Integrated Water Quality Assessment for Florida: 2004 305(b) Report and 303(d) List Update

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EXECUTIVE SUMMARY

Purpose and Contents

This report, *Integrated Water Quality Assessment for Florida,* provides an overview of Florida's surface water and ground water quality and trends. Referred to as integrated report because it fulfills the reporting requirements under Sections 305(b) and 303(d) of the federal Clean Water Act, the report must be submitted to the U.S. Environmental Protection Agency (EPA) every two years.

Chapter 1 provides information on the state's population, water resources, climate, and hydrogeology. It also summarizes Florida's major programs and activities to protect and manage surface water and ground water resources. Chapter 2 presents significant surface water quality findings and summarizes attainment of designated uses (these are functional classifications such as recreation, drinking water, and aquatic life) for rivers and streams, lakes, and estuarine and coastal waters. Long-term trends in surface water quality, as well as wetlands protection efforts, are also discussed. Chapter 3 presents significant ground water quality findings. The Appendices provide background information and supporting data.

Background

Water is Florida's most precious resource. We depend on a clean, reliable supply of water, not only when we turn on the faucet, but as the foundation of our economy. The state has more than 1,700 rivers and streams that flow for almost 52,000 miles, over 7,700 lakes covering about 1.6 million acres, 4,460 square miles of estuaries and bays, and more than 700 known springs—all of which support diverse habitats, plants, and animals, as well as food crops, industry, and recreation. In addition, Florida's enormous underground aquifer system supplies potable water to most of the population.

With almost 17 million people (2002 estimate), Florida is currently the fourth most populated state in the country, and its population continues to grow rapidly. Within the next 20 years, the state's population is expected to increase by more than 7 million people. Population growth is concentrated in southeastern Florida (Dade, Broward, and Palm Beach Counties), Jacksonville, Tampa–St. Petersburg, southwest Florida (from Sarasota to Naples), and Orlando. The pressures of this growth and its accompanying development will continue to pose serious threats to the state's water resources. Issues of water quality and quantity are inextricably linked, and maintaining both is critical to a sustainable economy and healthy environment.

Federal Assessment and Reporting Requirements

Section 305(b) of the Clean Water Act (CWA) requires states and other jurisdictions to submit biennial water quality reports to the EPA. These reports, referred to 305(b) reports, describe surface water and ground water quality and trends, the extent to which waters are attaining their designated uses (such as drinking water, recreation, and shellfish harvesting), and major impacts to surface water and ground water. Under Section 303(d) of the CWA, states are also required to identify waters that are not attaining their designated uses, submit to the EPA a list of these impaired waters (referred to as the 303[d] list because it is required under Section 303[d] of the CWA), and develop total maximum daily loads (TMDLs) for them. A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet its designated uses.

Water quality monitoring and data analysis are the foundation of water resource management decisions. The EPA and its state partners have worked together to develop an integrated 305(b) and 303(d) assessment approach to address water quality monitoring strategies, data quality and data quantity needs, and data interpretation methodologies. This 305(b) report continues the consolidation and alignment of the 305(b) and 303(d) assessment and reporting requirements.

Integrating the Federal Requirements into Florida's Watershed Management Approach

For the 2004 305(b) report, the Florida Department of Environmental Protection (FDEP) has moved further towards a comprehensive assessment by integrating the federal assessment and reporting requirements into its watershed management approach. The 1999 Florida Watershed Restoration Act directed FDEP to implement a comprehensive, integrated watershed approach to evaluating and managing the cumulative impacts to the state's waters. FDEP's Division of Water Resource Management initiated the watershed management approach in 2000, through the Bureau of Watershed Management.

To implement the watershed management approach, Florida's 52 basins have been divided into 29 groups that are distributed among FDEP's 6 districts. There are 5 basins each in the Northwest, Northeast, Southwest, South, and Southeast Districts, and 4 basins in the Central District. One basin is assessed in each district every year. Using a rotating basin management cycle, which ensures that each basin is assessed every 5 years, FDEP and local stakeholders assess individual basins, reach a consensus on the most important water quality problems, and cooperate in finding and implementing management solutions. The order and specific time frame for evaluating each basin in each district are based on a number of priority factors, including watersheds that contain surface water sources of drinking water, watersheds requiring TMDL development, and watersheds where Surface Water Improvement and Management (SWIM) plans are proposed or under way.

The assessment, consisting of multiple phases, has only been fully completed in two-fifths of the state's basins (the Group 1 and 2 basins), and the scope of the 303(d) list submittal is limited to the Group 1 and 2 basins. As part of FDEP's Watershed Management Approach, FDEP developed verified lists of impaired waters for the Group 1 and 2 basins in 2002 and 2003, respectively, and, as required by Subsection 403.067(4), Florida Statutes (F.S.), the lists were adopted by Secretarial Order. The resulting verified lists of impaired waters and waters to be delisted in the Group 1 and 2 basins amend the 1998 303(d) list of impaired Florida waters maintained by the EPA. FDEP plans to submit annual amendments to its 303(d) list as part of the watershed management approach, which rotates through all of the state's basins over a five-year cycle, and assessments in the remaining three-fifths of the state (the Group 3, 4, and 5 basins) will be completed over the next three years.

Surface Water Quality

Florida uses a three-tiered approach to monitoring surface water quality, ranging from the general to the specific. Tier 1, or probabilistic monitoring, addresses statewide and regional (within Florida) questions, and is used to develop statistical estimates of statewide water quality based on a representative sample. Tier II addresses basin-specific and stream-specific questions, and Tier III addresses site-specific questions. This report focuses on the results of the Tier 1 and Tier II monitoring activities, only.

Statewide Probabilistic Assessment (Tier I)

Cycle 1 of the statewide probabilistic assessment through the Integrated Water Resource Monitoring (IWRM) network began in 2000 and was completed in 2003. As described in Chapter 2, this network does not collect sufficient data at a given station or waterbody to determine use support for individual waterbodies. Instead, the results for each basin are aggregated by waterbody type and assessed against water quality targets to assess the overall health of that type of water in the basin. The results indicate that out of a total of 32, 929 miles of rivers and streams assessed, more than 80 percent met, 2 percent partially met, and almost 18 percent did not meet the water quality targets for for chlorophyll *a*, an indicator of nutrient enrichment. In addition, 50 percent met, about 36 percent partially met, and almost 14 percent did not meet the water quality targets for dissolved oxygen (DO). Fifty-nine percent met, about 15 percent partially met, and about 26 percent did not meet the water quality targets for fecal coliform bacteria.

Our of 1,680 square miles of large lakes assessed, almost 94 percent met, almost 6 percent partially met, and less than 1 percent did not meet the water quality targets for DO. Almost 97 percent met, more than 1 percent partially met, and just over 2 percent did not meet the water quality target for fecal coliform. In addition, more than 54 percent met, almost 24 percent partially met, and almost 22 percent did not meet the target for the Trophic State Index (TSI), an indicator of nutrient enrichment.

Out of 10,630 small lakes assessed, about 90 percent met, 4 percent partially met, and 5 percent did not meet the water quality target for fecal coliform. About 68 percent met, 14 percent partially met, and 18 percent did not meet the water quality target for the TSI. Finally, about 75 percent met, 20 percent partially met, and 5 percent did not meet the water quality target for DO.

Statewide Basin Assessments (Tier II)

This section of the 305(b) report compiles the results of three different types of information. First, it summarizes the assessments under the Impaired Surface Waters Rule methodology that have been completed for the Group 1 and 2 basins. Second, it carries over the 1998 303(d) list of impaired waters for the Group 3, 4, and 5 basins. Third, it provides preliminary, unverified assessment results for waterbodies in the Group 3, 4, and 5 basins that were ***not*** on the 1998 303(d) list.

The methodology used in the basin assessments is based on the Identification of Impaired Surface Waters Rule (IWR), Rule 62-303, Florida Administrative Code (F.A.C.), which provides specific criteria for determining if applicable designated uses (i.e., aquatic life use, shellfish propagation, recreational use, and drinking water use) are being met. The Impaired Surface Waters Rule methodology evaluates available quantitative biological data, exceedances of state criteria for conventional pollutants and toxics, data on nutrient impairment, beach advisory data, shellfish harvesting classification information, and fish consumption advisory information.

Surface Water Monitoring

Florida's Integrated Water Resources Monitoring (IWRM) Network consists of three tiers, ranging from the very general to specific. Tier 1, a probability-based approach (the Status Network), allows FDEP to assess statistically 100 percent of the waters of the state over a 5-year period. An additional statewide fixed station network (the Temporal Variability network) provides complimentary water quality loading information within the basins that links to Status Network monitoring. Monitoring in Tier II, which includes generalized basin assessments and monitoring required to verify waterbody impairment, addresses questions about individual basins or waterbodies. Tier III includes monitoring associated with FDEP's regulatory permits, intensive surveys for TMDL development, and studies designed to verify best management practices (BMPs).

While most of the state's monitoring has historically focused on water chemistry, FDEP has also developed bioassessment procedures that more directly assess whether aquatic life use support is being maintained. Bioassessment tools for streams (the Stream Condition Index and BioReconnaissance [BioRecon]) and lakes (the Lake Condition Index) are completed and being implemented in many of FDEP's monitoring programs. The results are currently used in the basin assessments. The wetland tools are nearing completion. However, an estuarine tool that is applicable statewide has not yet been developed.

Significant Findings

The map on this report's cover graphically displays an important conclusion on Florida's surface water quality: most water quality problems are found in highly urbanized central and south Florida. Problems are evident around the densely populated, major urban centers, including Jacksonville, Orlando, Tampa, Pensacola, Cape Kennedy, and the southeastern Florida coast. Basins with intense agricultural and industrial use are also associated with poor water quality. Water quality in the northwest and west-central sections of the state is better than in other areas.

For this report, FDEP assessed a total of 2,736 miles of rivers and streams, 423,488 acres of lakes, and 1,412 square miles of estuaries. This assessment was conducted in the Group 1 and 2 basins. Of the assessed miles, 47 percent of total river miles, 25 percent of total lake areas, and 17 percent of total estuarine areas meet their designated use. However, many waters had insufficient data for the assessment of designated use.

Major issues of concern include the following:

- *Primary contact and recreation use support and shellfish harvesting use support are sometimes limited by the presence of bacteria in the water column.*
- *In many waters, fish consumption use support is limited by excessive concentrations of mercury in fish tissue.*
- *Sediments in many urban estuaries such as Tampa Bay, the St. Johns River Estuary, and Pensacola Bay contain heavy metals and organic contaminants.*
- *In Florida Bay, algal blooms and extensive mangrove and seagrass dieoffs are important concerns. They likely stem from extensive channeling and hydrologic modifications in the watershed that have reduced freshwater flows to the bay. The lack of flushing from hurricanes, high water temperatures, and high salinity have exacerbated the problems in recent years.*
- *Over the last several years, concern has grown in Florida about the potential public health threat from harmful algal blooms (HABs). Typically caused by excess nutrients, these blooms can produce toxins that are harmful to humans. In general, researchers believe that freshwater algal blooms are increasing in frequency, duration, and magnitude and therefore may be a significant threat to surface drinking water resources and recreational sites (Williams, April 14, 2004). Citizens near the Lower St. Johns River and St. Lucie River Estuary have expressed particular concern about potential blooms of* Pfiesteria piscicida*, which has been documented to cause ulcers in fish and respiratory irritation, skin rashes, and possible neurocognitive disorders in humans in the mid-Atlantic region.* P. piscida *has never been positively identified in the Lower St. Johns, but* Pfiesteria*-like organisms have been found. No* Pfiesteria *or* Pfiesteria*-like events have been documented in Florida. The Florida Marine Research Institute in St. Petersburg has also evaluated coastal waters for* Pfiesteria*, and no samples to date have contained this species.*
- *A relatively new issue of concern in Florida is the presence of the toxigenic blue-green algae called cyanobacteria and their production of cyanotoxins. Blooms of cyanobacteria may produce toxins that can harm humans through exposure to contaminated fish, dermal contact, and even the inhalation of aerosols. Potentially toxigenic cyanobacteria have been found statewide, including river and stream systems such as the St. Johns, Caloosahatchee, Peace, and Kissimmee Rivers. A number of waterbodies in Florida are known to have extremely abundant populations of blue-green algae. These include Lakes Seminole and Tarpon in Pinellas County, Lakes Beauclair and Dora in Lake County, Newnans Lake in Alachua County, Lake Jesup in Seminole County, Lake Okeechobee in Okeechobee, Palm Beach, Hendry, and Glades Counties, and numerous others (Williams, April 14, 2004).*

Frequently, measured concentrations of cyanotoxins have been reported in some post-processed finished water of drinking water facilities in Florida. A few of these concentrations were above the suggested guideline levels. Consistent/persistent low levels of microcystins (0.1 to 1.0 ug/L) have been found in the Harris Chain of Lakes in central Florida and in Lake Okeechobee.

Pollutants Causing Impairment

The main pollutants or parameters causing nonattainment of designated use for streams and rivers include DO, coliform bacteria, nutrients (based on chlorophyll data), mercury, iron, and lead. DO levels often do not meet the water quality criterion. In some cases, these low DO levels are due to algal growth from excess nutrients. However, many systems in Florida have DO concentrations that naturally fall below the Class III criterion of 5 milligrams per liter (mg/L) and may still meet their designated use for aquatic life support. For lakes, nutrients (based on the Trophic State Index), selenium, DO, turbidity, iron, silver, and mercury are the major pollutants causing nonattainment of designated use (based on acreage as opposed to number of lakes). The main pollutants causing nonattainment in estuaries are bacteria (in shellfish), mercury, fecal coliform, nutrients (based on chlorophyll data), DO, copper, and iron.

Sources of Impairment

Because Florida is so populous and has grown so rapidly — especially over the last two decades — runoff from urban development or septic tanks is a major cause of nonpoint pollution. Other sources include agricultural activities (both row crops and animal farming, which are a large part of the state's current and historical economy), unvegetated lands, and atmospheric deposition. Nonpoint pollution is caused when rain washes pollutants off the landscape via stormwater, or causes them to leach into ground water. As it flows over the land and through the ground, runoff may carry nonpoint pollutants from many different sources to lakes, rivers, and estuaries in a watershed, and into ground water supplies. The pollutants in runoff often include nutrients from fertilizers, bacteria, pesticides, sediments, petroleum compounds, and metals.

In the past, most water quality problems resulted from domestic and industrial point sources. These are specific, identifiable sources of pollution discharged to surface waters from discrete, well-defined areas such as a facility discharge from the end of a pipe, a disposal well, or a wastewater sprayfield. They also include landfills, hazardous waste sites, Dry Cleaning Solvent Cleanup Program (DSCP) sites, and petroleum facility discharges, all of which have the potential to leach contaminants into ground water and surface water. While the state does not have extensive industrialization, industrialized urban areas also have the potential to contribute to point source pollution. By implementing new technologies, treating wastes better, reusing treated wastewater, and eliminating many surface water discharges, Florida's point source pollution has significantly diminished.

Surface Water Quality Trends

Changes in water quality are an important indicator of the health of surface waters. Enough data were available to evaluate long-term trends (1994 – 2003) in water quality for 1,861 waterbodies (streams, lakes, and estuaries). Overall, most (about 81 percent) showed no significant trends, while 8 percent improved and 11 percent worsened. The improvements generally resulted from wastewater treatment plant upgrades or new regional wastewater plants and nonpoint source controls in Tampa, Orlando, and several other cities. Worsening trends were found in 102 waterbodies, caused by both point and nonpoint sources, including agriculture and increased land development.

