrative Code, the Identification of Impaired Surface Waters Rule, defines applicable water quality standards for impaired waters and identifies the criteria for determining if waters should be included on the state's planning list and verified list. These standards include specific chemical parameters, nutrient impairment, biological impairment, fish consumption advisories, or ecological impairment.

Potential impairments are determined by assessing whether a waterbody or segment meets the criteria for inclusion on the planning list. The criteria for the planning list are less stringent than the criteria for the verified list. Once a waterbody is on the planning list, additional data and information will be gathered and examined to determine if the water should be included on the verified list or if additional data collection is needed to make that determination.

Status of Surface Water Quality

Impaired Waters Rule Methodology

To determine the status of water quality of surface waters in the basin, three categories of data—chemistry data, biological data, and fish consumption advisories—were evaluated to determine potential impairment. The main source of water quality data was information collected between 1989 and 1998 and stored in the U.S. Environmental Protection Agency's STOrage and RETrieval (STORET) database, where all data collected using federal or state funds must be entered. Chlorophyll data and observations of algal mats in the Santa Fe River and Suwannee River and its estuary subsequent 1998 were also used to assess these areas. Flow data came from the U.S. Geological Survey's stream gages. Other sources included the Department's Biology database and fish consumption advisory information from the Florida Department of Health. **Appendix E** contains a more detailed description of the methodology.

Chemistry Data

The chemistry data from STORET used in this evaluation were also used for preparing the state's 2000 305(b) report. The stations were determined to be ambient surface water stations, and information from point sources or wells was purposely excluded. The data included the following parameters.

Metals	Arsenic, aluminum, cadmium, chromium VI, chromium III, copper, iron, lead, mercury, nickel, selenium, silver, thallium, and zinc
Nutrients	Chlorophyll <i>a</i> for streams and estuaries and Trophic State Index (TSI) (chlorophyll <i>a</i> , total nitrogen, and total phosphorus) for lakes
Conventionals	Dissolved oxygen (DO), fecal coliforms, total coliforms, pH, and unionized ammonia

To determine if a waterbody or segment should be placed on the planning list for each parameter, the chemistry data were analyzed using a computer program written to evaluate the language in the impaired waters rule (IWR), with two exceptions. First, unionized ammonia data were not analyzed by the program, but rather with an Excel spreadsheet. Second, because the full complexity of the pH criterion could not be programmed, the incomplete listings for pH were not included. They will be further examined while additional data are collected during Phase 2 of the watershed cycle.

The data for metals and conventional parameters were compared with the state surface water quality criteria in Section 62-302.530, Florida Administrative Code. The IWR contains a table of sample sizes versus

exceedances. A water is placed on the planning list if there is at least 80 percent confidence that the actual criteria exceedance rate was greater than or equal to 10 percent.

Potential nutrient impairment was evaluated by calculating annual mean chlorophyll *a* values for estuaries and streams, the presence of algal mats in streams, and the TSI for lakes. For lakes, the TSI was calculated using chlorophyll *a*, total phosphorus, and total nitrogen measurements.

In estuarine areas, a water was considered nutrient enriched if the annual mean chlorophyll *a* values were greater than 11 mg/L or if annual mean chlorophyll *a* values increased by more than 50 percent over historical values for at least two consecutive years. For streams, a water was considered nutrient enriched if the annual mean chlorophyll *a* values were greater than 20 mg/L or if the annual mean increased by more than 50 percent over historical values for at least two consecutive years or there were algal mats in sufficient quantities to pose a nuisance or hinder reproduction of a threatened or endangered species.

A lake with a mean color greater than 40 platinum cobalt units was considered nutrient enriched if the annual mean TSI exceeded 60. A lake with a mean color less than or equal to 40 platinum cobalt units was considered nutrient enriched if the annual mean TSI exceeded 40. In addition, a lake was considered nutrient enriched if there was an increase in TSI over the 1989 to 1998 period or if TSI measurements were 10 units higher than historical values.

Biological Data

The biology data were assessed using the IWR as guidance. **Appendix F** presents the bioassessment methodology and summarizes the results of each bioassessment test for determining compliance with applicable state water quality rules. **Tables F-1** through **F-5** in the appendix contain the results of Stream Condition Index (SCI), Rapid Bioreconnaissance (BioRecon) and Lake Condition Index (LCI) assessments, index thresholds, and selected results from artificial substrate analyses (Hester-Dendy analyses) in the basin. All of the assessments were based on measurements of the integrity of surface water macroinvertebrate communities. The Department generated all the data used according to its standard operating procedures. Waters that met the criteria for inclusion on the planning list are indicated by placing “biology” as the parameter of impairment.

Fish Consumption Advisories

Fish consumption advisories were based on the Florida Department of Health’s “limited consumption” or “no consumption” advisories for surface waters because of high levels of mercury in fish tissue.

Planning Units

Nine river systems and a direct coastal drainage area are represented in the Suwannee Group 1 Basin. To assess these surface waterbodies, the basin was divided into 12 planning units: Upper Suwannee, Middle Suwannee, Lower Suwannee, Alapaha, Withlacoochee, Santa Fe, Aucilla/Wacissa, Econfinia, Fenholloway, Steinhatchee, Waccasassa, and other coastal basins.

Exceedance

The amount by which something, especially a pollutant, exceeds a standard or permissible measurement.

Figure 3.1 shows the locations and boundaries of these planning units. This assessment only focuses on the Florida surface waterbodies.

Using the watershed boundaries as defined by the U.S. Geological Survey's eight-digit hydrologic unit code (HUC), the Florida portions of the Upper Suwannee, Alapaha, Withlacoochee, and Aucilla/Wacissa Rivers were defined as individual planning units. The Lower Suwannee River eight-digit HUC was split into two planning units—Middle Suwannee and Lower Suwannee. In addition, the Econfina–Steinhatchee eight-digit HUC was divided into four planning units. The Econfina, Fenholloway, and Steinhatchee River watersheds each became separate planning units. The remaining areas of direct drainage to the Gulf of Mexico were lumped into a single coastal planning unit that includes the coast between the Steinhatchee and Lower Suwannee Rivers, between the Aucilla and Econfina Rivers, between the Econfina and Fenholloway Rivers, and between the Fenholloway and Steinhatchee Rivers.

Table 3.1 breaks down the area of each planning unit in Florida and Georgia, respectively. The Georgia portion of the Suwannee Basin significantly influences flow in the Suwannee River. Southern Georgia has clayey soils and typically a wet season in late winter and early spring when there is little active plant growth. These two factors combine to generate enormous amounts of runoff, causing spring floods in the Suwannee River.

Table 3.1: Area of Each HUC Watershed in Florida and Georgia

Watershed	Area (mi ²)	Georgia (mi ²)	Florida (mi ²)
Upper Suwannee	2,643	1,721 or 65%	922 or 35%
Alapaha	1,806	1,698 or 94%	108 or 6%
Withlacoochee	2,384	2,112 or 82%	272 or 18%
Lower Suwannee	1,576	0	1,576
Middle Suwannee (963)			
Lower Suwannee (613)			
Santa Fe	1,140	0	1,140
Suwannee Basin Total	9,549	5,531 or 58%	4,018 or 42%

Potentially Impaired Waters of Concern

This section discusses the number of waters that are potentially impaired for one or more water quality parameters. These potential impairments are discussed by waterbody segment, waterbody type, and parameter of concern. The assessment used to determine potential impairment is based on the methodology for identifying waters to be included on the state's planning list (Identification of Impaired Surface Waters Rule, Section 62-303, Florida Administrative Code).

Impaired Waterbody Segments

Figures 3.2A and **3.2B** show the segments with waterbody identification (WBIDs) numbers in the Suwannee Basin. **Figures 3.3** through **3.6** show the waters that are potentially impaired for nutrients, conventional water quality parameters, biology, and metals, respectively. **Appendix F** presents the bioassessment methodology used to determine if a water is potentially impaired for biology and the biology data used in the assessment.

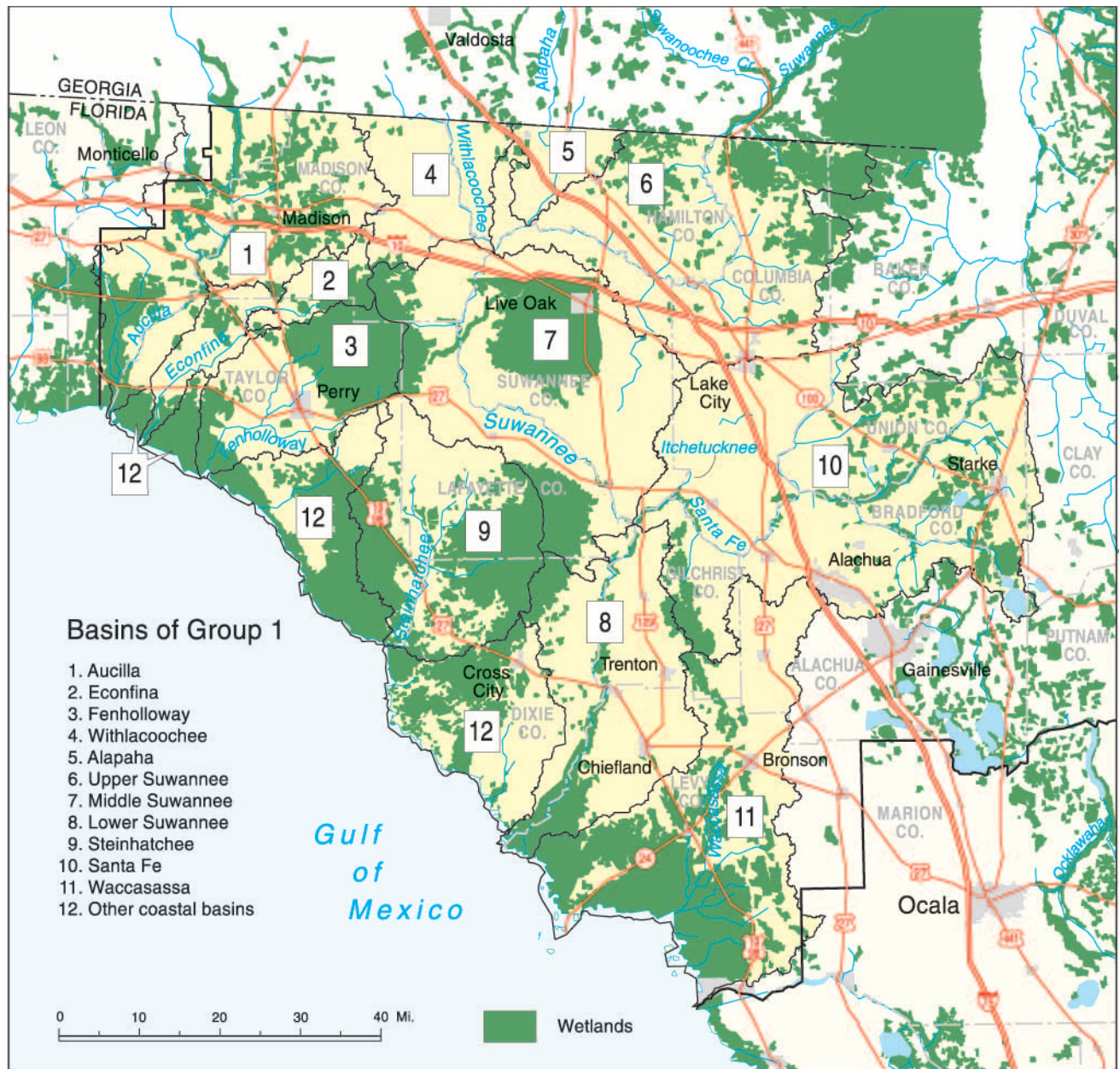


Figure 3.1: Planning Units of the Suwannee Group 1 Basin in Florida



Figure 3.2A: Segments with Waterbody Identification (WBIDs) Numbers in the Suwannee Basin (West)



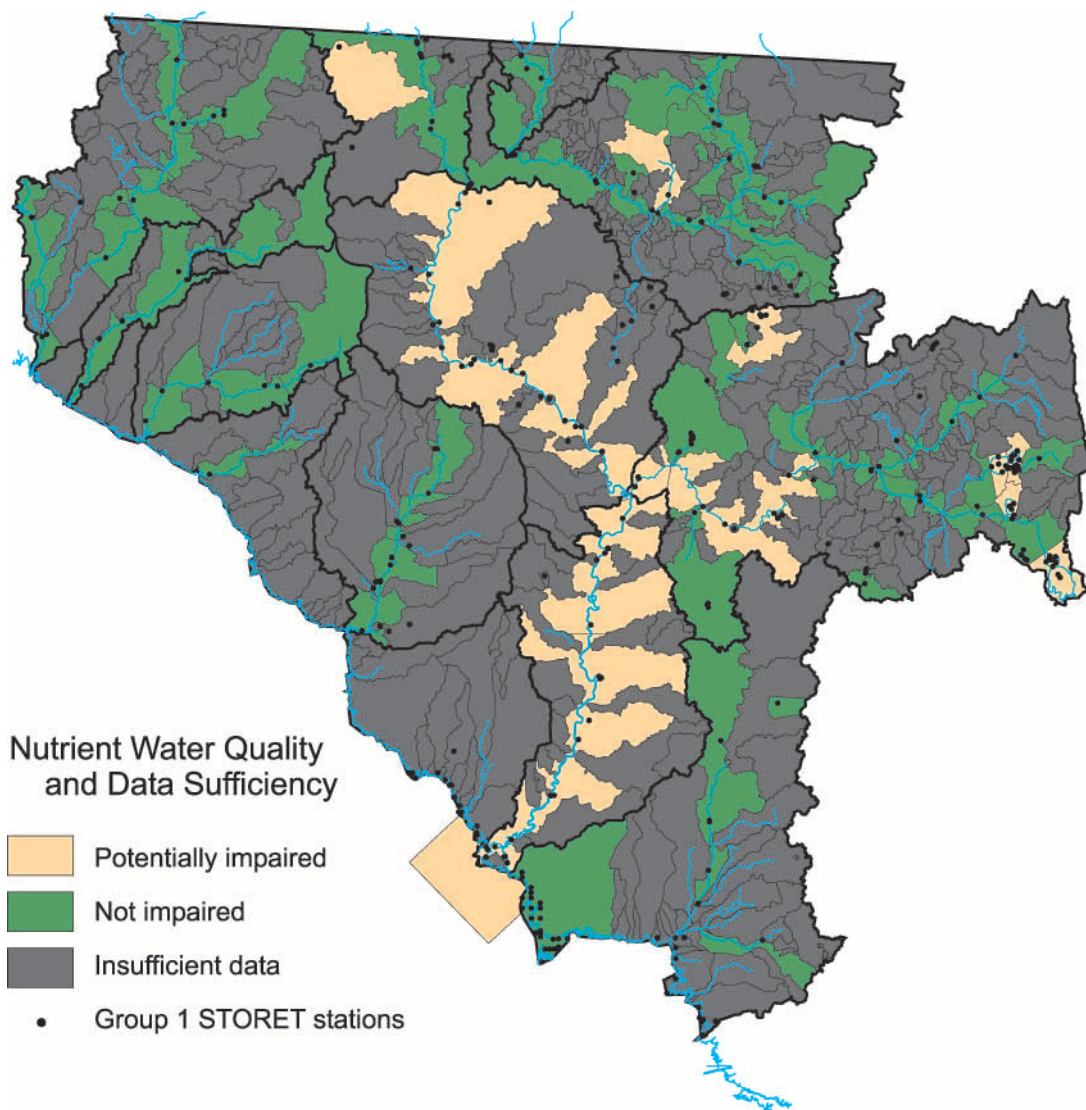


Figure 3.3: Suwannee Basin Waters Potentially Impaired for Nutrients According to the Impaired Surface Waters Rule

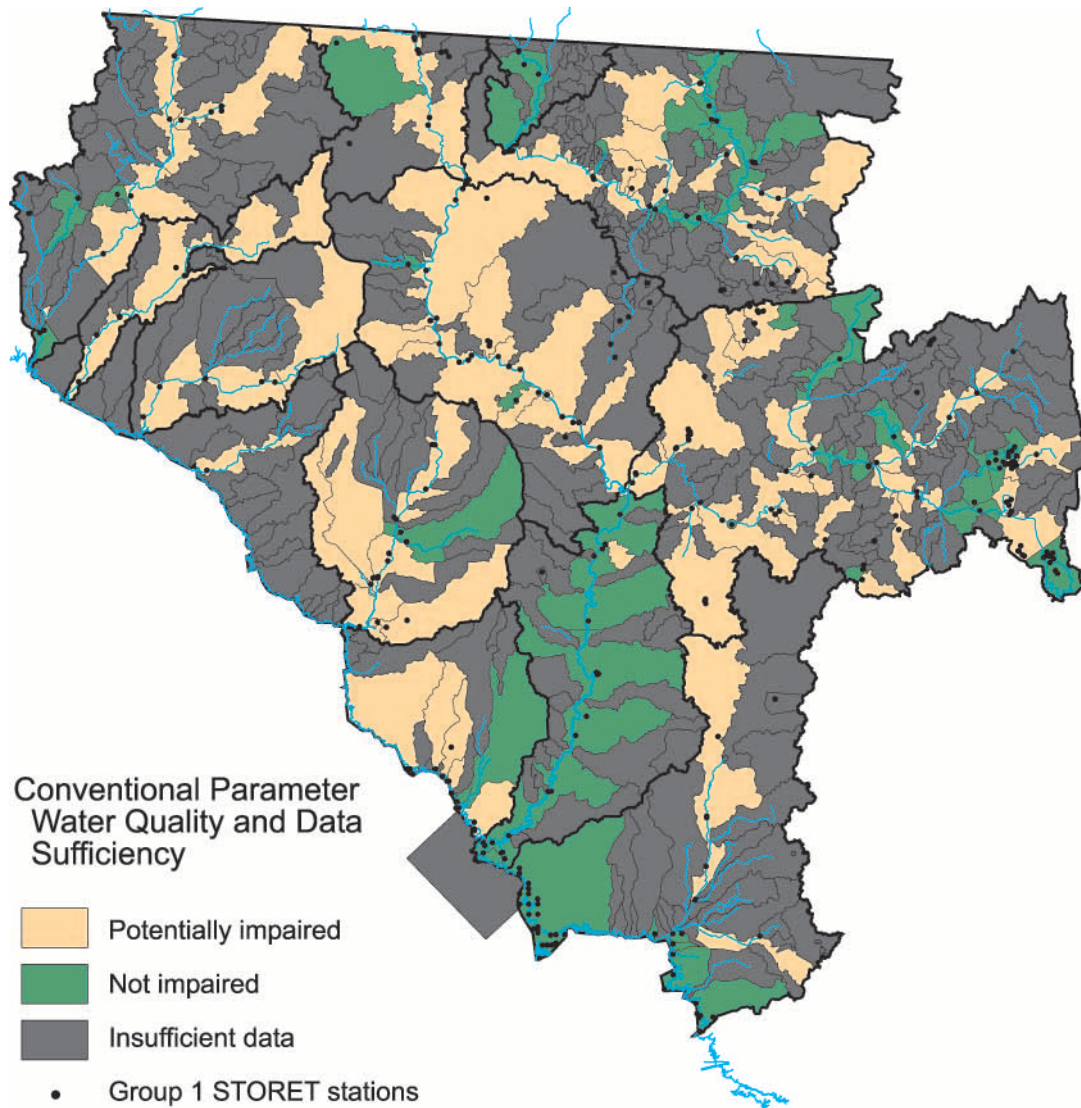


Figure 3.4: Suwannee Basin Waters Potentially Impaired for Conventional Water Quality Pollutants According to the Impaired Surface Waters Rule

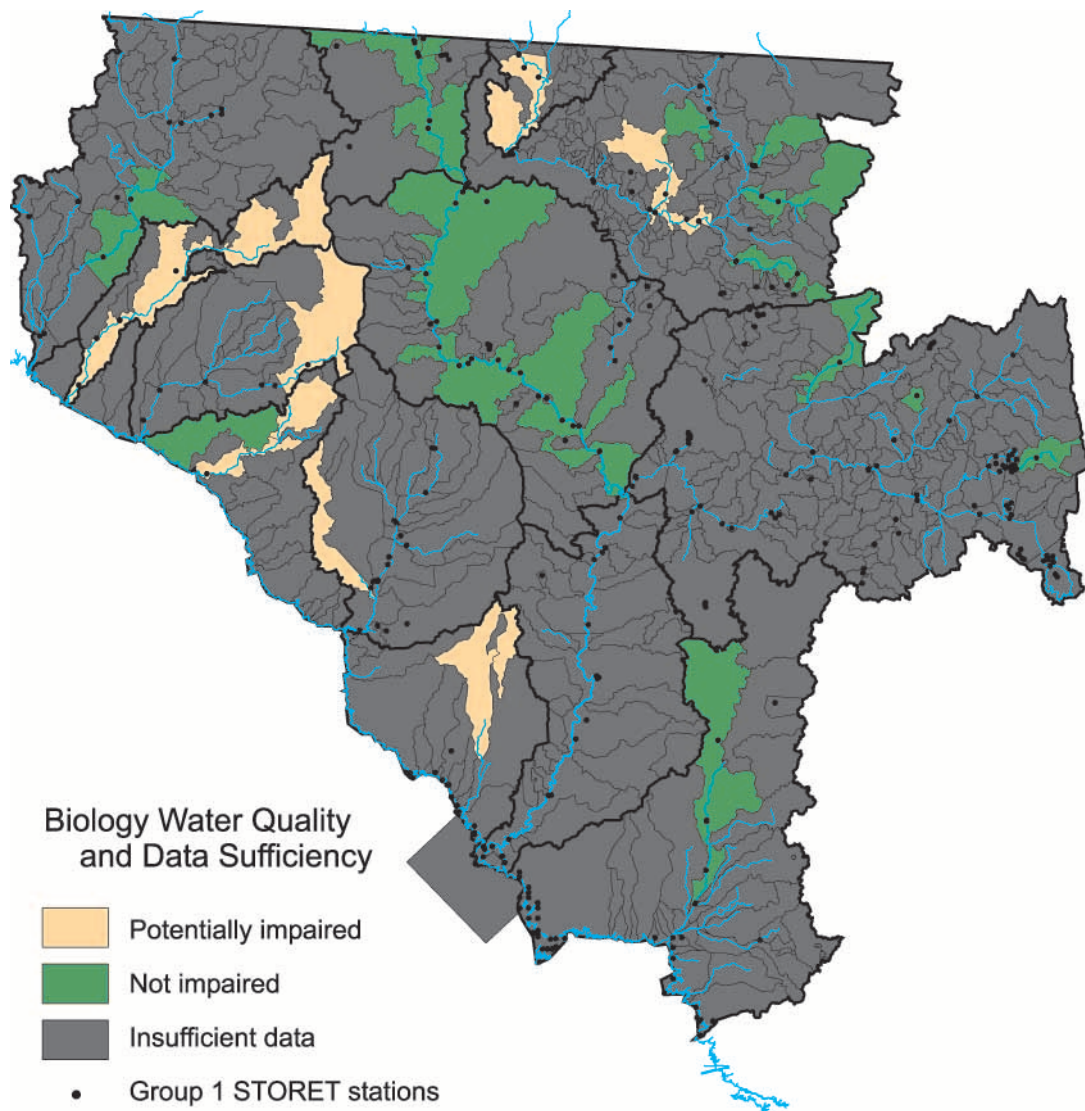


Figure 3.5: Suwannee Basin Waters Potentially Impaired for Biology According to the Impaired Surface Waters Rule

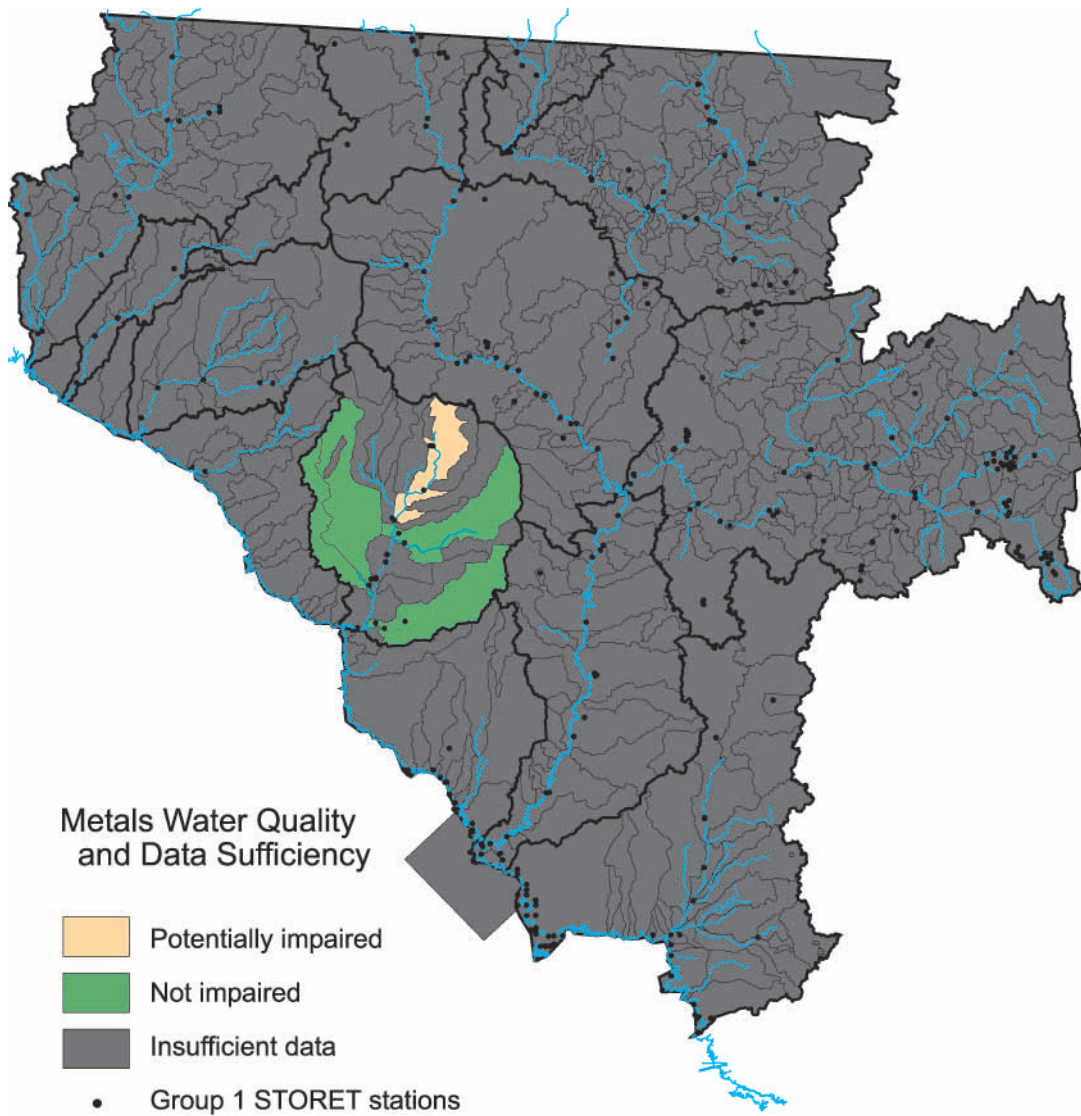
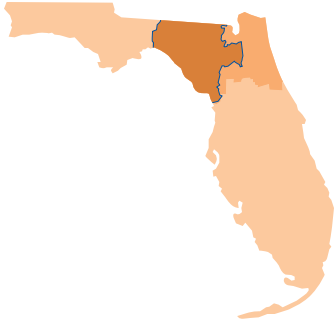


Figure 3.6: Suwannee Basin Waters Potentially Impaired for Metals According to the Impaired Surface Waters Rule



Impaired Waterbody Types

The Suwannee Group 1 Basin contains 530 individual waterbody segments that have defined areas of drainage associated with them. These segments are represented as polygons (see **Figures 3.2A** and **3.2B**). Each segment is classified based on its waterbody type: blackwater, estuary, lake, spring, or stream. The following summarizes potential water quality impairment by waterbody type, for waters with sufficient data under the IWR.

- Of 19 waterbody segments classified as blackwater, 17 had sufficient water quality data to be assessed. Of the 17, 11 were placed on the planning list of potentially impaired waterbodies—10 listed for DO and 1 for mercury fish consumption advisory.
- Of 11 waterbody segments classified as estuaries, 4 had sufficient water quality data to be assessed. One was placed on the planning list for nutrients.
- Of 43 lakes in the basin, only 11 had sufficient water quality data to be assessed. Seven of these were placed on the planning list—3 listed for nutrients and DO, 3 listed for just nutrients, 1 listed for DO and mercury fish consumption advisory.
- Of 40 waterbody segments classified as springs, 26 had sufficient water quality data to be assessed. Of these, 25 were placed on the planning list—23 listed for DO, 1 listed for DO and mercury fish consumption advisory, and 2 listed for DO and nutrients.
- Of 417 waterbody segments classified as streams, 82 had sufficient water quality to be assessed. Of the 82, 43 were placed on the planning list—22 listed for DO; 5 listed for DO and mercury fish consumption advisory; 3 listed for biology; 3 listed for DO and biology; 3 listed for DO and TC; 2 listed for TC; 1 listed for DO and FC; 1 listed for fish and total coliform; 1 listed for DO, TC, and FC; 1 listed for DO, biology, and nutrients; and 1 listed for fish consumption advisory. In addition, 6 segments were included on the planning list for nutrients based on the presence of algal mats.

In summary, of the 530 waterbody segments, only 140 had sufficient water quality data to be assessed. Of these, 87 were placed on the planning list of potentially impaired waterbodies.

Impairments by Parameters of Concern

Nutrients

Based on the criteria in the IWR, 7 lakes (Cherry, Alligator, Crosby, Rowell, Sampson, Santa Fe, and Hampton), 1 stream segment in Swift Creek, several segments of the Santa Fe River, the Middle and Lower Suwannee Rivers, and its estuary are potentially impaired because of excess nutrient concentrations.

Water Quality Standard Exceedences

Seventy-five waterbody segments in the basin were potentially impaired because they had DO concentrations less than the 5 milligrams per liter (mg/L) standard. This included 10 blackwaters, 4 lakes, 25 springs, and 36 stream segments. However, it should be noted that blackwater and spring discharges are naturally low in DO. A DO of less than 5 mg/L does not necessarily represent actual impairment.

Eight waterbody segments were potentially impaired because they had total coliform or fecal coliform counts in excess of standards. The standard for total coliform is 2,400 per 100 milliliters (mL), and for fecal coliform, 800 per 100 mL. Seven streams and 1 blackwater segment were identified.

Metals

One stream segment on the Steinhatchee River was potentially impaired because of a metals violation for iron.

Biology

Ten waterbody segments in the basin were potentially impaired for biology. Nine of these are classified as stream segments. They include portions of the Alapaha River, Swift Creek, Econfinia River, Fenholloway River, Weaver Warrior Creek, Spring Warrior Creek, Bevins (Boggy) Creek, Fishbone Creek, and Airport Canal. A portion of the Upper Suwannee River, a blackwater, was also potentially impaired for biology.

Ground Water and Surface Water Interaction

In the Suwannee Basin, ground water and surface water are so intimately connected that it is best to view them as a continuum. When the elevation of the Suwannee River exceeds that of the potentiometric surface of the upper Floridan aquifer, ground water discharge is stemmed and river (surface) water enters the aquifer. In some instances, major springs actually reverse their flow, redirecting ground water flow beneath and parallel to the river corridor. During normal and low river stage, however, ground water discharge is the predominant source of flow in the river. Most of the ground water discharge is via springs in or adjacent to the river.

As mentioned earlier, the Suwannee Basin has the highest density of springs in the world. **Table 3.2** summarizes data for these springs by watershed. Springs are classified according to the amount of water they discharge in cubic feet per second (cfs) or millions of gallons per day (mgd). First-magnitude springs discharge 100 cfs or more (64 mgd). Second-magnitude springs discharge between 10 and 100 cfs (6.4 to 64 mgd), third-magnitude



Table 3.2: Springs Data by Watershed¹

Basin	Aucilla/ Wacissa	Coastal	Econ- fina	Fenhol- loway	Stein- hatchee	Wacca- sassa	Ichetuck- nee	Santa Fe	Suwannee	Withla- coochee
Total Number	7	13	1	9*	13	3	8	60	115**	14
Magnitude										
1st	2				1		1	8	8	1
2nd	13	9	1	1	3	2	6	26	44	11
3rd	2	4		4	6	1	1	19	35	2
4th				1	3			7	27	
Total Flow										
(cfs)	932.42	219.72	6	25.93	498.01	48.19	345.72	3,204.12	3,240.98	550.59
Total Flow										
(mgd)	596.75	140.62	3.84	16.6	318.73	30.84	221.26	2,050.64	2,074.23	323.58
Range										
Nitrate-N (mg L ⁻¹)	<0.01 to 0.39	<0.02 to 0.07	<0.02	<0.02 to 0.38	<0.02 to 0.26	0.03 to 0.65	0.04 to 1.45	0.06 to 16.8+	0.01 to 19.2***	0.73 to 1.77

* Three springs were not field visited because of limited access.

** One spring did not have flow.

*** Two springs had nitrate-nitrogen concentrations greater than 10 mg L⁻¹.

+ One spring had nitrate-nitrogen concentration greater than 10 mg L⁻¹.

¹ Suwannee River Water Management District, WR99-02, WR00-03.

springs discharge between 1 and 10 cfs (.64 to 6.4 mgd), and fourth-magnitude springs discharge between 0.1 and 1 cfs (0.064 to .64 mgd).

Throughout the basin, the upper Floridan aquifer is the source of the spring discharge. This aquifer is extremely vulnerable to contamination because it is unconfined, shallow (less than 30 feet below the land surface), and exists in well-developed, karstic limestone mantled by a thin layer of silica sand. Contaminants from land use activities enter the aquifer directly through runoff into karst features (e.g., sinkholes) or rapidly through recharge that percolates through the porous silica sand.

Excess nitrate-nitrogen leached primarily from agricultural activities such as row and forage crops and dairy and poultry production continues to contaminate ground water in the basin. In the past 20 years, the potential load from these and other nitrate-nitrogen sources in the basin have increased (Katz et al., 1999). Concurrently, levels of nitrate-nitrogen several times the maximum contaminant level (MCL) of 10 mg/L have been detected in drinking water wells adjacent to agricultural sites, as well as in some of the area's springs.

Springs and diffused flow transfer the ground water nitrate load to the Suwannee River and its tributaries. Other sources include permitted facilities in the basin that discharge treated effluent to surface waters. **Appendix G** provides information on these facilities, by planning unit.

The nitrate-nitrogen concentration in the river has shown a statistically significant increasing trend over the past 20 years (Ham and Hatzell, 1996). The increased load is causing changes in periphyton in the Suwannee River and the Santa Fe River (a tributary), as well as extensive and frequent algal blooms (rapid growth of algae facilitated by excessive nutrient levels and other physical and chemical conditions) in the Suwannee River estuary (Phlips and Bledsoe, 1999; Bledsoe and Philips, 2000).

Utilizing the IWR, none of the Suwannee Basin's 197 springs were potentially impaired because of nutrients. However, to provide some perspective on the magnitude of the nutrient problem, consider that nitrate-nitrogen concentrations in unimpacted portions of the upper Floridan aquifer are less than 0.01 mg/L. Thus, a concentration of 10 mg/L potentially represents contamination in excess of 1,000 times greater than natural background.