The Temporal Variability (TV) Monitoring Network, consisting of 79 fixed surface water and 46 fixed ground water sites, was specifically designed to provide important information about long-term trends in state water quality. The statistical tests used by this trend monitoring program require adequate data over a long period of record for meaningful analysis. Because the program was initiated in 2000, data are just becoming available for analysis. The results of these investigations of surface water and ground water trends will be presented in future 305(b) reports.

Assessments for Specific Basins and Waterbody Segments (Tier III)

Tier III assessments include monitoring for permit compliance, site specific investigations, fifth-year inspections, and other monitoring, including the results of intensive surveys for TMDL development. The latter are provided in TMDL documents for individual impaired waterbody segments.

Ground Water Quality

Historically, ground water protection efforts focused on investigating and remediating local point sources of contamination to protect potable water supplies. Efforts to control nonpoint source pollution (polluted runoff generated by many different kinds of activities over a large area) centered on monitoring ground water resources affected by agricultural practices and developing agricultural best management practices (BMPs) to reduce nitrate levels in ground water.

Ground water protection is currently being integrating into FDEP's watershed management approach. As part of this effort, the water quality of ground water contributions to surface waterbodies (base flow) is now considered an equally important ground water use to ensure the support of aquatic life in surface waterbodies. This is particularly important in Florida, where ground water can provide as much as 80 percent of the total flow to surface waters.

Assessing ground water quality in every basin in the state has required the development of two new screening tools. The first of these tools, the Ground Water Resource Index (GRI), identifies statistically significant exceedances of ground water standards, based on human health–related criteria. If maximum contaminant levels (MCLs) or risk indicators were exceeded in more than 10 percent of the wells in a basin for any given parameter or indicator group, this would reflect a potentially significant basinwide issue, and the basin would receive a more intensive evaluation. The second screening tool, the Ground Water–Surface Water Relational Assessment (SRA), identifies areas where ground water contributions to surface water have the potential for adverse impacts to aquatic organisms in surface waterbodies. It is based on the percent of wells that exceed parameter-specific thresholds related to the environmental conditions necessary to support healthy aquatic life. More detailed evaluations to quantify ground water contributions to surface water are conducted when more than 10 percent of the wells exceed reference thresholds for a given analyte on a basinwide or subregional basis.

Ground Water Monitoring

Because ground water supplies about 87 percent of Florida's drinking water, Florida is a national leader in protecting this resource. FDEP established a ground water quality monitoring network in 1984, under the authority and direction of the 1983 Water Quality Assurance Act. Data from over 2,900 monitoring wells and 1,300 private water supply wells all the state's main aquifer systems are collected and stored in a database.

In 1999, FDEP initiated a probabilistic sampling Status Network to assess ground water and surface water quality on a basinwide scale. This sampling has been integrated into the agency's watershed management approach. Thus the ground water assessment has been conducted using the 29 surface water basins discussed in Chapter 2. The first round of sampling was initiated in 2000, and over 1,100 wells are evaluated in each watershed management cycle.

Monitoring results for the Ground Water Temporal Variability Network, which also began in 1999, are used to assess seasonal and long-term variability in ground water quality. The Florida Department of Health (FDOH)/FDEP Water Supply Restoration Program's Private Well Sampling Program also gathers private well data to investigate potential ground water contamination. Other, historical monitoring efforts include the Background Network, the Very Intense Study Area (VISA) Network, and FDOH's Private Water Well Quality Survey. More detailed, basin-specific, ground water monitoring includes monitoring required by permits for domestic wastewater facilities of 10,000 gallons or less without a discharge to surface waters, drinking water distribution systems, and potable well sampling.

The evaluation of ground water quality in this report is mainly based on data from the Status and Background Networks. The data were assessed using a comprehensive approach that included six major groups of contaminants: nutrients, biologicals, metals, organic chemicals, saline waters, and surface-water-to-ground-water indicators.

Significant Findings

Ground water quality across the state is remarkably good, considering the state's high population and vulnerable geology, which allows close interactions between surface water and ground water. Water quality is especially good in the Floridan aquifer, which is the major source of drinking water for all but the westernmost and southernmost parts of the state.

Nutrients. Agricultural and urban/home landscaping activities use large quantities of fertilizers that can contaminate ground water. Levels of nitrate greater than the ground water standard are generally limited to localized problems; however, elevated concentrations (above natural background) are appearing on a regional level.

Using the GRI screening, 17 percent (3 out of 23) of the unconfined-aquifer wells in the Kissimmee Basin have maximum concentrations exceeding the nitrate + nitrite MCL. The Kissimmee Basin also has total phosphorus and pesticide issues, which are discussed later in this summary.

Using the SRA screening criteria, 17 out of the 29 basins sampled exceed the threshold for nitrate + nitrite in unconfined aquifers. The data suggest that nitrate + nitrite above the SRA threshold is common in unconfined ground water throughout Florida and could contribute to the eutrophication of surface water where there is an interaction. The Ocklawaha Basin has the largest number and highest percentage of unconfined-aquifer wells exceeding the nitrate + nitrite threshold. For confined-aquifer wells, 7 of the 29 basins exceed the SRA screening criteria. The Ocklawaha and the Ochlockonee–St. Marks Basins have the highest exceedance rate for confined-aquifer wells, with 23 percent of wells over the SRA nitrate threshold. In both of these basins, the confined aquifer can discharge to surface water via natural springs.

Twelve of the 29 basins sampled also exceed the SRA threshold for total phosphorus. Although this may largely reflect the natural abundance of phosphate in many areas of the state, the phosphorus in ground water may also contribute to eutrophication in surface waters.

Biologicals. Of all ground water quality issues, bacterial contamination, which is indicated by elevated total and/or fecal coliform counts, is the most prevalent issue in ground water samples from the Status Network monitoring wells. Over one-third of the basins have significant exceedances of the GRI screening thresholds for total and/or fecal coliform, indicating potential public health issues. Twelve basins exceed the GRI threshold. The Ocklawaha Basin contains the highest percentage and the highest number of unconfined-aquifer wells that exceed the GRI criteria. For confined-aquifer wells, 7 basins exceed GRI thresholds, with the highest percentage and number found in the Sarasota–Peace–Myakka Basin. For the unconfined- and confined-aquifer wells, the data indicate that no basins exceed the SRA threshold.

For the unconfined-aquifer wells, 8 basins exceed GRI screening criteria for fecal coliform. The Ochlockonee–St. Marks Basin has the highest percentage and number of unconfined-aquifer wells exceeding the GRI criteria. For the confined aquifers, 2 basins exceed GRI screening criteria. None of the basins exceeds SRA screening criteria.

The significance of the bacterial contamination in ground water, however, must still be determined. High bacterial counts may be due to improper well construction (e.g., the absence of, or faulty, sanitary seals on residential wells), infrequent maintenance of water well systems (which include well and water storage and distribution systems), improper on-site disposal of domestic or animal wastes, or flooding and surface water infiltration of the water system. These considerations highlight the fact that individual well assessments are necessary, and that in all probability, bacterial issues are localized and may not be an issue outside of the individual wells themselves.

Metals. For the GRI and SRA screening, 17 primary and secondary metals were selected that have either a ground water standard and/or surface water threshold. The primary metals present a risk to human health and/or to aquatic organisms, depending on their concentration, while secondary metals affect the aesthetic properties of potable water and may also present a risk to aquatic organisms, depending on their concentration.

Based on the GRI analysis for primary metals, lead is the metal that most frequently exceeds GRI criteria in unconfined and confined aquifers, potentially posing a concern in basins where it exceeds applicable criteria in more than 10 percent of the wells. Potentially significant levels of lead are present in 23 of 29 basins for wells monitoring unconfined aquifers and 21 basins for confined-aquifer wells. Other metals identified as statistically significant in the unconfined-aquifer wells include cadmium in 7 basins and mercury in 3 basins. Cadmium, mercury, and thallium occur at potentially significant levels relative to the GRI criteria in confined-aquifer wells, but in only 1 or 2 basins. Although no basins exceed the current MCL-based GRI screening for arsenic, 10 basins have potential arsenic GRI exceedances, based on the MCL for arsenic that will be used in the near future.

Based on the GRI analysis for secondary metals, aluminum, iron, and manganese are ubiquitous, exceeding their respective screening criteria in unconfined and confined aquifers in most basins. Strontium is significant in confined-aquifer wells, being above the GRI criteria in 16 basins.

The SRA screening indicates that numerous metals are commonly found in both unconfined and confined ground water wells at levels that exceed aquatic life use support–based criteria for surface water. The following metals are the most prevalent: iron and lead (all basins), copper and zinc (27 basins), mercury (26 basins), cadmium (24 basins), and manganese and silver (20 basins). Several of the same metals are abundant in the wells monitoring confined aquifers in most basins. These include copper, iron, and lead (25 basins); zinc (24 basins); mercury (21 basins); and cadmium (18 basins).

Organics. The data from Background and VISA Network wells contain detections of only a few organic chemicals, correlating with the type of land use in the vicinity of the wells and the limited areal extent of organic contaminant plumes. None of the basins has a greater than 10 percent incidence of samples exceeding a ground water MCL or guidance concentration.

Statewide, the most commonly detected organic chemical compound is benzene, followed by vinyl chloride. Samples from an industrial area in the Pensacola Basin show the greatest number of volatile/semivolatile organics. Most of the pesticide detections are in samples from the Kissimmee Basin, where the most commonly detected pesticide is ethylene dibromide (EDB), a nematocide and fuel additive that is now banned. This is also the only basin in the state where nitrate is a potentially significant issue. No detections of several commonly used pesticides such as malathion are recorded, and endosulfan sulfate is detected in only one instance, in the Southeast Coast–Biscayne Bay Basin.

The data do not show any statewide ground water contamination from organic chemicals. However, localized, site-specific contamination does exist, generally caused by spills or activities before current protection programs were implemented. Typical sources include leaking underground storage tanks, historical landfills, and industrial facilities. More targeted monitoring is needed in areas where these contaminants are likely to be found, particularly where source water may be threatened.

Saline Waters. Saline or mineralized water caused by saltwater intrusion or upwelling can affect regional ground water quality. For unconfined-aquifer wells, 8 basins with coastal areas exceed GRI screening criteria. The highest percentage of unconfined-aquifer wells exceeding criteria is found in the Florida Keys and Everglades Basins. For the confined aquifers, 10 basins exceed GRI screening criteria. However, any potentially significant issue related to saltwater intrusion in the confined aquifer cannot be identified by this initial screening alone.

Ten of the 29 basins exceed SRA screening criteria. These include many of the same coastal basins that exceed GRI criteria. It is believed that the potential for confined, brackish systems to discharge to surface water exists in only 3 basins, where deep, flowing springs are present and/or where artesian pressure may be great enough for wells to flow.

Surface-Water-to-Ground-Water Indicators. Certain parameters can help to identify local areas where ground water concentrations are atypical and more characteristic of surface water. These parameters — which include total dissolved solids, specific conductance, total organic carbon, dissolved oxygen, and bacteria — exhibit a wide discrepancy in typical values between surface water and ground water. While difficult to interpret on a statewide scale, they will be routinely included in more detailed and case-specific evaluations.

CHAPTER 1: STATE OVERVIEW

Florida's 65,758 square miles support abundant, diverse natural resources. Some of these — for example, the Everglades — are found nowhere else. Florida also contains the only emergent coral reef in the continental United States. The state has 11,761 square miles of surface water (ranking third in the country in total water area) and enormous supplies of fresh water in its underground aquifers. Florida depends on water resources in many ways — for example, for its $7 billion fishing and $32 billion tourism industries.

Although the state ranks twenty-second in the country in total land area, it currently ranks fourth in population, and that population continues to grow rapidly. The pressures of population growth and its accompanying development present serious problems. Most Floridians live in coastal areas where less fresh water is available. As development continues, different users vie for water resources. Major challenges include maintaining overall water quality and supplies, protecting public health, satisfying competing and rapidly increasing demands for finite quantities of fresh water, minimizing damage to future water reserves, and ensuring healthy populations of fish and wildlife.

Despite the fact that water is plentiful in many areas, water quantity and quality have emerged as critical issues for this century. In 1950, Florida’s population of 2.8 million used about 2.9 billion gallons per day (bgd) of water of fresh ground water and surface water. In 1995, that number had risen to 7.2 bgd, and consumption is projected to rise to 9.3 billion gallons per day by 2020. In many areas, surface water and ground water quality has been degraded by industrial, residential, and agricultural land uses. Many point sources of pollution such as sewage treatment plant discharges have been eliminated, but contamination from widespread, diffuse nonpoint sources such as urban development and agriculture remains a problem.

This chapter provides background information about Florida’s population, water resources, climate, and physical features. It also describes Florida’s Water Resource Management Program for protecting surface water and ground water.

Atlas

Table 1 summarizes basic information on the state and its surface water resources.

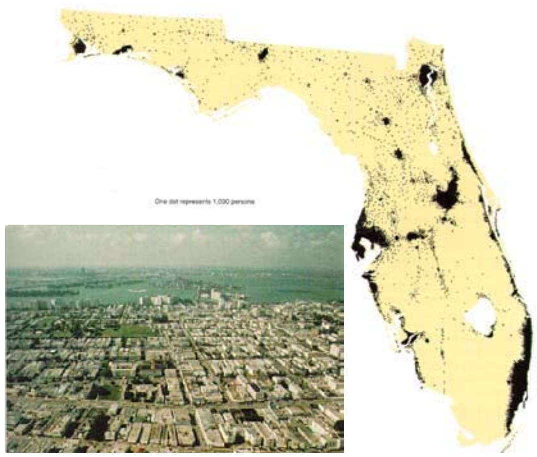
Table 1: 2004 Atlas of Florida

2000 estimated population (U.S. Census Bureau)	**15,982,378 people**
Ranking by population among 50 states	4th largest
Surface area	**65,758 square miles**
Ranking by land area among 50 states	22nd in size
Total water area	**11,761 square miles**
Ranking by total water area among 50 states	3rd largest
Number of U.S. Geological Survey hydrologic units (HUCs)	**52**
Total number of rivers and streams	**More than 1,700**
Total number of river and stream miles	**51,858 miles**
Total border river miles	191 miles
Chattahoochee River	*26 miles*
Perdido River	*65 miles*
St. Marys River	*100 miles*
Total density of rivers/streams	0.89 miles/square mile
Longest river (entirely in Florida)	**St. Johns River (273 miles)**
Largest discharge	**Apalachicola River (average of 24,768 cubic feet per second)**
Perennial streams	**19,705 miles**
Density of perennial streams	0.39 miles/square mile
Intermittent streams	**2,956 miles**
Density of intermittent streams	0.05 miles/square mile
Ditches and canals	**25,909 miles**
Density of ditches and canals	0.44 miles/square mile
Number of lakes, reservoirs, and ponds	**7,712 (area greater than or equal to 10 acres)**
Area of lakes, reservoirs, and ponds	1,618,368 acres
Largest lake	**Lake Okeechobee (435,840 acres)**
Area of estuaries and bays	**4,460 square miles**
Coastal area	**6,758 square miles**
Area of freshwater and tidal wetlands	**17,830 square miles**
Prominent wetlands systems	Everglades and Big Cypress Swamp, Green Swamp, Okefenokee Swamp, Big Bend coastal marshes, St. Johns River marshes
Area of islands greater than 10 acres	**1,314 square miles**
Number of known springs	**More than 700**
Combined spring outflow	8 billion gallons per day
Largest spring	Wakulla Springs (average discharge of 252 million gallons per day [mgd])
Number of first-order magnitude springs (flows greater than 64.6 mgd)	33

Sources: Fernald and Purdum, 1998.

Population

According to the 2000 U.S. census, Florida's population was 15,982,378. Currently the fourth most populous state in the country, it is projected to be the third most populated in the nation by 2025. Within the next two decades, the state's total population is expected to increase by 7.2 million people, the ninth largest population gain in the country. Florida is also expected to gain 1.9 million people through international migration between 1995 and 2025, the third largest net gain in the country.



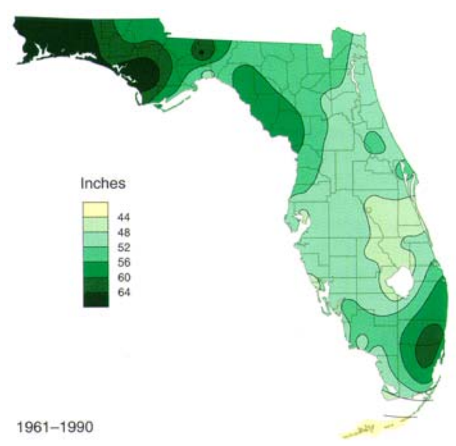
Florida Population, 1990
Source: *Fernald and Purdum,* 1998
Photo: Florida Department of Commerce

As the baby-boom generation (those born between 1946 and 1964) reaches retirement age, the numbers of elderly residents (65 and over) are expected to accelerate rapidly in all states. In Florida, the proportion of elderly is projected to expand from 18.6 percent in1995 to 26.3 percent in 2025. Florida had the country's highest proportion of elderly in 1995 and is also projected to have the highest proportion in 2025.

The state has a number of large, expanding population centers, including southeastern Florida (Dade, Broward, and Palm Beach Counties), Jacksonville, Tampa–St. Petersburg, southwest Florida (from Sarasota to Naples), and Orlando. In contrast, other relatively large areas of Florida are sparsely populated.

Water Resources

Florida has 51,858 miles of streams and rivers (about half of which are ditches and canals). It contains more than 7,700 lakes greater than 10 acres in size, with a total surface area of 1,618,368 acres. The state also has 4,460 square miles of estuaries and a coastline ranking second in length only to Alaska. A line running from the northeast corner of the state to Key West and back up to the northwest corner along the Gulf Coast would extend 1,300 miles. If the distance around barrier islands and estuaries were included, the line would stretch 8,460 miles.



Florida's Average Annual Rainfall, 1961–90
Source: Fernald and Purdum, 1998

The state has more than 1,700 streams and rivers. Differences in climate, hydrogeology, and location all affect their water quality. The longest river entirely in the state is the St. Johns, which flows north as a recognizable stream about 273 miles from the St. Johns Marsh in north St. Lucie County to its mouth at Jacksonville. The river drains a land area equal to about one-sixth of Florida's surface. The Apalachicola River, in the Florida Panhandle, has the largest discharge, averaging almost 25,000 cubic feet per second. Its basin, draining over 19,000 square miles, extends to north Georgia's southern Appalachian Mountains. Also, in the Panhandle, spring discharges give rise to ground water rivers, where the ground water base flow comprises 80 percent of the rivers' flow.

Lakes occupy close to 6 percent of Florida's surface. The largest, Lake Okeechobee (covering 435,840 acres), is the ninth largest lake in surface area in the United States and the second largest freshwater lake wholly within the conterminous United States.[1] Most of the state's lakes are shallow, averaging 7 to 20 feet deep, although many sinkhole lakes and parts of other lakes can be much deeper.

Florida lies on top of a vast underground aquifer system that provides potable water to most of the state's population. Ground water naturally discharges into streams, lakes, wetlands, coastal waters, and springs. Florida has more than 700 known springs, which discharge about 8 billion gallons of water per day. The largest spring by discharge is Wakulla Springs, with an average discharge of 252 million gallons per day (mgd). Florida also contains 33 of the 78 first-magnitude springs (defined as springs that discharge on average at least 64.6 mgd) in the United States. Several river systems in the state originate as spring discharges.

Climate

The state's climate ranges from a transitional zone between temperate and subtropical in the north and northwest, to tropical in the Keys. As a result, Florida's plants and animals are a mix of those from more temperate northern climates and those from the tropical Caribbean. Three hundred native trees and 3,500 vascular plants have been recorded. More than 425 bird species, about half the known species in the United States, can be seen in Florida.

Summers are long, with periods of very warm, humid air. Maximum temperatures average about 90° F., although temperatures of 100° F. or greater can occur in some areas. Winters are generally mild, except when cold fronts move across the state. Frosts and freezes are possible, but typically temperatures do not remain low during the day, and cold weather usually lasts no more than two or three days at a time.

Rainfall across the state varies with location and season. On average, more than 60 inches per year falls in the far northwest and southeast, while the Keys receive about 40 inches annually. This variability can create local water shortages. The heaviest rainfall occurs in northwestern Florida and in a strip 10 to 15 miles inland along the southeast coast.

Except for the northwestern part of the state, most of Florida has a rainy season and a relatively long dry season. In the peninsula, half the average annual rainfall usually falls between June and September. In northwestern Florida, a secondary rainy season occurs in late winter to early spring. The lowest rainfall for most of the state occurs in fall (October and November) and spring (April and May). The varying patterns of rainfall create differences in the timing of high and low discharges from surface waters.

An approximate diagonal line drawn from the mouth of the St. Johns River at the Atlantic Ocean to the boundary of Levy and Dixie Counties on the Gulf of Mexico depicts a climatic river basin divide. North and northwest of the divide, streams have high discharges in spring and late winter (March and April) and low discharges in the fall and early winter (October and November). A second low-water period occurs from May to June. South of the climatic divide, high stream discharges occur in September and October, and low discharges occur from May to June.

Hydrogeology

Surface Water

Most of Florida is relatively flat. The highest elevations are 345 feet near Lakewood, in Walton County in the Panhandle, and 312 feet at Sugarloaf Mountain in the peninsula (Lake County).[2] The longest river,

[1] *Fernald and Purdum, 1998.*
[2] *http://www.americasroof.com/highest/fl.shtml*

the St. Johns on Florida's east coast, only falls about a tenth of a foot per mile from the headwaters to the mouth. Farther south, below Lake Okeechobee, the land relief is less than six feet. Surface drainage and topographic relief are greatest in the streams and rivers entering north and northwest Florida from Alabama and Georgia. Most of these streams are alluvial, or sediment carrying. As the land flattens farther south, surface drainage becomes less distinct. Rivers and streams are typically slower moving, noneroding, and nonalluvial.

Many Florida rivers have their headwaters in wetlands. In its natural setting, the Green Swamp in Central Florida is the headwater for five major river systems: the (South) Withlacoochee, Ocklawaha, Peace, Kissimmee, and Hillsborough. In north Florida, the Suwannee and St. Marys Rivers originate in the Okefenokee Swamp. Throughout the state, smaller streams often disappear into wetlands and later re-emerge as channeled flows.

In the past, many wetlands were drained (for agriculture and urban development), and numerous rivers were channelized for navigation. The modifications were most intense in south Florida where, beginning in the 1920s, canals and levees were built to control flooding and drain wetlands. These modifications resulted in the loss of much of the original Everglades wetlands from Lake Okeechobee south and the channeling of the Kissimmee River.

Ground Water

Florida is in the Coastal Plain physiographic province, which is blanketed by surficial sands and underlain by a thick sequence of bedded limestone and dolomite. Together the surficial sands, limestone, and dolomites form an enormous ground water reservoir that provides proportionally larger quantities of ground water than in any other state.

These sources of high-quality, potable ground water underlying virtually all of Florida supported average withdrawals of more than 4,600 mgd in 1990. This remarkable resource supplies more than 90 percent of Florida's almost 16 million residents with drinking water. In addition, ground water resources supply over 50 percent of all water needs, including agricultural, industrial, mining, and electric power generation.

Florida primarily relies on the following four aquifer systems as drinking water sources:

- *The Floridan aquifer system, one of the most productive sources of ground water in the United States, extends across all of Florida, southern Georgia, and adjoining parts of Alabama and South Carolina. Many public water systems — including Jacksonville, Orlando, Clearwater, St. Petersburg, and Tallahassee— tap into the Floridan. It is also a major supplier of water for industrial, irrigation, and rural use. This aquifer provides 60 percent (2, 790 mgd) of Florida's potable water supplies.*
- *Unnamed surficial and intermediate aquifers, which are present over much of the state, are used when the deeper aquifers contain nonpotable water. They supply water needs for about 10 percent of the population, especially in rural locations. These aquifers provide 20 percent (948 mgd) of the state's potable water supplies.*
- *In southeast Florida, the Biscayne aquifer supplies virtually all the water needs for over 4 million residents in densely populated Dade, Broward, Palm Beach and Monroe Counties. This aquifer provides 18 percent (824 mgd) of Florida's potable water supplies. The EPA has designated the Biscayne Aquifer as a sole source drinking water aquifer.*
- *The sand and gravel aquifer, the major source of water supply in the western part of the Florida Panhandle, provides 2 percent (103 mgd) of Florida's potable water.*

Surface Water–Ground Water Interactions

Florida's low relief coupled with its geologic history have created unique hydrogeologic features. Large areas are characterized by karst topography, which forms when ground water dissolves limestone. Landforms in these areas include streams that disappear underground, springs and seeps where ground water rises to the surface, sinkholes, and caves. Surface water commonly drains underground and later reappears, sometimes in a completely different surface water basin from where it entered the ground. For example, drainage from a large karst area in Marion County provides water for Silver Springs, which discharges to the Ocklawaha River and then to the St. Johns River and the Atlantic Ocean. The same area also provides water for Rainbow Springs, which discharges to the Withlacoochee River and then to the Gulf of Mexico.

Hydrologic Divide
Source: *Fernald and Purdum. 1998*

Florida's sandy soils, high average rainfall, shallow water table, and porous karst terrain promote close and extensive interactions between ground water and surface water. By the same mechanisms, surface waters recharge underground aquifers. The fact that Florida contains more than one-third of the first-magnitude springs in the United States is an indication of significant ground water and surface water interchange. Most lakes and streams receive some ground water, but in a significant number of watersheds, ground water inflow contributes the base flow for streams. In the Springs Coast region of western Florida, for example, ground water provides 70 to 80 percent of the flow in spring runs.

A hydrologic divide interrupts the movement of Florida's ground water and surface water. The divide is represented by an approximate line extending from near Cedar Key on the Gulf Coast to New Smyrna Beach on the Atlantic Coast. Little, if any, surface water or ground water moves across this barrier. Most major rivers north of the line receive part of their discharges from outside Florida, in addition to rain. South of the divide, rain is the sole fresh water source. Hydrologically, the half of Florida lying south of the divide is an island. About 75 percent of the state's population lives in this area in peninsular Florida.

Florida's Water Resource Management Program

Florida's Water Resource Management Program is a comprehensive effort comprising a number of activities and programs. These include the Florida Water Plan, watershed management, water quality standards, management of nonpoint source pollution, wastewater facilities permitting, ambient monitoring, ground water protection, educational programs, and land use management. The Water Resource Management Program also includes extensive FDEP coordination with other agencies and programs, including the Surface Water Improvement and Management (SWIM) Program, run by the five regional water management districts.

Florida Water Plan

In 1972, the Florida legislature, recognizing the importance of the state's water resources, passed the Water Resources Act, Chapter 373, F.S., and the Florida Air and Water Pollution Control Act, Chapter 403, F.S. Many goals and policies in the State Comprehensive Plan, Chapter 187, F.S., also address water resources and natural systems protection. Section 373.036, F.S., outlines the requirements for developing the Florida Water Plan, which is to include the following:

- *FDEP's programs and activities related to water supply, water quality, flood protection, floodplain management, and natural systems;*
- *FDEP's water quality standards for surface water and ground water;*
- *The water management plans of the water management districts; and*
- *The Water Resource Implementation Rule (Rule 62-40, Florida Administrative Code [F.A.C.]), which provides goals, objectives, and guidance for the development and review of programs, rules, and plans relating to water resources.*

Under Florida's water management system, FDEP oversees the water management districts, an approach that balances the need for consistent statewide regulations with regional flexibility. As the primary stewards of the state's water resources, FDEP and the water management districts often must address competing public demands for water supplies, flood protection, water quality, and natural systems protection. To accomplish this, they have developed comprehensive water management plans for each region.

The Florida Water Plan builds on these regional plans to manage water resources. Its overall goal is to ensure the long-term sustainability of Florida's water resources to benefit the state's economy, natural systems, and quality of life. The most recent version of the plan identifies 16 key objectives and contains strategies and action steps to achieve those objectives. The objectives are grouped into 6 areas: watershed management; water supply; flood protection and floodplain management; water quality; natural systems; and management support, coordination, and evaluation. The plan emphasizes a watershed management approach and the need for interagency coordination in achieving statewide water management goals.

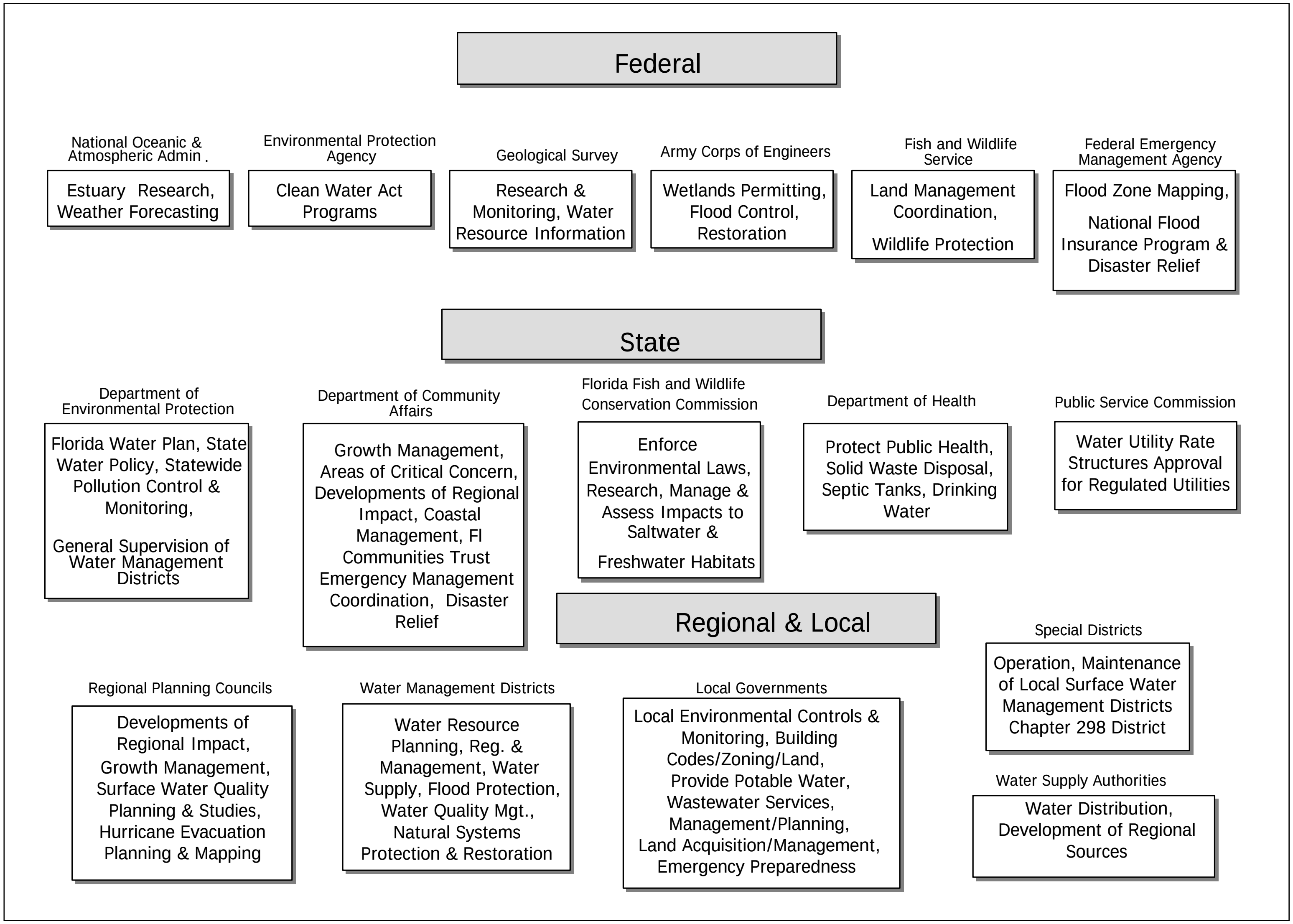
Table 2 lists the primary state, local, and regional coordination mechanisms for managing water resources. ***Figure 1*** shows the agencies responsible for water resource management and coordination in Florida, and lists their principal activities.