In water year 2000, SRWMD staff calculated that 78 percent of the nitrate-nitrogen load carried by the Suwannee River to the Gulf of Mexico was introduced into the river from the Middle Suwannee watershed and the bottom section of the Santa Fe watershed. Together, these represent less than 19 percent of the Suwannee Basin's land area. Virtually all the load comes from ground water discharge via springs.

Water Quality Evaluation by Basin Planning Unit

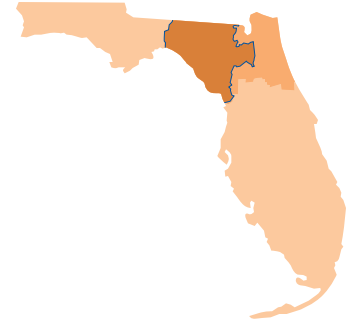
This section summarizes water quality characteristics and human-generated activities in the Suwannee Basin's planning units. The general water quality characteristics of waterbody types in each planning unit are presented and compared with statewide median values. **Appendix H** lists the STORET monitoring stations in the Suwannee Basin. **Appendix I** summarizes water quality statistics for the Suwannee River Basin by planning unit. It compares the median parameter concentrations in each waterbody type with statewide medians.

Upper Suwannee River Watershed

The Upper Suwannee River watershed drains about 2,643 square miles in southern Georgia and north Florida. Sixty-five percent of the watershed lies in Georgia. The Florida portion of the watershed, the Upper Suwannee River, drains 922 square miles in Hamilton, Columbia, and Suwannee Counties. Forested areas cover almost 53 percent and wetlands nearly 26 percent of the planning unit. The large area designated as urban and built-up in the center of the planning unit is actually an open-pit phosphate mine, owned and operated by PCS Phosphate, formerly known as Occidental. Agricultural lands bordering the river occupy slightly more than 10 percent of the watershed.

One hundred and fifteen waterbody segments (WBIDs) have water quality data available in STORET. Only 27 have sufficient data to be assessed using the criteria in the draft IWR. Of the 27, 10 are potentially impaired because of low DO, low pH, nutrients, total coliforms, biology, and fish consumption advisories based on mercury concentrations in fish tissues.

PCS Phosphate, a large phosphate strip mining and fertilizer manufacturing complex in Hamilton County, is the only major surface water discharger in the Upper Suwannee River planning unit. PCS produces liquid and granular fertilizers (di-ammonium phosphate, mono-ammonium phosphate, and triple superphosphate) and animal feeds (polyphos and discal phosphate). The complex has a design capacity of 226.9 mgd and discharges to Swift and Hunter Creeks, both of which flow into the Suwannee River.





Alapaha River Watershed

The Alapaha River watershed drains about 1,806 square miles in southern Georgia and north Florida. The Florida portion, the Alapaha planning unit, drains 108 square miles in Hamilton County. Forests cover almost 65 percent of the watershed. Agricultural lands are prominent in the southwestern part of the watershed, occupying slightly more than 20 percent of the land area.

Fifteen WBIDs have water quality data available in STORET. Only 5 of these have sufficient data to be assessed. Only 1 is potentially impaired because of fish consumption advisories based on mercury concentrations in fish tissues and low pH.

Withlacoochee River Watershed

The Withlacoochee River watershed drains about 2,384 square miles in southern Georgia and north Florida. The Florida portion of the Withlacoochee River watershed drains 272 square miles in Hamilton and Madison Counties. Forests cover nearly 57 percent of the planning unit, primarily along the river corridor. Agricultural lands are prominent in the western part of the watershed, occupying approximately 28 percent of the land area.

Ten WBIDs have water quality data available in STORET. Only 2 of these have sufficient data to be assessed. A segment of the Withlacoochee River is potentially impaired because of DO under the IWR and because of a fish consumption advisory for mercury. Cherry Lake is potentially impaired because of nutrients and low pH.

Tenneco Packaging Plant, a pulp and paper mill, manufactures bleached kraft linerboard. Although the plant is in Lowndes County, Georgia, it discharges its wastewater in Florida via a pipeline to the Withlacoochee River. The mill's design capacity is 55 mgd.

Middle Suwannee River Watershed

The Middle Suwannee River watershed planning unit drains 963 square miles of Suwannee, Lafayette, and Madison Counties and fractions of Taylor and Columbia Counties. Forested areas cover nearly 52 percent of the planning unit. Agricultural lands occupy 29 percent of the watershed and are well distributed in Suwannee County and concentrated adjacent to the river in Lafayette County.

Fifty-two WBIDs have water quality data available in STORET. Only 19 of these have sufficient data to be assessed, and of these, 16 are potentially impaired. The main stem of the Suwannee River is potentially impaired because of low DO and a fish consumption advisory for mercury. The remaining 15 are springs that are potentially impaired because of DO under the IWR. Because of the presence of algal mats in sufficient quantities to pose a nuisance, several segments of the Middle Suwannee River are potentially impaired due to nutrients.

Two permitted industrial facilities discharge wastewater into the Middle Suwannee River planning unit. Florida Power Corporation's Suwannee River Generation Plant is a steam electric-generating plant that uses the river for once-through cooling water. The plant's design capacity is

342 mgd. The other wastewater discharger, Goldkist Poultry Processing Facility, processes chickens from its grower operations in the surrounding counties. Its permitted capacity is 1.5 mgd.

Santa Fe River Watershed

The Santa Fe River watershed drains 1,384 square miles of Bradford, Union, Alachua, Columbia, and Gilchrist Counties. Forests cover slightly more than 50 percent of the planning unit. Agricultural lands occupy slightly more than 22 percent and are well distributed in Alachua, Columbia, and Gilchrist Counties.

One hundred and twenty-nine WBIDs have water quality data available in STORET. Only 36 of these WBIDs have sufficient data to be assessed, and 27 of the 36 are potentially impaired for low DO, low pH, nutrients, biology, and fish consumption advisories based on mercury concentrations in fish tissues. Because of the presence of algal mats in sufficient quantities to pose a nuisance, several segments of the Santa Fe River are potentially impaired due to nutrients.

There are a number of permitted dischargers. The largest is DuPont's Trail Ridge mine, a sand and heavy minerals mine, which discharges to Alligator Creek. The city of Starke's wastewater treatment plant, the other significant permitted facility, discharges both to a spray irrigation site south of the city and intermittently to a ditch that flows to Alligator Creek.

Lower Suwannee River Watershed

The Lower Suwannee River watershed drains 614 square miles of Gilchrist, Levy, and Dixie Counties and a fraction of Lafayette County. Forests cover slightly more than 41 percent of the planning unit. Agricultural lands, which occupy a little more than 26 percent, are concentrated adjacent to the river in Gilchrist and Levy Counties. Wetlands occupy slightly more than 17 percent of the land area.

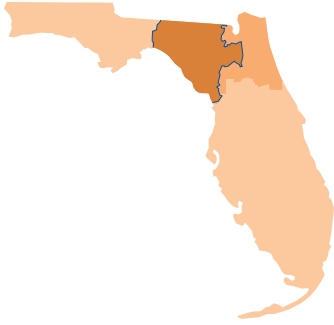
Twenty-nine WBIDs have water quality data available in STORET. Only 3 of these have sufficient data to be assessed. All 3 are springs; they are potentially impaired because of DO values under the IWR. Because of the presence of algal mats in sufficient quantities to pose a nuisance, several segments of the Lower Suwannee River are potentially impaired due to nutrients.

Aucilla/Wacissa River Watershed

The Aucilla/Wacissa River watershed drains 954 square miles in an area extending from Florida's Gulf Coast up into southern Georgia. In Florida's Jefferson and Madison Counties, the watershed drains 734 square miles. The remaining 220 square miles lie in Brooks and Thomas Counties in Georgia. In the Florida portion of the watershed, 79 percent of the land area is in forested wetlands, and 16 percent of the land is used for agricultural purposes.

Forty-eight WBIDs have water quality data available in STORET. Only 10 of these have sufficient data to be assessed. Of the 10, 4 are potentially impaired. Low DO was detected in all 4 waters, and low pH was detected in 3.

None of the permitted dischargers in the planning unit are major.



Econfina River Watershed

The Econfina River watershed drains 202 square miles of Madison and Taylor Counties. Wetlands are the dominant feature, occupying slightly more than 46 percent of the planning unit. Forests cover slightly more than 44 percent of the land area. Agricultural lands, which are concentrated in Madison County, occupy a little more than 6 percent.

Eight WBIDs have water quality data available in STORET. Only 1 of these has sufficient data to be assessed. This stream segment is potentially impaired because of low DO, low pH, and biology.

Fenholloway River Watershed

The Fenholloway River watershed drains 380 square miles, almost all of them in Taylor County. Forests occupy nearly 51 percent and wetlands almost 38 percent of the land area. Urban and agricultural lands, concentrated around the city of Perry, occupy nearly 9 percent of the watershed.

Fifteen WBIDs have water quality data available in STORET. Only 4 segments have sufficient data to be assessed, and all of these are on the Fenholloway River proper. All 3 sites are potentially impaired because of low DO; 1 is also potentially impaired because of pH and biology; and the other is also potentially impaired because of high total and fecal coliforms.

Buckeye Florida, L.P., a pulp and paper mill in Taylor County, discharges to the Fenholloway River and has been granted a mixing zone for chronic toxicity from point of discharge to the Gulf of Mexico. Ongoing discussions with Buckeye, EPA, and the Department are focused on alternative discharge scenarios. That will remove the discharge from the upper Fenholloway River and comply with applicable water quality standards. The Perry Domestic Wastewater Treatment Plant discharges to Spring Creek.

Steinhatchee River Watershed

The Steinhatchee River watershed drains 562 square miles of southern Lafayette, southeastern Taylor, and western Dixie Counties. Ninety-eight percent of the watershed is pine flatwoods and wetlands, most of which is used for commercial timber production.

Twenty-one WBIDs have water quality data available in STORET. Only 8 have sufficient data to be assessed. Six of these waterbodies are potentially impaired. Five of the 6 sites are stream segments, and all 5 are potentially impaired because of low DO concentrations. In addition, 1 stream segment is potentially impaired because of metals and biology, and another is also potentially impaired because of biology.

Coastal Watershed

The Coastal planning unit includes the areas between the four river systems—the Econfina, Fenholloway, Steinhatchee, and Suwannee Rivers—that drain directly into the Gulf of Mexico.

Aucilla/Econfina Coastal

The Aucilla/Econfina Coastal watershed drains about 23 square miles of forested wetland and coastal marsh in western Taylor County. The watershed contains one stream water quality station, which does not provide sufficient water quality information for an assessment.

Econfina/Fenholloway Coastal

The Econfina/Fenholloway Coastal watershed drains about 50 square miles of forested wetland and coastal marsh in western Taylor County. Forested areas cover almost 59 percent of the watershed, and wetlands about 40 percent. All other land uses occupy less than 1 percent each.

The watershed has 3 stream water quality stations, none of which have enough water quality information for an assessment.

Fenholloway/Steinhatchee Coastal

The Fenholloway/Steinhatchee Coastal watershed drains about 286 square miles in south central Taylor County. Wetlands occupy 94 percent of the watershed, and forested areas cover 6 percent.

Twenty-four WBIDs have water quality data available in STORET. Only 2 of these have sufficient data to be assessed. One stream, Spring Warrior Creek, is potentially impaired because of low DO and the other, Weaver Warrior Creek, because of biology.

Steinhatchee/Lower Suwannee Coastal

The Steinhatchee/Lower Suwannee Coastal watershed drains about 356 square miles of Dixie County. Wetlands occupy slightly more than 84 percent of the watershed. Nearly 15 percent is forested, and almost 1 percent is used for transportation, communications, and utilities.

Eighteen WBIDs have water quality data available in STORET. Only 7 of these have sufficient data to be assessed. Five stream segments are potentially impaired because of low DO and 2 stream segments, Fishbone Creek and Airport Canal, are potentially impaired because of biology.

Two small domestic wastewater plants discharge to surface waterbodies. The Cross City plant discharges to a ditch that flows into California Swamp, and the Nature Coast plant discharges to a ditch that flows into the Steinhatchee River.

Waccasassa River Watershed

The Waccasassa River watershed drains 901 square miles in Alachua, Gilchrist, and Levy Counties. Forested areas occupy more than 55 percent and wetlands over 18 percent of the planning unit. Agricultural lands occupy more than 15 percent, predominantly in the upper portion of the watershed.

Forty-one WBIDs have water quality available in STORET. Only 11 of these have sufficient data to be assessed. Of these 11, 4 are potentially impaired: 1 for total coliforms and a fish consumption advisory and the other 3 for low concentrations of DO.

The city of Cedar Key is the only permitted domestic wastewater discharger in the Waccasassa River watershed. Its facility discharges to a drip sprayfield.

Land Use and Pollutant Loadings

Land use is the principal factor affecting pollutant loading in the Suwannee Basin. Of nearly 5 million acres in the basin, 50 percent are forested and nearly 25 percent are wetlands. Agricultural land uses occur on slightly less than 16 percent of the basin. A little more than 6 percent is classified as urban and built-up. Transportation, communication, utilities, rangeland, and water occupy approximately 3 percent of the basin's area.

Table 3.3 summarizes broad (Level 1) land uses by planning unit, and the last section in the table breaks down land uses for the entire basin.

Although silviculture is not a listed land use category, it is probably the dominant activity. Most of the basin's forested areas and a significant portion of its wetlands are in silviculture. Specifically, these lands are managed to produce fiber using modern silvicultural practices, which include artificial drainage networks, the use of chemicals such as fertilizers and pesticides, and the use of BMPs to minimize adverse water quality impacts.

Table 3.3: Summary of Level 1 Land Uses by Planning Unit

Land Use	Upper Suwannee River			Alapaha River			Withlacoochee River		
Level 1	acres	mi ²	%	acres	mi ²	%	acres	mi ²	%
1000 - Urban and Built-Up	47,409	74	8.0	2,721	4	3.9	10,036	16	5.8
2000 - Agricultural	61,457	96	10.4	13,874	22	20.1	48,389	76	27.8
3000 - Rangeland	6,959	11	1.2	713	1	1	1,089	2	0.6
4000 - Forested	312,040	488	52.9	44,886	70	65	98,546	154	56.6
5000 - Water	4,996	8	0.8	476	1	0.7	3,247	5	1.9
6000 - Wetlands	153,117	239	26.0	5,946	9	8.6	11,667	18	6.7
7000 - Barren Land	110	0	0.0	17	0	0	51	0	0
8000 - Trans, Comm, and Utilities	3,772	6	0.6	471	1	0.7	1,075	2	0.6
Total	589,860	922	99.9	69,104	108	100	174,100	273	100
Land Use	Middle Suwannee River			Santa Fe River			Lower Suwannee River		
Level 1	acres	mi ²	%	acres	mi ²	%	acres	mi ²	%
1000 - Urban and Built-Up	45,975	72	7.5	76,463	119	8.6	46,285	72	11.8
2000 - Agricultural	178,835	279	29.0	197,544	309	22.3	103,168	161	26.3
3000 - Rangeland	5,978	9	1.0	12,071	19	1.4	4,955	8	1.3
4000 - Forested	317,932	497	51.6	443,323	693	50.1	161,246	252	41.1
5000 - Water	5,287	8	0.9	15,218	24	1.7	7,099	11	1.8
6000 - Wetlands	57,438	90	9.3	131,703	206	14.9	68,108	106	17.4
7000 - Barren Land	87	0	0.0	338	1	0	48	0	0
8000 - Trans, Comm, and Utilities	4,874	8	0.8	9,067	14	1	1,574	2	0.4
Total	616,406	963	100.1	885,727	1,385	100	392,483	612	100.1
Land Use	Aucilla River			Econfina River			Fenholloway River		
Level 1	acres	mi ²	%	acres	mi ²	%	acres	mi ²	%
1000 - Urban and Built-Up	12,761	20	2.7	1,771	3	1.4	12,906	20	5.3
2000 - Agricultural	74,645	117	15.9	7,921	12	6.1	8,497	13	3.5
3000 - Rangeland	3,921	6	0.8	1,102	2	0.9	887	1	0.4
4000 - Forested	205,050	320	43.6	57,273	89	44.3	123,785	193	50.9
5000 - Water	6,240	10	1.3	804	1	0.6	1,857	3	0.8
6000 - Wetlands	164,339	257	35.0	59,555	93	46.1	92,014	144	37.9
7000 - Barren Land	29	0	0.0	22	0	0.0		0	0.0
8000 - Trans, Comm, and Utilities	2,786	4	0.6	755	1	0.6	3,043	5	1.3
Total	469,771	734	99.9	129,203	201	100	242,989	379	100.1

Table 3.3 continued

Land Use	Steinhatchee River			Coastal			Waccasassa River		
Level 1	acres	mi²	%	acres	mi²	%	acres	mi²	%
1000 - Urban and Built-Up	2,929	5	0.8	8,503	13	1.9	42,904	67	8.1
2000 - Agricultural	1,128	2	0.3	6,001	9	1.3	79,872	125	15.1
3000 - Rangeland	692	1	0.2	1,492	2	0.3	11,587	18	2.2
4000 - Forested	187,659	293	52.2	209,567	327	46.9	293,733	459	55.4
5000 - Water	1,837	3	0.5	4,126	6	0.9	4,152	6	0.8
6000 - Wetlands	164,672	257	45.8	216,450	338	48.4	98,299	154	18.5
7000 - Barren Land	15	0	0.0	6	0	0.0		0	0.0
8000 - Trans, Comm, and Utilities	698	1	0.2	979	2	0.2		0	0.0
Total	359,630	562	100	447,124	697	99.9	530,547	829	100.1

Land Use	Entire Basin		
Level 1	acres	mi²	%
1000 - Urban and Built-Up	310,664	485	6.3
2000 - Agricultural	781,330	1,221	15.9
3000 - Rangeland	51,444	80	1.0
4000 - Forested	2,455,039	3,836	50.0
5000 - Water	55,337	86	1.1
6000 - Wetlands	1,223,348	1,911	24.9
7000 - Barren Land	723	1	0.0
8000 - Trans, Comm, and Utilities	29,092	45	0.6
Total	4,906,977	7,667	100

In 1995, the SRWMD contracted with Soil and Water Engineering Technology, Inc., to assess water quality in the entire water management district using a geographic information system (GIS). In January 1998, the company produced the Water Assessment Model (SR-WAM). The model used the water management district's GIS databases (including land use, soils, and hydrography) and known pollutant transport processes to estimate potential pollutant loading from various land uses.

Since nitrogen is the nutrient of primary concern in the basin, **Table 3.4** presents the results of the SR-WAM for this nutrient. The table shows the potential loadings of nitrogen in sediments, runoff, and recharge from various land uses. **Figure 3.7** shows the spatial distribution and relative magnitude of the loading of nitrogen to ground water. Information on loadings of other pollutants is available in the SR-WAM report.

Ground Water Quality Assessment

This status report evaluates the basin's regional ground water quality using data collected by the DEP Status Network, a monitoring network based on random sampling and designed to answer broad-based, statewide to basinwide questions (Copeland et al., 1999). The Status Network was developed in cooperation with a Technical Advisory Committee to provide

Table 3.4: Total Potential Source Loads Ranked by Land Use in the Basin

Total load = load sum (kg*1000), % = percentage of total District load

Sediment Nitrogen

Land Use	District (kg*10 ³) (%)		Aucilla (kg*10 ³) (%)		Coastal (kg*10 ³) (%)		Lower (kg*10 ³) (%)		Santa Fe (kg*10 ³) (%)		Withlacoochee (kg*10 ³) (%)		Alapaha (kg*10 ³) (%)		Upper (kg*10 ³) (%)		Waccasassa (kg*10 ³) (%)	
Row Crops	96	20.7	32	6.9	3	0.7	16	3.5	27	5.7	7	1.6	2	0.5	3	0.6	5	1.1
Commercial and Services	79	17.1	3	0.7	15	3.3	17	3.7	27	5.9	4	0.8	1	0.2	8	1.7	4	0.9
Wetland Forested Mixed	42	9.0	7	1.4	21	4.5	2	0.5	2	0.5	0	0.0	0	0.0	4	0.9	5	1.1
Transportation Corridors	33	7.2	4	0.9	5	1.1	6	1.4	7	1.5	1	0.2	1	0.1	6	1.2	4	0.8
Multiple Dwelling Units	32	7.0	1	0.2	3	0.6	6	1.2	13	2.9	2	0.5	1	0.1	5	1.2	1	0.3
Industrial	29	6.3	2	0.4	10	2.1	3	0.7	9	2.0	1	0.2	0	0.0	3	0.7	1	0.2
Improved Pasture	27	5.9	9	2.0	2	0.4	4	0.8	5	1.1	2	0.4	0	0.1	2	0.4	3	0.7
Ranchettes	24	5.3	2	0.4	3	0.6	7	1.6	6	1.3	1	0.3	0	0.1	1	0.3	3	0.7
Coniferous Plantations	16	3.4	2	0.4	7	1.5	2	0.3	2	0.4	0	0.1	0	0.0	2	0.3	1	0.3
Medium Density Residential	13	2.8	1	0.2	2	0.4	3	0.6	4	0.9	1	0.2	0	0.0	2	0.4	0	0.1
Low Density Residential	12	2.6	0	0.1	2	0.4	2	0.5	5	1.1	0	0.1	0	0.0	1	0.2	1	0.2
Bay Swamps	10	2.3	0	0.1	6	1.3	0	0.1	0	0.1	0	0.0	0	0.0	1	0.2	2	0.5
Barren Land	9	1.9	0	0.1	3	0.6	2	0.3	1	0.2	0	0.0	0	0.0	0	0.0	3	0.6
Prisons	7	1.5	0	0.1	1	0.1	1	0.3	3	0.7	0	0.1	-	-	1	0.1	0	0.1
Poultry Feeding Operations	5	1.1	0	0.0	0	0.1	2	0.4	2	0.4	1	0.1	0	0.0	0	0.1	0	0.0
Undeveloped Residential	5	1.0	0	0.0	0	0.0	3	0.6	0	0.1	0	0.0	-	-	0	0.0	1	0.3
Cypress	4	0.9	2	0.3	1	0.2	0	0.1	0	0.1	0	0.0	0	0.0	1	0.1	0	0.1
Phosphate Processing	3	0.7	-	-	-	-	-	-	-	-	-	-	-	-	3	0.7	-	-

Runoff Nitrogen

Land Use	District (kg*10 ³) (%)		Aucilla (kg*10 ³) (%)		Coastal (kg*10 ³) (%)		Lower (kg*10 ³) (%)		Santa Fe (kg*10 ³) (%)		Withlacoochee (kg*10 ³) (%)		Alapaha (kg*10 ³) (%)		Upper (kg*10 ³) (%)		Waccasassa (kg*10 ³) (%)	
Wetland Forested Mixed	1335	57.0	208	8.9	665	28.4	78	3.3	79	3.4	7	0.3	3	0.1	132	5.6	164	7.0
Bay Swamps	167	7.1	6	0.2	94	4.0	8	0.3	4	0.2	0	0.0	0	0.0	16	0.7	39	1.7
Coniferous Plantations	156	6.7	15	0.6	67	2.9	15	0.6	21	0.9	2	0.1	1	0.0	15	0.6	20	0.8
Row Crops	103	4.4	20	0.9	3	0.1	16	0.7	45	1.9	7	0.3	2	0.1	4	0.2	6	0.3
Commercial and Services	74	3.1	3	0.1	14	0.6	16	0.7	26	1.1	4	0.2	1	0.0	7	0.3	4	0.2
Cypress	65	2.8	24	1.0	15	0.6	4	0.2	5	0.2	2	0.1	1	0.1	10	0.4	4	0.2
Multiple Dwelling Units	64	2.7	2	0.1	6	0.2	11	0.5	26	1.1	5	0.2	1	0.1	11	0.5	2	0.1
Freshwater Marshes	51	2.2	12	0.5	14	0.6	7	0.3	1	0.1	1	0.0	0	0.0	3	0.1	12	0.5
Improved Pasture	47	2.0	8	0.3	4	0.2	7	0.3	11	0.5	2	0.1	1	0.0	5	0.2	10	0.4
Poultry Feeding Operations	42	1.8	1	0.1	5	0.2	11	0.5	19	0.8	3	0.1	0	0.0	3	0.1	0	0.0
Hardwoods	29	1.2	7	0.3	7	0.3	5	0.2	3	0.1	1	0.1	1	0.0	4	0.1	2	0.1
Industrial	27	1.2	2	0.1	9	0.4	3	0.1	9	0.4	1	0.0	0	0.0	3	0.1	1	0.0
Ranchettes	21	0.9	2	0.1	4	0.2	4	0.2	6	0.2	1	0.0	0	0.0	1	0.1	3	0.1
Transportation Corridors	17	0.7	2	0.1	3	0.1	3	0.1	4	0.2	0	0.0	0	0.0	3	0.1	2	0.1
Phosphate Mines	15	0.6	-	-	-	-	0	0.0	-	-	-	-	-	-	14	0.6	1	0.0
Prisons	14	0.6	1	0.0	1	0.0	2	0.1	7	0.3	1	0.0	-	-	1	0.1	1	0.0
Open Water	12	0.5	2	0.1	4	0.2	1	0.0	0	0.0	0	0.0	0	0.0	1	0.0	4	0.2
Mixed Wetland Hardwoods	12	0.5	1	0.1	1	0.1	4	0.2	4	0.2	0	0.0	-	-	0	0.0	1	0.0

Ground Water Nitrogen

Land Use	District (kg*10 ³) (%)		Aucilla (kg*10 ³) (%)		Coastal (kg*10 ³) (%)		Lower (kg*10 ³) (%)		Santa Fe (kg*10 ³) (%)		Withlacoochee (kg*10 ³) (%)		Alapaha (kg*10 ³) (%)		Upper (kg*10 ³) (%)		Waccasassa (kg*10 ³) (%)	
Row Crops	2326	35.3	265	4.0	38	0.6	770	11.7	640	9.7	259	3.9	76	1.2	95	1.4	182	2.8
Poultry Feeding Operations	1370	20.8	22	0.3	48	0.7	877	13.3	148	2.2	162	2.5	5	0.1	105	1.6	5	0.1
Dairies	701	10.7	15	0.2	-	-	541	8.2	40	0.6	-	-	-	-	8	0.1	97	1.5
Improved Pasture	555	8.4	16	0.2	11	0.2	116	1.8	116	1.8	12	0.2	5	0.1	25	0.4	255	3.9
Medium Density Residential	403	6.1	20	0.3	56	0.9	92	1.4	141	2.1	24	0.4	5	0.1	58	0.9	7	0.1
Low Density Residential	258	3.9	7	0.1	38	0.6	50	0.8	114	1.7	7	0.1	2	0.0	17	0.3	23	0.4
Ranchettes	231	3.5	12	0.2	21	0.3	81	1.2	60	0.9	12	0.2	3	0.0	14	0.2	29	0.4
Coniferous Plantations	191	2.9	10	0.2	64	1.0	37	0.6	25	0.4	5	0.1	2	0.0	20	0.3	27	0.4
Tree Nurseries	132	2.0	9	0.1	-	-	94	1.4	11	0.2	0	0.0	-	-	0	0.0	18	0.3
Peach and Pecan Orchards	97	1.5	43	0.7	-	-	23	0.4	22	0.3	5	0.1	-	-	3	0.0	1	0.0
Hardwoods	72	1.1	10	0.1	8	0.1	18	0.3	8	0.1	5	0.1	2	0.0	12	0.2	9	0.1
Ornamental Nurseries	57	0.9	20	0.3	-	-	26	0.4	7	0.1	1	0.0	1	0.0	0	0.0	3	0.0
Scrub and Brushland	32	0.5	1	0.0	4	0.1	6	0.1	7	0.1	0	0.0	0	0.0	4	0.1	9	0.1
Hardwood Conifer Mixed	20	0.3	1	0.0	2	0.0	2	0.0	5	0.1	1	0.0	0	0.0	7	0.1	2	0.0
Woodland Pasture	19	0.3	0	0.0	2	0.0	5	0.1	6	0.1	1	0.0	0	0.0	1	0.0	4	0.1
Barren Land	18	0.3	1	0.0	6	0.1	3	0.1	1	0.0	0	0.0	0	0.0	1	0.0	7	0.1
Kennels	14	0.2	-	-	-	-	10	0.2	-	-	2	0.0	-	-	-	-	2	0.0
Blueberries	12	0.2	0	0.0	-	-	2	0.0	8	0.1	-	-	0.0	0.0	0.0	0.0	0.0	0.0

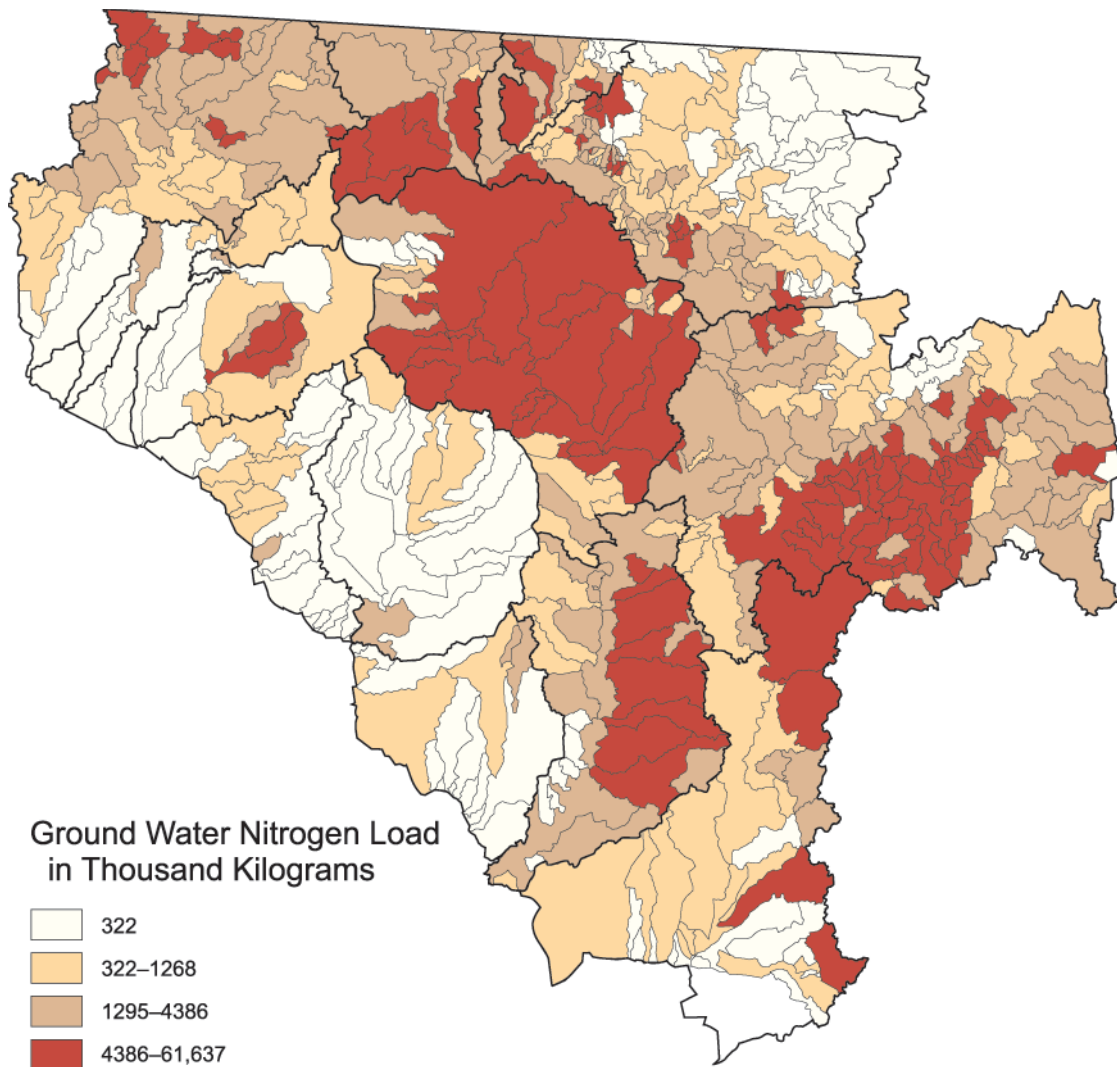


Figure 3.7: Estimated Annual Mean Ground Water Nitrogen Load



a scientific and statistically based methodology for evaluating Florida's statewide ground water and surface water quality.

Regional ground water quality is assessed using a Basin Resource Index (BRI) procedure that evaluates the monitoring results at individual wells and interprets them in a basinwide context. Individual pollutants are identified and targeted for further investigation during Phase 2 of the basin rotation cycle.

Ground Water Analytes of Concern (GWACs) are also identified. Precipitation is abundant in Florida, and ground water levels are typically near or at land surface. Thus, for most of the year, ground water flows from the ground water realm to surface waterbodies, providing the baseflow for most streams. This creates the potential for elevated concentrations of analytes in ground water to adversely influence surface water quality.

GWACs are analytes that exist at concentrations elevated above levels of concern for environmental health (in surface water), but below levels of concern for public health (based on drinking water criteria in ground water). For example, ground water with a nitrate (as N) concentration of 9 milligrams per liter (mg/L) is below the ground water standard of 10 mg/L, but might cause adverse ecological impacts when discharged into a surface water. The influence of GWACs is often apparent in Florida's many springs where ground water and surface water visibly interact and integrating ground water and surface water protection efforts are necessary to safeguard both resources.

Methodology

Ground Water Analytes of Concern

Precipitation is abundant in Florida, and ground water levels are typically near or at land surface. Thus, for most of the year, ground water flows from underneath the surface to surface water, providing the baseflow for most streams. This creates the potential for elevated concentrations of substances in ground water to influence surface water quality adversely.

Florida has a single designated use for ground water—drinking water. However, Florida surface water is protected for five designated use classifications. GWACs identify those analytes that exist at concentrations that do not necessarily pose a threat to public health via ground water, but could adversely impact the environmental health of surface waters. For example, ground water with a nitrate (as N) concentration of 9 mg/L is below the ground water standard of 10 mg/L, but might cause adverse impacts when discharged into a surface water with a background concentration of 0.5 mg/L. The influence of GWACs is often apparent in Florida's many springs, where ground water and surface water interact.

Status Network

GWACs are identified using data collected by Florida's Status Network. The Water Management Districts (WMDs) and selected counties cooperate with the Department in the operation and sampling of the network. The Status Network divides the state into 20 individual basins, 4 basins per each WMD. Each year a basin is sampled in each WMD, providing a

comprehensive statewide assessment over a four-year period. Focusing on the ground water portion of the network, 30 ground water samples are collected from the confined aquifer and 30 samples are collected from the unconfined aquifer (including springs) in a basin. Thus for any given year, approximately 300 total ground water samples are collected—150 from the confined aquifer and 150 from the unconfined aquifer.

The four basins, identified as Reporting Units (RU), in the Suwannee River Water Management District are the Middle and Lower Suwannee River Basin (RUA), Santa Fe and Waccasassa Rivers Basin (RUB), Upper Suwannee, Alapaha, Withlacoochee and Aucilla Rivers Basin (RUC), and the Coastal Rivers Basin (RUD).

The confined aquifer represents ground water that is overlaid by a relatively impervious layer, such as clay, that severely limits the exchange of water and chemicals above and below the layer. An unconfined aquifer has no confining unit between the zone of ground water saturation and the ground surface—essentially a surficial or water table aquifer.