Table 2. Primary Coordination Mechanisms for Managing State, Regional, and Local Water Resources

Function/Entity	***Primary Mechanisms***
General supervision over water management districts (policies, plans, and programs) (Florida Department of Environmental Protection)	a. Water Resources Coordinating Commission b. Meetings of the water management districts' executive directors c. Water Resource Implementation Rule (Rule 62-40, Florida Administrative Code, F.A.C.) d. Florida Water Plan/District Water Management Plan (DWMP) work group e. Issue-specific work groups (policy and rule development) f. Reuse Coordinating Committee g. Memoranda of understanding (delegation of programs and authorities) h. Permit streamlining, mitigation banking i. FDEP review of water management district rules and budgets, auditing
Statewide watershed management approach (Florida Department of Environmental Protection)	a. Implementation of rotating watershed management cycle for assessing the state's river basins b. Process for verifying impaired waterbodies in each basin c. Development of total maximum daily loads (TMDLs) for verified impaired waters d. Adaptive management
State Comprehensive Plan (Governor's Office)	Overall coordination by Governor's Office
State Land Development Plan (Florida Department of Community Affairs)	Interagency Planning Committees
Florida Transportation Plan (Florida Department of Transportation)	Interagency plan review process
Strategic regional policy plans (Regional Planning Councils)	a. Florida Water Plan/DWMP work group b. Plan review process (Subsection 186.507[2], F.S., and Rule 27E-5, F.A.C.)
Agricultural interests (Florida Department of Agriculture and Consumer Services)	Agricultural Water Policy Committee
Local comprehensive plans (Florida Department of Community Affairs)	Plan review process (Rule 9J-5, F.A.C.)
Water supply planning, wastewater management, stormwater management, solid waste management (Local governments)	FDEP and water management district programs for technical and financial assistance
Reuse of reclaimed water (Florida Department of Environmental Protection, water management districts, Florida Department of Community Affairs, Florida Department of Transportation, Public Service Commission)	Reuse Coordinating Committee

Function/Entity	***Primary Mechanisms***
U.S. Army Corps of Engineers	a. Public works program b. State clearinghouse review process c. Quarterly meetings between FDEP and the Corps d. Joint FDEP/Corps permit application process (Clean Water Act, Section 404) e. Memoranda of understanding f. Potential delegation of Section 404 permitting to FDEP
U.S. Environmental Protection Agency	a. U.S. Environmental Protection Agency (EPA)/FDEP yearly work plans and grants b. EPA technical assistance and special projects c. Delegation of EPA/Clean Water Act programs to FDEP
National Oceanic and Atmospheric Administration	a. Grants b. Cooperative agreements and special projects
U.S. Geological Survey	a. Contracts for technical services and data b. Cooperative agreements
U.S. Department of Agriculture Natural Resource Conservation Service (formerly Soil Conservation Service)	Contracts for technical services and data
U.S. Forest Service	Ecosystem Management teams
U.S. Fish and Wildlife Service	a. Acquisition programs b. Ecosystem Management teams c. Special projects
National Park Service	a. Acquisition programs b. Ecosystem Management teams
Alabama and Georgia	a. Memorandum of Agreement for Apalachicola–Chattahoochee–Flint/Alabama–Coosa–Tallapoosa Rivers Comprehensive Study b. Suwannee River Coordinating Committee c. St. Marys River Management Committee d. Florida–Alabama Water Resources Coordinating Council

Figure 1. Agencies Responsible for Water Resource Coordination and Management in Florida



Coordination with Other Agencies

Carrying out Florida's Water Resource Management Program requires coordination among governmental entities and agencies across state lines and in Florida.

Interstate Coordination. Section 403.60, F.S., authorizes the Governor to enter into interstate environmental agreements or compacts. The following coordinated efforts are currently under way:

1. *In 1997, Florida, Alabama, Georgia, and the federal government signed the Apalachicola–Chattahoochee–Flint (ACF) Basin Compact, a formal agreement to develop and maintain an equitable allocation of water in the ACF Basin. The compact expired in 2003 without an agreement on a water allocation.*

2. *In 1993, Nassau and Baker Counties in Florida and Charlton and Camden Counties in Georgia formed the St. Marys River Management Committee to identify water quality issues and protect the long-term environmental and economic resources of the St. Marys River.*

3. *Several years ago, the Florida and Alabama legislatures created the Florida–Alabama Water Resources Coordinating Council to collaborate in managing a shared resource, the Perdido River. FDEP and the Alabama Department of Environmental Management co-chair the council.*

4. *The Suwannee Basin Interagency Alliance coordinates interstate natural resource management in that basin. Florida and Georgia cochair the alliance, and a variety of federal, state, and regional agencies participates.*

Interagency Coordination. FDEP, in cooperation with the water management districts, is generally responsible for protecting the state's water resources. Sections 373.016 and 373.026, F.S., give FDEP authority to oversee the Water management districts, while the districts have authority over managing water quantity for flood control and protecting natural resources. In many cases, FDEP has formally delegated pollution control and prevention to local agencies. The following describes some of these agencies and major activities coordinated with FDEP:

1. *Many FDEP regulatory programs share responsibilities with the water management districts and local governments, or have delegated responsibilities to them under Chapters 253, 373, 376, and 403, F.S., and Chapter 62, F.A.C. Local governments include counties and municipalities. Rule 62-101 and Section 62-113.100, F.A.C., describe the delegations. FDEP coordinates and delegates pollution control programs to the water management districts and local governments.*

2. *The Florida Fish and Wildlife Conservation Commission (FWC) conducts monitoring and research into freshwater and anadromous fish, endangered species, and game and nongame wildlife. It also manages the state's freshwater fisheries and identifies regionally significant freshwater habitats. FDEP delegates to the commission the enforcement of some air and water pollution control laws (under Chapter 403, F.S.). FDEP may in turn report violations of Chapter 372, which authorizes wildlife management and regulation, to the commission. FDEP, the Florida Department of Health (FDOH), and the FWC jointly address concerns about mercury and other contaminants of Florida freshwater and marine fisheries. FDEP and the FWC routinely collect and analyze fish for mercury in a number of areas in Florida to define the geographic scope and severity of mercury levels in fish. FDOH takes the lead in issuing consumption advisories for fish caught in Florida waters; these advisories provide guidance on the types and amounts of fish that are unsafe to eat.*

3. *The Florida Department of Community Affairs is responsible for developing the State Land Development Plan, which must be consistent with the State Comprehensive Plan and compatible*

with the Florida Water Plan. The agency also reviews and certifies local government comprehensive plans for conformity with state planning requirements.

4. *FDOH manages statewide programs to protect public health. FDEP has delegated authority to FDOH to issue permits for individual domestic wastewater disposal facilities up to 10,000 gallons per day, without a discharge to surface waters, and to authorize the application of pesticides to waters of the state for insect control.*

   FDEP also delegates authority for drinking water distribution systems to some county public health units. FDEP coordinates with FDOH on a potable well–sampling program that restores or replaces potable water systems or potable private wells where contamination from pollutants is causing a health hazard. The county public health units, supported by FDOH funding, carry out sampling to identify contaminated drinking water wells. To optimize resources, wells are sampled in areas of known or suspected contamination, such as agricultural areas, near underground storage tanks, or near known contamination sites. To qualify for restoration, water sampling results must show that the contaminants in the potable water supply exceed a maximum contaminant level (MCL), or health advisory level, or that FDOH has determined the results indicate a health hazard. Restoration decisions are based on various options to determine the most cost-effective solution; these can include installing filter units on the affected wells, extending potable water supply to the affected wells, or connecting to a public water system. The legislature established this sampling and restoration program in 1983 (Chapter 376.30, F.S.).

5. *The Florida Department of Transportation prepares the Florida Transportation Plan, which has significant implications for protecting water resources and must be compatible with the Florida Water Plan.*

6. *FDEP delegates the permitting and enforcement of open burning rules, as well as the testing and certification of gasoline tank trucks and storage tanks, to the Florida Department of Agriculture and Consumer Services.*

7. *The Florida Department of Agriculture and Consumer Services is the state lead agency for pesticides. FDEP participates in the monthly review of pesticide registrations, coordinates other pesticide issues through the interagency Pesticide Management Review Group, and has a representative on the statewide Pesticide Review Council, which serves as a public forum for pesticide issues.*

8. *FDEP developed minimum construction standards for water wells, and the water management districts implement the permitting and enforcement provisions under a delegation agreement.*

The Watershed Management Approach

Watershed management is a comprehensive approach to managing water resources on the basis of hydrologic units — which are natural boundaries such as river basins — rather than arbitrary political or regulatory boundaries. On a simple level, Florida's watershed management approach provides a mechanism to focus resources on specific units (river or estuary basins) rather than trying to work on all state waters at one time. An important feature is the involvement of all the stakeholders who have an interest in an individual basin, in a cooperative effort to define, prioritize, and resolve water quality problems. Existing programs are coordinated to manage basin resources without duplicated effort.

FDEP's Division of Water Resource Management, Bureau of Watershed Management, is responsible for implementing and coordinating watershed management activities. The key components of this approach include the following:

- *The **basin management unit,** or geographic or spatial unit, is used to divide the state into smaller areas for assessment — generally groups of hydrologic unit codes (HUCs). HUCs are a nationwide cataloging system commonly used for watershed assessment and management. They provide a common framework for delineating watersheds and their boundaries at different geographic scales.*

- *A five-year **watershed management cycle** provides a set schedule that organizes work activities and helps to ensure that all waters are addressed in a timely manner. At the conclusion of the cycle, the process begins anew, allowing basin managers and stakeholders to respond to changing conditions or adjust strategies that have not performed as anticipated. The cycle was initiated in the state on July 1, 2000.*

- *A **Basin Management Action Plan,** or BMAP, developed for each basin in cooperation with stakeholders and local communities, coordinates and guides management actions. Other plans that provide reasonable assurance that water quality goals will be met may also be used. The BMAP specifies how pollutant loadings from point and nonpoint sources of pollution will be allocated and reduced to meet total maximum daily load (TMDL) requirements. A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet the waterbody's designated uses (such as recreation or drinking water use).*

- ***Forums and communication networks** help participants collect information, fill data gaps, and reach a consensus on solutions to the basin's problems.*

- *A statewide **basin rotation schedule** ensures that each of the state's river basins is assessed every five years.*

To implement the watershed management approach, Florida's 52 basins (51 hydrologic unit codes [HUCs] plus the Florida Keys) have been divided into 29 groupings. These have been further subdivided into 5 groups within each of FDEP's 6 districts statewide. There are 5 basins each in the Northwest, Northeast, Southwest, South, and Southeast Districts, and 4 basins in the Central District. Each district assesses 1 basin each year. The order and specific time frame for evaluating each basin in each district is based on a number of priority factors, including watersheds that contain surface water sources of drinking water, watersheds requiring TMDL development, and watersheds where SWIM plans are proposed or under way. Chapter 2 includes a more detailed description of the assessment process under the watershed management approach.

Surface Water Improvement and Management Program

In 1987, the Florida legislature passed the Surface Water Improvement and Management (SWIM) Act, Sections 373.451 through 373.4595, F.S. The act directed the state to develop management and restoration plans for preserving or restoring priority waterbodies. The legislation designated 6 SWIM waterbodies: Lake Apopka, Tampa Bay, Indian River Lagoon, Biscayne Bay, Lower St. Johns River, and Lake Okeechobee. Today, SWIM plans have been developed for 30 waterbodies statewide.

The SWIM Program addresses a waterbody's needs as a system of connected resources, rather than isolated wetlands or waterbodies. Its goals are protecting water quality and natural systems, creating governmental and other partnerships, and managing watersheds. While FDEP oversees the program, the water management districts are responsible for its implementation — including developing lists of additional high-priority waterbodies and waterbody plans (outlined under Rule 62-43, F.A.C.). The districts also provide matching funds for state revenues. In a collaborative effort, other federal and state agencies, local governments, and the private sector provide funds or in-kind services.

SWIM plans must contain the following:

- *A description of the waterbody;*
- *A list of governmental agencies with jurisdiction;*
- *A description of land uses;*
- *A list of point and nonpoint source discharges;*
- *Restoration strategies;*
- *Research or feasibility studies needed to support restoration strategies;*
- *A restoration schedule;*
- *An estimate of costs; and*
- *Plans for interagency coordination and environmental education.*

Pollutant Load Reduction Goals

A pollutant load reduction goal (PLRG) is an estimated reduction in stormwater pollutant loadings needed to preserve or restore designated uses in SWIM waterbodies that receive stormwater. Ultimately, water quality in a receiving water should meet state water quality standards, and PLRGs provide benchmarks toward which specific strategies can be directed. Interim PLRGs are best-judgment estimates of the pollution reductions from specific corrective actions. Final PLRGs are goals needed to maintain water quality standards.

The Water Resource Implementation Rule (Rule 62-40, F.A.C.) requires the water management districts to establish PLRGs for SWIM priority waters and other waterbodies, and include them as part of a SWIM plan, other watershed management plan, or districtwide or basin-specific rules.

Nonpoint Source Program

Florida established its first stormwater rules in 1979 and its first stormwater permitting program in 1982 (Rule 17-25, F.A.C.). While FDEP established and administers the stormwater rule, it has delegated permitting authority to four of the five water management districts (all except the Northwest Florida Water Management District). New developments, except for single-family dwellings, and modifications to existing discharges must obtain stormwater permits. Projects must include a stormwater management system that provides flood control and best management practices (BMPs) such as retention, detention, or wetland filtration to reduce stormwater pollutants. These BMPs are designed to remove at least 80 percent of the total suspended solids (TSS) pollutant loading. For Outstanding Florida Waters (OFWs), some other sensitive waters (such as shellfish-harvesting areas), and waters that are below standards, BMPs must be designed to remove 95 percent of the TSS loading.

A 1989 stormwater law directed FDEP to establish statewide goals for treatment and to oversee the implementation of regulatory programs, which were also delegated to the water management districts. Delegation allows minor design adjustments for Florida’s diverse landscape. In 1993, the legislature modified portions of Chapters 373 and 403, F.S., to streamline permitting. The Wetlands Resource Permit and the Management and Storage of Surface Water (MSSW) Permit were unified into a single Environmental Resource Permit to increase statewide consistency in minimizing the impacts of new land uses.

Point Source Permitting

Florida's well-established wastewater facility permitting program was revised in 1995 when the EPA authorized FDEP to administer a partial National Pollutant Discharge Elimination System (NPDES) Program, and then was expanded again in 2000 when the EPA authorized FDEP to administer the NPDES Stormwater Program. While the federal program only regulates discharges to surface waters, the state wastewater program issues permits for facilities that discharge to either surface water or ground water. Of 4,773 wastewater facilities in Florida, only 539 are permitted to discharge to state surface waters under individual permits. While an additional 343 facilities discharge to surface water under general permit authorization (and many others discharge stormwater to surface water under the NPDES Stormwater Program), most wastewater facilities in Florida discharge to ground water.

An important component of Florida’s wastewater management is the encouragement and promotion of reuse. In fact, the current reuse capacity (year 2000 data) represents about 51 percent of the total permitted domestic wastewater treatment capacity in Florida.

FDEP's district offices handle most of the permitting process, with the Tallahassee office overseeing the program, providing technical assistance, and coordinating with the EPA. The Tallahassee office also oversees the administrative relief mechanisms for applicants that are allowed under Florida law, as well as permits for steam electric–generating power plants that discharge to waters of the state. Wastewater permits, issued for up to five years, set effluent limits and monitoring requirements to provide reasonable assurance that water quality criteria will be met. A permit may allow a mixing zone when there is enough dilution to ensure that a waterbody's designated use will not be affected. In other special cases, a variance or exemption allows certain water quality standards to be exceeded. Facilities that cannot comply with new requirements may be issued or reissued a permit containing the effluent limitations to be met and an administrative order setting out the steps required to achieve compliance. This procedure applies only to facilities complying with an existing permit, and is not used in lieu of enforcement when a permittee is out of compliance with an existing permit or operating without a required permit.

All facilities must meet, at a minimum, appropriate technology-based effluent limitations. In many cases, water quality–based effluent limitations (WQBELs) may also be necessary. Two types of WQBELs are used (as defined in Rule 62-650, F.A.C.). Level I WQBELs are generally based on more simplified evaluations for streams and for permit renewals. To determine Level II WQBELs, which are typically calculated for more complicated situations, a waterbody is generally sampled intensively and computer models are used to predict its response to the facility’s discharge.

Ground water discharge permits address an array of discharge options, including sprayfields, percolation ponds, and injection wells. Direct discharge to ground water through wells is not allowed, except through the Underground Injection Control (UIC) Program. Ground water discharges are provided a ”zone of discharge” where ground water standards are not applied and the attenuation and dilution of contaminants occurs in the surficial aquifer. Zones of discharge are typically the lesser of 100 feet in diameter or the facility’s property boundary in areal extent, and vertically to the top of the next aquifer unit. Ground water monitoring plans are required to ensure that ground water flowing from the zone of discharge complies with ground water standards. Monitoring plans comprise upgradient background wells and downgradient compliance wells, and generally require quarterly monitoring. There are provisions for exemptions from individual ground water quality standards that allow certain standards to be exceeded. Historically, these have been primarily granted for the sodium standard in coastal areas.

Permit Compliance

FDEP's objective in permit compliance is to protect the quality of Florida's surface water and ground water by identifying pollution sources that do not meet water quality standards or specific permit conditions. To manage the state's wastewater facilities safely and adequately, the agency's compliance evaluation strategy, established as part of the annual state program plan, is based on its wastewater facilities compliance strategy ***(Table 3).*** Staff in FDEP's Division of Water Resource Management schedule compliance inspections based on each facility's permit expiration date (permits are issued for five years).

While the type and frequency of inspections are based on the staff available in each district office, all major facilities (as defined by the EPA) are inspected each year with at least a Compliance Evaluation Inspection. In the final year of the permit, in preparation for permit renewal and depending on its operating history, a facility may be subject to a rigorous Fifth-Year Inspection that includes five different types of inspections ***(Table 3).***

Table 3. Wastewater Facilities Compliance Strategy

Permit Year	***Inspection Type***
1	Performance Audit Inspection (PAI)
2	Compliance Evaluation Inspection (CEI)
3	Compliance Evaluation Inspection (CEI)
4	Compliance Evaluation Inspection (CEI)
5	Compliance Sampling Inspection (CSI)
5	Toxic Sampling Inspection (XSI)
5	Compliance Biomonitoring Inspection (CBI)
5	Impact Bioassessment Inspection (IBI)
5	Water Quality Inspection (WQI)

District compliance and enforcement staff make every effort to work with a permittee to resolve minor problems before beginning formal enforcement action. During inspections, it is the FDEP district staff's role to determine a facility's compliance with, or violations of, compliance schedules and permit conditions. Staff also verify the accuracy of facility records and reports, plant operation and maintenance requirements, effluent quality data, and the general reliability of the self-monitoring program under the permit.

Enforcement

FDEP enforces Florida's surface water quality standards under a formal Memorandum of Agreement with the EPA. The state follows the EPA's Enforcement Management System and the guidelines set out in the EPA document, *Technical Review Criteria and Enforcement Response Guide*. Using this structure, FDEP district staff investigate and document all violations, issue noncompliance and warning letters, conduct informal conferences, prepare case reports, and testify at administrative and judicial hearings.

When formal enforcement is necessary, staff attempt to negotiate a consent order — a type of administrative order in which civil penalties (such as fines) for noncompliance can be assessed. Consent orders also establish step-by-step schedules for complying with permit conditions and Florida law.

In 2001, the Florida legislature enacted the Environmental Litigation Reform Act (ELRA), which is intended to provide a fair, consistent, and expedient method for determining appropriate penalty amounts for violations. If a settlement cannot be reached through the consent order process, FDEP has the authority to issue a Notice of Violation (NOV) to collect penalties (up to $10,000), as specified in ELRA. The NOV can also be used when only corrective actions are needed and no penalties are being sought. When a serious violation endangers human health or welfare or the environment, FDEP issues a complaint for injunctive relief or takes other legal action, including an immediate final order for corrective action.

Healthy Beaches Program

Since 2000, FDOH has been monitoring Florida's coastal beaches for fecal coliform and enterococci as part of the Florida Healthy Beaches Program. While these bacteria may not necessarily be pathogenic, they are useful indicators of probable fecal contamination. Until 2002, the program collected water samples every 2 weeks, but an EPA grant has allowed the program to collect weekly samples at 305 sample sites in the state's 34 coastal counties since that time.

If a sampling event results in a "poor" bacterial indicator result in a single sample, then the county health department immediately collects a resample. If the resample confirms the high result, then an advisory or warning is issued, signs are posted parallel to the sample point, the results are posted on FDOH's Web site, and the news media are notified. If the county health department cannot collect a timely resample, it issues an advisory or warning with the first "poor" result obtained. Sampling events resulting in a "poor" classification normally require resampling. Current and historical results for all of Florida's coastal counties are available at http://apps3.doh.state.fl.us/env/beach/webout/default.cfm.

Major Ground Water Protection Programs

Florida's goal is to protect all its ground water, in shallow, intermediate, and deep aquifers. The state has been working since 1979 to implement programs that are comprehensive as well as integrated with one another. Twenty-six programs — either established or under development — are in place to protect, manage, or assess ground water. ***Table 4*** lists the state's ground water programs and protection activities and their status in early 2004. The Wellhead Protection Program, Source Water Assessment and Protection and Underground Injection Control Programs are approved by the EPA. FDEP is maintaining geographic information system (GIS) databases for the different programs. The ability to assess data spatially for compliance and analyze specific sites will improve the quality of future reports.

Table 4. Summary of State Ground Water Protection Programs

Programs or Activities	***Implementation Status***	***Responsible State Agency***
Active Superfund Amendments and Reauthorization Act (SARA) Title III Program	Established	FDEP*/FDCA
Ambient ground water monitoring system	Established	FDEP*/WMD
Aquifer vulnerability assessment	Continuing effort	FDEP*/WMD
Aquifer mapping	Under development	WMD/FGS
Aquifer characterization	Under development	FGS*/WMD
Comprehensive data management system	Evolving	FDEP
Ground water discharge permits	Established	FDEP
Ground water best management practices (BMPs)	Established	FDEP*/WMD/ FDACS
Ground water legislation	Established	FDEP*/WMD
Ground water classification	Established	FDEP
Ground water quality standards	Established	FDEP
Interagency coordination for ground water protection initiatives	Established	FDEP*/WMD
Nonpoint source controls	Established	FDEP*/WMD
Pesticide State Management Plan	Under development	FDACS*
Pollution Prevention Program	Established	FDEP
Resource Conservation and Recovery Act (RCRA)	Established	FDEP

Programs or Activities	*Implementation Status*	*Responsible State Agency*
Primacy		
Source Water Assessment and Protection Program (SWAPP)	Under development	FDEP
State Superfund	Continuing effort	FDEP
State RCRA Program incorporating more stringent requirements than RCRA primacy	Established	FDEP
State septic system regulations	Established	FDEP
Underground storage tank installation requirements	Established	FDEP
Underground Storage Tank Remediation Fund	Established	FDEP
Underground Storage Tank Permit Program	Established	FDEP
Underground Injection Control Program	Established	FDEP
Vulnerability assessment for drinking water/ wellhead protection	Established	FDEP
Well abandonment regulations	Established	WMD
Wellhead Protection Program (EPA-approved)	Established	FDEP
Well installation regulations	Established	WMD*/FDEP

*****Agency with primary responsibility for this activity

FDACS –Florida Department of Agriculture and Consumer Services
FDCA – Florida Department of Community Affairs
FDEP – Florida Department of Environmental Protection
FGS – FDEP's Florida Geological Survey
WMD – Florida's water management districts

Source Water Assessment and Protection Program (SWAPP)

Passed by Congress in 1974, the Safe Drinking Water Act was created to protect public health by regulating the nation's public drinking water supply. The law establishes national standards and practices to prevent the contamination of drinking water and ensure that the public has safe and reliable sources of water. In 1996, the act was amended to include the Source Water Assessment and Protection Program (SWAPP).

All 50 states participate in SWAPP. FDEP is responsible for implementing SWAPP in Florida. The program covers all public water systems in the state. SWAPP does not cover private potable (household) wells, systems serving less than 25 people, or bottled or vended water. SWAPP's specific purposes are as follows:

- *Assess and report potential source water contaminants and threats to public water systems;*
- *Identify potential sources of contaminants in an area;*
- *Determine the susceptibility of the water supply to any potential contaminants identified; and*
- *Notify the public and explain the significance of any identified potential contaminants.*

Florida has more than 6,500 public water systems, supplying water from about 12,000 individual wells or surface water intakes. The primary source of water for most public water systems is ground water. Only 21 public water systems produce drinking water from surface waters.

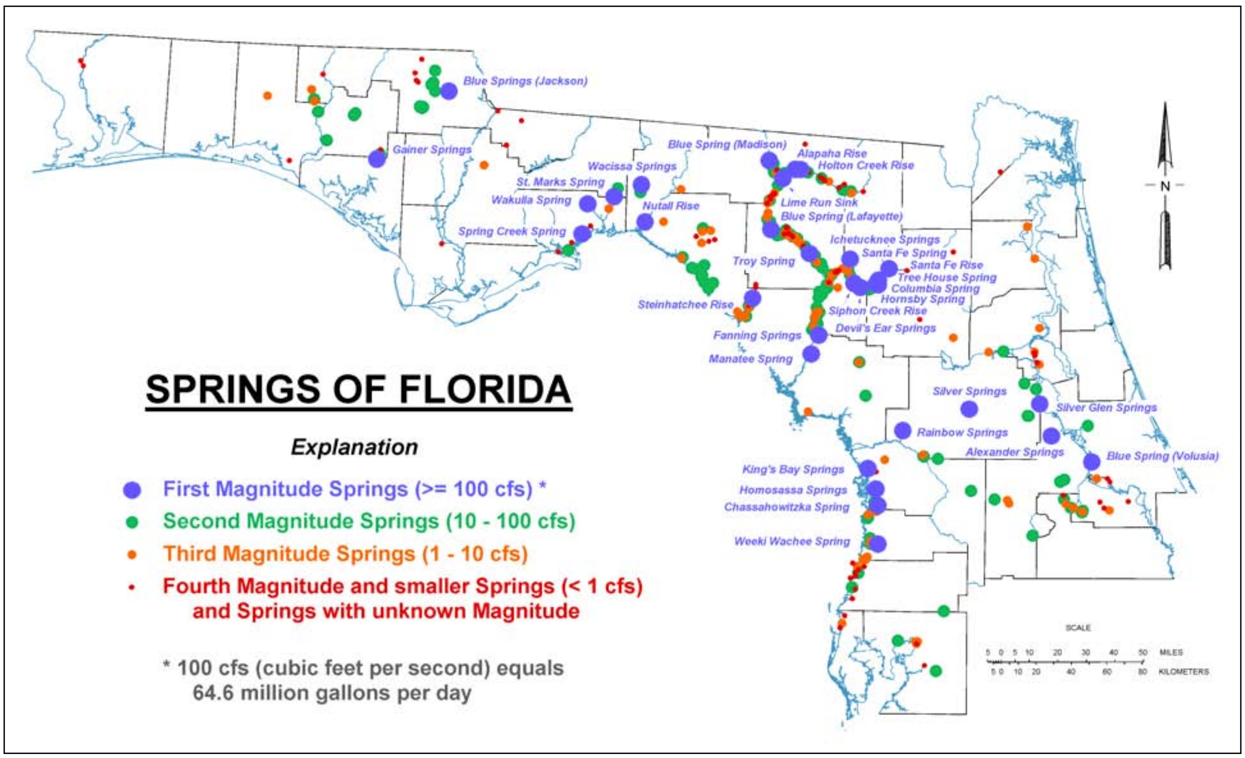
Potential sources of contamination are defined as facilities, sites, and activities that may affect the underlying ground water or nearby surface waters used for public drinking water. FDEP maintains information about many of these sources already through its regulatory programs. By using databases and GIS technology, FDEP is able to identify relationships of potential contaminant sources to approximately 12,000 public water supply intakes in Florida.

In 2003, Florida completed the first source water assessments, in the Suwannee, St. Marks, and Ochlockonee River Basins. Out of more than 400 public water systems assessed, 283 had no potential sources of contamination in their assessment areas. Florida will complete the remaining assessments in 2004. All results will be available at www.dep.state.fl.us/swapp and are searchable by county.

Florida Springs Initiative

Hydrogeologists estimate that there are more than 700 springs in the state ***(Figure 2)***, representing what may be the largest concentration of freshwater springs on Earth. Archaeological evidence indicates that humans have been attracted to Florida's life-giving springs for thousands of years. Florida's 14 state parks that are named for springs attracted over 2 million visitors in 1999. Private spring attractions and parks are a multimillion-dollar tourist industry.

Figure 2. Springs of Florida



Between 1950 and 1990, Florida's population more than quadrupled, and it continues to increase. With growth has come an unavoidable rise in water use, as well as extensive land use changes. During the twentieth century, flow discharge reductions were noted in many Florida springs and, since the 1970s, scientists have documented a decline in water quality in most springs, particularly increased levels of nitrate. Other threats include excessive recreational use and contaminants.

In 1999, the Secretary of FDEP directed the formation of a multiagency Florida Springs Task Force to recommend strategies for protecting and restoring Florida's springs. In 2000, the task force published its findings and recommendations in a report, *Florida's Springs: Strategies for Protection and Restoration* (available at http://www.dep.state.fl.us/springs/reports/floridaspringsreport.pdf).