Using year 2000 Status Network data, the median concentration of each measured analyte was compared to the median concentration of the same analyte measured within the remaining three basins within the appropriate WMD. Data for the other three basins were provided by the Department's Background Monitoring Network that was sampled during 1996–1999 (the Background Network has been replaced by the Status Network). Comparisons were made for confined and unconfined ground water.

A Mann-Whitney statistical test (Mendenhall et al., 1981) was used to compare the median concentrations. If the median concentration for any analyte in the sampled basin is significantly elevated—confidence level = 95 percent—then it is considered a GWAC and a potential contributor to the impairment of a surface waterbody. Elevated nutrients in ground water, such as nitrate, are of particular concern because of their potential to adversely impact surface water.

Assessment of Regional Ground Water Quality

Regional ground water quality is assessed using a BRI that evaluates the monitoring results at individual wells and interprets them in a basin-wide context. Individual pollutants are identified and targeted for further investigation during Phase 2 of the watershed management cycle.

BRI's indicate overall ground water quality on a regional scale. Each BRI is determined by the percentage of Status Network wells with analyte concentrations exceeding primary or secondary ground water standards, i.e., maximum contaminant levels (MCLs), or health-/aesthetic-based ground water guidance concentration levels. Primary ground water MCLs are human health-based; secondary MCLs are based on aesthetic considerations.

If an individual well has concentrations that exceed a health-based criterion, the well is categorized as **A–Action Recommended**—identifying site specific contamination and indicating that this water supply should be remediated. An individual well with concentrations exceeding an aesthetic criterion is categorized as **C–Concern**.



Similarly, two BRIs, one for human health and one for aesthetics, are calculated. If greater than 10 percent of the randomly sampled Status Network wells in a region are classified as **A** or **C**, then the ground water quality within the entire region is categorized for Action or Concern, as demonstrated in **Table 3.5**. This indicates broad-based conditions that impact ground water quality. BRIs cannot be accurately calculated in basins with less than 20 samples.

Table 3.5. Basin Resource Indices

Index	Wells Exceed 10%		Regional Category
BRI (health)	>10% of wells in region categorized as A	Yes No	A—Action Recommended N—No Basis for Action nor Concern
BRI (aesthetics)	>10% if wells in region categorized as C	Yes No	C—Concern N—No Basis for Action nor Concern

Since all possible analytes are not sampled, an **N** label does not mean that the sample provides no risk, but that enough evidence does not exist to suggest the Department should be concerned about the ground water in the well. BRI results should be carefully evaluated and only statements concerning ground water quality based on the measured analytes should be made. The Status Network analyte list appears in **Appendix J**.

Microbiology Data

The Department began the first comprehensive sampling of ground water microbiology in 2000. By 2003, the entire state will have been sampled for fecal coliform (F.Colif.) and enterococci bacteria in both confined and unconfined ground water. At press, only one quarter of the state has been sampled. Preliminary findings reveal that F.Colif. is problematic in shallow ground water and in springs, being present in 62 percent of all wells and springs sampled in the year 2000. EPA estimates that greater than 85 percent of contaminated public water supply wells is due to F.Colif. Several follow-up studies are now in progress to more accurately determine the extent and source of the problem.

Ground Water/Surface Water Interaction Issues

The Objectives and Methodology Section introduced the concept of GWACs. GWACs are ground water analytes that are below ground water quality standards, but may still exist at elevated concentrations that could adversely impact surface waters. GWACs are identified by analyzing data in a basin and comparing it to data collected in other basins of the same WMD. If the median concentration for an analyte is significantly elevated—using a 95 percent confidence interval—compared to the rest of the WMD, it is considered a GWAC. GWACs are reported as basin ratios, comparing the concentration of the analyte in the basin to the remainder of the WMD.

GWACs are identified for (1) confined ground water and (2) unconfined ground water. **Table 3.6** displays the results of this ground water analysis.

Confined Ground Water

Middle and Lower Suwannee Rivers Basin

Phosphorus was identified as a GWAC, with a basin ratio of 2.17. This indicates that phosphorus concentrations are 2.17 times greater in this basin than in the remainder of the SRWMD. The increase in phosphorus could simply reveal that Status Network wells tap more phosphatic zones of the aquifer. This is not unusual in north central Florida (Maddox et al., 1992). The increase in phosphorus could also indicate that nutrient concentrations, caused by land use activities, are on the increase.

Santa Fe and Waccasassa Rivers Basin

No GWACs were identified in this basin.

Upper Suwannee, Alapaha, Withlacoochee, and Aucilla Rivers Basin

No GWACs were identified in this basin.

Coastal Rivers Basin

No GWACs were identified in this basin.

Unconfined Ground Water

Middle and Lower Suwannee Rivers Basin

Nitrate (as N) is a GWAC of tremendous concern. It has a basin ratio of 26.50, indicating a more than 26-fold increase in the median concentration of nitrate in this basin relative to the remainder of the SRWMD. This is reflected in increased nitrate concentrations in the surface waterbodies of the basin.

Santa Fe and Waccasassa Rivers Basin

Phosphorus was identified as a GWAC, with a basin ratio of 1.23. This indicates that phosphorus concentrations are 1.23 times greater in this basin than in the remainder of the SRWMD. The increase in phosphorus could simply reveal that Status Network wells tap more phosphatic zones of the aquifer as described above.

Upper Suwannee, Alapaha, Withlacoochee, and Aucilla Rivers Basin

No GWACs were identified in this basin.

Coastal Rivers Basin

Ammonia (NH₃), ammonia plus organic nitrogen (TKN), and total organic carbon (TOC) were identified as GWACs. Their corresponding basin ratios are 11.00, 2.82, and 4.58, respectively, indicating significant increases in this basin when compared to the remainder of the SRWMD. Each of these nutrients have the potential to adversely impact the local surface waters.

Ground Water Quality Issues

Confined Ground Water

Middle and Lower Suwannee Rivers Basin

Very few wells tap confined ground water in this basin and only 9 wells were sampled by the Status Network. In addition, less than 20 wells were sampled in the basin as part of the Background Network between 1996–1999. Therefore, ground water indices were not determined for confined ground water within this basin. Note that no analyte exceeded ground water criteria from the wells that were sampled.



Table 3.6: Ground Water Analytes of Concern—Basin Ratios Indicating Analytes Significantly Elevated over Background Concentrations in Ground Water

Middle and Lower Suwannee Rivers Basin

CONFINED GROUND WATER

Analyte	Measurement Unit	Median Concen. RU ¹	Median Concen. RU ¹	RU ¹ /RU ³ Ratio
Color	Pt-Co Units	20.0	5.0	5.0
P	mg/L	0.13	0.06	0.06
Ca	mg/L	62.4	42.9	42.9
Alk	mg/L	185	151	151

UNCONFINED GROUND WATER

Analyte	Measurement Unit	Median Concen. RU ¹	Median Concen. RU ¹	RU ¹ /RU ³ Ratio
Temp	°C	22.6	21.9	1.03
DO	mg/L	1.62	0.28	5.79
pH	mg/L	7.16	6.90	1.04
Nitrate	mg/L	0.53	0.02	26.50

*RU¹=Suwannee River Reporting Unit A

**RU³=Suwannee River Reporting Units B, C, and D.

(note, $\alpha = 0.05$ for each test)

(Only Analytes Displaying Significantly Elevated Concentrations Are Listed.)

Santa Fe and Waccasassa Rivers Basin

CONFINED GROUND WATER

Analyte	Measurement Unit	Median Concen. RU ¹	Median Concen. RU ¹	RU ¹ /RU ³ Ratio
Na	mg/L	3.90	3.15	1.24
K	mg/L	0.59	0.41	1.44
Cl	mg/L	5.85	4.60	1.27
SO ₄	mg/L	1.95	1.15	1.70

UNCONFINED GROUND WATER

Analyte	Measurement Unit	Median Concen. RU ¹	Median Concen. RU ¹	RU ¹ /RU ³ Ratio
Color	Pt-Co Units	50.0	5.0	10.00
DO	mg/L	5.15	0.54	9.54
P	mg/L	0.048	0.039	1.23
o-PO ₄	mg/L	0.049	0.040	1.23

*RU¹=Suwannee River Reporting Unit B

**RU³=Suwannee River Reporting Units A, C, and D.

(note, $\alpha = 0.05$ for each test)

(Only Analytes Displaying Significantly Elevated Concentrations Are Listed.)

*Upper Suwannee, Alapaha, Withlacoochee, and Aucilla Rivers Basin***CONFINED GROUND WATER**

Analyte	Measurement Unit	Median Concn. RU¹	Median Concn. RU¹	RU¹/RU³ Ratio
K	mg/L	0.66	0.56	1.18

UNCONFINED GROUND WATER

Analyte	Measurement Unit	Median Concn. RU¹	Median Concn. RU¹	RU¹/RU³ Ratio
F	mg/L	0.14	0.10	1.40

*RU¹=Suwannee River Reporting Unit C.

**RU³=Suwannee River Reporting Units A, B, and D.

(note, $\alpha = 0.05$ for each test)

(Only Analytes Displaying Significantly Elevated Concentrations Are Listed.)

*Coastal Rivers Basin***CONFINED GROUND WATER**

Analyte	Measurement Unit	Median Concn. RU¹	Median Concn. RU¹	RU¹/RU³ Ratio
NH ₃	mg/L	0.16	0.02	8.00
TKN	mg/L	0.41	0.08	5.13
P	mg/L	0.125	0.054	2.31
o-PO ₄	mg/L	0.125	0.050	2.50
TOC	mg/L	6.40	1.20	5.33

UNCONFINED GROUND WATER

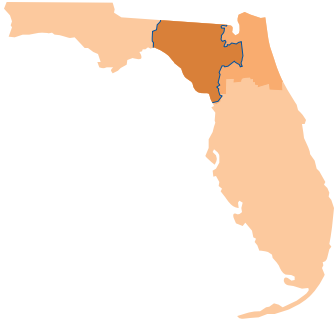
Analyte	Measurement Unit	Median Concn. RU¹	Median Concn. RU¹	RU¹/RU³ Ratio
NH ₃	mg/L	0.11	0.01	11.00
KKN	mg/L	0.31	0.11	2.82
TOC	mg/L	5.50	1.20	4.58

*RU¹=Suwannee River Reporting Unit D.

**RU³=Suwannee River Reporting Units A, B, and C.

(note, $\alpha = 0.05$ for each test)

(Only Analytes Displaying Significantly Elevated Concentrations Are Listed.)



Santa Fe and Waccasassa Rivers Basin; Upper Suwannee, Alapaha, Withlacoochee, and Aucilla Rivers Basin; Coastal Rivers Basin

The Status Network has not yet sampled these basins and Background Network data have been used to develop quasi-BRIs. It should be noted that no analyte exceeded its standard for confined ground water in these basins.

The quasi-BRIs are displayed below. The number of wells sampled and the percentages of exceedances for the two indices are listed. The BRIs (health) and BRIs (aesthetics) are “N” indicating that no regional problems were found in the basins and that confined ground water appears to be of good quality. However, it should be emphasized that ground water pollution may exist at individual wells within each basin.

Unconfined Ground Water and Springs

Middle and Lower Suwannee Rivers Basin

Thirty unconfined ground water wells in the Suwannee River Basin were sampled as part of the Status Network during the year 2000. Three wells indicated ground water quality impacts, all having F.Colif. concentrations greater than the primary MCL. The origin of F.Colif. is believed to be warm-blooded animals. Thus, its presence in ground water suggests a near surface origin. Its presence could be an indication that contaminated surface water migrating downward through the annular space of the well, or it could mean that a source of F.Colif. exists in the local ground water. It should be understood that the behavior of F.Colif. in ground water is not very well understood at this time and further studies addressing this issue are warranted.

BRI results are displayed in **Table 3.7**. The number of wells sampled and the percentage exceeding ground water criteria for the two indices are listed. The BRI (health) and the BRI (aesthetics) is “N,” indicating that no regional ground water quality problems have been identified in the basin. However, it should be emphasized that ground water pollution may exist at individual wells within the basin, as evidenced by the wells with F.Colif. contamination.

Santa Fe and Waccasassa Rivers Basin

The Status Network has not yet sampled this basin, and Background Network data have been used to develop a quasi-BRI. It should be noted that no analyte exceeded its standard for unconfined ground water in this basin.

The quasi-BRI is displayed in **Table 3.7**. The number of wells sampled and the percentages of exceedances for the two indices are listed. The BRI (health) and BRI (aesthetics) are “N,” indicating that no regional problems were found in the basin and that unconfined ground water appears to be of good quality. However, it should be emphasized that ground water pollution may exist at individual wells within each basin. For example, sulfate exceeded the secondary MCL at two wells. Note that both wells are located close to the coast, indicating a possible saline source for the high sulfate concentrations.

Table 3.7: Basin Resource Indices for Ground Water*Middle and Lower Suwannee Rivers Basin***A. SRA-CONFINED GROUND WATER**

BRI (Health)	N	A
Total Wells	Insufficient Data	
Percent of Wells		

BRI (Aesthetics)	N	C
Total Wells	Insufficient Data	
Percent of Wells		

B. SRA-UNCONFINED GROUND WATER

BRI (Health)	N	A
Total Wells	27	3
Percent of Wells	90.0	10.0
BRI (Health)=N		

BRI (Aesthetics)	N	C
Total Wells	30	0
Percent of Wells	100.0	0.0
BRI (Aesthetics)=N		

N=No Basis for Action Nor Concern, A=Action Recommended, C=Concern

*Santa Fe and Waccasassa Rivers Basin***A. SRB-CONFINED GROUND WATER**

BRI (Health)	N	A
Total Wells	50	0
Percent of Wells	100.0	0.0
BRI (Health)=N		

BRI (Aesthetics)	N	A
Total Wells	50	0
Percent of Wells	100.0	0.0
BRI (Aesthetics)=N		

B. SRB-UNCONFINED GROUND WATER

BRI (Health)	N	A
Total Wells	36	2
Percent of Wells	94.7	5.3
BRI (Health)=N		

BRI (Aesthetics)	N	A
Total Wells	38	0
Percent of Wells	100.0	0.0
BRI (Aesthetics)=N		

N=No Basis for Action Nor Concern, A=Action Recommended, C=Concern

*Upper Suwannee, Alapaha, Withlacoochee, and Aucilla Rivers Basin***A. SRC-CONFINED GROUND WATER**

BRI (Health)	N	A
Total Wells	31	0
Percent of Wells	100	0.0
BRI (Health)=N		

BRI (Aesthetics)	N	C
Total Wells	31	0
Percent of Wells	100.0	0.0
BRI (Aesthetics)=N		

B. SRC-UNCONFINED GROUND WATER

BRI (Health)	N	A
Total Wells	Insufficient Data	
Percent of Wells		

BRI (Aesthetics)	N	C
Total Wells	Insufficient Data	
Percent of Wells		

N=No Basis for Action Nor Concern, A=Action Recommended, C=Concern

*Coastal Rivers Basin***A. SRD-CONFINED GROUND WATER**

BRI (Health)	N	A
Total Wells	21	0
Percent of Wells	100	0.0
BRI (Health)=N		

BRI (Aesthetics)	N	C
Total Wells	21	0
Percent of Wells	100.0	0.0
BRI (Aesthetics)=N		

B. SRD-UNCONFINED GROUND WATER

BRI (Health)	N	A
Total Wells	43	4
Percent of Wells	91.5	8.5
BRI (Health)=N		

BRI (Aesthetics)	N	C
Total Wells	42	5
Percent of Wells	89.4	10.6
BRI (Aesthetics)=N		

N=No Basis for Action Nor Concern, A=Action Recommended, C=Concern

Upper Suwannee, Alapaha, Withlacoochee, and Aucilla Rivers Basin

The Status Network has not yet sampled these basins, and Background Network data have been used to develop quasi-BRIs. It should be noted that no analyte exceeded its standard for confined ground water in these basins.

Less than 20 wells (17) were sampled in the basin as part of the Background Network between 1996–1999. Therefore, ground water indices were not determined for unconfined ground water within this Reporting Unit.

Coastal Rivers Basin

The Status Network has not yet sampled these basins, and Background Network data have been used to develop quasi-BRIs. It should be noted that no analyte exceeded its standard for confined ground water in these basins.

The quasi-BRIs are displayed below. The number of wells sampled and the percentages of exceedances for the two indices are listed. The quasi-BRI (health) is “N,” and the quasi-BRI (aesthetics) is “C”. Note that sodium and chloride are a problem in 5 of the 47 wells sampled (Table 3.8). These analytes are indicative of potential saline problems. Note that the 5 wells are located along the Gulf of Mexico. Monitoring of these analytes should be continued.

Table 3.8 Wells with Analytes Exceeding Ground Water Quality Criteria

CONFINED GROUND WATER					
No Exceedances					
UNCONFINED GROUND WATER					
Map Well Number	Reporting Unit	GWQC Index	Result	Analyte	Measure Unit
1	SRA	Health	A	F. Colif.	8 colonies/100L
2	SRA	Health	A	F. Colif.	26 colonies/100mL
3	SRA	Health	A	F. Colif.	14 colonies/100mL
4	SRB	Aesthetics	C	SO ₄	380.00 mg/L
5	SRB	Aesthetics	C	SO ₄	360.00 mg/L
6	SRD	Aesthetics	C	SC	7800.0 μS/cm
6	SRD	Health	A	Na	1010.00 mg/L
6	SRD	Aesthetics	C	Cl	1900.0 mg/L
7	SRD	Aesthetics	C	SC	12780.0 μS/cm
7	SRD	Health	A	Na	2220.0 mg/L
7	SRD	Aesthetics	C	Cl	4200.0 mg/L
8	SRD	Health	A	Na	220.00 mg/L
8	SRD	Aesthetics	C	Cl	520.00 mg/L
9	SRD	Aesthetics	C	SC	2670.0 μS/cm
9	SRD	Aesthetics	C	Cl	630.00 mg/L
10	SRD	Aesthetics	C	SC	22700 μS/cm
10	SRD	Health	A	Na	4330.0 mg/L
10	SRD	Aesthetics	C	Cl	8900.0 mg/L

Note: All wells not listed in table have Health Index=N, Aesthetics Index=N, and Saline Index=F.

Evaluation of Ecological Resources

This section provides an inventory of the ecological protection priorities and a summary of ecological indicators potentially related to water quality problems in the Suwannee Group 1 Basin. The ecological protection priorities include the presence of threatened or endangered species, rare and imperiled fish or mollusks, eagle nests, significant wading bird rookeries, and manatee aggregation areas within the basin's watershed planning units. Indicators of ecological problems are also discussed by planning unit, particularly those that may result from a decline in surface water quality where documented information exists to indicate a potential for adverse ecological impacts. **Table 3.9** summarizes ecological protection issues by planning unit.

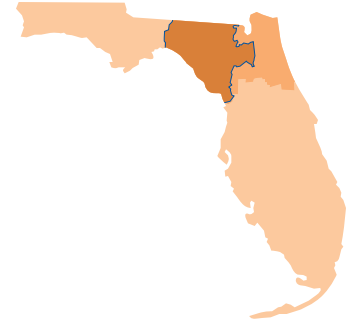


Table 3.9: Summary of Ecological Resource Protection Concerns, Suwannee Group 1 Basin Planning Units

Planning Unit	Outstanding Florida Waters	State Aquatic Preserves	Federal or State Listed Species	Rare or Imperiled Fish or Mollusks	Eagle Nests	Wading Bird Rookeries	Manatee Warmwater Habitat
Alapaha			X				
Aucilla	X	X	X	X	X	X	X
Coast between Steinhatchee & Lower Suwannee	X	X	X		X	X	
Coast between Aucilla & Econfinia	X	X	X		X		
Coast between Econfinia & Fenholloway	X	X	X		X	X	
Coast between Fenholloway & Steinhatchee	X	X	X		X	X	
Econfinia	X	X	X	X	X	X	
Fenholloway	X	X	X		X		
Lower Suwannee	X	X	X	X		X	X
Middle Suwannee	X	X	X	X	X	X	X
Santa Fe	X		X		X	X	X
Steinhatchee	X	X	X		X		
Upper Suwannee	X	X	X		X	X	X
Waccasassa	X	X	X		X	X	X
Withlacoochee			X	X	X		X

The Suwannee and its tributaries have abundant and diverse animal and plant species. A 1989 study by the Florida Department of Natural Resources listed 54 fish species, 39 amphibian species, 73 reptile species, 232 bird species, and 42 mammal species in the watershed. A number of these are listed as endangered or threatened by federal and/or state governments.



Ecological Priorities

Upper, Middle, and Lower Suwannee Planning Units

The entire Suwannee River, comprising the Upper, Middle, and Lower Suwannee planning units, is designated as an Outstanding Florida Water (OFW). The Middle Suwannee contains Peacock Springs State Recreation Area and Troy Spring. Fanning Springs State Park and Manatee Springs State Park are in the Lower Suwannee. Parts of the Lower Suwannee have also been designated as a National Wildlife Refuge. Coastal areas bordering the basin are part of the Big Bend Seagrasses Aquatic Preserve.

Of the 196 individual waterbodies and segments in the Upper, Middle, and Lower Suwannee planning units, 65 have documented ecological protection needs. Cumulatively, this group of planning units contains a variety of listed animal and plant species, rare and imperiled fish and mollusks, eagle nests, and wading bird rookeries. A number of the basin's living resources serve as indicators of surface water quality. These include the following species.

Manatee

The endangered manatee (*Trichechus manatus latirostris*) lives in both fresh and estuarine waters of the Gulf Coast, including the Lower Suwannee planning unit and the Suwannee estuary. It is ranked by the FNAI as rare or imperiled. The animals in the Lower Suwannee may be a peripheral expansion from the Crystal River population. The current manatee population numbers around 3,500 statewide. These large, warm-blooded herbivores, whose closest relative is the elephant, live between 50 and 70 years. They are adapted to both fresh water and salt water. Manatees require abundant vegetation, water that is at least six to seven feet deep, and a source of fresh water. Seagrass beds provide important habitat for feeding and resting. Because manatees are air-breathing mammals, they must come to the surface to breathe. Their reproductive rate is low, with females giving birth only every three years.

Florida lies at the northern limit of the species' range. Because they cannot tolerate temperatures lower than 20° C. (68° F.), manatees aggregate at the warm-water discharges of power plants and springs during cold fronts. They are vulnerable to cold weather, injuries from boat propellers, entrapment and crushing in locks and dams, surface water pollution, and coastal development. Some manatees in the Lower Suwannee were recently found to have papilloma virus infections that appear to have originated as a bovine strain. It is not known how they became infected, whether the virus has mutated into a manatee-specific type, how readily the virus is transmitted, whether the infections can be spread at manatee aggregation sites, or how the species will be affected over the long term.

Gulf Sturgeon

The Suwannee River appears to support the largest population of Gulf sturgeon (*Acipenser oxyrinchus desotoi*), as well as the most stable in terms of total numbers, among the coastal rivers of the Gulf of Mexico. The sturgeon is federally listed as threatened and state listed as a species of special concern, and it is ranked by the FNAI as rare or imperiled.

Hatchlings are born in fresh water and develop in the river, eventually moving into estuarine areas and, at about 20 pounds, into open marine waters. From the sea, mature adults return periodically to the Suwannee, swimming upstream to spawn. Females usually spawn only one to four times in their lives although they release millions of eggs each time. Individual fish may live as long as 20 years.

Estuaries provide especially valuable feeding habitat for juveniles and subadults, as well as for mature adults before and after spawning. Since the fish do not eat when they migrate upstream, they feed intensively beforehand to gain strength, and afterwards to regain the weight and length that they have lost. The riverbed must meet a number of requirements for them to spawn successfully, including gravel substrate of a particular size, a high surface velocity with **benthic** eddies, and a particular water chemistry and temperature.

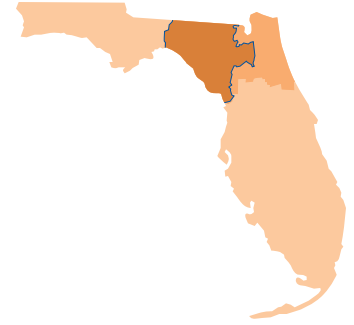
The current population is estimated to be about 7,650 fish. Although the population size is stable, it is extremely dynamic in structure, changing from year to year based on river levels. During a wet spring and summer, more eggs, larvae, and young fish survive. These larger year classes, which occur every five to seven years, dominate the population. Annually, natural mortality is about 16 percent.

Population and mortality estimates are important because they can determine the success of future conservation and management approaches. For example, adding six-month-old hatchery fish would do little to increase population size. First-year mortality is 99.99 percent, and a natural mortality rate of 16 percent after the first year means that few fish would survive to about 12 years, the age at which they begin to reproduce (Sulak, April 2001).

The Suwannee used to support a small commercial sturgeon fishery from 1899 to 1984, when the state banned fishing and placed the species under state protection. In 1995, the U.S. Fish and Wildlife Service and the Gulf State Marine Fisheries Commission issued a recovery plan. Primary threats to the sturgeon's survival include habitat loss, conflicts with human activities in nearshore waters where the fish feed intensively, and chronic toxicity from organochlorines and heavy metals. They require adequate water flows and good water quality to spawn successfully. The protection of adult females is especially critical to the species' recovery, since only about 80 females spawn in the Suwannee River each year (Daigle, 2000).

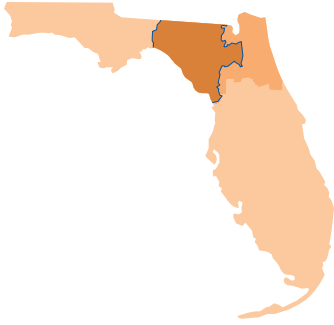
Freshwater Mussels

Historically, the Suwannee River system contained abundant, healthy populations of large freshwater mussels in the Unionidae family. The Florida Department of Regulation recorded 13 species of Unionid mussels. The endangered oval pigtoe (*Pleurobema pyriforme*), which is also ranked by the FNAI as rare or imperiled, was commonly found at 15 sites on the Suwannee River. The 1991–1993 surveys by the U.S. Fish and Wildlife Service and U.S. Geological Survey found the species only at one site on the New River, a tributary to the Santa Fe. Between 1995 and 2000, U.S.



Benthic

Occurring at the bottom of a body of water.



Geological Survey staff found a few live specimens at the New River site but nowhere else in the Suwannee Basin. The Department's water quality surveys also have not found specimens of either species. In 1999, the U.S. Fish and Wildlife Service issued a draft recovery plan for seven endangered and threatened freshwater mussels found in north Florida, including the oval pigtoe. Primary threats to the species' survival include the loss of habitat from erosional sedimentation, excess nutrients, and chronic toxicity effects on breeding and reproduction from organochlorines and heavy metals.

One very rare species, the unlisted Suwannee River moccasinshell (*Medionidus walkeri*), is endemic to the Suwannee River system, meaning that it is found nowhere else in the world. It has not received endangered species status because the U.S. Fish and Wildlife Service had no survey data on its status at the time of the listing process. The species is ranked by the FNAI as rare or imperiled. The last live specimen was seen in 1988. Between 1995 and 2000, U.S. Geological Survey staff found only one relict shell in the New River (Daigle, 2000).

Other Aquatic Species

Other long-term biological indicators recently observed at sampling sites in the Suwannee River were fish—mostly darters, shiners, and sunfish—and large dragonflies, which live three to five years in the aquatic larval stage. The black-banded darter (*Percina nigrofasciata*), a clean-water species, was seen below several flowing spring runs and in shallow areas of the Suwannee.

A few pollution-intolerant dragonflies, mostly blackwater clubtail (*Gomphus dilatatus*), the dragonhunter (*Hagenius brevistylus*), Illinois river cruiser (*Macromia illinoensis*), and royal river cruiser (*M. taeniolata*) were recently seen at several sites on the Suwannee River. Their aquatic life cycle runs from three to five years.

Alapaha Planning Unit

Of the 15 individual waterbodies and segments in the Alapaha planning unit, 3 have documented ecological protection needs in the form of listed animal and plant species.

Santa Fe Planning Unit

The Santa Fe River system—consisting of the Santa Fe River, Lake Santa Fe, Little Lake Santa Fe, Santa Fe Swamp, Olustee Creek, the Ichetucknee River below S.R. 27, and certain waters in the Osceola National Forest, but excluding all other tributaries—is designated as an OFW. This planning unit also contains Ichetucknee Springs State Park, O'Leno State Park, River Rise State Preserve, and San Felasco Hammock State Preserve.

In the Santa Fe planning unit, 48 of 129 individual waterbodies and segments have documented ecological protection needs, including listed animal and plant species, eagle nests, wading bird rookeries, and manatee warmwater habitats.

The manatee population in the Santa Fe River may be a peripheral expansion from the Crystal River population. The Ichetucknee siltsnail

(*Cincinnatia mica*), which is ranked by the FNAI as rare and imperiled, is found only in a small spring along the bank of the Ichetucknee River. The redeye chub (*Notropis harperi*) has only been collected in springs and spring runs in the Lower Santa Fe.

Withlacoochee Planning Unit

Out of 10 individual waterbodies and segments in the Withlacoochee planning unit, 5 have documented ecological protection needs, including listed animal and plant species, rare and imperiled fish or mollusks, eagle nests, and manatee warmwater habitats.

Aucilla/Wacissa Planning Unit

The Aucilla/Wacissa planning unit contains 48 individual waterbodies and segments. Of these, 14 have documented ecological protection needs, including numerous listed animal and plant species, eagle nests, a wading bird rookery in Welaunee Creek, manatee warmwater habitats, and rare and imperiled mollusk species. Protected species include the American alligator, alligator snapping turtle, swallow-tailed kite, Florida mouse, black bear, and numerous wading birds such as the snowy egret, tricolor heron, reddish egret, little blue heron, limpkin, sandhill crane, wood stork, and brown pelican.

Econfina, Fenholloway, and Steinhatchee Planning Units

The Econfina River, which is designated as an OFW, contains Econfina River State Park. Portions of the Econfina, Fenholloway, and Steinhatchee planning units along the Gulf Coast, as well as the coastal planning unit discussed in the next section, are also a part of the Big Bend Seagrasses Preserve.

Econfina Planning Unit

Of 8 individual waterbodies and segments, 1 has documented ecological protection needs, including listed animal and plant species, rare and imperiled fish or mollusks, eagle nests, and wading bird rookeries.

Fenholloway River Planning Unit

Of 15 individual waterbodies and segments, 6 have documented ecological protection needs, including listed animal and plant species and eagle nests.

Steinhatchee Planning Unit

Of 21 individual waterbodies and segments, 7 have documented ecological protection needs, including listed animal and plant species and eagle nests.

Coastal Planning Unit

Of 18 individual waterbodies and segments between the Steinhatchee and Lower Suwannee Rivers, 8 have listed animal and plant species, eagle nests, and wading bird rookeries. The single waterbody segment between



the Aucilla and Econfina Rivers has federally listed plant species and eagle nests. Of 3 individual waterbodies and segments between the Econfina and Fenholloway Rivers, 2 have listed animal and plant species, eagle nests, and wading bird rookeries. Finally, of the 24 individual waterbodies and segments between the Fenholloway and Steinhatchee Rivers, 10 have listed animal and plant species, eagle nests, and wading bird rookeries.

The 1991 SWIM Plan developed for the coastal rivers area—including the Econfina, Fenholloway, and Steinhatchee Rivers—identified at least 16 wading bird rookeries, with several more rookeries along the fringes of the basin. Species found include the snowy egret, tricolor heron, reddish egret, little blue heron, wood stork, and brown pelican. Wading bird species that nest in groups (called “colonies”) are among the most visible, beautiful, and popular wildlife species in Florida. Because of their large size and gregarious habits, their numbers are fairly easily counted, and populations of these birds are widely regarded as useful indicators of the health of coastal and wetland ecosystems. Certain sites (and species) are vulnerable to disturbance by humans and pets, as well as depredations by raccoons, which eat the eggs and hatchlings. Discarded fishing line continues to entangle and kill colonial waterbirds; this is the single most significant cause of mortality of adult brown pelicans.

Protection of the birds’ food supply and foraging and nesting habitat, including small wetlands, is crucial. Colonial birds feed in marshes, wet prairies, and sloughs, and their numbers decline if they cannot find enough small fish and other species such as crustaceans. On a larger scale, watershed issues remain extremely important to the long-term welfare of many colonial species. They are highly mobile and may move throughout the watershed during the nesting season seeking food.

Waccasassa Planning Unit

Portions of the Waccasassa planning unit are designated as OFWs, including the Lower Suwannee National Wildlife Refuge, Cedar Key National Wildlife Refuge, Cedar Key Scrub State Reserve, Waccasassa Bay State Preserve, and Big Bend Seagrasses Aquatic Preserve.

The Waccasassa planning unit contains 41 individual waterbodies and segments, 26 of which have documented ecological protection needs in the form of listed animal and plant species, eagle nests, wading bird rookeries, and manatee warmwater habitats. Goethe State Forest, south of Bronson, has a healthy population of red-cockaded woodpeckers.

Ecological Problems

Nitrate-Nitrogen Contamination

Increased nitrate-nitrogen concentrations have been measured in a number of Middle Suwannee springs, the Middle Suwannee River itself, and the Suwannee estuary. Tributaries to the Suwannee contribute some of this contamination. Elevated nitrate-nitrogen concentrations have been found in springs in the Lower Santa Fe River. The Santa Fe River contributes about 1,000 tons of nitrate-nitrogen annually to the Gulf, with smaller

amounts coming from the Withlacoochee and Alapaha Rivers. The main source is contaminated ground water flowing to surface waters through the basin's numerous springs. Levels appear to be highest in springs with low flow rates and "younger" water that has been underground for 10 years or less.

High levels of nitrate-nitrogen have the potential to affect human health and the environment. In drinking water, the chemical can be harmful at levels greater than the standard of 10 mg/L, especially for infants. It can also promote the excessive growth of phytoplankton or macroalgae in springs, rivers, and lakes. In lakes, phytoplankton turn the water green; in rivers and springs, larger, filamentous algae cover rocks and other hard surfaces.

Recent studies (SRWMD, 1999) show a statistically significant positive correlation between nitrate-nitrogen and the biomass of periphyton, a larger type of algae. Excessive growth of the algae causes biological effects by altering the structure or abundance of natural communities. Thick periphyton mats have been found in springs along the Suwannee and in the river and estuary. In 1999, an estimated 4,745 tons of nitrate-nitrogen were carried to the estuary. Levels in the estuary have been measured as high as 1.4 mg/L of NO₃-N.

Algal blooms occur in the estuary about 60 percent of the time. The dominant species at the mouth of the Suwannee are usually the green algae (*Chlorophyta*) *Spirogyra*, *Rhizoclonium*, and *Cladophora*, and the blue-green algae (*Cyanobacteria*) *Lyngbya*. Within the estuary itself, the genus *Enteromorpha* predominates. During the dry season or periods of drought, the blooms remain in the immediate estuary and move somewhat up into the mouth of the Suwannee. During the rainy season, more tannin-stained water enters the estuary, pushing the blooms farther offshore. Over the past five years, algal biomass has increased and levels have fluctuated from high to very low, which may indicate increased pollution stress.

A recent study supports the hypothesis that the abundance of phytoplankton are related to spatial and temporal patterns of nutrients. Major weather events such as El Niño and La Niña may play a role in algal community structure because they influence factors such as color, rate of water flow, water depth, and the length of time that water resides in the river and estuary (Bledsoe, 1998).