In 2001, the Florida Springs Task Force II was formed to guide implementation of the "Action Steps" in the report. During the same year, the Florida legislature, with the support of the Governor and FDEP's Secretary, allocated approximately $2.5 million to begin the process of protecting and restoring Florida's springs. Funding was continued in 2002 and 2003. As of 2003, approximately $7.5 million had been spent in three broad areas: research and monitoring, landowner assistance, and educational outreach. Some of these projects, which will provide data for future 305(b) assessments, include the following:

- *A quarterly trend-monitoring network, designed to depict long-term trends, that includes all of Florida's clear-water first-magnitude springs (flows of 100 cubic feet per second [cfs] and greater) and several second-magnitude springs (flows of 10 to100 cfs). Although this quarterly springs network is not part of the Temporal Variability Network discussed in Chapter 3, the same analytes are collected during the same months. No data are available because the network has been in operation for only a year and a half, and at least three years of data are needed to begin trend analysis.*
- *Biannual to annual biological assessments in spring runs using FDEP's Stream Condition Index.*
- *The establishment of continuous stage and flow gaging stations in most first-magnitude spring runs.*
- *The installation of continuous flow metering in selected spring caves.*
- *The delineation of ground water basins for major spring systems ("springsheds").*
- *Biological baseline studies in underwater cave systems and spring runs.*
- *Spring-specific ecosystem studies.*
- *The updating of spring inventories.*

The results of research and monitoring data are used to direct landowner assistance projects aimed at increasing springs protection. Projects funded through the Florida Springs Initiative include nutrient abatement projects such as upgrading and relocating septic systems, fencing off sensitive areas to cattle, removing invasive, non-native aquatic plants, and implementing agricultural BMPs. The physical restoration of springs and spring runs has also been a priority, and rules to protect state sovereignty springs have been developed and enacted. Educational projects have included producing informational booklets and flyers, creating spring-specific local working groups, constructing kiosks at highly visited springs, developing the award-winning interactive Web site, www.floridasprings.org, and sponsoring the PBS film *Water's Journey – The Hidden Rivers of Florida.* A state-approved educational effort centered around the film and associated Web resources is under development and will be included in the curriculum of all Florida public schools.

CHAPTER 2: SURFACE WATER QUALITY ASSESSMENT

Overview

Florida's Tiered Monitoring Approach

Surface water monitoring in Florida is organized at different scales, ranging from the general to the specific. This approach is commonly referred to as tiered monitoring. FDEP's Integrated Water Resource Monitoring Strategy (IWRMS) uses three tiers for carrying out its water monitoring activities. Tier I addresses statewide and regional (within Florida) questions, while Tiers II and III investigate local water quality conditions to characterize the "health" of an individual system and to determine the location, extent, and severity of the problem in areas where water quality thresholds are not met. The specific activities associated with each tier of monitoring are as follows:

- *Tier I consists of a Status Network and a Trend Network. The Status Network uses a probabilistic monitoring design to estimate water quality across the entire state, based on a representative subsample of water resources. FDEP's Trend Network or Temporal Variability (TV) Network uses a fixed station design to examine changes in water quality and flow over time throughout the state. The objective of these networks is to provide scientifically defensible information on the important chemical, physical, and biological characteristics of surface waters and aquifer systems of Florida. Both networks are designed to measure condition using a variety of threshold values, including water quality standards, water quality indices, and other appropriate ecological indicators. It should be noted that, because of specific guidance in the IWR, the term "attainment" is not used when comparing water quality results with thresholds. Rather, the estimate of statewide condition for Tier I monitoring is whether a particular analyte meets the threshold, or whether it is above or below the threshold.*
- *Tier II includes strategic monitoring designed to address questions in specific basins and stream segments that are associated with determinations of imparirment for the TMDL Program. It also includes all of the extensive monitoring activities for FDEP's Springs Initiative which was discussed in the preceding chapter. Monitoring in response to citizen concerns and environmental emergencies is also considered Tier II.*
- *Tier III generally answers site-specific questions that are regulatory in nature. Examples of Tier III activities include monitoring to determine whether site-specific alternative criteria (SSACs) should apply to certain waters, monitoring tied to regulatory permits issued by FDEP, monitoring to establish TMDLs, and monitoring to evaluate the effectiveness of best management practices (BMPs). Tier III monitoring can include monitoring activities for specific studies of state water quality standards that are under evaluation for revision, or new development.*

Because the assessment results discussed in this chapter are based on information from the three tiers of monitoring activities, the chapter follows the same organizational structure—that is, from general to specific. The chapter first provides the conceptual framework for understanding the monitoring results. The two principal elements of the framework are assessment of designated use attainment and Florida's surface water quality standards. Preliminary results for the statewide probabilistic assessment on whether thresholds used for assessment are met (Tier I monitoring) are presented, as well as a description of the monitoring design for Cycle 1, water resource types, sampling schedule, and analytes and indicators sampled. Next, the chapter provides an overview of the statewide basin assessments (Tier II monitoring), including a discussion of the implementation of FDEP's watershed management approach. Detailed assessments are provided for different waterbody types (rivers and streams, lakes, and estuaries). The causes of nonattainment of designated use, long-term water quality trends, and major water quality issues are also discussed for each waterbody type. Although no comprehensive monitoring network exists for wetlands, an inventory of major wetlands and historical coverage of wetlands in the state is provided, along with a description of wetlands water quality standards and wetlands management and protection efforts. Finally, some of the Tier III activities for evaluating specific basins and waterbody segments are described; however, no specific results are presented in this report.

While both the Probabilistic Assessment (Status Network or Tier 1) and the Basin Assessments (Tier 2) include summaries of statewide conditions, it is important to note that there are fundamental differences in these two assessments, and as such, it is not surprising that they give different results. Most significantly, insufficient data are collected at individual sites in the Probabilistic Network to determine use support, and only the Basin Assessments report on use attainment. Further, the assessment targets, parameter lists, and sample sizes are different for the two assessments. As the Probabilistic Network continues to evolve, the Department plans to make comparisons between the Tier 1 and Tier 2 assessment results. With its randomized monitoring stations, results of the Probabilistic Network should be more representative of statewide conditions, and may be able to shed light on any biases in the Basin Assessments that are an artifact of monitoring locations.

Assessment of Designated Use Attainment

Florida's water quality standards, the foundation of the state's program of water quality management, designate the "present and future most beneficial uses" of the waters of the state (Subsection 403.061[10], F.S.). Water quality criteria for surface water and ground water, expressed as numeric or narrative limits for specific parameters, describe the water quality necessary to maintain these uses. Florida's surface water is classified using the following five designated use categories:

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 class)*

While the designated uses of a given waterbody are established using this surface water quality classification system, it is important to note that the EPA uses slightly different terminology in its description of designated uses. Because FDEP is required to provide use attainment status for both the state's 305(b) report and the state's 303(d) list of impaired waters, FDEP uses EPA terminology when assessing waters for use attainment. The water quality evaluations and decision processes for listing impaired waters that are defined in the Impaired Surface Waters Rule (IWR; Rule 62-303, F.A.C.) are based on the following designated use attainment categories:

Aquatic Life Use Support-Based Attainment
Primary Contact and Recreation Attainment
Fish and Shellfish Consumption Attainment
Drinking Water Use Attainment and Protection of Human Health

Table 5 summarizes the designated uses assigned to Florida's various surface water classifications.

The IWR provides a science-based methodology for evaluating water quality data in order to identify impaired waters, establishes specific thresholds for impairment, and establishes requirements for data sufficiency and data quality. The complete text of the rule is available at http://www.dep.state.fl.us/water/tmdl/docs/amendedIWR.pdf.

Table 5. Designated Use Attainment Categories for Surface Waters in Florida

Designated Use Attainment Category Used in the Impaired Surface Waters Rule Evaluation	*Applicable Florida Surface Water Classification*
Aquatic Life Use Support-Based Attainment	Class I, II, and III
Primary Contact and Recreation Attainment	Class I, II, and III
Fish and Shellfish Consumption Attainment	Class II
Drinking Water Use Attainment	Class I
Protection of Human Health	Class I, II, and III

Sections 62-302.500 and 62-302.530, F.A.C, list the specific water quality criteria corresponding to each surface water classification. Water quality classifications are arranged in order of the degree of protection required, with Class I waters generally having the most stringent water quality criteria and Class V the least. However, Class I, II, and III surface waters share water quality criteria established to protect recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. All waters of the state are considered to be Class III, except for those specifically identified in Section 62-302.600, F.A.C. All waters of the state are required to meet the "Minimum Criteria for Surface Waters," as identified in Section 62-302.500, F.A.C.

Table 6 lists the extent of Florida waters that must meet federal Clean Water Act goals for fishable and swimmable waters. These numbers are based on mileages in the Florida Waterbody System database.

Table 6. Waters Classified for Uses Consistent with Clean Water Act Goals

Waterbody Type	*Fishable*	*Swimmable*
Estuaries (square miles)	4,460	4,460
Lakes (acres)	1,618,368	1,618,368
Rivers (miles)	19,624	19,624
Coastal	44	44

Note: The table includes only waters assigned a Florida waterbody number. It does not include approximately 25,909 miles of ditches and canals to which numbers could not be assigned.

A waterbody with exceptional recreational or ecological significance may also be designated an Outstanding Florida Water (OFW). The intent of an OFW designation is to maintain ambient water quality, even if these designations are more protective than those required under the waterbody's surface water classification. OFWs include waters in state and national parks, preserves, and sanctuaries; rivers designated as wild and scenic at federal or state levels; and "special" waters that have exceptional environmental or recreational significance. OFWs are listed in Section 62-302.700, F.A.C. ***Table 7*** lists the waterbodies designated since 1996.

Table 7. OFWs Designated from 1996 – 2004

Wiggins Pass and Cocohatchee River
Lake Disston
Weekiwachee Springs and Riverine System

Statewide Probabilistic Assessment (Tier I)

It is fiscally and logistically prohibitive to sample every segment of river or stream, every acre of lake, or each individual monitoring well in the state annually. In recognition of this serious resource constraint, FDEP traditionally relied heavily on water quality monitoring data from outside sources, such as state and federal databases, including the EPA's STOrage and RETrieval database (STORET). While this approach enlarged the overall population of waters monitored beyond that FDEP could provide, the information was still limited to approximately 20 to 30 percent of the state's rivers and streams in 305(b) reports, up to and including the 2000 report.[3] As a result, prior to the establishment of the Status Network, a majority of Florida's waters may not have been monitored or completely assessed in any two-year cycle of reporting to the EPA.

The EPA's recently published Integrated Report Guidance on 2004 requirements for water quality assessment, listing, and reporting under Sections 303(d) and 305(b) of the Clean Water Act states that a probabilistic monitoring design is a cost-effective approach to producing a statistical statement of known confidence to describe the aggregate condition of water resources.[4] Florida adopted this approach beginning in 2000, so that the condition of all of the state's aquatic resources could be estimated with a known statistical confidence. Data produced by the Status Network can be used to complement traditional Clean Water Act 305(b) reporting.

Two separate but complementary probabilistic designs estimate the condition of the state's surface fresh and marine waters, using key ecological indicators. FDEP is responsible for the freshwater component, and the Florida Fish and Wildlife Conservation Commission (FWC), with the EPA, designed and implements the marine network.

The information in this report focuses on the freshwater portion of the probabilistic monitoring network. The Status Monitoring Network, maintained by FDEP, is based on the EPA's Environmental Monitoring and Assessment Program (EMAP) model. Sampling of the network occurs as a stratified, rotating basin, multiyear approach to sampling and reporting on aquatic resources from the entire state.

All stratified, random sampling networks use predefined geographic units so that the results can address questions at different scales. To carry out systematic sampling, Florida's waters were subdivided into identifiable waterbodies, or resource types. The resulting data for these resource types were reviewed and analyzed statewide for a number of key indicators. ***Figures 5*** through ***12*** in the main body of the report***,*** as well as ***Tables A.2*** through ***A.21*** in **Appendix A,** provide summary information for the surface water portion of the Status Monitoring Network. Chapter 3 summarizes the assessment results for the ground water portion of the Status Network.

Status Network Monitoring Design: Cycle 1, 2000 – 03

Cycle 1 of Florida's Status Monitoring Network was initiated in January 2000 and completed in December 2003. (Cycle 2, which was redesigned to capture TMDL basin boundaries and resource-specific

[3] FDEP, 2000, 2002.
[4] U.S. Environmental Protection Agency, July 21, 2003.

indicators, was initiated in January 2004 and is discussed in a later section.) Basic design elements for Cycle I include the following:

- *The geographic design of rotating reporting units;*
- *The definition of water resource types to be monitored;*
- *The analytes/indicators to be measured for each resource; and*
- *A sampling schedule.*

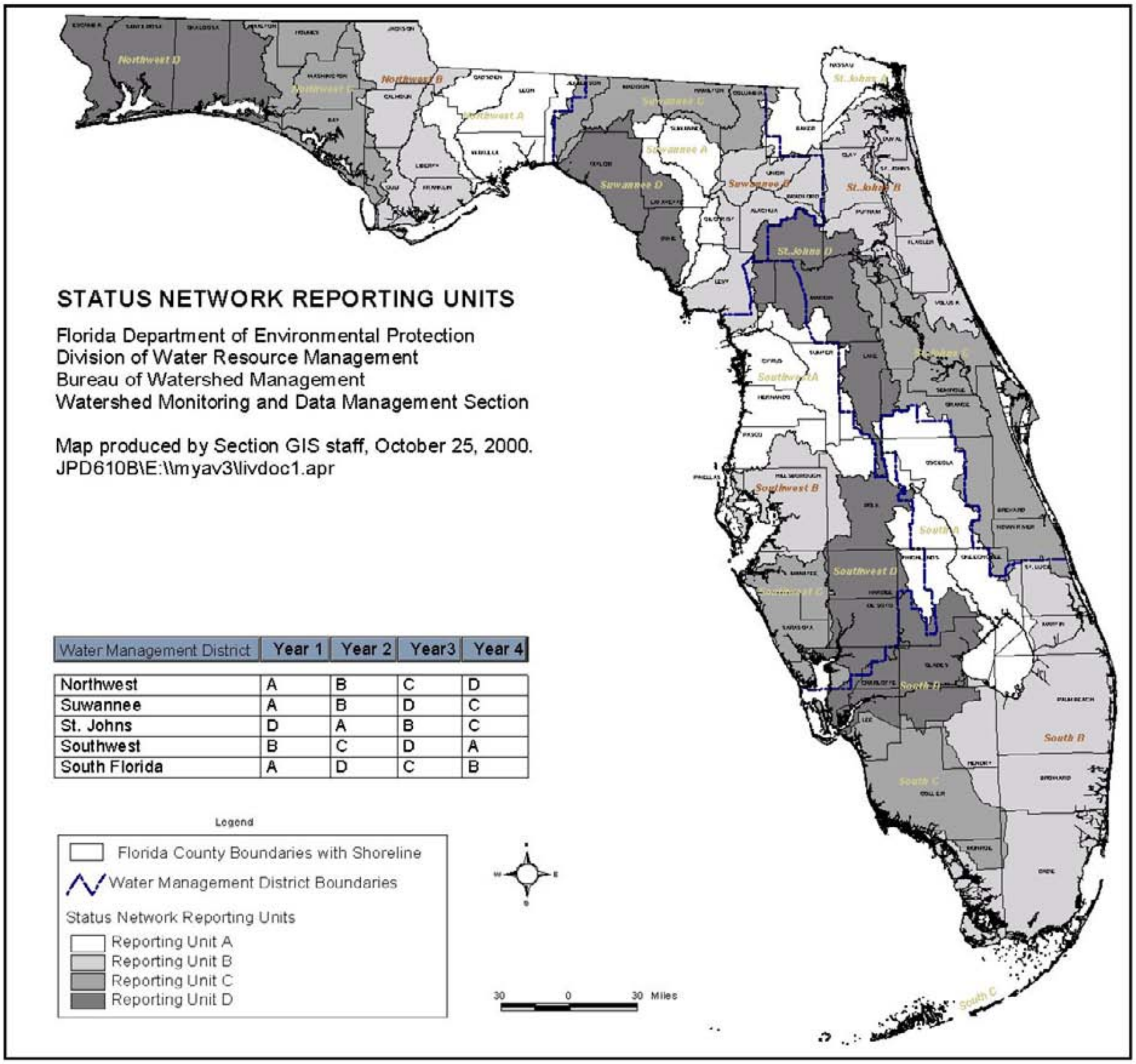
Geographic Design

The IWRM Status Network used predefined geographic units that comprise the whole, so that the resulting data can address questions ranging from the scale of the whole (statewide) to smaller geographic units (basinwide). The strata used to define the Status Network design for Cycle 1 include the following:

- *Base geography 1:100,000 (state of Florida);*
- *Water management district (WMD) boundaries; and*
- *Four reporting areas within each WMD that comprise single or multiple U.S. Geological Survey (USGS) hydrologic units (HUCs).*

The state was divided into five primary spatial strata that coincide with the five WMD boundaries. Secondary spatial strata (reporting units, or RUs) were determined as one or more of the hydrologic units that fit within the WMD boundaries ***(Figure 3).*** Each district was divided into four RUs, designated with an alphabetic character, A through D. The four RUs within each WMD provide the basis of a multiyear, rotating basin monitoring approach. During the four-year cycle, all RUs from each district are sampled in a random sequence. (If additional information is required, FDEP has prepared a CD containing all the geographic information used in the Status Monitoring Network.)