Although gross changes in seagrass distribution have not been observed, the nitrate-nitrogen contamination has the potential to cause seagrass beds in the estuary to decline. Seagrasses, which are extremely sensitive to pollution, are an important indicator of overall surface water quality and ecosystem health. These grass flats, which require light to grow, are found in shallow waters off Florida's Gulf Coast, usually no deeper than six to eight feet. They support an interlinked community of diverse marine organisms, including grasses, algae, worms, mollusks, benthic organisms, sea turtles, and waterbirds. Seagrasses are an important feeding ground for the endangered Florida manatee, while also providing valuable shelter



and nursery and juvenile habitat for many commercial and recreational fish and shellfish species. The grasses help to stabilize shifting sands on the bottom, increase water clarity by trapping fine bottom sediments, and reduce nutrient levels in the water.

Invasive Exotic Species

Invasive aquatic vegetation is a problem in a number of areas in this group of planning units. These exotic species respond to increased nutrients in the water and also contribute to water quality problems.

The Suwannee River in Dixie County is infested with water lettuce and water hyacinth. In the Santa Fe planning unit, water lettuce covers portions of the Ichetucknee River. The Santa Fe River in Alachua, Columbia, and Gilchrist Counties has problems with hydrilla and floating aquatic plants. Hydrilla has become established in Lake Sampson. It also covers large areas in Lake Rowell, which in addition has problems with floating aquatic vegetation. Studies by the Florida Fish and Wildlife Conservation Commission show that excessive levels of hydrilla reduce the productiveness of Lake Rowell's bass fishery and cause problems such as hypoxia, muck accumulations, and impeded navigation. The lake, which receives nutrient-enriched wastewater from the city of Starke's sewage treatment plant as well as urban and agricultural stormwater runoff, has increased levels of green and blue-green algae.

Excessive hydrilla growth is a problem in the southern part of Alligator Lake in the Santa Fe planning unit. The lake, which receives stormwater from residential and commercial development in Lake City as well as wastewater from a ground water decontamination project, is eutrophic to hypereutrophic. Until recently, the lake also received treated discharges from a sewage treatment plant. Green and blue-green algae are present in high levels, and blue-green algae blooms occur periodically. Hypoxic conditions are present in summer.

Fish Consumption Advisories

A limited consumption advisory has been issued in the entire Suwannee Basin for gar, largemouth bass, and bowfin because of elevated mercury levels between 0.5 and 1.5 parts per million in fish tissues. The advisory includes the Alapaha, Withlacoochee, and Santa Fe Rivers and their tributaries, as well as the Waccasassa River, Lake Altho, and the Lower Suwannee National Wildlife Refuge. There is also a limited consumption advisory because of mercury for king mackerel and sharks harvested in all coastal waters. The Fenholloway River has a no consumption advisory for all fish species because of dioxin contamination.

Because fish in most of the other river systems and freshwater bodies in the Suwannee Basin have not been sampled, it is not known whether consumption advisories should be placed on these waters.

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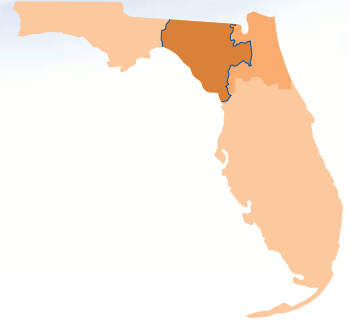
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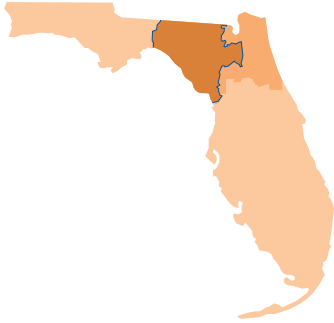


Chapter 4: Planning List of Potentially Impaired Waters

Chapter Summary

This chapter provides the Department's "planning list" of potentially impaired surface waters in the basin, describes the relationship between the planning list and subsequent verified and 303(d) lists, and provides a list of waters that the Department intends to propose to delist from the 1998 303(d) list.





The Planning List

The methodology used to develop the planning list follows the tenet of “independent applicability,” which means that a water will be listed if any of its designated uses are potentially impaired. As such, the planning list (see **Table 4.1**) can be thought of as a summary of any potential impairment noted in the assessment chapter. The table lists each waterbody, why it was listed as potentially impaired, and the parameters of concern. The table also states whether the water was listed on the 1998 303(d) list. As described in the introduction to Chapter 3, waters on the planning list must meet specific thresholds and data sufficiency and data quality requirements contained in Section 62-303, Florida Administrative Code. Waters that were previously on the 1998 303(d) list but for which there were insufficient data for an assessment are included on the planning list. Previously listed waters will also receive higher priority for monitoring and TMDL development.

The waterbodies on the planning list can be cross-referenced with **Figures 4.1A** and **4.1B**, which depict the segments with waterbody identification (WBIDs) numbers in the Suwannee Basin.

Figure 4.2 shows a graphic depiction of the waters on the planning list. The potential nutrient impairments due to the presence of algal mats (Middle and Lower Suwannee Rivers and the Santa Fe Rivers) and chlorophyll concentrations in the Suwannee River estuary are also noted on this figure. Although the entire watershed for the listed water is highlighted, only the main waterbody in the assessment unit has been assessed, and other waters in the watershed may not be potentially impaired.



Figure 4.1A: Segments with Waterbody Identification (WBIDs) Numbers in the Suwannee Basin (West)



Figure 4.1B: Segments with Waterbody Identification (WBIDs) Numbers in the Suwannee Basin (East)

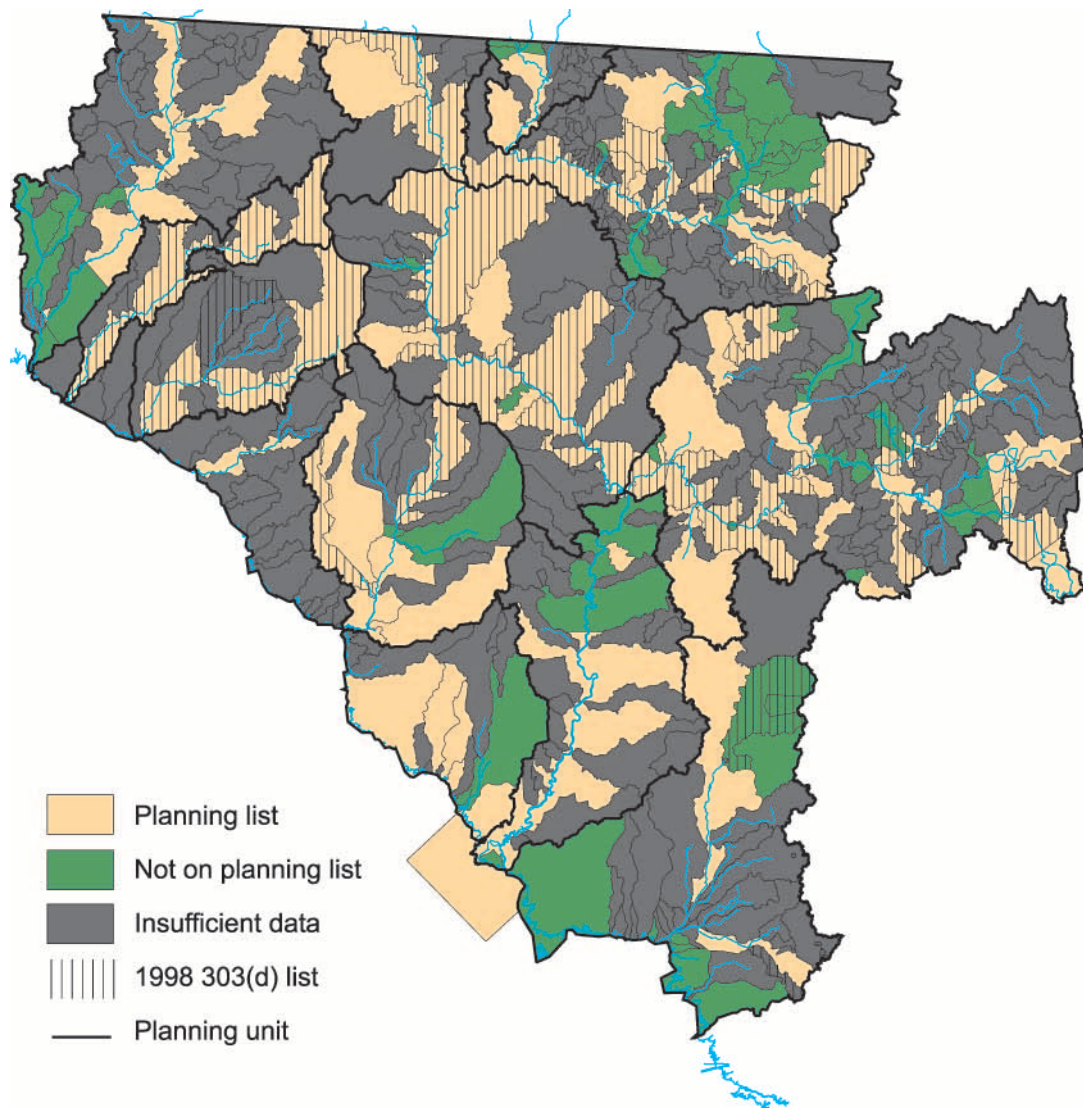


Figure 4.2: Planning List for All Causes of Potential Impairment Except Fish Advisories, with Overlay of 1998 303(d) List.

Note: Fish advisories are listed in the text.

Table 4.1: Planning List Summary for All Causes of Potential Impairment, Including the 1998 303(d) List

Planning Unit and Basin	WBID	Waterbody Type	Potentially Impaired Based on IWR	On 1998 303(d) List of Potentially Impaired Waters	Constituents of Concern*
Alapaha					
Alapaha River	3324	Stream	X		<i>Hg-fish advisory</i>
Aucilla					
Aucilla River	3310	Stream	X		<i>DO</i>
Aucilla River	3310C	Blackwater	X		<i>DO</i>
Little Aucilla River	3314	Blackwater	X		<i>DO</i>
Aucilla River	3424A	Stream	X		<i>DO</i>
Econfina					
Econfina River	3402	Stream	X	X	DO, biology , coliforms, cadmium
Fenholloway					
Fenholloway at Mouth	3473A	Stream	X	X	DO, TC, FC , coliforms, nutrients, BOD, ammonia, dioxin-fish advisory
Fenholloway BL Pulp	3473B	Stream	X	X	DO , nutrients, TSS, ammonia, BOD, Hg-fish advisory
Fenholloway AB Pulp	3473C	Stream		X	DO, biology , nutrients
Rocky Creek	3489	Stream		X	Turbidity, coliforms
Econfina/Steinhatchee/Fenholloway/Coastal					
Steinhatchee River	3573	Stream	X		<i>DO</i>
Steinhatchee River	3573B	Stream	X	X	DO , metals, biology
Steinhatchee Spring	3573Z	Spring	X		<i>DO</i>
Califorina (rocky) CR	3577	Stream	X		<i>DO</i>
Bevins (boggy) Creek	3603	Stream	X	X	<i>DO</i> , biology, coliforms, BOD
Sand Hill Creek	3674	Stream	X		<i>DO</i>
Fenholloway/Steinhatchee Coastal					
Weaver Warrior Creek	3556	Stream	X		<i>Biology</i>
Spring Warrior Creek	3556A	Stream	X		<i>DO</i>
Steinhatchee/Lower Suwannee Coastal					
Fishbone Creek	3686	Stream	X		<i>Biology</i>
Airport Canal	3691	Stream	X		<i>Biology</i>
Direct Runoff to Gulf	3701	Stream	X		<i>DO</i>
Butler (Lilly) Creek	3705	Stream	X		<i>DO</i>
Amason Creek	3706	Stream	X		<i>DO</i>
Direct Runoff to Gulf	3720	Stream	X		<i>DO</i>
Direct Runoff to Gulf	3724	Stream	X		<i>DO</i>
Lower Suwannee					
Suwannee River (lower)	3422, 3422A	Stream	X		<i>Nutrients (algal mats)</i>
Suwannee River (lower)	3422B	Stream	X	X	DO, Hg-fish advisory , nutrients
Suwannee River Estuary		Estuary	X		<i>Nutrients (algal mats)</i>
Guaranto Spring	3422K	Spring	X		<i>DO</i>

Table 4.1 continued

Planning Unit and Basin	WBID	Waterbody Type	Potentially Impaired Based on IWR	On 1998 303(d) List of Potentially Impaired Waters	Constituents of Concern*
Lower Suwannee(continued)					
Turtle Spring	3422M	Spring	X		DO
Hart Springs	3422N	Spring	X		DO
Manatee Spring	3422R	Spring	X		DO
Fanning Springs	3422S	Spring	X		DO, Hg-fish advisory
Middle Suwannee					
Suwannee River (middle)	3422B	Stream	X	X	DO, nutrients (algal mats), Hg-fish advisory
Branford Spring	3422J	Spring	X		DO
Ruth Spring	3422L	Spring	X		DO
Mearson Spring	3422P	Spring	X		DO
Troy Spring	3422T	Spring	X		DO
Royal Spring	3422U	Spring	X		DO
Convict Spring	3422V	Spring	X		DO
Running Spring	3422W	Spring	X		DO
Telford Spring	3422X	Spring	X		DO
Charles Spring	3422Y	Spring	X		DO
Falmouth Spring	3422Z	Spring	X		DO
Peacock Slough	3483	Spring	X		DO
Little River Spring	3496Z	Spring	X		DO
Allen Mill Pond	3525	Spring	X	X	DO, nutrients
Blue Spring	3528	Spring	X		DO
Owens Spring	3568	Spring	X		DO
Rock Bluff Spring	3673	Spring	X		DO
Santa Fe					
Olustee Creek	3504A	Blackwater	X		DO
New River	3506	Stream	X	X	DO, TC, coliforms, nutrients
New River	3506A	Blackwater	X		DO, TC
Alligator Lake	3516	Lake	X	X	Nutrients, DO, coliforms
Ichetucknee River	3519	Stream	X		DO
Ichetucknee Spring	3519Z	Spring	X	X	DO, nutrients
Cannon Creek	3520	Stream	X		TC
Rose Creek Sink	3531A	Stream	X		DO
Five Mile Creek	3578	Stream		X	DO, coliforms, nutrients
Lake Rowell	3598B	Lake	X	X	Nutrients, DO
Alligator Creek	3598C	Stream	X		DO, TC
Lake Sampson	3598D	Lake	X		Nutrients
Santa Fe River	3605A	Stream	X	X	DO, nutrients (algal mats), Hg-fish advisory
Santa Fe River	3605B	Stream		X	Nutrients (algal mats), DO
Santa Fe River	3605C	Stream	X	X	DO, nutrients (algal mats), fish,
Santa Fe River	3605E	Stream	X		DO
Altho Drainage	3605F	Lake	X	X	DO, Hg-fish advisory
Santa Fe Lake	3605G	Lake	X		Nutrients
Trail Springs	3605Z	Spring	X		DO
Pariners Branch	3626	Stream	X		TC
Hampton Lake	3635A	Lake	X	X	DO, Nutrients
Rocky Creek	3641	Stream	X	X	DO, coliforms, nutrients, BOD
Mill Creek Sink	3644	Stream	X		DO

Table 4.1 continued

Planning Unit and Basin	WBID	Waterbody Type	Potentially Impaired Based on IWR	On 1998 303(d) List of Potentially Impaired Waters	Constituents of Concern*
Santa Fe (continued)					
Cow Creek	3649	Stream	X		<i>DO</i>
Hornsby Spring Run	3653	Spring	X		<i>DO</i>
Blue Creek	3682	Stream	X		<i>DO, FC</i>
Upper Suwannee					
Suwannee River (upper)	3341	Stream	X	X	DO, Hg-fish advisory, nutrients
Suwannee River (upper)	3341A	Blackwater	X		<i>Hg-fish advisory</i>
Rocky Creek NR Benton	3351	Blackwater	X		<i>DO</i>
Swift Creek	3375	Stream	X	X	DO, nutrients, biology, TSS
Deep Creek	3388	Blackwater	X	X	DO, Hg-fish advisory coliforms, nutrients
Roaring Creek	3392	Blackwater	X	X	DO, nutrients, TSS, turbidity
Camp Branch	3401	Stream	X	X	DO, TC, coliforms, nutrients
Jerry Branch	3423	Blackwater	X		<i>DO</i>
Robinson Creek	3448	Blackwater	X		<i>DO</i>
Falling Creek	3477	Blackwater	X	X	DO, coliforms, nutrients
Lake Jeffery Outlet	3499	Stream		X	Biology
Waccasassa					
Ten Mile Creek	1325	Stream	X		<i>DO</i>
Waccasassa River	3699	Stream	X		<i>T.coliform, Hg-fish advisory</i>
Little Waccasassa River	3703	Stream	X	X	<i>Hg-fish advisory, DO</i>
Horsehole Creek	3747	Stream		X	<i>DO</i>
Withlacoochee					
Withlacoochee River	3315	Stream	X	X	DO, biology, nutrients, turbidity, Hg-fish advisory
Jumping Gully Creek	3318	Stream		X	<i>DO, nutrients, turbidity</i>
Lake Cherry	3322	Lake	X		<i>nutrients</i>

*—Regular text indicates 303(d) list only; italic text indicates planning list only; and bold text indicates both lists.

Hg—Mercury; DO—Dissolved oxygen; TC—Total coliform; FC—Fecal coliform; BOD—Biochemical oxygen demand;

TSS—Total suspended solids

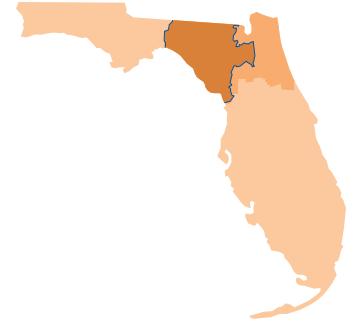
Relationship between the Planning List and the 303(d) List

The planning list is the first step of a two-step process to develop the state's Section 303(d) list of impaired waters. As part of the watershed management approach, these potentially impaired waters will be further assessed during Phase 2 to verify whether they are impaired. In addition to more thoroughly evaluating the data used to place these waters on the planning list (including verification of quality assurance and data sufficiency requirements), the Department, working with local stakeholders, will identify other existing data and collect additional data as needed to complete the assessment. Detailed strategic monitoring plans will be developed for each basin in cooperation with existing monitoring programs, with monitoring initially focused on verification of any impairment.

Once the additional monitoring is completed, the data will be assessed and the Department will develop a verified list of impaired waters. This list of waters for which the Department will develop TMDLs will be adopted by Secretarial Order. Once adopted, the list will be submitted to the U.S. Environmental Protection Agency (EPA) as the state's 303(d) list for the basin.

As required by the 1999 Florida Watershed Restoration Act, the planning list will be submitted to the EPA for informational purposes only and will not be used in the administration or implementation of any regulatory program. However, the planning list is extremely important, as it drives monitoring in the basin and is the precursor to the verified list. As such, stakeholders are encouraged to review the planning list very carefully, including the data used by the Department to produce the list. If stakeholders have access to recent data (collected in the last 10 years) that were not used, they should either enter the data into STORET or submit the data to the Department so that it can be used in the full assessment conducted after the Phase 2 monitoring. Local stakeholders are also encouraged to participate actively in the strategic monitoring, including the development and implementation of the monitoring.

Local stakeholders may also have plans to address the potential impairment identified on the planning list. If they feel their plans provide reasonable assurance that water quality standards will be met in the future, they should contact Department staff and describe their restoration plans. As required by the Florida Watershed Restoration Act, the Department will not place waters on the verified list if proposed or existing pollution control mechanisms are expected to result in the attainment of water quality standards. In fact, some local stakeholders may want to develop restoration plans so that their waters are not listed on the verified 303(d) list.





Waters To Be Delisted

It should be noted that not all of the waters on the 1998 303(d) list were placed on the planning list. The Department plans to request that the EPA delist from the 1998 303(d) list the waters and parameters in **Table 4.2**. These waters met the data sufficiency requirements of the planning list, but were not identified as potentially impaired using the planning list methodology. As such, sufficient data exist to indicate the waters should be delisted, and they will not be placed on the planning list. It should be noted that both listing and delisting decisions are parameter specific, and some waters may remain on the list for other parameters.

Table 4.2: Planning List Constituents Proposed for Delisting

Planning Unit and Basin	WBID	Constituents for Proposed Delisting
Econfina/SteinhatcheeFenholloway/Coastal		
Fenholloway AB Pulp	3473C	DO

Waters with Constituents Not Impaired

This section represents the waters that are not impaired for one or more constituents according to the Impaired Surface Waters Rule methodology. The constituents that have sufficient data to be assessed and are not impaired are listed for individual waters in **Table 4.3**. **Figures 3.3 to 3.6** show the location of the waters not impaired for nutrients, conventionals, biology, and metals, respectively. Note that some of the waters are also listed in **Table 4.1** because the waters are potentially impaired for other constituents.

Monitoring Other Waters

As identified in Chapter 3, there are many waterbodies in the Suwannee Group 1 Basin for which there are insufficient water quality data for an assessment. These are shown in the watersheds identified in **Figure 4.2**. Because of resource limitations, it will not be possible for the Department to monitor all of these waterbodies within these basins during the first watershed management cycle. The priority for strategic monitoring during Phase 2 of the cycle will be to conduct monitoring and data gathering to address potentially impaired waters identified on the planning list (see **Table 4.1**). While the Department plans to monitor these waters during subsequent watershed cycles, local stakeholders may want to take the initiative to monitor these waters sooner and the Department would like to coordinate with these local efforts.

Table 4.3: Waters with Constitutes Not Impaired According to the Impaired Surface Waters Rule

Planning Unit and Basin	WBID	Constituents Not Impaired
Alapaha		
Alapaha River	3324	<i>Nutrients</i>
Aucilla		
Aucilla River	3310	<i>Biology, nutrients, fish</i>
Aucilla River	3310A	<i>Nutrients, conventionals, fish</i>
Aucilla River	3310B	<i>Fish</i>
Aucilla River	3310C	<i>Nutrients, fish</i>
Little Aucilla River	3314	<i>Nutrients</i>
Wacissa River	3424	<i>Nutrients</i>
Aucilla River	3424A	<i>Nutrients</i>
Anderson Bay Drain	3430	<i>Nutrients</i>
Welaunee Creek	3436	<i>Conventionals</i>
Coast between Stein and LowSuw		
Sanders Creek	3702	<i>Conventionals</i>
Direct Runoff to Gulf	3725	<i>Conventionals</i>
Coast between Fen and Stein		
Spring Warrior Creek	3556A	<i>Nutrients</i>
Direct Runoff to Gulf	3580	<i>Biology</i>
Econfina		
Econfina River	3402	<i>Nutrients</i>
Fenholloway		
Fenholloway at Mouth	3473A	<i>Nutrients</i>
Fenholloway BL Pulp	3473B	<i>Nutrients</i>
Fenholloway AB Pulp	3473C	<i>Nutrients</i>
Upper Suwannee		
Suwannee River (upper)	3341	<i>Nutrients</i>
Suwannee River (upper)	3341A	<i>Nutrients</i>
Suwannee River (upper)	3341B	<i>Nutrients</i>
Suwannee River (upper)	3341C	<i>Nutrients</i>
Rocky Creek NR Benton	3351	<i>Nutrients</i>
Hunter Creek	3364	<i>Nutrients, conventionals, biology</i>
Little Creek	3368	<i>Biology</i>
Deep Creek	3388	<i>Biology, nutrients</i>
Suger Creek	3389	<i>Conventionals</i>
Roaring Creek	3392	<i>Nutrients</i>
Camp Branch	3401	<i>Nutrients</i>
Robinson Creek	3448	<i>Nutrients</i>
Falling Creek	3477	<i>Biology, nutrients</i>
Middle Suwannee		
Suwannee River (lower)	3422B	<i>Biology</i>
Bethel Creek	3480	<i>Conventionals</i>
Owens Spring	3568	<i>Conventionals</i>
Lower Suwannee		
Suwannee River (lower)	3422	<i>Conventionals, fish</i>
Suwannee River (lower)	3422A	<i>Conventionals, fish</i>
Direct Runoff to Gulf	3733	<i>Conventionals</i>

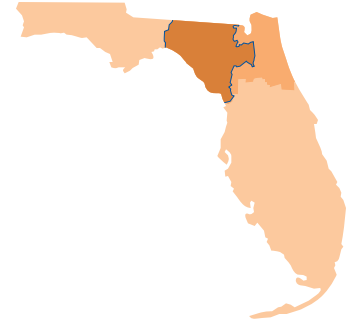




Table 4.3 continued

Planning Unit and Basin	WBID	Constituents Not Impaired
Santa Fe		
Olustee Creek	3504	<i>Conventional, biology</i>
Olustee Creek	3504A	<i>Nutrients</i>
New River	3506	<i>Nutrients</i>
New River	3506A	<i>Nutrients</i>
Price Creek	3517	<i>Conventional</i>
Ichetucknee river	3519	<i>Nutrients</i>
Cannon Creek	3520	<i>Nutrients</i>
Lake Butler	3566	<i>Biology</i>
Sampson River	3598	<i>Nutrients</i>
Alligator Creek	3598C	<i>Biology, nutrients</i>
Lake Sampson	3598D	<i>Conventional</i>
Santa Fe River	3605D	<i>Nutrients</i>
Santa Fe River	3605E	<i>Nutrients</i>
Altho Drainage	3605F	<i>Nutrients</i>
Blue Spring	3605X	<i>Conventional</i>
Pareners Branch	3626	<i>Nutrients</i>
Cow Creek	3649	<i>Nutrients</i>
Turkey Creek	3681	<i>Nutrients, conventional</i>
Blue Creek	3682	<i>Nutrients</i>
Steinhatchee		
Steinhatchee River	3573	<i>Nutrients</i>
Steinhatchee River	3573A	<i>Nutrients, conventional, metals</i>
Steinhatchee River	3573B	<i>Nutrients</i>
Califorina (Rocky) CR	3577	<i>Metals</i>
Bevins (Boggy) Creek	3603	<i>Metals</i>
Eight Mile Creek	3607	<i>Conventional, metals</i>
Sand Hill Creek	3674	<i>Metals</i>
Waccasassa		
Ten Mile Creek	1325	<i>Nutrients</i>
Sheephead Creek	1326	<i>Conventional</i>
Direct Runoff to Gulf	1328	<i>Conventional</i>
Direct Runoff to Gulf	1332	<i>Conventional</i>
Direct Runoff to Gulf	1335	<i>Conventional</i>
Waccasassa River	3699	<i>Biology, nutrients</i>
Watermelon Pond	3703A	<i>Nutrients</i>
Black Point Swamp	3729	<i>Nutrients, conventional</i>
Direct Runoff to Gulf	3743	<i>Conventional</i>
Jumping Gully Creek	3318	<i>Biology</i>
Lake Alcyon	3319	<i>Biology</i>
Withlacoochee		
Withlacoochee River	3315	<i>Biology, nutrients</i>

**Italic text indicates waters on the planning list for other constituents*

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APPENDICES

Appendix A: Outstanding Florida Waters in the Suwannee Basin

National Wildlife Refuges (NWR)	St. Marks National Wildlife Refuge
	Lower Suwannee National Wildlife Refuge
	Cedar Keys National Wildlife Refuge
State Parks or State Recreation Areas	Fanning Springs State Park
	Ichetucknee Springs State Park
	Manatee Springs State Park
	O'Leno State Park
	Peacock Springs State Recreation Area
	Suwannee River State Park
State Preserves or State Reserves	Cedar Key Scrub State Reserve
	River Rise State Preserve
	San Felasco Hammock State Preserve
	Waccasassa Bay State Preserve
Waters in areas acquired through donation, trade, or purchase	Andrews Tract
	Big Bend Coastal Tract
	Big Shoals
	Econfina River
	Florida's first magnitude springs (Levy County)
	Levy County forest/sandhills
	Wacissa/Aucilla Rivers
Aquatic Preserves	Big Bend Seagrasses Aquatic Preserve except some selected areas
Special Waters	Aucilla River
	Santa Fe River system, consisting of the Santa Fe River, Lake Santa Fe, Little Lake Santa Fe, Santa Fe Swamp, Olustee Creek, and the Ichetucknee River below S.R. 27, but excluding all other tributaries
	Suwannee River
	Wacissa River
National Forests	Certain waters in the Osceola National Forest

Appendix B: Natural Communities in the Suwannee Basin

Category	Community Type	Area in Acres	Percent of Total Area	Characteristics
Uplands				
1	Coastal strand	1	0.00001	Occurs on well-drained sandy coastlines and includes typically zoned vegetation of upper beach, nearby dunes, or coastal rock formations.
2	Dry prairie	91	0	Large treeless grasslands and shrublands on very flat terrain interspersed with scattered cypress domes, cypress strands, isolated freshwater marshes, and hammocks.
3	Pinelands	1,542,056	31.16	Includes north and south Florida pine flatwoods, south Florida pine rocklands, scrubby flatwoods, and commercial pine plantations. Cypress domes, bayheads, titi swamps, and freshwater marshes are commonly interspersed in isolated depressions.
4	Sand pine scrub	96	0.00	Xeric plant community dominated by overstory of sand pine. Occurs in well-drained sands deposited along former shorelines and islands of ancient seas.
5	Sandhill	60,614	1.22	Xeric plant community dominated by overstory of scattered longleaf pine, along with understory of turkey oak and bluejack oak. Occurs in areas of rolling terrain on deep, well-drained sands.
6	Xeric oak scrub	1,931	0.04	Hardwood community consisting of clumps of low-growing oaks interspersed with white sand. Occurs in areas of deep, well-washed sterile sand.
7	Mixed hardwood pine	42,631	0.86	Southern extension of the Piedmont southern mixed hardwoods, occurring mainly on clay soils of the northern Panhandle. Also includes upland forests in which a mixture of conifers and hardwoods dominate overstory.
8	Hardwood hammock	480,135	9.70	Includes major upland hardwood associations that occur statewide on fairly rich sandy soils.
9	Tropical hammock	N/A	N/A	Cold-intolerant hardwood community with very high plant diversity that occurs on coastal uplands in extreme south Florida. It is characterized by tropical trees and shrubs at the northern edge of their range, which extends into the Caribbean.
10	Coastal salt marsh	81,633	1.65	Herbaceous and shrubby wetland communities that include cordgrass, needlerush, and transitional or high salt marshes, occurring statewide in brackish waters along protected low energy estuarine shorelines.
Wetlands				
11	Freshwater marsh	65,479	1.32	Wetland communities dominated by wide assortment of herbaceous plant species growing on sand, clay, marl, and organic soils in areas where water depths and inundation regimes vary.
12	Cypress swamp	304,077	6.14	Regularly inundated communities that form forested buffer along large rivers, creeks, and lakes, or occur in depressions as circular domes or linear strands. Strongly dominated by bald cypress or pond cypress.
13	Hardwood swamp	445,995	9.01	Association of wetland adapted trees, composed either of pure stands of hardwoods or hardwood-cypress mixture. Occurs on organic soils and forms forested floodplain of nonalluvial rivers, creeks, and broad lake basins.
14	Bay swamp	20,352	0.41	Hardwood swamps often found in shallow depressions in pinelands or at base of sandy ridges where seepage maintains constantly wet soils. Broadleaf evergreen trees such as sweetbay, swamp bay, and loblolly bay dominate overstory.
15	Shrub swamp	32,305	0.65	Dominated by low-growing, woody shrubs or small trees, usually found in wetlands changed by natural or human perturbations such as altered hydroperiod, fire, clear-cutting or land clearing, and siltation.
16	Mangrove swamp	N/A	N/A	Dense, brackish water swamps, usually dominated by red, black, and white mangroves that occur along low-energy shorelines and in protected, tidally influenced bays of southern Florida. Comprises

				freeze-intolerant tree species that are distributed south of a line from Cedar Key on the Gulf Coast to St. Augustine on the Atlantic coast.
17	Bottomland hardwood	N/A	N/A	Wetland-adapted forests composed of pure stands of hardwoods or a mixture of hardwoods and cypress. They occur throughout the state on organic soils and form the forested floodplains of nonalluvial rivers, creeks, and broad lake basins. Tree species include a mixed overstory containing black gum, water tupelo, bald cypress, blue beech, and swamp ash.
Open Water				
18	Water	57,381	1.16	Commonly comprises open water areas of inland lakes, ponds, rivers, and streams and brackish and saline waters of estuaries, bays, and tidal creeks.
Disturbed				
19	Grass and agricultural land	483,473	9.77	Upland communities with very low-growing grasses and forbs. Intensively managed sites such as improved pastures, lawns, golf courses, road shoulders, cemeteries, or weedy fallow agricultural fields.
20	Shrub and brush	969,634	19.59	Includes different situations where natural upland communities have recently been disturbed and are recovering through natural successional processes.
21	Exotic plant communities	N/A	N/A	Upland and wetland areas dominated by invasive non-native species that outgrow and outcompete native plant communities.
22	Barren land	361,006	7.29	Developed areas such as roads, parking lots, and buildings.
TOTAL		4,948,890		

N/A—This community type is not present in the basin.

Source: Cox, James, Randy Kautz, Maureen MacLaughlin, and Terry Gilbert. 1994. *Closing the Gaps in Florida's Wildlife Habitat Conservation System*. Tallahassee, Florida: Florida Game and Fresh Water Fish Commission.

Appendix C: Protected Animal and Plant Species in the Suwannee Basin

Scientific Name*	Common Name	Federal Protection Status	State Protection Status	FNAI Global Rank	FNAI State Rank
FISH					
<i>Acipenser oxyrinchus desotoi</i>	Gulf sturgeon	LT	LS	G3T2	S2
<i>Micropterus notius</i>	Suwannee bass	N	LS	G3	S3
Amphibians and Reptiles					
<i>Alligator mississippiensis</i>	American alligator	T(S/A)	LS	G5	S4
<i>Ambystoma cingulatum</i>	Flatwoods salamander	LT	PS	G2G3	S2S3
<i>Gopherus polyphemus</i>	Gopher tortoise	N	LS	G3	S3
<i>Drymarchon corais couperi</i>	Eastern indigo snake	LT	LT	G4T3	S3
<i>Macrochelys temminckii</i>	Alligator snapping turtle	N	LS	G3G4	S3
<i>Pituophis melanoleucus mugitus</i>	Florida pine snake	N	LS	G4T3?	S3
<i>Pseudemys concinna suwanniensis</i>	Suwannee cooter	N	LS	G5T3	S3
<i>Rana capito</i>	Gopher frog	N	LS	G3G4	S3
<i>Stilosoma extenuatum</i>	Short-tailed snake	N	LT	G3	S3
BIRDS					
<i>Ammodramus maritimus peninsulae</i>	Scott's seaside sparrow	N	LS	G4T2	S2
<i>Aphelocoma coerulescens</i>	Florida scrub jay	LT	LT	G3	S3
<i>Aramus guarana</i>	Limpkin	N	LS	G5	S3
<i>Athene cunicularia floridana</i>	Florida burrowing owl	N	LS	G4T3	S3
<i>Charadrius melodus</i>	Piping plover	LT	LT	G3	S2
<i>Cistothorus palustris marianae</i>	Marian's marsh wren	N	LS	G5T3	S3?
<i>Egretta caerulea</i>	Little blue heron	N	LS	G5	S4
<i>Egretta rufescens</i>	Reddish egret	N	LS	G4	S2
<i>Egretta thula</i>	Snowy egret	N	LS	G5	S4
<i>Egretta tricolor</i>	Tricolored heron	N	LS	G5	S4
<i>Eudocimus albus</i>	White ibis	N	LS	G5	S4
<i>Falco sparverius paulus</i>	Southeastern American	N	LT	G5T3T4	S3?
<i>Grus canadensis pratensis</i>	Florida sandhill crane	N	LT	G5T2T3	S2S3
<i>Haematopus palliatus</i>	American oystercatcher	N	LS	G5	S3
<i>Haliaeetus leucocephalus**</i>	Bald eagle	LT	LT	G4	S3
<i>Mycteria americana</i>	Wood stork	N	LT	G4	S2
<i>Picoides borealis</i>	Red-cockaded	LE	LT	G3	S2
<i>Rynchops niger</i>	Black skimmer	N	LS	G5	S3
<i>Sterna antillarum</i>	Least tern	N	LT	G4	S3
MAMMALS					
<i>Microtus pennsylvanicus dukecampbelli</i>	Salt marsh vole	LE	LE	G5T1	S1
<i>Podomys floridanus</i>	Florida mouse	N	LS	G3	S3
<i>Sciurus niger shermani</i>	Sherman's fox squirrel	N	LS	G5T2	S2
<i>Ursus americanus floridanus[#]</i>	Florida black bear	N	LT	G5T2	S2
Invertebrates					
<i>Pleurobema pyriforme</i>	Oval pigtoe	LE	N	G2	S?
<i>Procambarus erythropterus</i>	Santa Fe cave crayfish	N	LS	G1	S1

* Species listed in boldface type use or live in freshwater, saltwater, and/or wetland communities.

** Proposed for federal delisting because of the species' recovery.

The Florida black bear is a listed species everywhere in Florida but Columbia and Baker Counties and the Apalachicola National Forest.

Scientific Name*	Common Name	Federal Protection Status	State Protection Status	FNAI Global Rank	FNAI State Rank
PLANTS					
<i>Agrimonia incisa</i>	Incised groove-bur	N	LE	G3	S2
<i>Arnoglossum diversifolium</i>	Variable-leaved Indian-plantain	N	LT	G2	S2
<i>Asplenium monanthes</i>	Single-sorus spleenwort	N	LE	G4	S1
<i>Blechnum occidentale</i>	Sinkhole fern	N	LE	G5	S1
<i>Brickellia cordifolia</i>	Flyr's brickell-bush	N	LE	G2G3	S1
<i>Callirhoe papaver</i>	Poppy mallow	N	LE	G5	S2
<i>Calycanthus floridus</i>	Sweetshrub	N	LE	G5	S2
<i>Calydorea caelestina</i>	Bartram's ixia	N	LE	G2	S2
<i>Carex chapmanii</i>	Chapman's sedge	N	LE	G3	S2
<i>Cheilanthes microphylla</i>	Southern lip fern	N	LE	G5	S3
<i>Coelorachis tuberculosa</i>	Piedmont jointgrass	N	LT	G3	S3
<i>Corallorrhiza odontorhiza</i>	Autumn coralroot	N	LE	G5	SH
<i>Ctenium floridanum</i>	Florida toothache grass	N	LE	G2	S2
<i>Drosera intermedia</i>	Spoon-leaved sundew	N	LT	G5	S3
<i>Eleocharis rostellata</i>	Beaked spikerush	N	LE	G5	S1
<i>Forestiera godfreyi</i>	Godfrey's privet	N	LE	G2	S2
<i>Hasteola robertorum</i>	Florida hasteola	N	LE	G1	S1
<i>Hexastylis arifolia</i>	Heartleaf	N	LT	G5	S3
<i>Leitneria floridana</i>	Corkwood	N	LT	G3	S2
<i>Litsea aestivalis</i>	Pondspice	N	LE	G3	S2
<i>Matelea floridana</i>	Florida spiny-pod	N	LE	G2	S2
<i>Minuartia godfreyi</i>	Godfrey's sandwort	N	LE	G1	S1
<i>Najas filifolia</i>	Narrowleaf naiad	N	LT	G1	S1
<i>Phyllanthus leibmannianus</i> spp. <i>platylepsis</i>	Pinewood dainties	N	LE	G3G5T2	S2
<i>Pteroglossaspis ecristata</i>	Giant orchid	N	LT	G2	S2
<i>Pycnanthemum floridanum</i>	Florida mountain-mint	N	LT	G3	S3
<i>Salix floridana</i>	Florida willow	N	LE	G2	S2
<i>Spigelia loganioides</i>	Pinkroot	N	LE	G1G2Q	S1S2
<i>Thelypteris reptans</i>	Creeping marsh fern	N	LE	G5	S1

*Species listed in boldface type use or live in freshwater, saltwater, and/or wetland communities.

Note: The Federal Protection Status column indicates the official federal endangerment status or level of legal protection, under the U.S. Endangered Species Act Classification, for the plant or animal species, subspecies, or variety as proposed or determined by the U.S. Fish and Wildlife Service or the National Oceanic and Atmospheric Administration (marine species). If the species has no published status under the Endangered Species Act, this space is left blank. The federal classifications are as follows:

LE = Listed as Endangered.

LT = Listed as Threatened.

T(S/A) = Threatened due to similarity in appearance.

N = Not currently listed, nor currently being considered for listing.

The State Protection Status column shows the official state endangerment status or level of legal protection for animals listed by the Florida Fish and Wildlife Conservation Commission and plants listed by the Florida Department of Agriculture and Consumer Services (FDACS). The state classifications are as follows:

Animals listed by Florida Fish and Wildlife Conservation Commission

LE = Listed as Endangered.

LT = Listed as Threatened.

LS = Listed as Species of Special Concern.

PS = Proposed as Species of Special Concern.

N = Not currently listed, nor currently being considered for listing.

Plants listed by Florida Department of Agriculture and Consumer Services

LE = Listed as Endangered.

LT = Listed as Threatened.

N = Not currently listed, nor currently being considered for listing.

The Florida Natural Areas Inventory (FNAI) Global Rank characterizes relative rarity or endangerment worldwide, with G1 being critically imperiled globally because of extreme rarity or because of extreme vulnerability to extinction, and G5 being demonstrably secure globally. Similarly, the FNAI State Rank of S1 through S5 characterizes relative rarity or endangerment in Florida. The rankings are based on many factors, the most important being the estimated number of occurrences, estimated abundance (number of individuals), range, estimated adequately protected occurrences, relative threat of destruction, and ecological fragility.

Sources: Florida Fish and Wildlife Conservation Commission, *Florida's Endangered Species, Threatened Species, and Species of Special Concern, Official Lists*, <http://www.state.fl.us/fwc/pubs>; Marois, Katherine C., *Tracking List of Rare, Threatened, and Endangered Plants and Animals and Natural Communities of Florida* (Tallahassee: Florida Natural Areas Inventory, June 1999); Ashton, Ray E., Ed.; *Rare and Endangered Biota of Florida* (Gainesville: University Press of Florida, 1992); Wunderlin, Richard P., *Guide to the Vascular Plants of Florida* (Gainesville: University Press of Florida, 1998).

Appendix D: Nonlisted Animal and Plant Species in the Suwannee Basin

Scientific Name*	Common Name	FNAI Global Rank	FNAI State Rank
FISH			
<i>Acantharchus pomotis</i>	Mud sunfish	G5	S3
<i>Agonostomus monticola</i>	Mountain mullet	G5	S3
<i>Ameiurus serracanthus</i>	Spotted bullhead	G3	S3
<i>Cyprinella leedsi</i>	Bannerfin shiner	G3G4	S3
<i>Enneacanthus chaetodon</i>	Blackbanded sunfish	G4	S3
<i>Notropis cummingsae</i>	Dusky shiner	G5	S4
<i>Umbra pygmaea</i>	Eastern mudminnow	G5	S3
AMPHIBIANS AND REPTILES			
<i>Ambystoma tigrinum</i>	Tiger salamander	G5	S3
<i>Amphiuma pholeter</i>	One-toed amphiuma	G3	S3
<i>Clemmys guttata</i>	Spotted turtle	G5	S3?
<i>Crotalus adamanteus</i>	Eastern diamondback rattlesnake	G4	S3
<i>Crotalus horridus</i>	Timber rattlesnake	G4	S3
<i>Eumeces egregius insularis</i>	Cedar key mole skink	G4T1	S1
<i>Heterodon simus</i>	Southern hognose snake	G2	S2
<i>Nerodia clarkii clarkii</i>	Gulf salt marsh snake	G4T3	S3?
<i>Notophthalmus perstriatus</i>	Striped newt	G2G3	S2S3
<i>Pseudobranchius striatus lustricolus</i>	Gulf hammock dwarf siren	G5T1	S1
<i>Rana virgatipes</i>	Carpenter frog	G5	S2
<i>Stereochilus marginatus</i>	Many-lined salamander	G5	S1
BIRDS			
<i>Accipiter cooperii</i>	Cooper's hawk	G5	S3?
<i>Aimophila aestivalis</i>	Bachman's sparrow	G3	S3
<i>Ardea alba</i>	Great egret	G5	S4
<i>Buteo brachyurus</i>	Short-tailed hawk	G4G5	S1
<i>Elanoides forficatus</i>	Swallow-tailed kite	G5	S2S3
<i>Laterallus jamaicensis</i>	Black rail	G4	S3?
<i>Nyctanassa violacea</i>	Yellow-crowned night-heron	G5	S3?
<i>Nycticorax nycticorax</i>	Black-crowned night-heron	G5	S3?
<i>Picoides villosus</i>	Hairy woodpecker	G5	S3?
<i>Plegadis falcinellus</i>	Glossy ibis	G5	S2
<i>Seiurus motacilla</i>	Louisiana waterthrush	G5	S3
MAMMALS			
<i>Eptesicus fuscus</i>	Big brown bat	G5	S3
<i>Mustela frenata olivacea</i>	Southeastern weasel	G5T4	S3?
<i>Mustela vison halilimnetes</i>	Gulf salt marsh mink	G5T3	S3
<i>Myotis austroriparius</i>	Southeastern bat	G3G4	S3
<i>Neofiber alleni</i>	Round-tailed muskrat	G3	S3

*Species listed in boldface type use or live in freshwater, saltwater, and/or wetland communities.

Scientific Name*	Common Name	FNAI Global Rank	FNAI State Rank
INVERTEBRATES			
<i>Caecidotea hobbsi</i>	Florida cave isopod	G2G3	S2
<i>Cicindela hirtilabris</i>	Peninsular tiger beetle	G4	S4
<i>Cicindela scabrosa</i>	Scrub tiger beetle	G3	S3
<i>Cincinnati mica</i>	Ichetucknee siltsnail	G1	S1
<i>Crangonyx grandimanus</i>	Florida cave amphipod	G2G3	S2
<i>Crangonyx hobbsi</i>	Hobbs cave amphipod	G2G3	S2S3
<i>Medionidus walkeri</i>	Suwannee moccasinshell	G1	S?
<i>Nemopalpus nearcticus</i>	Sugarfoot moth fly	G?	S?
<i>Procambarus horsti</i>	Big Blue Spring cave crayfish	G1G2	S1
<i>Procambarus lucifugus</i>	Light-fleeing cave crayfish	G2G3	S2S3
<i>Procambarus pallidus</i>	Pallid cave crayfish	G2G3	S2S3
<i>Remasellus parvus</i>	Swimming little Florida cave isopod	G1G2	S1
<i>Troglocambarus maclanei</i>	North Florida spider cave crayfish	G2G3	S2
<i>Utterbackia peninsularis</i>	Peninsular floater	G3	S2
PLANTS			
<i>Anemone berlandieri</i>	Texas anemone	G4?	S2
<i>Aristida rhizomophora</i>	Florida three-awned grass	G2	S2
<i>Asplenium x heteroresiliens</i>	Wagner's spleenwort	HYB	S1S2
<i>Gymnopogon chapmanianus</i>	Chapman's skeletongrass	G3	S3
<i>Helianthus debilis</i> spp. tardiflorus	Late flowering beach sunflower	G5T3	S3
<i>Rhynchospora culixa</i>	Georgia beakrush	G1	SH
<i>Rhynchospora decurrens</i>	Decurrent beakrush	G3G4	S3S4
<i>Sium floridanum</i>	Florida water parsnip	G1Q	S1
<i>Ulmus crassifolia</i>	Cedar elm	G5	S1

*Species listed in boldface type use or live in freshwater, saltwater, and/or wetland communities.

Note: The Florida Natural Areas Inventory (FNAI) Global Rank characterizes relative rarity or endangerment worldwide, with G1 being critically imperiled globally because of extreme rarity or because of extreme vulnerability to extinction, and G5 being demonstrably secure globally. Similarly, the FNAI State Rank of S1 through S5 characterizes relative rarity or endangerment in Florida. The rankings are based on many factors, the most important being the estimated number of occurrences, estimated abundance (number of individuals), range, estimated adequately protected occurrences, relative threat of destruction, and ecological fragility.

Sources: Florida Fish and Wildlife Conservation Commission, *Florida's Endangered Species, Threatened Species, and Species of Special Concern, Official Lists*, <http://www.state.fl.us/fwc/pubs>; Marois, Katherine C., *Tracking List of Rare, Threatened, and Endangered Plants and Animals and Natural Communities of Florida* (Tallahassee: Florida Natural Areas Inventory, June 1999); Ashton, Ray E., Ed.; *Rare and Endangered Biota of Florida* (Gainesville: University Press of Florida, 1992); Wunderlin, Richard P., *Guide to the Vascular Plants of Florida* (Gainesville: University Press of Florida, 1998).

Appendix E: Basin Status Report Assessment Methodology

The Department relies on environmental data from a variety of sources to carry out its mission to protect human health and the environment. Effective project planning, sampling design, and raw data review are essential to ensure that the data collected and analyzed are relevant to the decisions being made.

Federal and State Requirements

The primary starting point for the Basin Status Report was the 305(b) assessment report. Section 305(b) of the Clean Water Act (CWA) requires states to report biennially to the U.S. Environmental Protection Agency (EPA) on their water quality. The 305(b) report provides information on the physical, chemical, biological, and cultural features of each river basin in the state. This initial assessment provides a common factual basis for identifying information sources and major issues, and determining future changes, strategies, and actions necessary to preserve, protect, and/or restore water quality in individual basins. Understanding the physical framework of each basin allows the development of a methodology and an accurate picture of the waters that are most impaired or vulnerable to contamination.

Section 303(d) of the CWA requires states to submit lists of surface waters that do not meet applicable water quality standards and establish TMDLs for each of these waters on a prioritized schedule. In 1999, the Florida Legislature enacted the Florida Watershed Restoration Act, which clarifies the Department's statutory authority to establish TMDLs, and establishes a process for identifying and listing impaired waters for developing TMDLs and the associated watershed management plans needed to allocate and achieve the needed pollutant load reductions.

Section 303(d) of the Clean Water Act and Chapter 403.067, Florida Statutes, describe impaired waters as those waterbodies or waterbody segments that do not meet applicable water quality standards. This is a broad term that includes designated uses, water quality criteria, the Florida antidegradation policy, and moderating provisions. Using procedures defined in the Impaired Waters Rule (IWR), Section 62-303, Florida Administrative Code, existing water quality data were evaluated to determine whether waters on the 1998 303(d) list in each basin were, in fact, impaired.

Watershed Management Approach

The Department's statewide approach to water resource management, called the watershed management approach, is the framework for implementing TMDLs. Rather than focusing on individual sources of pollution, each entire basin is assessed as a functioning system. The watershed management approach will be implemented through a five-phase process in which federal, state, regional, tribal, local governments, and other watershed stakeholders identify watersheds not meeting clean water or other natural resource goals and work cooperatively to focus resources and implement effective strategies to restore water quality. The Basin Status Report initiates Phase 1 of the cycle for each basin.

Each Basin Status Report evaluates surface water quality and provides a broad overview and analysis of the basin, characterizing its hydrologic, ecological, and socioeconomic setting, and historical, current, and proposed watershed management issues and activities. Each assessment includes an analysis of major water quality parameters; water quality issues by planning unit; an evaluation of ecological resources; land use potential and pollutant loadings; and a planning list of potentially impaired waters.

Impaired Waters Rule

The IWR establishes the methodology to identify surface waters of the state that will be included on the state's planning list of waters to be assessed under Chapters 403.067(2) and (3), Florida Statutes. The methodology for developing the planning list includes an evaluation of aquatic life use support, primary contact and recreational use support, fish and shellfish consumption use support, drinking water use support, and protection of human health. The rule also establishes a methodology to identify impaired waters that will be included on the state's verified list of impaired waters, for which the Department will calculate TMDLs, under Subsection 403.067(4), Florida Statutes.

The Basin Status Reports use the methodology in Section 62-303.300, Florida Administrative Code, to develop a planning list pursuant to Subsection 403.067(2), Florida Statutes. As required by Subsection 403.067(2), Florida Statutes, the planning list will not be used in the administration or implementation of any regulatory program. It will be submitted to the U.S. Environmental Protection Agency for informational purposes only. Waters on this planning list have been assessed pursuant to Chapter 403.067(3), Florida Statutes, as part of the Department's watershed management approach. During this assessment, the Department will determine if the water body is impaired and if the impairment is caused by pollutant discharges using the methodology in Part III, Section 62-303.400, Florida Administrative Code, the verified list under the impaired waters rule. The resultant verified list of impaired waters will then consist of the list of waters for which TMDLs will be developed by the Department.

STORET

STORET is the EPA's Oracle-based **STO**rage and **RE**trieval database. It is used to store the nation's biological, chemical, and physical water quality data for ground water and surface water. In Florida, federal, state, local, and interstate agencies; universities, contractors; laboratories; and volunteer organizations such as LakeWatch and the Bream Fisherman's Association submit data to STORET.

In early 1992, the EPA modernized STORET to take advantage of new technological and information management developments. As a result, STORET now consists of two interrelated databases. The Legacy Data Center (LDC) stores historical water quality data from the 1960s until the end of 1998. The modernized STORET database contains data collected from 1999 onwards.

Basin Status Reports

The primary objective of the Basin Status Reports is to evaluate surface water quality data to determine if individual waterbodies and/or segments are potentially impaired based on the methodology for the impaired waters rule in Section 62-303, Florida Administrative Code. Three categories—chemical data, biological data, and fish consumption advisories—were evaluated to determine if a water segment is potentially impaired. Potential impairments were determined by evaluating whether an assessment unit (a waterbody segment with a waterbody identification number, or WBID) met the planning list criteria defined in the IWR for specific chemical parameters, nutrient impairment, biological impairment, fish consumption advisory, or ecological impairment. As noted above, the impaired waters rule identifies the criteria for determining if waters are to be included on the planning list and/or verified list. The criteria for the planning list are less stringent than the criteria for the verified list. Once an assessment unit is placed on the planning list, the data for each waterbody and/or segment will be examined based on IWR criteria to determine if the water should be included on the verified list or if additional data collection is needed to make that determination.

The chemistry data used in the basin assessments are taken from the EPA's STORET database. The stations used for the chemical assessment were determined to be ambient surface water stations, and information from point sources or wells was specifically excluded. Stations were classified as one of five waterbody types—spring, stream, lake, estuary, or blackwater—based on criteria described in the 305(b) report. The chemistry data for the planning list covers the period from 1989 to 1998. It includes parameters categorized as metals (e.g., arsenic, lead, and cadmium), nutrients (e.g., chlorophyll *a*, total nitrogen, and total phosphorus) or conventional parameters (e.g., oil and grease, fecal coliforms, and pH). The chemistry data for the verified list covers the period from 1994 to 1998 and includes the same parameters. The planning and verified lists will be amended to include any additional chemistry or biology data that are gathered or reported chemistry data from 1998 to the present, once those data are verified through the IWR protocol.

The chemistry data were analyzed to determine if an assessment unit should be placed on the planning list for each of the above parameters. The analysis consisted of running the data through a SAS computer program that was written according to the language contained in the IWR, with two exceptions. First, the unionized ammonia data was not analyzed by the program, but rather by using an Excel spreadsheet. Second, the full language for pH could not be programmed, and thus the incomplete listings for pH are not included, but will be investigated further while additional data are being collected. Data analysis and statistical summaries of WBIDs, waterbody types, and parameters obtained through STORET data were conducted using Excel applications, SYSTAT statistical software, and ArcView GIS applications.

The metal and conventional parameter data were compared with the state's numeric criteria in Section 62-302.530, Florida Administrative Code. A water was placed on the planning list if there was at least 80 percent confidence that the actual criteria exceedance rate was greater than or equal to 10 percent. A table of sample sizes versus exceedances may be found in Section 62-303.320, Florida Administrative Code, Table 1, of the IWR.

Potential nutrient impairment was evaluated by calculating the Trophic State Index (TSI) for lakes and calculating annual mean chlorophyll *a* values for estuaries and

streams. For lakes, the TSI was calculated based on procedures outlined in the 1996 305(b) report. Lakes with a mean color greater than 40 platinum cobalt units were considered nutrient enriched if the annual mean TSI exceeded 60. Lakes with a mean color less than or equal to 40 platinum cobalt units were considered nutrient enriched if the annual means TSI exceeded 40. In addition, lakes were considered nutrient enriched if there was an increase in TSI over the 1989 to 1998 period or if TSI measurements were ten units higher than historical values. In estuarine areas, if the annual mean chlorophyll *a* values were greater than 11 µg/L or if annual mean chlorophyll *a* values increased by more than 50 percent over historical values for at least two consecutive years, the water was considered nutrient enriched. For streams, if the annual mean chlorophyll *a* values were greater than 20 µg/l or if the annual means increased by more than 50 percent over historical values for at least two consecutive years, the water was considered nutrient enriched.

Segments were placed on the planning list based on fish consumption advisories issued by the Florida Department of Health, urging limited consumption or no consumption of fish in select Florida waters because of high levels of mercury or other contaminants in fish tissue.

The biology data were assessed using the IWR as guidance. The purpose behind using bioassessment methodology in surface water characterizations is that biological components of the environment manifest long-term water quality conditions and thus provide a better indication of a waterbody's true health than discrete chemical or physical measurements alone. Similar to water quality criteria, bioassessment methods involve the identification of a biological reference condition, based on data from unimpaired or least-impacted waters in a given region. For the Basin Status Reports, the reference condition data were used to establish expected scores, ranging from best to worst, for various measures of community structure and function, such as numbers or percentages of particular species or feeding groups. Community structure and function data from waters of unknown quality within the same region as reference waters were compared with the expected scores of metrics to evaluate their biological integrities.

Metrics (e.g., number of taxa, percent Diptera, percent filter feeders) were used independently and as an aggregated group called an index. Indices have advantages over individual metrics in that they can integrate several related metrics into one score that reflects a wider range of biological variables. A number of bioassessment metrics and indices exist for assessing populations of plant and animal life, including fish, diatoms (e.g., microscopic algae, unicellular plankton), and macroinvertebrates (e.g., insects, crayfish, snails, and mussels).

Only macroinvertebrate data from ambient sites in state surface waters were used in the bioassessments analyzed for the basin reports. This included data from sites designated as test and background sites for NPDES fifth-year inspections, but excluded data from effluent outfalls from discharging facilities or data from monitoring sites not clearly established to collect ambient water quality data. Because site-specific habitat and physicochemical assessment information (e.g., percent suitable macroinvertebrate habitat, water velocities, extent of sand or silt smothering, and riparian buffer zone widths) were not available at the time of reporting, they were not included here. However, habitat and physicochemical assessment information is instrumental in pinpointing the causes for failed bioassessment metrics and will be included in future

reporting. Data used in the basin status reports were obtained from the Department's Biological Database (SBIO) and the EPA's STORET Water Quality Database, where it could be substantiated that such data were generated in compliance with the bioassessment standard operating procedures referenced in Section 62-303.330, Florida Administrative Code.

Bioassessments were provided for streams, lakes, canals and rivers. Scoring of the individual metrics of the LCI, except percent Diptera, were performed according to the following formula:

$100(B/A)$ where A = the 95 percentile of the reference population and B = observed value

For percent Diptera the following formula was used:

$100 (100-B)/(100-A)$ where A = the 95 percentile of the reference population and B = observed value

An average LCI score was calculated by averaging the scores of the six metrics contained within the method: total number of taxa; total number of taxa belonging to the orders Ephemeroptera, Odonata and Trichoptera (EOT taxa); percent EOT taxa; Shannon-Wiener Index score; Hulbert Index score; and percent Dipteran individuals. LCI calculations are only provided for clear lakes (≤ 20 platinum cobalt units). Since macroinvertebrate-based indices have not been shown to assess colored lakes in Florida accurately (> 20 platinum cobalt units), they have been excluded from bioassessments.

A total SCI score was calculated by adding the scores of the seven metrics contained within the method, i.e., total number of taxa; total number of taxa belonging to the orders Ephemeroptera, Plecoptera and Trichoptera (EPT taxa); percent Chironomid taxa; percent dominant taxa; percent Diptera; percent filter feeders; and Florida Index. Definitions and specific methods for the generation and analysis of bioassessment data are referenced in the Basin Status Reports.

Data were used from the databases noted above without regard to the randomness of sample site selection. The general period of record for data used in the analysis of lotic waters was January 1, 1989, through December 31, 1998. The period of record for data used in the analysis of lentic waters was June 21, 1995, through December 31, 1998. The seasons are defined as follows: winter (1/1–3/31), spring (4/1–6/30), summer (7/1–9/30) and fall (10/1–12/31). Wet seasons are generally spring and summer and dry seasons are fall and winter, although conditions can vary within the state as a whole.

Appendix F: Bioassessment Methodology, Bioassessments by Planning Unit, and Supporting Data

Methodology

Bioassessment is an increasingly accepted tool for evaluating the health of surface waters. The premise behind using bioassessment methodology to characterize surface waters is that biological components of the environment manifest long-term water quality conditions and can presumably provide a better indication of the true health of the waters involved than discrete chemical or physical measurements alone.

Like water quality criteria, bioassessment methods identify a biological reference condition, based on data from unimpaired or least-impacted waters in a given region. The reference condition data are used to establish expected scores, ranging from best to worst, for various measures of community structure and function, such as numbers or percentages of particular species or feeding groups. Data on community structure and function from waters of unknown quality in the same region as reference waters are compared with the expected scores of metrics to evaluate their biological integrity. Metrics may be used independently or as an aggregated group called an index. Indices have advantages over individual metrics in that they can integrate several related metrics into one score that reflects a wider range of biological variables.

A number of bioassessment metrics and indices exist for assessing populations of plant and animal life, including fish, diatoms, and macroinvertebrates. The bioassessments in this appendix include only macroinvertebrate data. Because site-specific habitat and physicochemical assessment information (e.g., percent suitable macroinvertebrate habitat, water velocities, extent of sand or silt smothering, and riparian buffer zone widths) was not available at the time of reporting, it is not included. However, habitat and physicochemical assessment information is instrumental in pinpointing the causes for failed bioassessment metrics and should be included in future reporting.

Bioassessments are provided for streams, canals, and rivers with data generated according to the Department's standard operating procedures FS-7420 and FS-7430 and analyzed according to the Stream Condition Index (SCI) for Florida (Barbour *et al.*, 1996) (FDEP SOP #LT-7200) and/or Section 62-302.530(11), Florida Administrative Code (Biological Integrity Standard). Bioassessments are also provided for clear lakes ($\leq$ 20 platinum cobalt units) with data generated according to the Department's standard operating procedure FS-7460 and analyzed according to the Lake Condition Index (LCI) for Florida (Gerritsen *et al.*, 2000) (FDEP SOP # LT-7300). Since macroinvertebrate-based indices have not been shown to assess colored lakes in Florida accurately ($>$ 20 platinum cobalt units), they have been excluded from the bioassessments in this appendix.

The data used in this Basin Status Report were obtained from the Department's Biological Database (SBIO) and the U.S. Environmental Protection Agency's STORET Water Quality Database, where it could be substantiated that the data were generated in compliance with the bioassessment standard operating procedures in Section 62-303.330, Florida Administrative Code.

The data from these databases were used without regard to the randomness of sample site selection. Only ambient data from state surface waters were used, excluding data from effluent outfalls from discharging facilities or data from monitoring sites not clearly established to collect ambient water quality data.

The general period of record for data used in the analysis of lotic waters was January 1, 1989, through December 31, 1998. The period of record for data used in the analysis of lentic waters was June 21, 1995, through December 31, 1998. The beginning date corresponds to the inception of the current Department standard operating procedure for sampling lakes (FS-7460). For this report, the seasons are defined as follows; winter (1/1–3/31), spring (4/1–6/30), summer (7/1–9/30), and fall (10/1–12/31). Wet seasons are generally spring and summer and dry seasons are fall and winter, although conditions can vary in the state as a whole.

Metric Definitions

of Taxa—This metric is otherwise known as taxa richness. In this report, it indicates the total number of macroinvertebrate taxa found in a sample of stream or lake bottom, other in-water substrate such as fallen branches or roots, or artificial surface placed in the waterbody for invertebrate colonization. A taxon (singular) is a group of organisms with common traits and characteristics, such as dragonflies (taxon Odonata). As the environment is stressed, the number of taxa present generally decreases.

of Chironomid Taxa—Chironomids are flies that are prevalent in many surface waters. This metric is also a measure of taxa richness.

of EPT or EOT Taxa—Particular organisms or groups of organisms in a given surface water habitat are more sensitive to changes in the environment than others, making them good indicators of environmental stress. Mayflies (Ephemeroptera), stoneflies (Plecoptera), caddisflies (Trichoptera), and dragonflies and damselflies (Odonata) are four such taxa.

% Diptera—Dipterans are flies, many of which are tolerant of poor water quality conditions. This metric represents the fraction of the total number of dipteran organisms in a sample. A large fraction indicates an invertebrate community that is predominantly tolerant of low water quality.

Florida Index—The Florida Index is a weighted measurement of the numbers of Class I and Class II macroinvertebrate species known in Florida. It assigns points to stream-dwelling macroinvertebrates based on their sensitivities to pollution. It is an index in itself, but the results can be incorporated into other indices as measurements of biological integrity.

% Filter Feeders—Filter-feeding organisms indicate the flow regime in a waterbody. The larger the fraction of the total community consisting of filter feeders, the more likely it is that the waterbody has a good flow regime.

% Dominant Taxon—In all waterbodies, the taxon that exists in greater number than all others is known as the dominant taxon. A high percentage of the dominant taxon in a sample indicates lower diversity and poorer water quality.

Shannon-Wiener Diversity Index—This is a measurement of macroinvertebrate community health, specified in Section 62-302, Florida Administrative Code. It incorporates levels of taxa richness (how many taxa are present) with the distribution of individuals among taxa present (how evenly they are distributed). Like the Florida Index, it is an index in itself. However, the result is often included in other indices of biological integrity. Low diversity scores indicate conditions where only a few species are present at the exclusion of other taxa.

Hulbert Index—This index is also a weighted measurement of the numbers of Class A and Class B species of macroinvertebrates known in Florida lakes. It is also an index in itself, but the result is included in the calculation of the Lake Condition Index as a separate metric value.

Bioassessment by Basin Planning Unit

Tables F-1 through **F-4** contain the results of Stream Condition Index (SCI) and Rapid Bioassessment (BioRecon) assessments performed in the basin, index thresholds, and selected results from artificial substrate analyses (Hester-Dendy analyses). No lake data were available in the basin for calculating the Lake Condition Index. **Table F-5** summarizes the results of each bioassessment test with determinations of compliance with applicable state water quality rules. All tests employed and data analyzed are based on measurements of surface water macroinvertebrate community integrity. All data used were generated by the Department according to its standard operating procedures.

A. Alapaha River

Available bioassessment data consisted of one BioRecon conducted in the Alapaha River on July 20, 1995. The results were failures of all three BioRecon metrics and a rating of **potentially impaired**. More bioassessment data is required from more locations in this planning unit to draw conclusions on its overall biological integrity.

B. Aucilla River

One site in the Aucilla River was assessed on two dates in 1992 (summer and winter). An SCI assessment and a Hester-Dendy assessment indicated good, clean conditions. Based on this information, the Aucilla River is **not potentially impaired**.

C. Aucilla/Econfina Coastal

No bioassessment data were available.

D. Econfina River

Data were available from the Econfina River over a period of five years, from August 1992 to August 1997. Except for one failed SCI in February 1994, the results of all other assessments were good to excellent. The failed SCI, however, puts this waterbody in the **potentially impaired** category.

E. Econfina/Fenholloway Coastal

No bioassessment data were available.

F. Fenholloway River

Data from only one assessment in one waterbody was available for analysis. The assessment was a BioRecon, conducted in 1998, which failed in all three metrics. Therefore, the Fenholloway River is considered **potentially impaired**.

G. Fenholloway/Steinhatchee Coastal

Data from Weaver Warrior Creek, Spring Creek, and Spring Warrior Creek were available for analysis. The period of record is 1990 to 1998. A BioRecon conducted in Weaver Warrior Creek in 1998 failed all three metrics, placing this water in the **potentially impaired** category. Two sites in Spring Creek served as background and test sites for monitoring discharges from the Perry Wastewater Treatment Plant in 1990: STORET station numbers 22050009 (background) and 22050010 (test). Both sites were confirmed clean via Hester-Dendy analyses and the test site met the biological integrity criteria in Section 62-302.530(11), Florida Administrative Code. Spring Warrior Creek failed an SCI assessment in August 1994, presumably because of a low percentage of filter feeders (1 percent) and EPT taxa (2 percent) and a relatively high percentage contribution to the total taxa by the dominant taxon (33 percent). These results indicate water quality conditions that do not support sensitive species. Seasonal effects are implicated, since this waterbody had a passing SCI score, with a much higher percentage of filter feeders (45 percent), during the following winter (February 1995). Even so, because of the failed SCI in 1994, Spring Warrior Creek is considered **potentially impaired**.

H. Lower Suwannee River

No bioassessment data were available.

I. Middle Suwannee River

Two sites in the Suwannee River established as test and background sites for monitoring discharges from the Goldkist Poultry Company had excellent SCI scores in April 1995. These were STORET station numbers 21020019 (background) and 21020072 (test). Both yielded excellent SCI scores and **no potential impairments**. No other bioassessment information was available for analysis in this planning unit.

J. Santa Fe River

Bioassessment data were available for three waters: Olustee Creek, Silver Run Creek, and Alligator Creek, from the period May 1991 to September 1998. One site in Olustee Creek showed good to excellent results from four SCI assessments conducted in 1994, 1995, and 1996, and only one failed metric in a BioRecon in July 1995. These results indicate good overall biological integrity within the macroinvertebrate population of Olustee Creek and **no potential impairments**.

Two sites in Silver Run Creek served as test and background sites for monitoring discharges from the Lake Butler Wastewater Treatment Plant in September 1992 (SCI) and again in October 1992 (Hester-Dendy). These were STORET station numbers 21030058 (background) and 21030059 (test). Because the September 1992 SCI assessments yielded a passing (excellent) score for the background site and a failing score for the test site, Silver Run Creek in the area of the test site is considered **potentially impaired**. The Hester-Dendy analyses conducted in October 1992 at both sites indicated moderate impairment at both the background and test sites; however, the test site met the biological integrity criterion in Section 62-302.530(11), Florida Administrative Code. The test site also failed an SCI in September 1995. Specific water chemistry data (such as conductance and dissolved oxygen) need to be evaluated to determine if the differences in bioassessment scores could be attributed to differences in water quality between the two sites.