Figure 3. Cycle 1 Status Monitoring Network Reporting Units and Rotation Schedule



Water Management District	Year 1	Year 2	Year3	Year 4
Northwest	A	B	C	D
Suwannee	A	B	D	C
St. Johns	D	A	B	C
Southwest	B	C	D	A
South Florida	A	D	C	B

Water Resource Types

The Status Network was designed to ultimately monitor and report on all waters of the state. In order to systematically sample the many different occurrences of water, these waters have been subdivided into "resources." Each resource constitutes readily identifiable surface waterbodies or ground water access (springs/wells) for the purpose of characterizing resources of interest to FDEP.[5]

There are six water resource types: four surface water (rivers, streams, large lakes, and small lakes) and two ground water (confined and unconfined aquifers). The number and density of each water resource affect the sampling strategy. As a result, some of the resources have been subdivided to facilitate sampling and resource evaluation. The resource types and their subdivisions are summarized in ***Table 8*** and discussed in the following sections.

Surface Water

Rivers, Streams, and Canals. Perennial rivers, streams, and canals statewide are included in the list frame (that is, the total group of the resource type that *could* be sampled) as candidates for sampling. For the first two years, rivers were subdivided into two water resource types based on stream order. Low-order streams are defined as perennial streams of stream orders 1 through 3. High-order streams and canals include higher order streams (stream order 4 or above) that were expected to require different sampling strategies than smaller streams. Canals predominate in many areas of the state where former streams and rivers have been modified to enhance drainage. Because they require similar sampling strategies and represent master drainage systems, they are included in the high-order stream category. In order to sample rivers, streams, and canals randomly, each category of stream was broken into one-meter stream lengths. The stream segments in each category were placed on list frames and randomly selected.

In subsequent years, stream order was found to be problematic due to inconsistencies in the GIS coverage used. Rivers, streams, and canals were then divided into "Large Rivers" and "Small Streams," based on a GIS coverage that better estimates the major rivers of the state, with subsequent review by WMD project managers. Once the "Large Rivers" coverage was determined, the remaining rivers on the 1:100,000 geographic scale coverage were deemed "Small Streams." The WMDs nominated rivers of regional concern to be included in the list for "Large Rivers," thus appending and updating the sample selection efforts for the last two years of the four-year cycle. Each WMD region used different coverages in different years, according to the amount of reconnaissance work that had been accomplished.

Lakes. Lakes were subdivided into two resource types: large lakes of 10 hectares or greater and small lakes between 1 and 9.9 hectares. This differentiation on the basis of area was intended to accommodate differing sampling strategies and methods, and to allow better representation of resources. The total area within large lakes would have skewed selection and caused under-representation of small lakes in the sample design, had all lakes been in one category. Small lakes are randomly sampled from a list frame, and selected as a "point feature" (one lake per selection), while a grid is overlaid on large lakes and samples are randomly chosen from the entire area of large lakes.

Ground Water

Confined and Unconfined Aquifers. Ground water includes those portions of Florida's aquifers that have the potential for supplying potable water or affecting the quality of currently potable water as it was

[5] ***Note:*** *Because the Status Network includes ground water sampling, the overview of the network in this section briefly describes the principal ground water resource types.* ***Table 9*** *includes the ground water analytes that are sampled, and* ***Figure 4*** *includes the index periods for ground water sampling. Chapter 3 contains the results of the ground water assessment.)*

defined in 1998. Florida has three major aquifer systems,[6] all of which are sampled: the surficial aquifer system (SAS), the intermediate aquifer system (IAS), and the Floridan aquifer system (FAS).

Ground water was subdivided into two resource types for the purposes of sampling and resource characterization: (1) unconfined aquifers, semiconfined aquifers, and springs; and (2) confined aquifers. Typically, the SAS, which is unconfined and near the land surface, can be readily affected by human activities. Because of this vulnerability to contamination, the SAS was randomly sampled where present. In areas where the SAS was not present and either the IAS or the FAS was unconfined, these aquifers were sampled as part of the unconfined aquifer target population (that is, the total group of this resource type).

Table 8. Water Resource Types for Cycle 1, Status Monitoring Network

Surface Water: Years 1, (2)[7]	***Surface Water: Years (3),[8] 4***
High-Order Streams (Rivers and Canals) (stream order 4 and above)	"Management" Rivers (Selected major rivers and canals)
Low-Order Streams (stream orders 1-3)	Small Streams (all other perennial flowing waters except those in "Management" Rivers)
Large Lakes: 10 hectares (ha.) and greater	Large Lakes: 10 ha. and greater
Small Lakes: 9.9 ha. and smaller	Small Lakes: 9.9 ha. and smaller
Estuarine, Nearshore, and Marine Waters (FMRI): Years 1-4	
Ground Water: Years 1-4	
Unconfined aquifer: Unconfined and semiconfined wells, and springs Confined aquifer: Wells	

Sampling Schedule

Each year, 30 random samples are collected from each of the surface water resource types just described in 1 reporting unit of each of the 5 WMDs. Thus, over 900 samples (6 resource types x 5 WMDs x 30 samples) are collected for any given year, including quality assurance samples. The indicator list, which consists of both chemical and biological parameters, is discussed in the next section.

Many of the indicators used in the Status Network are seasonal.[9] Generally, monitoring programs do not have the monetary resources to characterize this variability, or to assess ambient conditions in all seasons for "all" resources (i.e., all of Florida's fresh waters). Therefore, sampling has often been limited to a confined portion of the year (index period) when indicators are expected to show the greatest response or the least variability. Annual sampling for the Status Monitoring Network occurs during different index periods of 4 to 12 weeks for each resource type ***(Figure 4).***

[6] Florida Geological Survey, 1988.
[7] The Suwannee, St. Johns, South, and Southwest Florida Basins used High-Order Stream coverage. Northwest Florida switched to "Management" Rivers coverage.
[8] The South Florida Basin used High-Order Stream coverage; all other regional reporting units used "Management" Rivers coverage for their larger rivers. The St. Johns River and South Florida Basins used Low-Order Stream coverage in Year 3 for their streams.
[9] Oviatt and Nixon, 1973; Jefferies and Terceiro, 1985; Grassle et al., 1985, Holland et al., 1987.

Analytes and Indicators

The analytes and indicators sampled though the Status Network ***(Table 9)*** provide chemical and biological information on water quality. The overall purpose is to use these values as a gage of the overall condition of a given basin, using water quality targets that are typically based on a standard or guidance value. The design estimates the percent of a resource that may exceed or be within some range of an analytical measurement, with known error. Some analytes are not associated with a water quality use or standard, and are designed to simply evaluate the chemical composition of water.

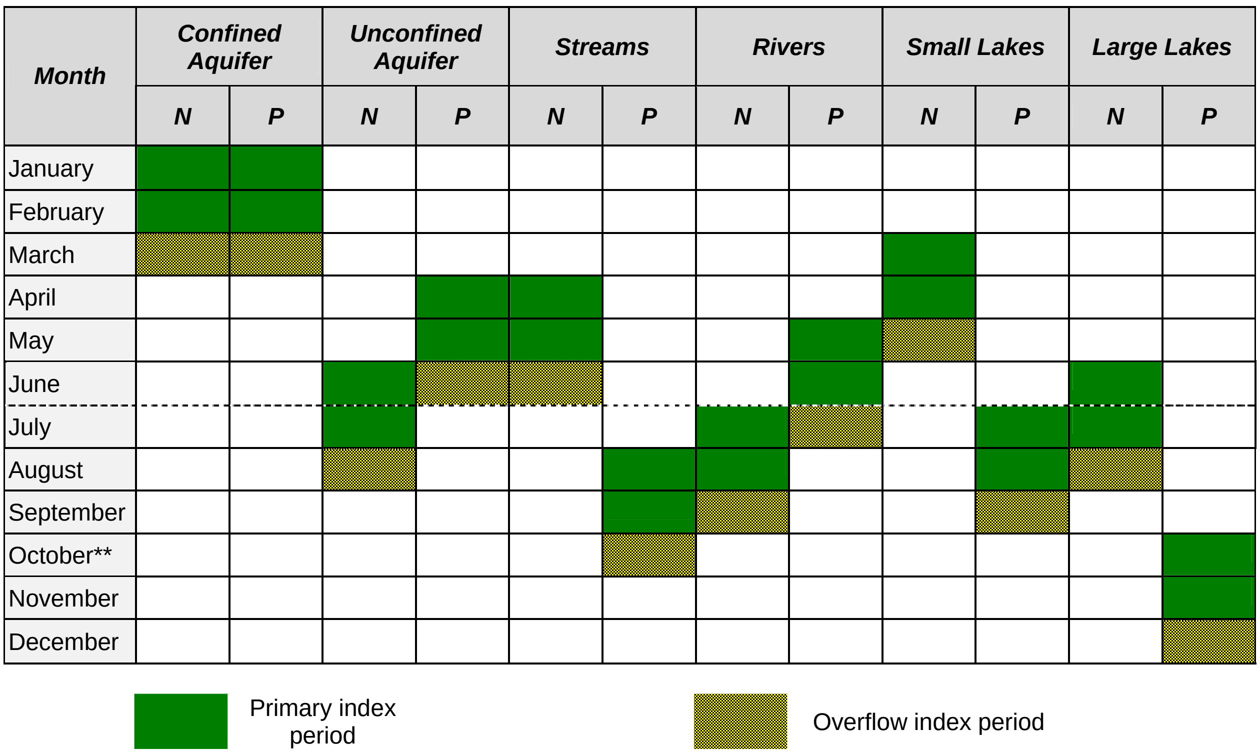
Table 9. Analytes Sampled for Cycle 1 of the Status Network in 2000-2003

Indicator	***High-Order Streams***	***Low-Order Streams***	***Large Lakes***	***Small Lakes***	***Aquifers***
Calcium	T	T	T	T	D
Magnesium	T	T	T	T	D
Sodium	T	T	T	T	D
Potassium	T	T	T	T	D
Chloride	T	T	T	T	D
Sulfate	T	T	T	T	D
Fluoride	T	T	T	T	D
Alkalinity	T	T	T	T	D
Nitrate + Nitrite	T	T	T	T	D
Ammonia	T	T	T	T	D
Kjeldahl Nitrogen	T	T	T	T	D
Phosphorus	T	T	T	T	D
Orthophosphate	D	D	D	D	D
Organic Carbon	T	T	T	T	T
Dissolved Solids	T	T	T	T	T
Suspended Solids	T	T	T	T	T
Turbidity	T	T	T	T	T
Color	T	T	T	T	T
Total Coliform	T	T	T	T	T
Fecal Coliform	T	T	T	T	T
E. coli	T	T	T	T	T
Enterococci		T	T	T	T
Chlorophyll *a*	T	T	T	T	
Algal Growth Potential			T	T	
Phytoplankton			T	T	
Water Temperature	X	X	X	X	X
pH	X	X	X	X	X
Specific Conductance/ Salinity	X	X	X	X	X
Dissolved Oxygen	X	X	X	X	X
Secchi Depth	X	X	X	X	
Total Depth	X	X	X	X	
Sample Depth	X	X	X	X	
Habitat Assessment	X	X			
Depth to Water (from					X

Indicator	High-Order Streams	Low-Order Streams	Large Lakes	Small Lakes	Aquifers
LSE)					
Land Surface Elevation (LSE)					X
Microlanduse					X

T – Total sample
D – Filtered sample
X – Other sample or measurement

Figure 4. Index Periods for Sampling Surface Water and Ground Water Resource Types



Dashed line indicates proposed contract period start/finish

N – North Florida (Northwest Florida Water Management District, Suwannee River Water Management District)
P – Peninsular Florida (Alachua County, St. Johns River Water Management District, Southwest Florida Water Management District, South Florida Water Management District)

Water Quality Targets Used and Applicable Surface Water Quality Standards

This network does not collect sufficient data at a given station or waterbody to determine use support for individual waterbodies. Instead, the results for each basin are aggregated by waterbody type and assessed against water quality targets to assess the overall health of that type of water in the basin.

These targets are generally based on applicable water quality criteria in Chapter 62-302, F.A.C., or, in the case of the assessment of nutrient impacts, the nutrient impairment thresholds provided in the IWR.

Waters sampled in the Status Network are in Classes I and III under the Florida Surface Water Quality Standards.[10] Class I criteria protect potable water supply use, and Class III criteria protect recreation and aquatic life uses. Some of the analytes sampled in the Status Network have numeric surface water quality standards to protect one or more of these uses ***(Table 10).*** For additional information on Florida's designated use classifications, see the section on *Attainment of Designated Use* at the beginning of this chapter.

Table 10. Surface Water Quality Analytes from Cycle 1 of the Status Network that Have Numeric Surface Water Quality Standards, Freshwater Criteria that Apply to Single Samples of Those Parameters, and Uses They Protect

Analyte	***Criterion****	***Designated Use***
Chloride Fluorides Total Dissolved Solids	250 mg/L 1.5 mg/L 1000 mg/L (max)	Potable Water Supply
Fecal Coliform Bacteria Total Coliform Bacteria	400 (single sample max) 1000 (single sample max)	Recreation
Alkalinity Dissolved Oxygen Fluorides pH Specific Conductance Turbidity Unionized Ammonia (Calculated from temperature, pH, salinity, ammonia)	20 mg/L > 5 mg/L 10 mg/L >6, <8.5 su 1275 or 50 percent above background 29 NTU above background 0.02 mg/L	Aquatic Life

* mg/L – Milligrams per liter
su – Standard units
NTU – Nephelometric turbidity units

Status Network Surface Water Assessment Results for 2000–03

Table 11 explains the terms used in the assessment and the water quality targets used to assess basin water quality. ***Figures 5*** through ***13*** present categoric results for selected indicators for each surface water resource type, statewide*.* Additionally, ***Table 12*** presents the statewide estimate of the miles of rivers and streams, square miles of large lakes, and number of small lakes that exhibit good, fair, and poor responses for a respective indicator. ***Figures 14, 15,*** and ***16*** present a statewide summary of these indicators for each surface water resource type. ***Tables A.2*** through ***A.21*** (in **Appendix A)** summarize results from the surface water portion of the Status Monitoring Network for 2000–03, by resource type (Rivers and Streams, Large Lakes, and Small Lakes) for each individual reporting unit. While samples were collected for both rivers and streams individually, data were combined for the analysis of the larger river and stream resources.