Two sites in Alligator Creek served as test and background sites for monitoring discharges from the Starke Wastewater Treatment Plant in May 1991. These were STORET station numbers 21030076 (background) and 21030077 (test). The background site was shown to be clean and the test site was moderately stressed. However the test site met the biological integrity criterion in Section 62-302,530(11), Florida Administrative Code, therefore **no potential impairments** were indicated.

K. Steinhatchee River

Bioassessment data from only one site on one date were available for assessing this planning unit, at Boggy Creek. Because the assessment, a BioRecon, failed all three metrics, Boggy Creek is considered **potentially impaired**. Specific water quality data are needed to evaluate probable causes for the failures.

L. Steinhatchee/Lower Suwannee Coastal

Two sites in Belly Deep Creek served as test and background sites for monitoring discharges from the Cross City Wastewater Treatment Plant in September 1991 and again in October 1991. These were STORET station numbers 22050008 (background) and 22050033 (test). Both sites failed SCI assessments in September 1991, which indicates that the background site was a poor choice for monitoring the effects of this point source discharge. In October 1991, Hester-Dendy results showed the background site as clean while the test site was shown to be moderately stressed. The test site met the biological integrity criterion in Section 62-302.530(11), Florida Administrative Code, but because of the failure of the September 1991 SCI, Belly Deep Creek is considered **potentially**

impaired. Specific water quality data from both sites are needed to evaluate probable impacts from the point source discharge.

M. Upper Suwannee River

A significant amount of bioassessment data from five waters in this planning unit were available from which to evaluate biological integrity. These included Swift Creek, Little Creek, Falling Creek, Robinson Creek, and the Suwannee River. The period of record was February 1992 to August 1998.

Two sites in Swift Creek served as test and background sites for monitoring discharges from the Occidental Chemical Company in November 1997. These were STORET station numbers 21010043 (background) and 21020040 (test). The background site was shown to be clean and it passed an SCI assessment with an excellent score. The test site was shown to be moderately stressed, and while it passed an SCI assessment with a good score, it did not meet the biological integrity criterion in Section 62-302.530(11), Florida Administrative Code. It had also failed an earlier SCI in 1994, therefore it is considered **potentially impaired**. Specific water quality data from both sites are needed to evaluate probable impacts from the point source discharge.

Falling Creek had good to excellent SCI scores throughout its period of record, with **no potential impairments**.

Eight SCIs were conducted in Robinson Creek from March 1993 to January 2000, with seven very good and one good designation. A BioRecon in January 2000 rated healthy.

Two sites in the Suwannee River served as test and background sites for monitoring discharges from the White Springs Wastewater Treatment Plant in November 1993, December 1993 and June 1995. These were STORET station numbers 21010040 (background) and 21010041 (test). The background site had excellent, clean results on all assessment dates. The test site passed an SCI assessment with an excellent score in November 1993 and met the biological integrity criterion in Section 62-302.530(11), Florida Administrative Code in June 1995, but failed to meet the criterion in December 1993. Therefore this portion of the Suwannee River is considered **potentially impaired**. Specific water quality data from both sites are needed to evaluate probable impacts from the point source discharge.

N. Waccasassa River

Bioassessment data from the Waccasassa River during the period February 1992 to September 1998 shows excellent scores for seven SCI assessments and **no potential impairments**.

O. Withlacoochee River

Bioassessment data were available from two waters in this planning unit: the Withlacoochee River and Bellville Creek. The period of record was April 1995 to December 1998. Both SCI and Hester-Dendy assessments were conducted in both waterbodies and all results were good to excellent, with most excellent. **No potential**

impairments were indicated in either Bellville Creek or this portion of the Withlacoochee River.

Conclusions

In evaluating the overall biological integrity of the Suwannee Basin based on bioassessment data, it should be stressed that in some areas limited data were available and, if possible, further bioassessments should be performed where clear trends or influences have not been indicated. For the most part, bioassessment data from throughout the basin indicate good to excellent water quality and a healthy macroinvertebrate population. The exceptions are waters that receive point source discharges. A clear pattern of test site failures was shown in most cases where background and test site bioassessment data were available. Future bioassessments should pay particular attention to those areas of the basin.

Table F-1: Analysis of Macroinvertebrate Data from Samples Taken in the Suwannee Basin by the 20-Dipnet Sweep Sample Collection Method (FDEP SOP #FS-7420)

Waterbody	WBID	Planning Unit	STORET Station #	Sample Date	# of EPT Taxa ^a		# of Chironomid Taxa	% Diptera	FL Index Score ^b	% Filter Feeders	% Dominant Taxon	Region	SCI ^c	
					Taxa	Taxa							Score	Evaluation
Aucilla River	3310	Aucilla River	22040002	9/1/92	30	2	3	27.12	11	13.56	35.59	Panhandle East	23	good
Econfina River	3402	Econfina River	22050023	8/31/92	32	3	3	6.73	14	12.98	16.35	Panhandle East	25	good
Econfina River	3402	Econfina River	22050023	2/2/93	26	5	4	37.89	19	18.42	9.47	Panhandle East	29	excellent
Econfina River	3402	Econfina River	22050023	8/4/93	32	5	4	30.57	17	21.34	19.75	Panhandle East	31	excellent
Econfina River	3402	Econfina River	22050023	2/1/94	21	4	0	84.38	5	38.22	73.8	Panhandle East	17	poor
Econfina River	3402	Econfina River	22050023	8/3/94	46	5	2	29.7	10	15.15	7.88	Panhandle East	29	excellent
Econfina River	3402	Econfina River	22050023	2/15/95	32	5	4	14.66	10	32.33	26.72	Panhandle East	25	good
Econfina River	3402	Econfina River	22050023	8/12/97	39	7	3	40.13	24	39.8	17.76	Panhandle East	33	excellent
Spring Warrior Creek	3556A	Fen/Stein Coastal	22050059	8/3/94	33	2	2	6.61	7	1.1	33.48	Panhandle East	17	poor
Spring Warrior Creek	3556A	Fen/Stein Coastal	22050059	2/15/95	28	4	2	55.75	12	45.11	36.78	Panhandle East	25	good
Suwannee River	3422B	Middle Suwannee	21020019	4/24/95	45	8	3	44.3	23	29.11	18.99	Panhandle East	33	excellent
Suwannee River	3422B	Middle Suwannee	21020072	4/24/95	31	6	2	49.59	18	45.87	18.18	Panhandle East	31	excellent
Alligator Creek	3598C	Santa Fe River	21030077	9/15/98	22	3	1	34.74	10	10.53	15.79	Northeast	27	excellent
Olustee Creek	3504	Santa Fe River	21030074	8/8/94	19	1	3	79.78	11	55.62	55.06	Northeast	21	good
Olustee Creek	3504	Santa Fe River	21030074	3/15/95	29	9	3	32.98	21	13.83	13.83	Northeast	29	excellent
Olustee Creek	3504	Santa Fe River	21030074	7/18/95	32	2	1	40.38	6	11.54	11.54	Northeast	27	excellent
Olustee Creek	3504	Santa Fe River	21030074	1/10/96	30	8	2	44.78	18	30.97	20.15	Northeast	31	excellent
Silver Run Creek	3566	Santa Fe River	21030058	9/15/92	30	6	1	23.96	23	25	14.58	Northeast	29	excellent
Silver Run Creek	3566	Santa Fe River	21030059	9/15/92	13	0	1	56.41	1	0.32	33.97	Northeast	13	poor
Silver Run Creek	3566	Santa Fe River	21030059	9/25/95	12	0	4	81	6	0	51.6	Northeast	17	poor
Belly Deep Creek	3691	Stein/Low Suw Coast	22050008	9/23/91	25	2	3	67.85	2	0.29	24.19	Panhandle East	15	poor
Belly Deep Creek	3686	Stein/Low Suw Coast	22050033	9/23/91	20	0	1	36.08	0	0	44.3	Panhandle East	15	poor
Falling Creek	3477	Upper Suwannee	21010018	2/8/94	18	2	1	80	5	76.56	66.25	Northeast	23	good
Falling Creek	3477	Upper Suwannee	21010018	7/12/94	17	3	2	48.21	12	71.88	38.39	Northeast	21	good
Falling Creek	3477	Upper Suwannee	21010018	1/4/95	31	10	4	55.9	26	29.5	16.77	Northeast	31	excellent
Falling Creek	3477	Upper Suwannee	21010018	7/17/97	29	8	2	45.24	23	40.48	26.19	Northeast	29	excellent
Suwannee River	3341A	Upper Suwannee	21010040	11/15/93	48	5	5	49.37	23	27.64	10.97	Panhandle East	31	excellent
Suwannee River	3341A	Upper Suwannee	21010041	11/15/93	53	9	6	35.14	17	16.22	18.53	Panhandle East	33	excellent
Swift Creek	3368	Upper Suwannee	21010033	8/24/94	26	6	4	40.71	24	48.23	30.97	Northeast	29	excellent
Swift Creek	3368	Upper Suwannee	21010033	1/17/95	23	7	2	37.08	20	39.89	16.85	Northeast	31	excellent
Swift Creek	3368	Upper Suwannee	21010033	7/22/96	40	10	5	30	25	7.81	11.88	Northeast	29	excellent
Swift Creek	3368	Upper Suwannee	21010033	1/13/98	24	8	3	54.08	19	39.29	32.65	Northeast	27	excellent
Swift Creek	3388	Upper Suwannee	21010043	2/11/92	32	5	2	26.8	17	6.7	20.62	Northeast	31	excellent
Swift Creek	3388	Upper Suwannee	21010043	11/10/97	27	9	1	21.78	20	21.29	20.79	Northeast	29	excellent
Swift Creek	3375	Upper Suwannee	21020040	8/15/94	27	1	3	56.59	12	7.14	34.62	Panhandle East	19	poor
Swift Creek	3375	Upper Suwannee	21020040	11/10/97	31	5	1	64.2	14	9.94	31.82	Panhandle East	25	good
Swift Creek	3364	Upper Suwannee	21020063	8/15/94	20	1	3	14.07	14	6.67	25.93	Northeast	23	good
Swift Creek	3364	Upper Suwannee	21020063	11/10/97	18	4	1	11.32	6	14.62	34.91	Northeast	29	excellent

Waccasassa River	3699	Waccasassa River	23020001	9/14/94	29	5	1	18.69	9	18.69	20.56	Peninsular	31	excellent
Waccasassa River	3699	Waccasassa River	23020001	2/26/97	43	7	2	46.15	21	29.81	20.51	Peninsular	33	excellent
Waccasassa River	3699	Waccasassa River	23020001	9/14/98	34	7	2	22.14	26	12.86	26.43	Peninsular	29	excellent
Bellville Creek	3319	Withlacoochee	21010034	4/17/95	33	7	4	48.76	14	24.79	13.22	Panhandle East	31	excellent
Withlacoochee River	3318	Withlacoochee	21010029	4/17/95	35	3	2	42.22	15	25.93	14.07	Panhandle East	27	excellent
Withlacoochee River	3318	Withlacoochee	21010029	7/28/97	38	3	6	16.36	15	0.61	15.15	Panhandle East	23	good
Withlacoochee River	3318	Withlacoochee	21010029	12/7/98	52	8	5	45.83	19	13.19	12.5	Panhandle East	33	excellent
Withlacoochee River	3315	Withlacoochee	21010030	4/17/95	50	8	4	32.13	19	21.15	20.98	Panhandle East	33	excellent
Withlacoochee River	3315	Withlacoochee	21010030	7/28/97	48	10	4	36.76	19	37.38	20.56	Panhandle East	31	excellent
Withlacoochee River	3315	Withlacoochee	21010030	12/7/98	45	7	3	59.06	14	14.17	9.45	Panhandle East	33	excellent

^a Total number of invertebrate taxa in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies). Otherwise known as the EPT Index.

^b Florida Index score. Methods per Ross, 1990.

^c Stream Condition Index score and evaluation, per method shown for Florida in Table F-2 and Barbour, 1996.

Table F-3: Analysis of Macroinvertebrate Data from Samples Taken in the Suwannee Basin by the BioRecon Sample Collection Method (FDEP SOP #FS-7410)

Waterbody	WBID	Planning Unit	STORET Station #	Sample Date	Region	# of Taxa		FL Index ^a		# of EPT Taxa ^b		Overall Evaluation
						Score	Score	Score	Score	Score	Score	
Olustee Creek	3504	Santa Fe River	21030074	7/18/95	Northeast	16	failed	6	passed	3	passed	suspect
Alapaha River	3324	Alapaha River	21010008	7/20/95	Panhandle East	21	failed	16	failed	5	failed	impaired
Weaver Warrior Creek	3556	Fen/Stein Coastal	22050052	8/4/98	Panhandle East	21	failed	1	failed	0	failed	impaired
Fenholloway River	3473C	Fenholloway River	22050028	2/2/98	Panhandle East	13	failed	6	failed	3	failed	impaired
Boggy Creek	3603	Steinhatchee	22050064	8/4/98	Panhandle East	23	failed	4	failed	2	failed	impaired
Swift Creek	3388	Upper Suwannee	21010043	8/5/98	Northeast	20	passed	13	passed	3	passed	healthy
Evaluation Thresholds:												
					Northeast	≥ 17		≥ 6		≥ 3		
					Panhandle East	≥ 24		≥ 19		≥ 9		

^a Florida Index score. Methods per Ross, 1990.^b Total number of taxa in the invertebrate orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies).

Table F-4: Analysis of Macroinvertebrate Data from Samples Taken in the Suwannee Basin by the Hester-Dendy Artificial Substrate Sample Collection Method (FDEP SOP #BA-13 and #IZ-29)

Waterbody	WBID	Planning Unit	STORET Station #	Sample Date	Shan/Wien Score ^a	Overall Evaluation ^b	Rule 62-302.530(11) F.A.C. Station Type	Meets Criteria ^c
Aucilla River	3310	Aucilla River	22040002	3/16/92	3.51	Clean	Unknown	
Aucilla River	3310	Aucilla River	22040002	9/1/92	4.76	Clean	Unknown	
Econfina River	3402	Econfina River	22050023	8/31/92	4.17	Clean	Unknown	
Spring Creek	3580	Fen/Stein Coastal	22050009	11/19/90	3.39	Clean	Background	
Spring Creek	3580	Fen/Stein Coastal	22050010	11/19/90	3.13	Clean	Test	YES
Alligator Creek	3598C	Santa Fe River	21030076	5/28/91	3.93	Clean	Background	
Alligator Creek	3598C	Santa Fe River	21030077	5/28/91	2.97	Moderately Stressed	Test	YES
Silver Run Creek	3566	Santa Fe River	21030058	10/12/92	2.49	Moderately Stressed	Background	
Silver Run Creek	3566	Santa Fe River	21030059	10/12/92	2.6	Moderately Stressed	Test	YES
Silver Run Creek	3566	Santa Fe River	21030059	9/25/95	2.47	Moderately Stressed	Unknown	
Belly Deep Creek	3691	Stein/Low Suw Coast	22050008	10/21/91	3.52	Clean	Background	
Belly Deep Creek	3686	Stein/Low Suw Coast	22050033	10/21/91	2.74	Moderately Stressed	Test	YES
Falling Creek	3477	Upper Suwannee	21010018	2/8/94	2.05	Moderately Stressed	Unknown	
Suwannee River	3341A	Upper Suwannee	21010040	12/27/93	3.49	Clean	Background	
Suwannee River	3341A	Upper Suwannee	21010041	12/27/93	1.62	Severely Stressed	Test	NO
Suwannee River	3341A	Upper Suwannee	21010040	6/12/95	3.53	Clean	Background	
Suwannee River	3341A	Upper Suwannee	21010041	6/12/95	2.78	Moderately Stressed	Test	YES
Suwannee River	3341A	Upper Suwannee	21020019	4/24/95	3.73	Clean	Background	
Suwannee River	3341A	Upper Suwannee	21020072	4/24/95	2.91	Moderately Stressed	Test	YES
Swift Creek	3388	Upper Suwannee	21010043	3/3/92	2.02	Moderately Stressed	Unknown	
Swift Creek	3375	Upper Suwannee	21020040	11/10/97	2.39	Moderately Stressed	Background	
Swift Creek	3388	Upper Suwannee	21010043	11/10/97	3.43	Clean	Test	NO
Swift Creek	3375	Upper Suwannee	21020040	8/15/94	2.61	Moderately Stressed	Unknown	
Belville Creek	3319	Withlacoochee River	21010034	4/17/95	3.78	Clean	Unknown	
Withlacoochee River	3318	Withlacoochee River	21010029	4/17/95	3.6	Clean	Unknown	
Withlacoochee River	3315	Withlacoochee River	21010030	4/17/95	3.34	Clean	Unknown	
Withlacoochee River	3315	Withlacoochee River	21010030	12/7/98	3.3	Clean	Unknown	
Withlacoochee River	3318	Withlacoochee River	21010029	12/7/98	3.61	Clean	Unknown	

^a Shannon-Wiener Diversity Index score. Methods based on Pielou, 1977.

^b Based on Friedemann and Hand, 1989.

^c Only test sites with associated background sites were evaluated.

Table F-5: Bioassessment Summary for the Suwannee Basin for the Period January 1, 1989 Through December 31, 1998

Waterbody	WBID	Planning Unit	STORET Station #	Sample Date	SCI	Biorecon				HD		Potentially Impaired per Rule 62-303.330 FAC
						# of Taxa	FI Index	# of EPT Taxa	Overall	Meets Water Quality Standards per Rule 62-302.530(11) FAC ^a	Overall	
Alapaha River	3324	Alapaha River	21010008	7/20/95		failed	failed	failed	impaired		clean	YES
Aucilla River	3310	Aucilla River	22040002	3/16/92								NO
Aucilla River	3310	Aucilla River	22040002	9/1/92	good							NO
Aucilla River	3310	Aucilla River	22040002	9/1/92							clean	NO
Econfina River	3402	Econfina River	22050023	8/31/92	good							NO
Econfina River	3402	Econfina River	22050023	8/31/92							clean	NO
Econfina River	3402	Econfina River	22050023	2/2/93	excellent							NO
Econfina River	3402	Econfina River	22050023	8/4/93	excellent							NO
Econfina River	3402	Econfina River	22050023	2/1/94	poor							YES
Econfina River	3402	Econfina River	22050023	8/3/94	excellent							NO
Econfina River	3402	Econfina River	22050023	2/15/95	good							NO
Econfina River	3402	Econfina River	22050023	8/12/97	excellent							NO
Spring Creek	3580	Fen/Stein Coastal	22050009	11/19/90							clean	NO
Spring Creek	3580	Fen/Stein Coastal	22050010	11/19/90						YES	clean	NO
Spring Warrior Creek	3566A	Fen/Stein Coastal	22050059	8/3/94	poor							YES
Spring Warrior Creek	3566A	Fen/Stein Coastal	22050059	2/15/95	good							NO
Weaver Warrior Creek	3566	Fen/Stein Coastal	22050052	8/4/98		failed	failed	failed	impaired			YES
Fenholloway River	3473C	Fenholloway River	22050028	2/2/98		failed	failed	failed	impaired			YES
Suwannee River	3422B	Middle Suwannee	21020019	4/24/95	excellent							NO
Suwannee River	3422B	Middle Suwannee	21020072	4/24/95	excellent							NO
Alligator Creek	3598C	Santa Fe River	21030076	5/28/91							clean	NO
Alligator Creek	3598C	Santa Fe River	21030077	5/28/91						YES	moderately stressed	NO
Alligator Creek	3598C	Santa Fe River	21030077	9/15/98	excellent							NO
Olustee Creek	3504	Santa Fe River	21030074	8/8/94	good							NO
Olustee Creek	3504	Santa Fe River	21030074	3/15/95	excellent							NO
Olustee Creek	3504	Santa Fe River	21030074	7/18/95	excellent							NO
Olustee Creek	3504	Santa Fe River	21030074	7/18/95		failed	passed	passed	suspect			NO
Olustee Creek	3504	Santa Fe River	21030074	1/10/96	excellent							NO
Silver Run Creek	3566	Santa Fe River	21030058	9/15/92	excellent							NO
Silver Run Creek	3566	Santa Fe River	21030058	10/12/92							moderately stressed	NO
Silver Run Creek	3566	Santa Fe River	21030059	9/15/92	poor							YES
Silver Run Creek	3566	Santa Fe River	21030059	10/12/92						YES	moderately stressed	NO
Silver Run Creek	3566	Santa Fe River	21030059	9/25/95	poor							YES
Silver Run Creek	3566	Santa Fe River	21030059	9/25/95							moderately stressed	NO
Belly Deep Creek	3691	Stein/Low Suw Coast	22050008	9/23/91	poor							YES
Belly Deep Creek	3691	Stein/Low Suw Coast	22050008	10/21/91							clean	NO
Belly Deep Creek	3686	Stein/Low Suw Coast	22050033	9/23/91	poor							YES
Belly Deep Creek	3686	Stein/Low Suw Coast	22050033	10/21/91						YES	moderately stressed	NO
Boggy Creek	3603	Steinhatchee	22050064	8/4/98		failed	failed	failed	impaired			YES

References for Appendix F

- Barbour, M. T., J. Gerritsen, and J. S. White. 1996. *Development of the Stream Condition Index (SCI) for Florida*. Prepared for the Florida Department of Environmental Protection. Owings Mills, Maryland. Tetra Tech, Inc.
- Friedemann, M., and J. Hand. 1989. *Typical Water Quality Values for Florida's Lakes, Streams and Estuaries*. Tallahassee, Florida: Florida Department of Environmental Regulation.
- Pielou, E. 1977. *Mathematical Ecology*. New York. John Wiley and Sons, Inc.
- Ross, L. T. 1990. *Methods for Aquatic Biology*. Tallahassee, Florida: Florida Department of Environmental Regulation. Technical Series 10(1): 1-47.

Appendix G: Suwannee Permitted Facilities with Surface Water Discharges

Upper Suwannee River Basin

WBID	FACILITY_ID	NAME	DESCRIPTION	PERM CAP (MGD)	DESIGN_CAP
3381	FL0000655	PCS PHOSPHATE--SUWANNEE RIVER MINE	Industrial Wastewater		200
3341A	FL0031275	WHITE SPRINGS WWTP, TOWN OF	Domestic WWTP	0.15	0.15
3381	FL0036226	PCS PHOSPHATE--SWIFT CHEMICAL COMPLEX	Industrial Wastewater	26.9	26.9
3503	FL0043567	COCHRAN FOREST PRODUCTS	Industrial Wastewater		0.05

Withlacoochee River Basin

WBID	FACILITY_ID	NAME	DESCRIPTION	PERM CAP (MGD)	DESIGN_CAP
3315	FL0000281	TENECO PACKAGING INC.	Industrial Wastewater	55	55

Middle Suwannee River Basin

WBID	FACILITY_ID	NAME	DESCRIPTION	PERM CAP (MGD)	DESIGN_CAP
3422B	FL0000183	FL POWER CORP.- SUWANNEE RIVER GENERATING PLANT	Industrial Wastewater		342
3422B	FL0001465	GOLD KIST INC - LIVE OAK PROCESSING	Industrial Wastewater	1.5	1.04
3438	FLG910868	B.P. INTERSTATE/S&S FOOD STORE #122 (CLUSTER)	Petroleum Cleanup GP (long term)		

Santa Fe River Basin

WBID	FACILITY_ID	NAME	DESCRIPTION	PERM CAP (MGD)	DESIGN_CAP
2501	FL0000051	EI DUPONT DE NEMOURS TRAILRIDGE MINE	Industrial Wastewater	30	30
3548C	FL0028126	STARKE, CITY OF	Domestic WWTP	1.65	1.65
3516	FL0038300	WESTVACO CORP-ST JOHN'S DEPT	Industrial Wastewater	0.0482	0.0482
3671	FL0041114	PROGRESS MOBILE HOME PARK	Domestic WWTP	0.013	0.013
3516	FL0176281	RISSEY SOUTH FIRST STREET	Industrial Wastewater	0.036	0.036
3488	FLG830117	I-10 GULF/RICHARDSON OIL CO.	Petroleum Cleanup GP (long term)		
3488	FLG830124	FIKE'S AMOCO/KIRBY OIL CO.	Petroleum Cleanup GP (long term)		
3488	FLG910357	S&S FOOD STORE NO. 37	Petroleum Cleanup GP (long term)		0.025

Aucilla River Basin

WBID	FACILITY_ID	NAME	DESCRIPTION	PERM CAP (MGD)	DESIGN_CAP
3367	FL0016535	UDDER DELITE DAIRY	Industrial Wastewater		
3373	FL0039659	FLORIDA PLYWOODS, INC	Industrial Wastewater	0.0141	0.0131
3314	FLG830249	BOOTHE'S EXXON	Petroleum Cleanup GP (long term)		
3355	FLG830450	GRUBBS PETROLEUM SITES	Petroleum Cleanup GP (long term)		
3355	FLG910360	NORTHSIDE FINA	Petroleum Cleanup GP (long term)		

Fenholloway River Basin

WBID	FACILITY_ID	NAME	DESCRIPTION	PERM CAP (MGD)	DESIGN_CAP
3473B	FL0000876	BUCKEYE FLORIDA	Industrial Wastewater		58
3518	FL0026387	PERRY, CITY OF	Domestic WWTP	1.25	1.25

Steinhatchee/Lower Suwannee Coastal Basin

WBID	FACILITY_ID	NAME	DESCRIPTION	PERM CAP (MGD)	DESIGN_CAP
3686	FL0027791	CROSS CITY #1 & #2, CITY OF	Domestic WWTP	0.4	0.4
3698	FL0044326	NATURE COAST PROPERTIES WWTF	Domestic WWTP	0.005	0.005

Waccasassa River Basin

WBID	FACILITY_ID	NAME	DESCRIPTION	PERM CAP (MGD)	DESIGN_CAP
3729	FL0031216	CEDAR KEY, CITY OF WWTP	Domestic WWTP	0.166	0.166

Appendix H: Suwannee Basin STORET Stations

Withlacoochee River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3315Z	BLUE SPRINGS NEAR MADISON FLA	56	93	6
3315A	SUWANACOOCHEE SPRING AT ELLAVILLE FLORIDA	60	93	3
3315	WITHLACOOCHEE #1 MADISON COUNTY	70	89	27
3315	WITHLACOOCHEE #2 HAMILTON COUNTY	70	89	24
3315	WITHLACOOCHEE #3 HAM-MAD COU	70	89	26
3315	WITHLACOOCHEE R. NEAR JUMPING GULLEY CREEK	89	95	12
3315	WITHLACOOCHEE R. NEAR JUMPING GULLEY CREEK	89	95	12
3321	LAKE OCTAHATCHEE N LOBE NEAR W SHORE	94	94	4
3321	LAKE OCTAHATCHEE NORTH LOBE CENTER	94	94	5
3321	LAKE OCTAHATCHEE SOUTH LOBE CENTER	94	94	5
3322	CHERRY LAKE CENTER	95	98	48
3319	LAKE ALCYON CENTER	95	95	5
3315	WITHLACOOCHEE RIVER AT C-145	89	98	109
3315	WITHLACOOCHEE RIVER AT C-150	89	98	72
3315	WITHLACOOCHEE RIVER AT SR6	89	92	37
3315	WITHLACO UPSTM OF CONFLUENCE With SUW R	92	98	72

Waccasassa River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3699	WACCASASSA RIVER/OTTER CREEK/FRESHWATER REF SITE	75	97	55
3699	WACCASASSA RIVER @ SR 326	87	94	39
3699	WACCASASSA RIVER @ SR 24	87	98	80
3729	Oyster rack @ E side of Lone Cabbage Reef	90	98	160
3729	1/2 mile up Barnett Creek on N shore	90	98	134
3729	S tip of Lone Cabbage rf	90	98	159
3729	Mouth of Geiger Creek	90	98	142
3729	S/SE from 247 and S of channel	90	98	153
3729	Mouth of E Pass @ tidal gage	90	98	146
3729	Mouth of Little Trout Creek	90	98	137
3729	W side of Deer Is @ white sand beach	90	98	144
3729	In gap S of Deer Island	90	98	130
3729	At mouth of Clark Creek	90	98	110
3729	E of Deer Island	90	98	104
3729	North end of #4 Bridge	90	98	173
3729	Mouth of Sand Creek	90	98	130
3729	Mouth of Dennis Creek	90	98	156
3729	Back of Goose Creek	90	98	71
3729	Back of Seabreeze Creek	92	98	90
3729	Back of Dennis Creek	92	98	63
3729	Northwest Side of #4 Channel	90	98	196
3729	Mouth of Lukens Creek	92	98	92
3729	#3 Channel East of Rye Key	90	98	215
3729	N of #3 Channel West of Bridge	90	98	34
3729	Mouth of #3 Channel	90	98	216
3729	Northwest of Scale Key	90	98	209
3729	1/2 Mile North of Scale Key	90	98	84
3729	#3 Channel East of Bridge	90	98	80
3729	#3 Channel West of #3 Bridge	90	98	137
3729	Shell Mound	90	98	126

3729	Middle of Cove near Shell Mound	90	98	99
3729	Between Long Cabbage & Raleigh I	92	98	151
3729	Northeast of #3 Channel Mouth	90	98	198
3729	Cove west of Live Oak Pt.	92	98	84
1326	South end of Stafford Is.	90	98	177
1326	CM# 36 Waccasassa Channel	90	98	180
1328	CM# 34 Waccasassa Channel	90	98	176
1332	W Tip of Island at Trout Cr	90	98	140
1332	Between Trout Cr & Turtle Cr Bay	91	98	129
1332	Mouth of Turtle Creek Bay	91	98	143
3743	East of Live Oak Key	90	98	145
3729	South of Live Oak Key	92	98	143
1335	boat ramp at Hwy 40 and river	90	98	167
1335	west of Hwy 40 Bridge in Bird Ck	91	98	138
1335	mouth of Vassey Creek	91	98	143
1335	NE of Hodges Is S of burned out house	92	98	114
1335	mouth of Demory Ck	93	98	105
1332	north side Lows Bay near dead mangroves	91	98	100
1332	west of South Mangrove Point	92	98	115
3703A	WATERMELON1_ALACHUA_CO	88	94	23
3703A	WATERMELON2_ALACHUA_CO	88	92	23
3703A	WATERMELON3_ALACHUA_CO	88	92	23
3729	CHANNEL 4 NEAR OLD BRIDGE	97	98	14
1325	TEN MILE CREEK AT LEBANON STATION AT US 19	89	92	22
3699	WACCASASSA RIVER @ SR-24	94	95	4
3699	WACCASASSA RIVER AT GULF HAMMOCK AT US 19	89	98	35
3731A	LAKE MARION - OPEN WATER	94	95	2
3738A	LITTLE BONABLE LAKE - OPEN WATER	94	95	4
3738C	TIGER LAKE - OPEN WATER	94	95	6
3738B	BONABLE LAKE - OPEN WATER	94	95	3
1335	Back of Bumblebee Creek	90	98	132

Upper Suwannee River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3493	BORROW PIT 1 - EAST SIDE STILL ROAD	87	89	4
3493	BORROW PIT 2 - WEST SIDE STILL ROAD	87	89	4
3493	BORROW PIT 4 - BETWEEN I-10 & FR 215A	87	89	4
3493	BORROW PIT 5 - ACROSS S-250 FROM WORK CENTER	88	89	3
3449	ROCKY CREEK NEAR GENOA FLORIDA	0	0	0
3368	LITTLE CREEK NEAR BENTON FLORIDA	0	0	0
3341	ALAPAHA RISE SPRING NR ADAMS FLA	75	90	3
3388	STA.DC01.DEEP CREEK UPS SUWANNEE RIVER CONFLNCE	98	98	2
3388	STA. DC02.DEEP CREEK AT OLD RIVER ROAD	98	98	2
3388	STA.DC03.DEEP CREEK 0.3 MILES UPS OLD RIVER ROAD	98	98	2
3388	STA. DC04.DEEP CREEK AT U.S. HWY. 441	98	98	2
3388	STA. DC05.DEEP CREEK 1.1 MILE UPS U.S. HWY. 441	98	98	2
3388	STA. DC06. DEEP CR AT CR 237 (DOUBLE RUN RD)	98	98	2
3448	ROBINSON CR. AT SR 426	92	98	20
3477	FALLING CREEK @ CR 131, ABOVE FALLS	94	97	11
3351	ROCKY CREEK @ WOODPECKER ROAD	94	97	9
3368	LITTLE CREEK AT US 441	94	98	12
3388	DEEP CREEK @ DOUBLE RUN ROAD	92	93	9
3341	SUWANNEE R FLA HWY #249	81	89	5
3341C	SUWANNEE R W US 441	75	90	91

3364	HUNTERS CREEK AT SR 135	76	90	88
3364	HUNTERS CREEK AT SR 135	76	90	88
3364	HUNTERS CREEK AT SR 135	76	90	88
3364	HUNTERS CREEK AT SR 135	76	90	88
3364	HUNTERS CREEK AT SR 135	76	90	88
3499	LAKE JEFFERY	97	97	3
3499	JEFFERY1_COLUMBIA_CO	92	93	10
3499	JEFFERY2_COLUMBIA_CO	92	93	10
3499	JEFFERY3_COLUMBIA_CO	92	93	10
3401	CAMP BRANCH	89	98	90
3388	DEEP CREEK AT US441	89	98	101
3368	LITTLE CREEK AT US 441 NORTH OF DEEP CREEK	92	93	6
3389	SUGAR CREEK AT OLD US 129	92	93	6
3477	FALLING CREEK AT C-250	89	92	33
3477	FALLING CREEK BRANCH AT DOUBLE RUN ROAD	92	98	36
3477	FALLING CREEK AT C-131	89	98	69
3364	HUNTER CREEK	89	98	102
3364	HUNTER CREEK	89	98	102
3364	HUNTER CREEK	89	98	102
3364	HUNTER CREEK	89	98	102
3364	HUNTER CREEK	89	98	102
3423	JERRY BRANCH	89	90	6
3448	ROBINSON BRANCH AT C-246	89	98	104
3351	ROCKY CREEK AT WOODPECKER ROAD	89	98	104
3392	ROARING CREEK	89	98	102
3341B	SUWANNEE RIVER AT STATE ROAD 6	89	98	115
3341B	SUWANNEE RIVER BELOW HUNTER CREEK	89	92	37
3341A	SUWANNEE RIVER ABOVE WHITE SPRINGS	89	92	37
3341A	SUWANNEE RIVER BELOW WHITE SPRINGS	89	98	114
3341A	SUWANNEE RIVER ABOVE SWIFT CREEK	89	92	36
3341A	SUWANNEE RIVER BELOW SWIFT CREEK	89	92	36
3341	SUWANNEE RIVER AT SUWANNEE SPRINGS	89	98	116
3341	SUWANNEE RIVER ABOVE ALAPHAH RISE	89	92	37
3341	SUWANNEE RIVER BELOW ALAPAHA RIVER	92	98	38
3341	SUWANNEE RIVER ABOVE WITHLACOOCHEE RIVER	89	98	111
3375	SWIFT CREEK AT US 41	89	98	107
3341Z	WHITE SPRINGS	95	95	2

Steinhatchee River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3607	EIGHT MILE CREEK NEAR CROSS CITY, FL	88	89	6
3573	STEINHATCHEE RIVER NEAR CROSS CITY, FLA.	66	94	109
3573	STEINHATCHEE RIVER NEAR STEINHATCHEE, FL	87	89	14
3603	BOGGY CREEK NEAR STEINHATCHEE, FL	87	89	14
3674	SAND HILL CREEK NEAR STEINHATCHEE, FL	88	89	12
3573	STEINHATCHEE RIVER AT STEINHATCHEE, FL	87	89	14
3573B	STEINHATCHEE RIVER I SR357	71	89	30
3573	STEINHATCHEE I RIVER SR358	72	89	29
3674	SAND HILL CREEK @ SR 358	87	89	19
3573A	STEINHATCHEE R. OFF SR51 NEAR SPRINGS	87	89	19
3573B	STEINHATCHEE R. AT SR51 NEAR COOKS HAMMOCK	87	89	19
3674	SAND HILL CREEK ON DIRT OFF SR 358	87	89	16
3603	BOGGY CREEK AT SR 51	87	89	17
3577	ROCKY CREEK AT SR 51	87	89	17
3573	STEINHATCHEE RIVER BELOW FALLS	87	89	18

3573	STEINHATCHEE RIVER ABOVE FALLS	87	89	17
3573	STEINHATCHEE R @ USGS GUAGING STATION N US 19/98	87	89	18
3607	EIGHT MILE CK. 1.8 MI. EAST SR 51	89	89	8
3573B	STEINHATCHEE RIVER NEAR MAYO	90	92	31
3573Z	STEINHATCHEE SPRING OFF SR-51 IN LAFAYETTE CO.	92	98	18
3573A	STEINHATCHEE RIVER NEAR STEINHATCHEE SPRINGS	90	98	104
3573	STEINHATCHEE RIVER AT US 19/98	90	91	11
3573	STEINHATCHEE RIVER AT US 19/98	90	98	90
3573	STEINHATCHEE RIVER AT STEINHATCHEE	90	98	54

Santa Fe River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3605D	SANTA FE RIVER AT WORTHINGTON SPRINGS, FLA.	57	95	329
3519Z	ICHETUCKNEE SPRING NR HILDRETH, FLA.	66	93	23
3605X	BLUE SPRING NEAR HIGH SPRINGS FL	75	90	2
3605Y	GINNIE SPRING NEAR HIGH SPRINGS, FLA	74	93	3
3653	HORNSBY SPRING NR HIGH SPRINGS, FLA.	72	90	4
3605E	SANTE FE R S OF BROOKER FLA 235	71	94	33
3605A	SANTA FE RIVER SR 129	70	90	218
3605F	LAKE ALTHO #2 SE QUADRANT OF L	71	94	8
3605F	LAKE ALTHO #3 NE QUADRANT OF L	71	94	7
3605F	LAKE ALTHO #4 W EDGE L MID N S	71	94	9
3566	LAKE BUTLER #4 CENTER OF LAKE	71	97	6
3605G	SANTA FE L #5 NW CORNER OF LITTL	71	98	53
3598D	LAKE SAMPSON #4 NEAR WESTERN SHO	74	98	12
3635A	LAKE HAMPTON #1 NEAR NORTH SHORE	73	94	8
3635A	LAKE HAMPTON #3 NEAR SOUTHERN SH	73	94	8
3635A	LAKE HAMPTON #4 NEAR WESTERN SHO	73	98	14
3593	LAKE CROSBY #2 EAST SHORE	73	94	12
3593	LAKE CROSBY #4 WEST SHORE	73	94	13
3598B	LAKE ROWELL # EAST SHORE	73	94	7
3516	ALLIGATOR LK EAST OF WATER WORKS	76	94	34
3605G	LITTLE SANTA FE LAKE NORTHEAST SECTION	95	95	4
3605G	LITTLE SANTA FE LAKE SOUTHEAST SECTION	95	95	4
3605G	LITTLE SANTA FE LAKE EAST OF SANTA FE CANAL	95	95	5
3593	LAKE CROSBY NE OF CENTER	94	98	13
3530	SWIFT CREEK POND CENTER	94	94	7
3530	SWIFT CREEK POND SOUTH SECTOR	94	94	6
3530	SWIFT CREEK POND NORTH SECTOR	94	94	6
3649A	WATERS LAKE WEST OF CENTER	94	94	5
3649A	WATERS LAKE NORTH SHORE	94	94	3
3649A	WATERS LAKE SOUTH SHORE	94	94	3
3504	OLUSTEE CREEK AT SR-100	79	96	16
3598C	ALLIGATOR CREEK BELOW THE STARKE WWTP	98	98	2
3516	ALLIGATOR LAKE	92	95	25
3516	ALLIGATOR LAKE SOUTH LOBE	92	97	58
3598	SAMPSON RIVER @ CR 225	98	98	2
3598B	LAKE ROWELL CENTER	98	98	4
3641	ROCKY CREEK AT ANTIOCH CHURCH ROAD	92	93	8
3578	FIVE MILE CREEK @ CR 239A	92	97	20
3598B	STREAM FROM LAKE ROWELL TO LAKE SAMPSON	88	90	9
3598B	LAKE ROWELL BETWEEN NORTHERN TWO FISH ATTRACTORS	88	90	9
3598B	LAKE ROWELL .5 MI. N. ALIGATOR C. 100 YDS OFFSHR	88	90	9
3598C	ALLIGATOR CREEK APPX. 100 YDS UP FROM L. ROWELL	88	90	9

3598B	LAKE ROWELL APPX. .25 MILE SOUTH OF ALLIGATOR CR	88	90	9
3598B	LAKE ROWELL SOUTHERN END BY CATTAIL CLUMP	88	90	9
3635A	HAMPTON1_BRADFORD_CO	91	98	122
3635A	HAMPTON2_BRADFORD_CO	91	98	122
3635A	HAMPTON3_BRADFORD_CO	91	98	122
3598C	ALIGATOR CREEK @ U.S. 301	94	95	4
3598C	ALIGATOR CREEK NR LK ROWELL	94	95	4
3598C	ALLIGATOR CREEK	89	92	35
3516	ALLIGATOR LAKE NORTH LOBE EAST	89	98	60
3516	ALLIGATOR LAKE NORTH LOBE WEST	89	98	69
3516	ALLIGATOR LAKE SOUTH LOBE	89	98	65
3605F	LAKE ALTHO	89	92	74
3605X	BLUE SPRING IN GILCHRIST COUNTY	92	98	24
3520	CANNON CREEK AT CANNON CREEK ROAD	92	98	26
3593	LAKE CROSBY NORTH	94	95	4
3593	LAKE CROSBY	89	92	74
3593	LAKE CROSBY SOUTHWEST	94	95	4
3649	COW CREEK NEAR FORT WHITE AT C-138	92	98	33
3626	PARENERS BRANCH AT C-1491 IN ALACHUA COUNTY	92	98	32
3641	ROCKY CREEK NEAR LACROSSE AT C-235	92	93	6
3635A	LAKE HAMPTON	89	92	74
3653	HORNSBY SPRING IN ALACHUA COUNTY	92	98	23
3519Z	ICHETUCKNEE SPRING HEAD ABOVE US 27	91	98	15
3519	ICHETUCKNEE RIVER BLUE HOLE SPRING	91	92	12
3519	ICHETUCKNEE RIVER MISSION SPRINGS	91	92	12
3519	ICHETUCKNEE RIVER DEVIL'S EYE SPRING	91	92	12
3519	ICHETUCKNEE RIVER MILL POND SPRING	91	92	12
3519	ICHETUCKNEE RIVER ABOVE US 27	89	98	103
3605G	LITTLE LAKE SANTA FE	89	92	74
3605G	LAKE SANTA FE	89	92	74
3605G	LAKE SANTA FE AT MELROSE BAY	91	92	14
3598D	LAKE SAMPSON NR ROWELL/SAMPSON CANAL	94	95	4
3598D	LAKE SAMPSON	89	92	74
3598D	LK SAMPSON SOUTH	94	95	4
3598D	LAKE SAMPSON NR SAMPSON RIVER	94	95	4
3598D	NORTH LAKE SAMPSON	94	95	4
3605G	BETWEEN LAKE SANTA FE AND LITTLE LAKE SANTA FE	91	92	14
3506A	NEW RIVER AT CR 125	90	98	67
3506	NEW RIVER NEAR RAIFORD	90	92	31
3506	NEW RIVER NEAR RAIFORD	90	92	31
3506	NEW RIVER NEAR LAKE BUTLER	90	98	66
3506	NEW RIVER NEAR LAKE BUTLER	90	98	66
3506	NEW RIVER AT SR 18	89	98	104
3506	NEW RIVER AT SR 18	89	98	104
3504A	OLUSTEE CREEK AT SR 18	89	98	109
3605W	POE SPRINGS IN ALACHUA COUNTY	98	98	2
3517	PRICE CREEK AT C-133	98	98	3
3531A	ROSE CREEK SINK HOLE	95	96	4
3598B	LAKE ROWELL NR ALIGATOR CRK	94	95	4
3598B	LAKE ROWELL	89	92	74
3598B	CANAL BETWEEN LAKE ROWELL AND LAKE SAMPSON	90	92	16
3598B	LAKE ROWELL NR OUTFALL TO LK SAMPSON	94	95	4
3605F	SANTA FE RIVER AT US 301	92	93	6
3605	SANTA FE RIVER NEAR GRAHAM	89	92	38
3605E	SANTA FE RIVER AT BROOKER	89	98	110

3605D	SANTA FE RIVER AT WORTHINGTON SPRINGS	89	98	109
3605C	SANTA FE RIVER AT O'LENO	89	98	111
3605C	SANTA FE RIVER AT US 441	89	98	107
3605C	SANTA FE RIVER AT SR 47 NEAR FORT WHITE	89	98	125
3605A	SANTA FE RIVER AT US 129 NEAR HILDRETH	89	98	109
3598	SAMPSON RIVER	89	98	109
3605Z	TRAIL SPRING IN GILCHRIST COUNTY	92	98	15
3682	BLUES CR .25M. W OF BL CR SUB GATE S. SIDE OF RD	90	95	12
3682	BLUES CR 50 FT W OF BR @ ENT TO UF AQ. RSRCH	87	95	17
3682	BLUES CR @ BIG OTTER RAVINE	87	90	2
3682	BLUES CR STAFF GA APPR 1MI UPSTR BG OTTER RAVIN	90	95	14
3682	BLUES CR @ BIG OTTER RAVINE AT STAFF GAGE	90	95	18
3644	MILL CR DSCHRG TO ALACHUA SINK NEAR 441&75	90	95	11
3681	TURKEY CRS SIDE BR IN SAN FEL. ST PRSRV	85	95	16
3605F	ALTO1_ALACHUA_CO	87	98	127
3605F	ALTO2_ALACHUA_CO	87	98	126
3605F	ALTO3_ALACHUA_CO	87	98	127
3605G	LITTLESANTAFE1_ALACHUA_CO	86	98	145
3605G	LITTLESANTAFE2_ALACHUA_CO	86	98	146
3605G	LITTLESANTAFE3_ALACHUA_CO	86	98	145
3605G	MELROSE_BAY1_ALACHUA_CO	86	98	145
3605G	MELROSE_BAY2_ALACHUA_CO	86	98	146
3605G	MELROSE_BAY3_ALACHUA_CO	86	98	146
3605G	SANTAFE1_ALACHUA_CO	86	98	145
3605G	SANTAFE2_ALACHUA_CO	86	98	145
3605G	SANTAFE3_ALACHUA_CO	86	98	145

Middle Suwannee River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3422Q	ELLAVILLE SPRING AT ELLAVILLE FLORIDA	73	90	2
3422Z	FALMOUTH SPRING AT FALMOUTH FLA	73	93	3
3422X	TELFORD SPRING AT LURAVILLE, FLA.	60	93	8
3422T	TROY SPRING NEAR BRANFORD FLA	60	93	5
3422B	SUWANNEE RIVER AT BRANFORD, FLA.	1	96	440
3422J	BRANFORD SPRINGS AT BRANFORD FLA	56	93	4
3496	LITTLE RIVER SPRINGS NEAR BRANFORD FLORIDA	73	93	2
3496	LITTLE RIVER SPRINGS NEAR BRANFORD FLORIDA	73	93	2
3561	MORGAN LAGOON	90	90	3
3422P	MEARSON SPRING NEAR MAYO FLORIDA	75	93	2
3422V	CONVICT SPRING NEAR ALTON FLORIDA	73	93	8
3528	BLUE SPRING NEAR DELL FLORIDA	73	93	10
3422B	SUWANNEE R AT DOWLING P BR	81	83	46
3422B	SUWANNEE R ELLAVILLE US 90	77	95	54
3496A	LOW LAKE CENTER	95	96	10
3438A	PEACOCK LAKE CENTER	98	98	5
3568	WMD SITE ID -051317003	90	94	2
3438A	PEACOCK IN SUWANNEE CO	91	92	8
3438A	PEACOCK IN SUWANNEE CO	91	92	8
3438A	PEACOCK IN SUWANNEE CO	91	92	8
3525	ALLEN MILL POND SPRING OFF C-251B	92	98	8
3422J	BRANFORD SPRING	96	98	6
3422Y	CHARLES SPRINGS	95	98	11
3422V	CONVICT SPRING OFF C-334 IN LAFAYETTE COUNTY	92	98	21
3480	BETHEL CREEK AT STATE ROAD 53	92	93	6
3422Z	FALMOUTH SPRG OFF US 90 SUWANNEE CO	94	98	17

3528	LAFAYETTE BLUE SPRINGS NEAR MAYO FL	95	98	10
3496	LITTLE R AT C-137	94	94	3
3496	LITTLE R AT C-137	94	94	3
3496	LITTLE R AT C-252	94	94	3
3496	LITTLE R AT C-252	94	94	3
3496	LITTLE R AT C-49	94	94	3
3496	LITTLE R AT C-49	94	94	3
3496	LITTLE R AT 180 STREET	94	94	2
3496	LITTLE R AT 180 STREET	94	94	2
3496	LITTLE R AT 81ST ROAD	94	94	3
3496	LITTLE R AT 81ST ROAD	94	94	3
3496Z	LITTLE R SPRG OFF C-249 SUWANNEE CO	94	98	16
3422P	MEARSON SPRINGS	96	98	9
3483	ORANGE GROVE SPRING	96	96	3
3568	OWENS SPRING OFF C-251 IN LAFAYETTE COUNTY	92	94	8
3483	PEACOCK SPRING IN SUWANNEE COUNTY	92	98	14
3422L	RUTH/LITTLE SULFUR SPRINGS	96	98	7
3422U	ROYAL SPRING IN SUWANNEE COUNTY	92	98	23
3422W	RUNNING SPRING IN SUWANNEE COUNTY	92	97	12
3422B	SUWANNEE RIVER AT ELLAVILLE BELOW US 90	89	98	111
3422B	SUWANNEE RIVER BELOW GOLDKIST DISCHARGE	89	92	36
3422B	SUWANNEE RIVER AT DOWLING PARK	89	98	111
3422B	SUWANNEE RIVER AT LURAVILLE	89	98	110
3422B	SUWANNEE RIVER AT BRANFORD	89	98	127
3422X	TELFORD SPRING IN SUWANNEE COUNTY	92	98	22
3422T	TROY SPRING OFF C-425 IN LAFAYETTE COUNTY	92	98	21
3422M	TURTLE SPRINGS ON SUWANNEE RIVER	96	98	6
3483	KARST WINDOW PEACOCK S.P.	96	96	3

Lower Suwannee River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3673	ROCK BLUFF SPRINGS NR BELL FLA	56	93	5
3422S	FANNIN SPRINGS NR WILCOX FLA	56	90	7
3422R	MANATEE SPRING NR CHIEFLAND FLA	56	90	6
3422A	SUWANNEE R @ US 19/98	70	90	167
3733	Northern Pass Channel Marker #9	90	98	171
3422A	Southeast of Salt Creek CM # 2	90	98	158
3422A	Confluence of Suwannee River & E Pass	90	98	155
3422A	E/SE of 239 on flat	90	98	140
3422A	Su R @ mouth of Channel to Suwannee Shrs Marina	90	98	164
3422A	SUWANNEE RIVER AT FOWLERS BLUFF	88	89	4
3668A	GOVERNOR_HILL1_DIXIE_CO	90	90	2
3668A	GOVERNOR_HILL2_DIXIE_CO	90	90	2
3668A	GOVERNOR_HILL3_DIXIE_CO	90	90	2
3422S	FANNING SPRINGS	95	98	13
3422K	GUARANTO SPRINGS	96	98	7
3422N	HART SPRINGS	96	98	8
3422R	MANATEE SPRINGS	95	98	10
3673	ROCK BLUFF SPRING IN GILCHRIST COUNTY	92	98	22
3422A	MID CHANNEL UPSTREAM OF BULL CREEK	96	98	35
3422A	ALLIGATOR PASS MARKER 21	96	98	38
3422	SUWANNEE RIVER AT ROCK BLUFF	89	98	111
3422	SUWANNEE RIVER AT ROCK BLUFF	89	98	111
3422A	SUWANNEE RIVER NEAR WILCOX	89	98	108
3422A	SUWANNEE RIVER AT FOWLER'S BLUFF	89	98	111

3422A	SUWANNEE RIVER AT GOPHER RIVER	89	98	120
3422A	SUWANNEE RIVER BELOW TOWN OF SUWANNEE	90	92	31
3422A	SUWANNEE RIVER AT EAST PASS	90	92	27

Fenholloway River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3489	ROCKY CREEK NEAR STEINHATCHEE, FL (Name??)	87	89	14
3473C	FENHOLLOWAY RIVER NEAR FOLEY, FLA.	66	93	8
3473B	FENHOLLOWAY RIVER AT FOLEY, FLA.	56	93	30
3473B	FENHOLLOWAY 5 FR BR ON SR 356	70	95	47
3473A	FENHOLLOWAY 6 AT OLD FISH CAMP	70	98	72
3473C	FENHOLLOWAY RIVER NEAR FOLEY AT US 27	89	98	63
3473B	FENHOLLOWAY RIVER AT US 19	89	98	57
3473A	FENHOLLOWAY BELOW SPRING CREEK OFF C-136	92	98	37

Econfina River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3402	ECONFINA R AT US 98	72	98	100
3402	ECONFINA R AT US 19 & 27	72	98	95
3402	ECONFINA RIVER 3 3MI NW OF US98	72	93	26
3402	ECONFINA RIVER 5 SR14	72	94	54
3402	ECONFINA RIVER AT US-27	94	98	17
3402	ECONFINA RIVER NEAR PERRY	89	92	22
3402	ECONFINA RIVER AT US-98	94	98	19

Fenholloway/Steinhatchee Coastal

WBID	STATION DESCRIPTION	BD	ED	NOBS
3556A	SPRING WARRIOR CREEK OFF SR-361A	81	98	49

Steinhatchee/Lower Suwannee Coastal

WBID	STATION DESCRIPTION	BD	ED	NOBS
3701	mouth of Boggy Creek	90	98	152
3701	mouth of Main Canal	90	98	200
3701	canal by Horseshoe seafood	90	98	160
3701	dock on Cotton Is	92	98	293
3702	1/2 mile up Sanders Ck	90	98	148
3706	back of Amazon Cr 1/2 mi near grassy Is	93	98	140
3720	mouth of Fishbone Creek	90	98	279
3720	back of Fishbone Creek 3/4 mi from mouth	93	98	146
3705	back of Butler Ck near grassy Is	93	98	159
3725	mouth of Johnson Creek	90	98	278
3725	up Johnson Creek 3/4 mi	93	98	186
3724	Mouth of S Double Barrel Creek	90	98	151
3724	1/2 mile up S Double Barrel @ Palms on N shore	90	98	122
3724	Mouth unnamed creek S of S Double Barrel Creek	90	98	141

Aucilla River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3310	AUCILLA RIVER AT LAMONT, FLA.	66	91	21
3310	AUCILLA RIVER AT LAMONT, FLA.	66	91	21
3310C	AUCILLA R AT FLA 146	71	91	26
3310	AUCILLA R 5 SR 257 S LAMONT	71	91	32
3310	AUCILLA R 5 SR 257 S LAMONT	71	91	32
3314	LITTLE AUCILLA RIVER SR55 NFORK	78	91	12
3314	LITTLE AUCILLA RIV SO FORK SR-55	78	91	12

3314	LITTLE AUCILLA RIV FLATWOOD CH R	78	91	12
3310C	AUCILLA R AT US 90	71	94	60
3314	LITTLE AUCILLA R US HWY 90	76	94	51
3424Z	WACISSA SPRING; NO.2; JEFFERSON CO.	94	94	2
3436	WELAUNEE CREEK JEFFERSON CO. W.OF IAMONIA LK.	92	95	9
3424	LAKE WACISSA1 JEFFERSON CO	93	95	23
3424	LAKE WACISSA2 JEFFERSON CO	93	95	23
3424	LAKE WACISSA3 JEFFERSON CO	93	95	23
3424A	AUCILLA R US 98	71	98	99
3310	AUCILLA R AT US 19-27	71	98	188
3310	AUCILLA R AT US 19-27	71	98	188
3430	AUCILLA RIVER @ US-27	94	98	17
3310A	AUCILLA RIVER NR US-98	94	98	17

Alapaha River Basin

WBID	STATION DESCRIPTION	BD	ED	NOBS
3324	ALAPAHA RIVER 1 SR 150 HAMILTON	72	96	7
3324	ALAPAHA RIVER NEAR JENNINGS AT C-150	89	98	112

Appendix I: Water Quality Statistics for the Suwannee Basin, by Planning Unit

Table I-1: Alapaha Planning Unit

Alapaha - Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	114	Narrative	9	27.535	20	23 ^b
Conductivity (umhos/cm)	114	1275 or >50% Nat. Background	31.65	133.75	60.5	335 ^b
Dissolved Oxygen (mg/l)	114	5	6.1	10.67	7.3	5.8 ^b
B.O.D. (mg/l)	26	Narrative	0.5	1.95	1	1.5 ^b
pH (s.u.)	114	between 6 and 8.5 ^c	4.9545	7.035	6.175	7.1 ^b
Total Suspended Solids (mg/l)	112		1	14.45	4	7 ^b
Secchi Depth (meters)	79		0.4	1	0.6	0.8 ^b
Color (PCU)	111		50	400	150	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	111	Narrative	0.6325	1.725	1	1.2 ^b
NO ₃ – N (mg/l)	112	10 (Class I)	0.025	1.046	0.255	0.1 ^b
NH ₃ – N (mg/l)	111		0.001	0.0775	0.015	0.04
Unionized Ammonia (mg NH ₃ /l)	108	0.02	0.0000	0.0002	0.0000	0.00020
Organic N (mg/l)	111	Narrative	0.26	1.1	0.67	1.105
Total Phosphorus (mg/l)	112	Narrative	0.04595	0.41135	0.1805	0.09 ^b
Chlorophyll a (ug/l)	26		0.36	5.2	1.205	6 ^b
Total Coliform (#/100ml)	16	2400	9.875	1797.5	165	600 ^b
Fecal Coliform (#/100ml)	0	800	-	-	-	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from

FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Alapaha	Count	# Exceeds	% Exceeds
	108	0	0

*None of the WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-2: Aucilla Planning Unit

Aucilla- Blackwater

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	32	Narrative	9.92	27	19.95	19.85
Conductivity (umhos/cm)	32	1275 or >50% Nat. Background	31.1	102.25	47.5	68.75
Dissolved Oxygen (mg/l)	30	5	0.65	6.2225	2.875	5.6
B.O.D. (mg/l)	31	Narrative	0.8	3.8	1.6	1.4
pH (s.u.)	32	between 6 and 8.5 ^c	3.855	6.045	4.75	4.5
Total Suspended Solids (mg/l)	32		1	16.4	4	98
Secchi Depth (meters)	31		0.15	1	0.4	0.4
Color (PCU)	32		131	500	300	400
Nutrients and Bacteria						
Total Nitrogen (mg/l)	26	Narrative	0.775	3.8625	1.41	
NO ₃ – N (mg/l)	26	10 (Class I)	0.0055	0.03	0.01	0.0255
NH ₃ – N(mg/l)	31		0.01	0.725	0.13	0.03
Unionized Ammonia (mg NH ₃ /l)	31	0.02	0.0000	0.0012	0.0000	0.0000
Organic N (mg/l)	31	Narrative	0.8	3.8	1.4	
Total Phosphorus (mg/l)	31	Narrative	0.011	0.24	0.04	0.07
Chlorophyll a (ug/l)	0		-	-	-	0.535
Total Coliform (#/100ml)	25	2400	50	2000	500	300
Fecal Coliform (#/100ml)	25	800	2.8	300	60	56

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Aucilla- Spring

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	2	Narrative	22.055	23.045	22.55	21.725
Conductivity (umhos/cm)	2	1275 or >50% Nat. Background	213.1	268.9	241	276.5
Dissolved Oxygen (mg/l)	2	5	2.605	6.295	4.45	2.925
B.O.D. (mg/l)	0	Narrative	-	-	-	
pH (s.u.)	2	between 6 and 8.5 ^c	7.285	7.555	7.42	7.2775
Total Suspended Solids (mg/l)	2		1.1	2.9	2	
Secchi Depth (meters)	2		1.41	1.59	1.5	1.5
Color (PCU)	0		-	-	-	5
Nutrients and Bacteria						
Total Nitrogen (mg/l)	2	Narrative	0.411	0.609	0.51	
NO ₃ – N (mg/l)	2	10 (Class I)	0.125	0.215	0.17	0.7275
NH ₃ – N (mg/l)	2		0.00535	0.01165	0.0085	0.01
Unionized Ammonia (mg NH ₃ /l)	2	0.02	0.00011	0.00012	0.00012	
Organic N (mg/l)	2	Narrative	0.196	0.484	0.34	
Total Phosphorus (mg/l)	2	Narrative	0.04705	0.04795	0.0475	0.0435
Chlorophyll a (ug/l)	0		-	-	-	
Total Coliform (#/100ml)	0	2400	-	-	-	
Fecal Coliform (#/100ml)	0	800	-	-	-	

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Aucilla- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	134	Narrative	11.725	26	20.4	23 ^b
Conductivity (umhos/cm)	134	1275 or >50% Nat. Background	35	343.05	130	335 ^b
Dissolved Oxygen (mg/l)	131	5	4.5	8.5	6.3	5.8 ^b
B.O.D. (mg/l)	93	Narrative	0.25	1.85	1	1.5 ^b
pH (s.u.)	133	between 6 and 8.5 ^c	5.142	7.74	6.85	7.1 ^b
Total Suspended Solids (mg/l)	132		0.5	8	3	7 ^b
Secchi Depth (meters)	80		0.4	3.0785	0.75	0.8 ^b
Color (PCU)	132		12.75	400	150	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	195	Narrative	0.114	1.3457	0.412	1.2 ^b
NO ₃ – N (mg/l)	126	10 (Class I)	0.005	0.155	0.027	0.1 ^b
NH ₃ – N (mg/l)	126		0.005	0.087	0.023	0.04
Unionized Ammonia (mg NH ₃ /l)	106	0.02	0.00000	0.00114	0.00007	0.00020
Organic N (mg/l)	130	Narrative	0.1518	1.2865	0.65	1.105
Total Phosphorus (mg/l)	200	Narrative	0.00855	0.1	0.036	0.09 ^b
Chlorophyll a (ug/l)	62		0	2.953	1	6 ^b
Total Coliform (#/100ml)	86	2400	135	3500	450	600 ^b
Fecal Coliform (#/100ml)	87	800	8	490	62	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Aucilla	Count	# Exceeds	% Exceeds
	34	0	0

*None of the WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-3: Fenholloway/Steinhatchee Coastal Planning Unit

Fenholloway/Steinhatchee Coastal- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	15	Narrative	15.13	24.09	21.8	23 ^b
Conductivity (umhos/cm)	15	1275 or >50% Nat. Background	114	397.4	322	335 ^b
Dissolved Oxygen (mg/l)	15	5	1.94	7.98	5.5	5.8 ^b
B.O.D. (mg/l)	14	Narrative	0.565	1.805	0.95	1.5 ^b
pH (s.u.)	15	between 6 and 8.5 ^c	6.195	7.675	6.81	7.1 ^b
Total Suspended Solids (mg/l)	14		0.5	6.1	1.5	7 ^b
Secchi Depth (meters)	6		0.5375	0.8	0.7	0.8 ^b
Color (PCU)	14		46.5	317.5	95	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	15	Narrative	0.2904	1.3145	0.497	1.2 ^b
NO ₃ – N (mg/l)	15	10 (Class I)	0.0054	0.086	0.037	0.1 ^b
NH ₃ – N (mg/l)	15		0.0241	0.0971	0.041	0.04
Unionized Ammonia (mg NH ₃ /l)	15	0.02	0.00002	0.00135	0.00014	0.00020
Organic N (mg/l)	15	Narrative	0.244	1.29	0.44	1.105
Total Phosphorus (mg/l)	15	Narrative	0.0435	0.0773	0.06	0.09 ^b
Chlorophyll a (ug/l)	0		-	-	-	6 ^b
Total Coliform (#/100ml)	14	2400	122.3	2855	270	600 ^b
Fecal Coliform (#/100ml)	14	800	12.6	849.5	46.5	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Fenholloway/Steinhatchee Coastal—Blackwater

*No data available from 1989–1998 for blackwater.

*Much of the data was represented by three rows for one sampling date. These lines were consolidated onto line where applicable.

UNIONIZED AMMONIA

CstFenStein	Count	# Exceeds	% Exceeds
	1	0	0

*None of the WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-4: Steinhatchee/Lower Suwannee Coastal Planning Unit

Steinhatchee/Lower Suwannee Coastal- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	2506	Narrative	11.6	31.5	24.8	23 ^b
Conductivity (umhos/cm)	0	1275 or >50% Nat. Background	-	-	-	335 ^b
Dissolved Oxygen (mg/l)	2410	5	3.8	11	7.1	5.8 ^b
B.O.D. (mg/l)	0	Narrative	-	-	-	1.5 ^b
pH (s.u.)	1146	between 6 and 8.5 ^c	7.5	8.3	8	7.1 ^b
Total Suspended Solids (mg/l)	0		-	-	-	7 ^b
Secchi Depth (meters)	0		-	-	-	0.8 ^b
Color (PCU)	0		-	-	-	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	0	Narrative	-	-	-	1.2 ^b
NO ₃ – N (mg/l)	0	10 (Class I)	-	-	-	0.1 ^b
NH ₃ – N (mg/l)	0		-	-	-	0.04
Unionized Ammonia (mg NH ₃ /l)	0	0.02	-	-	-	0.00020
Organic N (mg/l)	0	Narrative	-	-	-	1.105
Total Phosphorus (mg/l)	0	Narrative	-	-	-	0.09 ^b
Chlorophyll <i>a</i> (ug/l)	0		-	-	-	6 ^b
Total Coliform (#/100ml)	0	2400	-	-	-	600 ^b
Fecal Coliform (#/100ml)	0	800	-	-	-	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

*None--no NH3 data for CstSteinLS

Table I-5: Econfina Planning Unit

Econfina - Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	126	Narrative	12	25.55	20.55	23 ^b
Conductivity (umhos/cm)	126	1275 or >50% Nat. Background	42.75	433	150.5	335 ^b
Dissolved Oxygen (mg/l)	123	5	3.6	7.435	5.4	5.8 ^b
B.O.D. (mg/l)	82	Narrative	0.5	2.595	1.05	1.5 ^b
pH (s.u.)	126	between 6 and 8.5 ^c	3.735	7.66	6.73	7.1 ^b
Total Suspended Solids (mg/l)	124		0.5	8	2	7 ^b
Secchi Depth (meters)	92		0.25	1	0.5	0.8 ^b
Color (PCU)	125		45	758	335	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	125	Narrative	0.315	1.985	1.01	1.2 ^b
NO ₃ – N (mg/l)	126	10 (Class I)	0.002	0.08075	0.0205	0.1 ^b
NH ₃ – N (mg/l)	125		0.001	0.1184	0.022	0.04
Unionized Ammonia (mg NH ₃ /l)	109	0.02	0.00000	0.00076	0.00007	0.00020
Organic N (mg/l)	125	Narrative	0.262	1.98	1	1.105
Total Phosphorus (mg/l)	126	Narrative	0.01725	0.205	0.079	0.09 ^b
Chlorophyll a (ug/l)	16		0.1075	2.8	0.365	6 ^b
Total Coliform (#/100ml)	77	2400	55.6	5220	500	600 ^b
Fecal Coliform (#/100ml)	65	800	8.2	1420	64	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

*Some of the data was represented by three rows for one sampling date. These lines were consolidated onto line where applicable.

UNIONIZED AMMONIA

Econfina	Count	# Exceeds	% Exceeds
	25	0	0

*None of the WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-6: Fenholloway Planning Unit

Fenholloway- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	174	Narrative	13.7	31.035	22.6	23 ^b
Conductivity (umhos/cm)	174	1275 or >50% Nat. Background	58.65	2607	699.5	335 ^b
Dissolved Oxygen (mg/l)	174	5	1	7.635	3.95	5.8 ^b
B.O.D. (mg/l)	142	Narrative	0.5	21.925	3.35	1.5 ^b
pH (s.u.)	174	between 6 and 8.5 ^c	3.5525	7.43	6.925	7.1 ^b
Total Suspended Solids (mg/l)	168		1	18.65	4	7 ^b
Secchi Depth (meters)	157		0.04	0.5	0.2	0.8 ^b
Color (PCU)	170		50	2200	800	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	169	Narrative	0.473	10.062	2.29	1.2 ^b
NO ₃ – N (mg/l)	171	10 (Class I)	0.01	0.605	0.07	0.1 ^b
NH ₃ – N (mg/l)	169		0.005	5.44	0.41	0.04
Unionized Ammonia (mg NH ₃ /l)	149	0.02	0.00000	0.11008	0.00180	0.00020
Organic N (mg/l)	168	Narrative	0.447	10	2.125	1.105
Total Phosphorus (mg/l)	171	Narrative	0.021	2.65	0.569	0.09 ^b
Chlorophyll a (ug/l)	32		0.1475	71.35	0.75	6 ^b
Total Coliform (#/100ml)	98	2400	9	5745	390	600 ^b
Fecal Coliform (#/100ml)	14	800	34.95	4090	265	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Fenholloway	Count	# Exceeds	% Exceeds
	149	37	25

WBID	Exceeds	Measured	% Exceeds
3473A	4	34	11.76470588
3473B	33	56	58.92857143
3473C	0	59	0
3489	0	0	0
SUM	37		

*The WBIDs in boldface type met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-7: Lower Suwannee Planning Unit

Lower Suwannee- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	1451	Narrative	14.05	29.15	22.6	23 ^b
Conductivity (umhos/cm)	699	1275 or >50% Nat. Background	72	6000	269	335 ^b
Dissolved Oxygen (mg/l)	1340	5	4.4	9.1	6.5	5.8 ^b
B.O.D. (mg/l)	173	Narrative	0.5	2.6	1	1.5 ^b
pH (s.u.)	1079	between 6 and 8.5 ^c	6.499	8.3	7.57	7.1 ^b
Total Suspended Solids (mg/l)	642		1	12	2.5	7 ^b
Secchi Depth (meters)	670		0.55	3.4	1.2	0.8 ^b
Color (PCU)	680		15	400	120	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	677	Narrative	0.65	1.332	1.02	1.2 ^b
NO ₃ – N (mg/l)	683	10 (Class I)	0.1	1	0.57	0.1 ^b
NH ₃ – N (mg/l)	677		0	0.08	0.015	0.04
Unionized Ammonia (mg NH ₃ /l)	634	0.02	0.00001	0.00212	0.00016	0.00020
Organic N (mg/l)	677	Narrative	0.05	0.912	0.45	1.105
Total Phosphorus (mg/l)	682	Narrative	0.025	0.221	0.121	0.09 ^b
Chlorophyll <i>a</i> (ug/l)	250		0.129	6.637	0.795	6 ^b
Total Coliform (#/100ml)	538	2400	7	733.45	96	600 ^b
Fecal Coliform (#/100ml)	0	800	-	-	-	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Lower Suwannee- Lake

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	0	Narrative	-	-	-	25.5
Conductivity (umhos/cm)	0	1275 or >50% Nat. Background	-	-	-	200
Dissolved Oxygen (mg/l)	0	5	-	-	-	7.75
B.O.D. (mg/l)	0	Narrative	-	-	-	1.65
pH (s.u.)	0	between 6 and 8.5 ^c	-	-	-	7.2
Total Suspended Solids (mg/l)	0		-	-	-	120
Secchi Depth (meters)	1		0.089	0.089	0.089	0.9
Color (PCU)	0		-	-	-	35
Nutrients and Bacteria						
Total Nitrogen (mg/l)	6	Narrative	0.6925	1.12	0.845	1.1 ^b
NO ₃ – N (mg/l)	0	10 (Class I)	-	-	-	0.013
NH ₃ – N (mg/l)	0		-	-	-	0.02
Unionized Ammonia (mg NH ₃ /l)	0	0.02	-	-	-	0.00020
Organic N (mg/l)	6	Narrative	29.7547	29.7547	29.7547	1.2
Total Phosphorus (mg/l)	6	Narrative	0.00825	0.00975	0.009	0.05 ^b
Chlorophyll <i>a</i> (ug/l)	6		1	2.5	1	12 ^b
Total Coliform (#/100ml)	0	2400	-	-	-	199
Fecal Coliform (#/100ml)	0	800	-	-	-	11

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Lower Suwannee- Spring

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	63	Narrative	20.58	22.49	22.1	21.725
Conductivity (umhos/cm)	63	1275 or >50% Nat. Background	272	439.9	408	276.5
Dissolved Oxygen (mg/l)	63	5	1.01	2.69	2	2.925
B.O.D. (mg/l)	0	Narrative	-	-	-	
pH (s.u.)	64	between 6 and 8.5 ^c	6.95	7.64	7.215	7.2775
Total Suspended Solids (mg/l)	45		0	2.8	0.5	
Secchi Depth (meters)	5		1.64	8.5	3	1.5
Color (PCU)	48		0.5	5	2.5	5
Nutrients and Bacteria						
Total Nitrogen (mg/l)	58	Narrative	0.877	4.07	1.305	
NO ₃ – N (mg/l)	64	10 (Class I)	0.88	3.9025	1.295	0.7275
NH ₃ – N (mg/l)	63		0.0005	0.02	1.00E-02	0.01
Unionized Ammonia (mg NH ₃ /l)	59	0.02	0.00000	0.00022	0.00007	
Organic N (mg/l)	58	Narrative	0	0.1215	0.025	
Total Phosphorus (mg/l)	63	Narrative	0.0084	0.1007	0.06	0.0435
Chlorophyll <i>a</i> (ug/l)	0		-	-	-	
Total Coliform (#/100ml)	9	2400	5	1340	30	
Fecal Coliform (#/100ml)	0	800	-	-	-	

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Lower Suwannee	Count	# Exceeds	% Exceeds
	694	3	0

WBID	Exceeds	Measured	%
3422	2	208	0.961538
3422A	1	426	0.234742

*None of the met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-8: Middle Suwannee Planning Unit

Middle Suwannee- Lake

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	10	Narrative	16.09	29.215	25.05	25.5
Conductivity (umhos/cm)	12	1275 or >50% Nat. Background	54.2	2914	61	200
Dissolved Oxygen (mg/l)	8	5	0.61	7.725	3.75	7.75
B.O.D. (mg/l)	6	Narrative	3.125	65	20.6	1.65
pH (s.u.)	12	between 6 and 8.5 ^c	4.6	6.9955	6.1	7.2
Total Suspended Solids (mg/l)	3		3.1	9.4	4	120
Secchi Depth (meters)	27		0.603	2.134	1.219	0.9
Color (PCU)	3		68	194	140	35
Nutrients and Bacteria						
Total Nitrogen (mg/l)	30	Narrative	0.93	201.045	1.3	1.1 ^b
NO ₃ – N (mg/l)	6	10 (Class I)	0.00325	0.07	0.026	0.013
NH ₃ – N (mg/l)	6		0.005	162.5	65.0125	0.02
Unionized Ammonia (mg NH ₃ /l)	1	0.02	0.58467	0.58467	0.58467	0.00020
Organic N (mg/l)	6	Narrative	0.95	225	96.05	1.2
Total Phosphorus (mg/l)	30	Narrative	0.069	47.5	0.0875	0.05 ^b
Chlorophyll a (ug/l)	24		7.15	105.65	25	12 ^b
Total Coliform (#/100ml)	3	2400	22.3	220.3	43	199
Fecal Coliform (#/100ml)	5	800	3.4	609400	46	11

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.^b Statewide median values obtained from FDEP, 2000 305B Report.^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Middle Suwannee- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	562	Narrative	12.31	26.5	21.05	23 ^b
Conductivity (umhos/cm)	557	1275 or >50% Nat. Background	46.6	335	190	335 ^b
Dissolved Oxygen (mg/l)	562	5	4	8.2	5.8	5.8 ^b
B.O.D. (mg/l)	130	Narrative	0.5	2.555	1	1.5 ^b
pH (s.u.)	567	between 6 and 8.5 ^c	5.391	7.907	7	7.1 ^b
Total Suspended Solids (mg/l)	528		1	10	2.5	7 ^b
Secchi Depth (meters)	469		0.5	2.46	0.9	0.8 ^b
Color (PCU)	528		30	593	160	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	557	Narrative	0.618	1.4884	0.96	1.2 ^b
NO ₃ – N (mg/l)	562	10 (Class I)	0.025	0.9695	0.381	0.1 ^b
NH ₃ – N (mg/l)	557		0.001	0.0814	0.02	0.04
Unionized Ammonia (mg NH ₃ /l)	520	0.02	0.00000	0.00134	0.00009	0.00020
Organic N (mg/l)	557	Narrative	0.096	1.24	0.57	1.105
Total Phosphorus (mg/l)	562	Narrative	0.03605	0.39	0.16	0.09 ^b
Chlorophyll <i>a</i> (ug/l)	129		0.174	4.044	0.65	6 ^b
Total Coliform (#/100ml)	465	2400	15.2	710	130	600 ^b
Fecal Coliform (#/100ml)	17	800	5.6	80.8	20	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Middle Suwannee- Spring

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	240	Narrative	19.48	22.2	21.3	21.725
Conductivity (umhos/cm)	241	1275 or >50% Nat. Background	327	431	351	276.5
Dissolved Oxygen (mg/l)	237	5	0.3	3.8	1.4	2.925
B.O.D. (mg/l)	14	Narrative	-	-	-	
pH (s.u.)	244	between 6 and 8.5 ^c	6.86	7.54	7.26	7.2775
Total Suspended Solids (mg/l)	189		0	5	1	
Secchi Depth (meters)	24		0.575	16.5	3.45	1.5
Color (PCU)	192		0.5	15	2.5	5
Nutrients and Bacteria						
Total Nitrogen (mg/l)	240	Narrative	0.69	7.807	1.995	
NO ₃ – N (mg/l)	245	10 (Class I)	0.62	7.726	1.88	0.7275
NH ₃ – N (mg/l)	245		0.0005	0.0452	1.00E-02	0.01
Unionized Ammonia (mg NH ₃ /l)	227	0.02	0.00000	0.00047	0.00007	
Organic N (mg/l)	240	Narrative	0.0095	0.2915	0.05	
Total Phosphorus (mg/l)	244	Narrative	0.01445	0.1	0.043	0.0435
Chlorophyll <i>a</i> (ug/l)	0		-	-	-	
Total Coliform (#/100ml)	43	2400	5	490	45	
Fecal Coliform (#/100ml)	0	800	-	-	-	

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Middle Suwannee	Count	# Exceeds	% Exceeds
	748	3	0

WBID	Exceeds	Measured	%
3561	1	1	100
3422B	2	486	0.411523
SUM	3		

*None of WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.
(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-9: Santa Fe Planning Unit

Sante Fe- Lake

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	931	Narrative	13.75	30.35	24.1	25.5
Conductivity (umhos/cm)	905	1275 or >50% Nat. Background	55	318	80	200
Dissolved Oxygen (mg/l)	932	5	2.8	10.245	7.3	7.75
B.O.D. (mg/l)	542	Narrative	0.5	7.39	1.2	1.65
pH (s.u.)	913	between 6 and 8.5 ^c	4.918	9.024	6.28	7.2
Total Suspended Solids (mg/l)	826		2	17	2.5	120
Secchi Depth (meters)	2127		0.127	2.743	1.5	0.9
Color (PCU)	831		15	200	45	35
Nutrients and Bacteria						
Total Nitrogen (mg/l)	2175	Narrative	0.36	1.328	0.54	1.1 ^b
NO ₃ – N (mg/l)	855	10 (Class I)	0.005	0.12	0.025	0.013
NH ₃ – N (mg/l)	835		0.005	0.183	0.015	0.02
Unionized Ammonia (mg NH ₃ /l)	790	0.02	0.00000	0.01063	0.00003	0.00020
Organic N (mg/l)	835	Narrative	0.317	2.1	0.67	1.2
Total Phosphorus (mg/l)	2204	Narrative	0.007	0.22	0.015	0.05 ^b
Chlorophyll a (ug/l)	1973		2	32.24	7	12 ^b
Total Coliform (#/100ml)	487	2400	0.5	794	15	199
Fecal Coliform (#/100ml)	75	800	0.5	103	4	11

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.^b Statewide median values obtained from FDEP, 2000 305B Report.^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Sante Fe- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	1613	Narrative	11.6	26.14	21.1	23 ^b
Conductivity (umhos/cm)	1608	1275 or >50% Nat. Background	57	390.65	177	335 ^b
Dissolved Oxygen (mg/l)	1613	5	2.6	9.2	6	5.8 ^b
B.O.D. (mg/l)	453	Narrative	0.5	4.3	1	1.5 ^b
pH (s.u.)	1605	between 6 and 8.5 ^c	5.49	7.79	6.97	7.1 ^b
Total Suspended Solids (mg/l)	1526		0.5	11	2.5	7 ^b
Secchi Depth (meters)	1032		0.25	2.545	0.775	0.8 ^b
Color (PCU)	1454		2.5	500	150	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	1581	Narrative	0.4	1.92	0.92	1.2 ^b
NO ₃ – N (mg/l)	1602	10 (Class I)	0.025	0.85	0.22	0.1 ^b
NH ₃ – N (mg/l)	1581		0.001	0.15	0.015	0.04
Unionized Ammonia (mg NH ₃ /l)	0	0.02	0.00000	0.00119	0.00007	0.00020
Organic N (mg/l)	1581	Narrative	0.05	1.46	0.66	1.105
Total Phosphorus (mg/l)	1578	Narrative	0.027	1.2	0.15	0.09 ^b
Chlorophyll <i>a</i> (ug/l)	373		0.12	3.38	0.56	6 ^b
Total Coliform (#/100ml)	919	2400	4.9	2000	250	600 ^b
Fecal Coliform (#/100ml)	81	800	4	1100	133	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Sante Fe- Spring

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	80	Narrative	20.955	22.8	22.3	21.725
Conductivity (umhos/cm)	80	1275 or >50% Nat. Background	299.9	439.25	334	276.5
Dissolved Oxygen (mg/l)	80	5	0.4	5.6	2.9	2.925
B.O.D. (mg/l)	0	Narrative	-	-	-	
pH (s.u.)	81	between 6 and 8.5 ^c	6.79	7.6	7.27	7.2775
Total Suspended Solids (mg/l)	68		0	6	2	
Secchi Depth (meters)	5		1.08	2.5	1.25	1.5
Color (PCU)	71		0.5	22.5	2.5	5
Nutrients and Bacteria						
Total Nitrogen (mg/l)	83	Narrative	0.691	4.998	1.1	
NO ₃ – N (mg/l)	83	10 (Class I)	0.601	4.897	0.93	0.7275
NH ₃ – N (mg/l)	83		0.0005	0.04	0.005	0.01
Unionized Ammonia (mg NH ₃ /l)	78	0.02	0.00000	0.00049	0.00007	
Organic N (mg/l)	83	Narrative	0.01	0.238	0.05	
Total Phosphorus (mg/l)	82	Narrative	0.0201	0.1353	0.052	0.0435
Chlorophyll a (ug/l)	0		-	-	-	
Total Coliform (#/100ml)	14	2400	2.65	116.15	13.5	
Fecal Coliform (#/100ml)	0	800	-	-	-	

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Sante Fe- Blackwater

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	220	Narrative	10.39	27	19.95	19.85
Conductivity (umhos/cm)	220	1275 or >50% Nat. Background	42	178.6	70	68.75
Dissolved Oxygen (mg/l)	220	5	1.195	8.9	5.5	5.6
B.O.D. (mg/l)	79	Narrative	0.5	4	1.3	1.4
pH (s.u.)	220	between 6 and 8.5 ^c	3.8895	7.2405	5.17	4.5
Total Suspended Solids (mg/l)	220		0.5	12	2.5	98
Secchi Depth (meters)	173		0.3	0.94	0.5	0.4
Color (PCU)	220		69.75	830	300	400
Nutrients and Bacteria						
Total Nitrogen (mg/l)	218	Narrative	0.4535	2.03525	1.125	
NO ₃ – N (mg/l)	220	10 (Class I)	0.01	0.091	0.025	0.0255
NH ₃ – N (mg/l)	218		0.005	0.31105	0.03	0.03
Unionized Ammonia (mg NH ₃ /l)	210	0.02	0.00000	0.00022	0.00000	0.00000
Organic N (mg/l)	218	Narrative	0.417	1.919	1.085	
Total Phosphorus (mg/l)	220	Narrative	0.00495	0.7	0.1435	0.07
Chlorophyll <i>a</i> (ug/l)	72		0.0955	20.945	0.985	0.535
Total Coliform (#/100ml)	86	2400	1.625	3225	350	300
Fecal Coliform (#/100ml)	7	800	14.4	805	152	56

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Santa Fe	Count	# Exceeds	% Exceeds
	2520	24	1

WBID	Exceeds	Measured	%
3516	17	171	9.94
3644	4	11	36.36
3598B	1	97	1.03
3598C	2	46	4.35
SUM	24		

*The WBIDs in boldface type met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-10: Steinhatchee Planning Unit

Steinhatchee- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	361	Narrative	12.5	27.4	21	23 ^b
Conductivity (umhos/cm)	361	1275 or >50% Nat. Background	80	24000	340	335 ^b
Dissolved Oxygen (mg/l)	360	5	1.295	8.205	5.2	5.8 ^b
B.O.D. (mg/l)	124	Narrative	0.5	3.1	1.3	1.5 ^b
pH (s.u.)	361	between 6 and 8.5 ^c	6.42	7.83	7.19	7.1 ^b
Total Suspended Solids (mg/l)	334		0.5	32	3	7 ^b
Secchi Depth (meters)	193		0.3	1.84	0.6	0.8 ^b
Color (PCU)	362		32.15	698.5	140	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	360	Narrative	0.265	1.6155	0.8475	1.2 ^b
NO ₃ – N (mg/l)	360	10 (Class I)	0.01	0.1302	0.025	0.1 ^b
NH ₃ – N (mg/l)	361		0.0005	0.11	0.03	0.04
Unionized Ammonia (mg NH ₃ /l)	343	0.02	0.00001	0.00204	0.00027	0.00020
Organic N (mg/l)	361	Narrative	0.24	1.53	0.78	1.105
Total Phosphorus (mg/l)	361	Narrative	0.019	0.224	0.057	0.09 ^b
Chlorophyll <i>a</i> (ug/l)	90		0.12	12.385	0.535	6 ^b
Total Coliform (#/100ml)	99	2400	23.8	1300	210	600 ^b
Fecal Coliform (#/100ml)	22	800	9.1	168	61.5	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Steinhatchee- Spring

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	18	Narrative	11.52	21.045	20.25	21.725
Conductivity (umhos/cm)	18	1275 or >50% Nat. Background	218.8	739	700	276.5
Dissolved Oxygen (mg/l)	18	5	0.2	8.275	0.4	2.925
B.O.D. (mg/l)	0	Narrative	-	-	-	
pH (s.u.)	18	between 6 and 8.5 ^c	6.527	7.2975	6.92	7.2775
Total Suspended Solids (mg/l)	18		0	5.15	2	
Secchi Depth (meters)	0		-	-	-	1.5
Color (PCU)	18		10	179	30	5
Nutrients and Bacteria						
Total Nitrogen (mg/l)	18	Narrative	0.30275	0.73875	0.445	
NO ₃ – N (mg/l)	18	10 (Class I)	0	0.043	0.025	0.7275
NH ₃ – N (mg/l)	18		0.00425	0.19475	0.164	0.01
Unionized Ammonia (mg NH ₃ /l)	17	0.02	0.00003	0.00089	0.00062	
Organic N (mg/l)	18	Narrative	0.2955	0.684	0.44	
Total Phosphorus (mg/l)	18	Narrative	0.03995	0.11695	0.072	0.0435
Chlorophyll a (ug/l)	0		-	-	-	
Total Coliform (#/100ml)	0	2400	-	-	-	
Fecal Coliform (#/100ml)	0	800	-	-	-	

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Steinhatchee	Count	# Exceeds	% Exceeds
	359	1	0

WBID	Exceeds	Measured	%
3573	1	181	0.55

*None of the WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-11: Upper Suwannee Planning Unit

Upper Suwannee- Lake

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	4	Narrative	26	27.85	26.5	25.5
Conductivity (umhos/cm)	5	1275 or >50% Nat. Background	46.2	122.8	77	200
Dissolved Oxygen (mg/l)	0	5	-	-	-	7.75
B.O.D. (mg/l)	1	Narrative	0.7	0.7	0.7	1.65
pH (s.u.)	5	between 6 and 8.5 ^c	5.824	7.588	7.4	7.2
Total Suspended Solids (mg/l)	1		2	2	2	120
Secchi Depth (meters)	31		1.219	1.829	1.524	0.9
Color (PCU)	5		50	100	100	35
Nutrients and Bacteria						
Total Nitrogen (mg/l)	31	Narrative	0.525	0.67	0.58	1.1 ^b
NO ₃ – N (mg/l)	5	10 (Class I)	0	0.0016	0	0.013
NH ₃ – N (mg/l)	5		0.0224	0.13	0.04	0.02
Unionized Ammonia (mg NH ₃ /l)	4	0.02	0.00082	0.00134	0.00132	0.00020
Organic N (mg/l)	1	Narrative	0.57	0.57	0.57	1.2
Total Phosphorus (mg/l)	35	Narrative	0.01	0.064	0.013	0.05 ^b
Chlorophyll a (ug/l)	30		3	11.55	5	12 ^b
Total Coliform (#/100ml)	1	2400	230	230	230	199
Fecal Coliform (#/100ml)	1	800	2	2	2	11

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.^b Statewide median values obtained from FDEP, 2000 305B Report.^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Upper Suwannee- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	1047	Narrative	11.3	27.5	19.8	23 ^b
Conductivity (umhos/cm)	1047	1275 or >50% Nat. Background	51	435	166	335 ^b
Dissolved Oxygen (mg/l)	1047	5	3.4	9.1	6.4	5.8 ^b
B.O.D. (mg/l)	282	Narrative	0.5	2.7	1	1.5 ^b
pH (s.u.)	1042	between 6 and 8.5 ^c	4.8	7.4995	6.86	7.1 ^b
Total Suspended Solids (mg/l)	1046		0.85	15	2.75	7 ^b
Secchi Depth (meters)	571		0.15	1.275	0.5	0.8 ^b
Color (PCU)	1046		22	722.5	145	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	1036	Narrative	0.5375	2.6525	1.04	1.2 ^b
NO ₃ – N (mg/l)	1047	10 (Class I)	0.025	1.097	0.15	0.1 ^b
NH ₃ – N (mg/l)	1036		0	0.555	0.042	0.04
Unionized Ammonia (mg NH ₃ /l)	978	0.02	0.00000	0.00233	0.00013	0.00020
Organic N (mg/l)	1036	Narrative	0.28	1.9	0.835	1.105
Total Phosphorus (mg/l)	1045	Narrative	0.1426	4.76	0.622	0.09 ^b
Chlorophyll a (ug/l)	251		0.16	17.5	0.72	6 ^b
Total Coliform (#/100ml)	285	2400	15.4	2000	260	600 ^b
Fecal Coliform (#/100ml)	0	800	-	-	-	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Upper Suwannee- Spring

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	2	Narrative	21.315	23.385	22.35	21.725
Conductivity (umhos/cm)	2	1275 or >50% Nat. Background	251.75	265.25	258.5	276.5
Dissolved Oxygen (mg/l)	2	5	0.03	0.57	0.3	2.925
B.O.D. (mg/l)	0	Narrative	-	-	-	
pH (s.u.)	2	between 6 and 8.5 ^c	7.4975	7.6325	7.565	7.2775
Total Suspended Solids (mg/l)	2		1.1	2.9	2	
Secchi Depth (meters)	2		1.2675	1.5825	1.425	1.5
Color (PCU)	2		13.25	71.75	42.5	5
Nutrients and Bacteria						
Total Nitrogen (mg/l)	2	Narrative	0.206	0.314	0.26	
NO ₃ – N (mg/l)	2	10 (Class I)	0.0105	0.0195	0.015	0.7275
NH ₃ – N (mg/l)	2		0.02315	0.02585	0.0245	0.01
Unionized Ammonia (mg NH ₃ /l)	2	0.02	0.00043	0.00060	0.00051	
Organic N (mg/l)	2	Narrative	0.1955	0.2945	0.245	
Total Phosphorus (mg/l)	2	Narrative	0.11315	0.16985	0.1415	0.0435
Chlorophyll a (ug/l)	0		-	-	-	
Total Coliform (#/100ml)	0	2400	-	-	-	
Fecal Coliform (#/100ml)	0	800	-	-	-	

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Upper Suwannee- Blackwater

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	976	Narrative	10.7	28.925	20.5	19.85
Conductivity (umhos/cm)	976	1275 or >50% Nat. Background	45	190	66	68.75
Dissolved Oxygen (mg/l)	975	5	2	9.23	6.2	5.6
B.O.D. (mg/l)	337	Narrative	0.5	2.82	1	1.4
pH (s.u.)	960	between 6 and 8.5 ^c	3.6195	7.2015	4.44	4.5
Total Suspended Solids (mg/l)	972		0.5	13	2.5	98
Secchi Depth (meters)	739		0.2	0.8	0.5	0.4
Color (PCU)	971		60	890	350	400
Nutrients and Bacteria						
Total Nitrogen (mg/l)	960	Narrative	0.46285	2.2555	1.14	
NO ₃ – N (mg/l)	975	10 (Class I)	0.01	0.13	0.025	0.0255
NH ₃ – N (mg/l)	960		0.005	0.17	0.026	0.03
Unionized Ammonia (mg NH ₃ /l)	882	0.02	0.00000	0.00041	0.00000	0.00000
Organic N (mg/l)	960	Narrative	0.4095	2.1905	1.1	
Total Phosphorus (mg/l)	973	Narrative	0.025	0.744	0.14	0.07
Chlorophyll a (ug/l)	321		0.14	7.01	1	0.535
Total Coliform (#/100ml)	444	2400	20	1800	168.5	300
Fecal Coliform (#/100ml)	31	800	7	225	60	56

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Upper Suwannee	Count	# Exceeds	% Exceeds
	1866	5	0

WBID	Exceeds	Measured	%
3341	1	282	0.35
3375	4	100	4.00

*None of the WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-12: Waccasassa Planning Unit

Waccasassa - Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	5208	Narrative	12.8	30.9	23.2	23 ^b
Conductivity (umhos/cm)	130	1275 or >50% Nat. Background	105.45	37055	253	335 ^b
Dissolved Oxygen (mg/l)	4638	5	4.3	11.3	7.7	5.8 ^b
B.O.D. (mg/l)	85	Narrative	0.25	2.38	1	1.5 ^b
pH (s.u.)	2163	between 6 and 8.5 ^c	7.4	8.3	8	7.1 ^b
Total Suspended Solids (mg/l)	124		0.575	46.2	2.5	7 ^b
Secchi Depth (meters)	96		0.3	2.4	0.8	0.8 ^b
Color (PCU)	129		20	500	100	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	125	Narrative	0.2556	1.356	0.66	1.2 ^b
NO ₃ – N (mg/l)	127	10 (Class I)	0.01	0.2	0.05	0.1 ^b
NH ₃ – N (mg/l)	125		0.0018	0.11	0.015	0.04
Unionized Ammonia (mg NH ₃ /l)	66	0.02	0.00001	0.00226	0.00025	0.00020
Organic N (mg/l)	125	Narrative	0.126	1.272	0.6	1.105
Total Phosphorus (mg/l)	126	Narrative	0.01625	0.18225	0.058	0.09 ^b
Chlorophyll <i>a</i> (ug/l)	43		0.141	31.33	1.4	6 ^b
Total Coliform (#/100ml)	92	2400	50	5000	475	600 ^b
Fecal Coliform (#/100ml)	49	800	14	928	80	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Waccasassa – Estuary

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	1136	Narrative	13.3	29.7	22.3	25.4
Conductivity (umhos/cm)	0	1275 or >50% Nat. Background	-	-	-	40550
Dissolved Oxygen (mg/l)	1041	5	4.2	11	7.2	6.27
B.O.D. (mg/l)	0	Narrative	-	-	-	1.4
pH (s.u.)	567	between 6 and 8.5 ^c	7.5	8.4	8	7.8
Total Suspended Solids (mg/l)	0		-	-	-	477
Secchi Depth (meters)	0		-	-	-	1.08
Color (PCU)	0		-	-	-	22.5
Nutrients and Bacteria						
Total Nitrogen (mg/l)	0	Narrative	-	-	-	0.8 ^b
NO ₃ – N (mg/l)	0	10 (Class I)	-	-	-	0.03
NH ₃ – N (mg/l)	0		-	-	-	0.03
Unionized Ammonia (mg NH ₃ /l)	0	0.02	-	-	-	0.00070
Organic N (mg/l)	0	Narrative	-	-	-	0.6945
Total Phosphorus (mg/l)	0	Narrative	-	-	-	0.07 ^b
Chlorophyll <i>a</i> (ug/l)	0		-	-	-	9 ^b
Total Coliform (#/100ml)	0	2400	-	-	-	58.5
Fecal Coliform (#/100ml)	0	800	-	-	-	15

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Waccasassa – Lake

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	0	Narrative	-	-	-	25.5
Conductivity (umhos/cm)	0	1275 or >50% Nat. Background	-	-	-	200
Dissolved Oxygen (mg/l)	0	5	-	-	-	7.75
B.O.D. (mg/l)	0	Narrative	-	-	-	1.65
pH (s.u.)	0	between 6 and 8.5 ^c	-	-	-	7.2
Total Suspended Solids (mg/l)	0		-	-	-	120
Secchi Depth (meters)	0		-	-	-	0.9
Color (PCU)	0		-	-	-	35
Nutrients and Bacteria						
Total Nitrogen (mg/l)	54	Narrative	0.3065	0.891	0.605	1.1 ^b
NO ₃ – N (mg/l)	0	10 (Class I)	-	-	-	0.013
NH ₃ – N (mg/l)	0		-	-	-	0.02
Unionized Ammonia (mg NH ₃ /l)	0	0.02	-	-	-	0.00020
Organic N (mg/l)	0	Narrative	-	-	-	1.2
Total Phosphorus (mg/l)	53	Narrative	0.003	0.0124	0.007	0.05 ^b
Chlorophyll <i>a</i> (ug/l)	54		1	6.7	2	12 ^b
Total Coliform (#/100ml)	0	2400	-	-	-	199
Fecal Coliform (#/100ml)	0	800	-	-	-	11

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Waccasassa	Count	# Exceeds	% Exceeds
	66	1	2

WBID	Exceeds	Measured	%
3729	1	11	9.09

*None of the WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-13: Withlacoochee Planning Unit

Withlacoochee- Lake

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	30	Narrative	13.78	30.2	28	25.5
Conductivity (umhos/cm)	30	1275 or >50% Nat. Background	28.45	50	44	200
Dissolved Oxygen (mg/l)	30	5	0.5	9.865	7.6	7.75
B.O.D. (mg/l)	16	Narrative	0.25	2	1.2	1.65
pH (s.u.)	26	between 6 and 8.5 ^c	5.01	7.1	5.73	7.2
Total Suspended Solids (mg/l)	17		1	5	3	120
Secchi Depth (meters)	16		0.6375	3.25	1.95	0.9
Color (PCU)	21		5	240	10	35
Nutrients and Bacteria						
Total Nitrogen (mg/l)	20	Narrative	0.3267	1.0815	0.517	1.1 ^b
NO ₃ – N (mg/l)	20	10 (Class I)	0.002	0.1405	0.0155	0.013
NH ₃ – N (mg/l)	20		0.005	0.09195	0.017	0.02
Unionized Ammonia (mg NH ₃ /l)	14	0.02	0.00000	0.00048	0.00001	0.00020
Organic N (mg/l)	19	Narrative	0.279	0.973	0.49	1.2
Total Phosphorus (mg/l)	20	Narrative	0.019	0.41	0.0305	0.05 ^b
Chlorophyll a (ug/l)	3		0.2225	0.2495	0.245	12 ^b
Total Coliform (#/100ml)	17	2400	1	220	40	199
Fecal Coliform (#/100ml)	17	800	1	60.4	8	11

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.^b Statewide median values obtained from FDEP, 2000 305B Report.^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Withlacoochee- Spring

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventionals						
Temperature (C)	1	Narrative	21.6	21.6	21.6	21.725
Conductivity (umhos/cm)	1	1275 or >50% Nat. Background	272	272	272	276.5
Dissolved Oxygen (mg/l)	1	5	3	3	3	2.925
B.O.D. (mg/l)	0	Narrative	-	-	-	
pH (s.u.)	2	between 6 and 8.5 ^c	7.515	7.785	7.65	7.2775
Total Suspended Solids (mg/l)	0		-	-	-	
Secchi Depth (meters)	0		-	-	-	1.5
Color (PCU)	1		2.5	2.5	2.5	5
Nutrients and Bacteria						
Total Nitrogen (mg/l)	2	Narrative	0.749	1.271	1.01	
NO ₃ – N (mg/l)	2	10 (Class I)	0.649	1.171	0.91	0.7275
NH ₃ – N (mg/l)	2		0.00575	0.01925	0.0125	0.01
Unionized Ammonia (mg NH ₃ /l)	1	0.02	0.00017	0.00017	0.00017	
Organic N (mg/l)	2	Narrative	0.1	0.1	0.1	
Total Phosphorus (mg/l)	2	Narrative	0.04	0.04	0.04	0.0435
Chlorophyll <i>a</i> (ug/l)	0		-	-	-	
Total Coliform (#/100ml)	0	2400	-	-	-	
Fecal Coliform (#/100ml)	0	800	-	-	-	

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

Withlacoochee- Stream

Parameter	Number Obsv.	Criteria	5th %	95th %	Median	Statewide Median ^a
Conventional						
Temperature (C)	311	Narrative	11.5	26.4	19.7	23 ^b
Conductivity (umhos/cm)	311	1275 or >50% Nat. Background	49.5	375.5	141	335 ^b
Dissolved Oxygen (mg/l)	310	5	4.3	8.6	6.05	5.8 ^b
B.O.D. (mg/l)	96	Narrative	0.5	2.2	1	1.5 ^b
pH (s.u.)	310	between 6 and 8.5 ^c	5.939	7.8055	6.935	7.1 ^b
Total Suspended Solids (mg/l)	309		0.5	13	2.5	7 ^b
Secchi Depth (meters)	228		0.4675	2.065	0.8	0.8 ^b
Color (PCU)	306		10	300	100	71 ^b
Nutrients and Bacteria						
Total Nitrogen (mg/l)	295	Narrative	0.367	1.206	0.88	1.2 ^b
NO ₃ – N (mg/l)	304	10 (Class I)	0.0815	0.877	0.3	0.1 ^b
NH ₃ – N (mg/l)	297		0.001	0.0912	0.016	0.04
Unionized Ammonia (mg NH ₃ /l)	286	0.02	0.00000	0.00094	0.00009	0.00020
Organic N (mg/l)	295	Narrative	0.08	0.983	0.51	1.105
Total Phosphorus (mg/l)	299	Narrative	0.05	0.3071	0.12	0.09 ^b
Chlorophyll a (ug/l)	75		0.297	4.779	0.77	6 ^b
Total Coliform (#/100ml)	59	2400	5	1930	110	600 ^b
Fecal Coliform (#/100ml)	2	800	18.85	124.15	71.5	75 ^b

^a Statewide median values obtained from FDEP, 1995 Typical Water Quality Values for Florida...1990-1995 unless otherwise noted.

^b Statewide median values obtained from FDEP, 2000 305B Report.

^c Please see Rule 62-302.530 F.A.C. for detailed explanation of criterion if natural background outside this range.

UNIONIZED AMMONIA

Withlacoochee	Count	# Exceeds	% Exceeds
	288	0	0

*None of the WBIDs met the minimum number of exceedences to be placed on the planning list for unionized ammonia.

(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

Table I-14: Suwannee Basin Exceedances for Unionized Ammonia

*The WBIDs in boldface type met the minimum number of exceedences to be placed on the planning list for unionized ammonia.
(Table 1, Rule 62-303, ERC Adopted Version 05/01/01)

WBID	Exceeds	Measured	%
Aucilla			
none			
Alapaha			
none			
CtsSteinLS			
none			
CstFenStein			
none			
Econfina			
none			
Fenholloway			
3473A	4	34	11.76470588
3473B	33	56	58.92857143
Lower Suwannee			
3422	2	208	0.961538462
3422A	1	426	0.234741784
Middle Suwannee			
3561	1	1	100
3422B	2	486	0.411522634
Upper Suwannee			
3341	1	282	0.35
3375	4	100	4.00
Santa Fe			
3516	17	171	9.94
3644	4	11	36.36
3598B	1	97	1.03
3598C	2	46	4.35
Steinhatchee			
3573	1	181	0.55
Waccasassa			
3729	1	11	9.09
Withlacoochee			
none			

Appendix J: Status Monitoring Indicator/Analyte List for Ground Water

INDICATOR	MCL Threshold		Dissolved or Total
	Primary	Secondary	
Calcium			D
Magnesium			D
Sodium	160		D
Potassium			D
Chloride		250	D
Sulfate		250	D
Fluoride	4	2	D
Alkalinity			D
Nitrate + Nitrite	10		D
Ammonia			D
Kjeldahl Nitrogen			D
Phosphorous			D
Organic Carbon			T
Dissolved Solids		500	T
Suspended Solids			T
Turbidity			T
Color		15	T
Total Coliform	4		T
Fecal Coliform	4**		T
<i>E. Coli</i>			T
Enterococci			T
Water Temperature			X
pH		< 6.5, > 8.5	X
Specific Conductance/Conductivity			X
Dissolved Oxygen			X
Depth to Water (from LSE)			X
Land Surface Elevation (LSE)			X
Microlanduse			X

T - total sample

D - filtered sample

X - other sample or measurement

**4 - used as surrogate for Total Coliform



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