The function of Tier I investigations is to report on the watershed and statewide estimate of condition. The Status Network is not intended to evaluate site-specific problems, or answer questions about cause and effect. It is a valuable tool to help focus further investigations, including setting basin- and indicator-specific priorities.

[10] *Rule 62-302, F.A.C.*

Future data analyses will include Status and Trend Network data to examine variability in the results, in order to determine the reason for water quality differences in the basins studied. For example, the Trophic State Index (TSI) varied widely among reporting units of the state ***(Figures 8*** and ***11);*** further efforts could focus on determining if there is an underlying reason for basins not meeting the threshold for use support in the TSI category. Tier II and III investigations of these results, forming a new investigation or using available data (such as other investigations of lakes in the region, or examining geographic coverages such as land use), would be a reasonable next step.

Table 11. Legend for Terms and Indicators Used in Figures 5 through 12

Term	Explanation
Resource	The status surface water network design report focuses on the following three resource types: • Rivers and streams were combined into a single resource for this cycle. • Small Lakes are 1 to 9.9 hectares (ha.) in size. • Large Lakes are 10 ha. or greater.
Indicators	Indicators include the following: • Rivers and Streams: Chla and Fecal coliforms. • Small Lakes and Large Lakes: TSI and Fecal coliforms. • Large and Small Lakes and Combined river/stream resources: DO.
Meeting Threshold	TSI thresholds are color-based: • For samples with color less than or equal to 40 PCU, thresholds is less than or equal to = 40. • For samples with color less than 40 PCU, threshold is less than or equal to 60. • Chla threshold is less than or equal to 16 µg/L. • DO is 5.0 mg/L or above. • Fecal coliforms are less than 200 CFU.
Partially Meeting Threshold	TSI: • For samples with color less than or equal to 40 PCU, threshold is 40-50. • For samples with color greater than 40 PCU, threshold is 60-70. • Chla: 16-20 µg/L. • DO: 2.0-5.0 mg/L. • Fecal coliforms: 200-400 CFU.
Not Meeting Threshold	TSI: • For samples with color less than or equal to 40 PCU, threshold is greater than50. • For samples with color greater than 40 PCU, threshold is greater than70. • Chla: Greater than 20 µg/L. • DO: Below 2.0 mg/L. • Fecal coliforms: Greater than 400 CFU.

TSI – Trophic State Index
Chla – Chlorophyll a
DO – Dissolved oxygen
PCU – Platinum cobalt units
µg/L– Micrograms per liter

mg/L – Milligrams per liter
CFU – Colony-forming units

Status Network 2004 – 08

As discussed earlier in this chapter, the Status Monitoring Network has been redesigned to accommodate the TMDL basin rotation schedule. Instead of 20 reporting units, the monitoring design incorporates the 29 basins (encompassing 51 HUCs plus the Florida Keys) that FDEP's Watershed Management Program uses for its assessments as the fundamental units for sampling and reporting. These basin reporting units are sampled using the same 5-year rotation that the Watershed Management Program uses for its assessments; however, the sampling occurs 1 to 2 years ahead of the TMDL rotation. At the end of the 5-year cycle, the entire state will be sampled.

The resulting effort provides both recently collected data from the region of interest and an estimate of condition for the 4 surface water and 2 ground water resources from each of the 29 basins. The results will be provided annually to FDEP's Watershed Assessment Section to complement the basin reports, and will be summarized every 2 years in the 305(b) report.

It is important to note that because of the change in reporting units, not all resources are present in all basins. For example, the larger Tampa region reporting unit used in Cycle 1 of the Status Monitoring Network has been subdivided into the Tampa Bay and Tampa Bay Tributaries Basins. This eliminates large rivers from Tampa Bay and shifts them into the Tampa Bay Tributaries coverage.

Major changes have been made to the analyte list in Cycle 2 of the Status Monitoring Network. The new analyte list includes measures of biological condition in rivers and streams, and the condition of plant communities and sediment chemistry in lakes. Analytes with primary drinking water standards have also been added to measure the condition of aquifers. These measures will better reflect the condition of these resources.

Figure 5. Statewide Summary of Chlorophyll a Assessment for Rivers and Streams

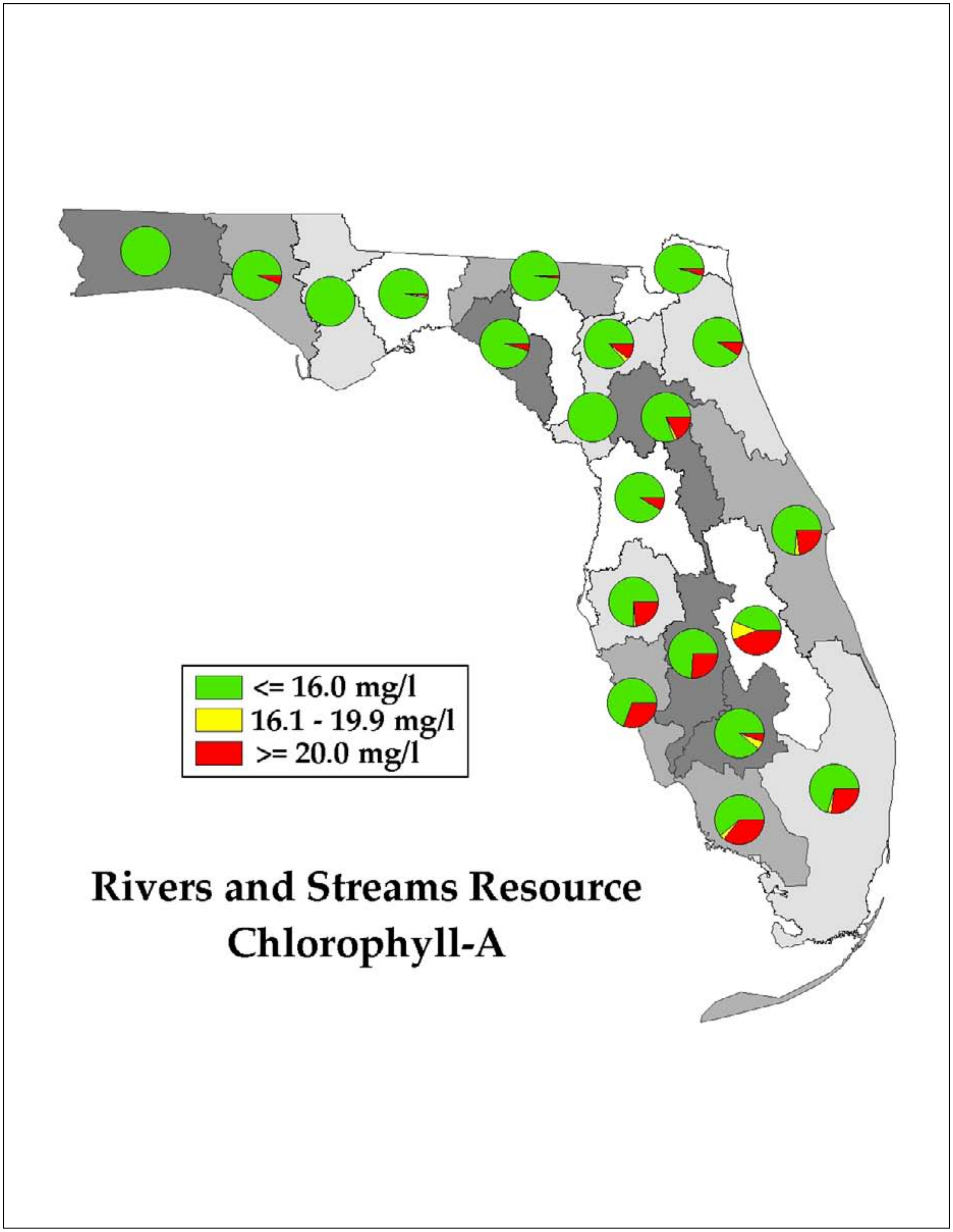


Figure 6. Statewide Summary of Fecal Coliform Assessment for Rivers and Streams

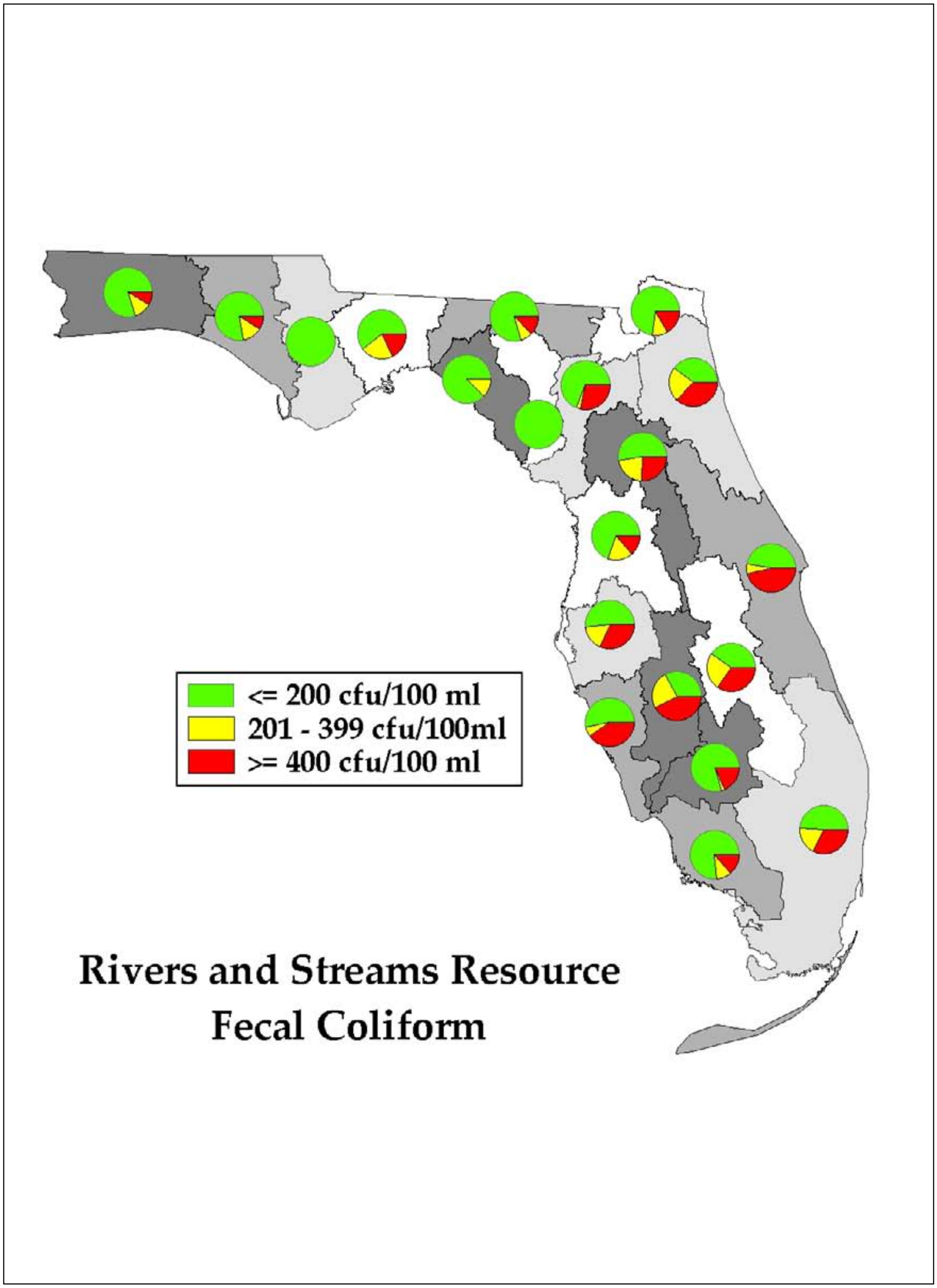


Figure 7. Statewide Summary of Dissolved Oxygen Assessment for Rivers and Streams

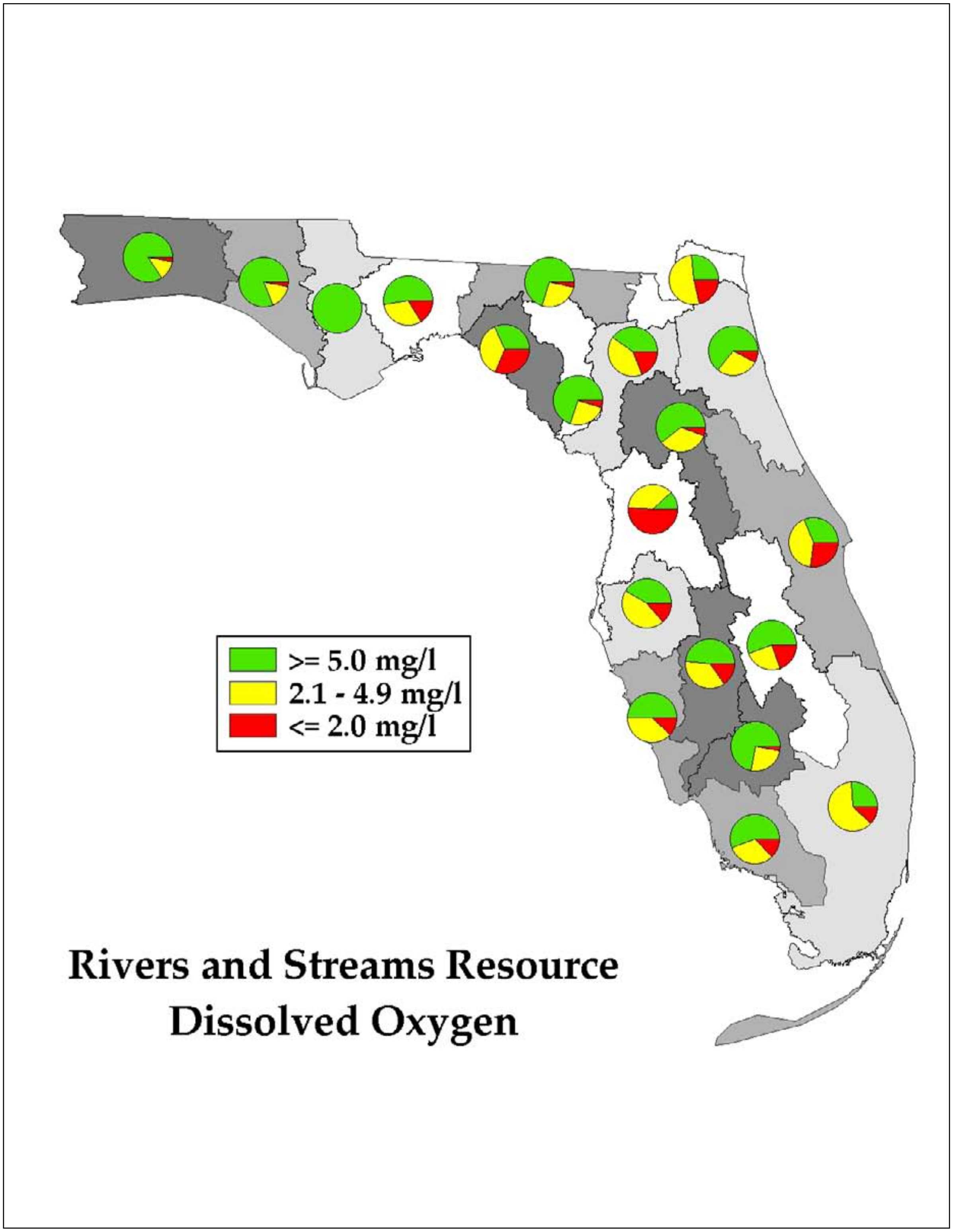


Figure 8. Statewide Summary of Trophic State Index Assessment for Large Lakes

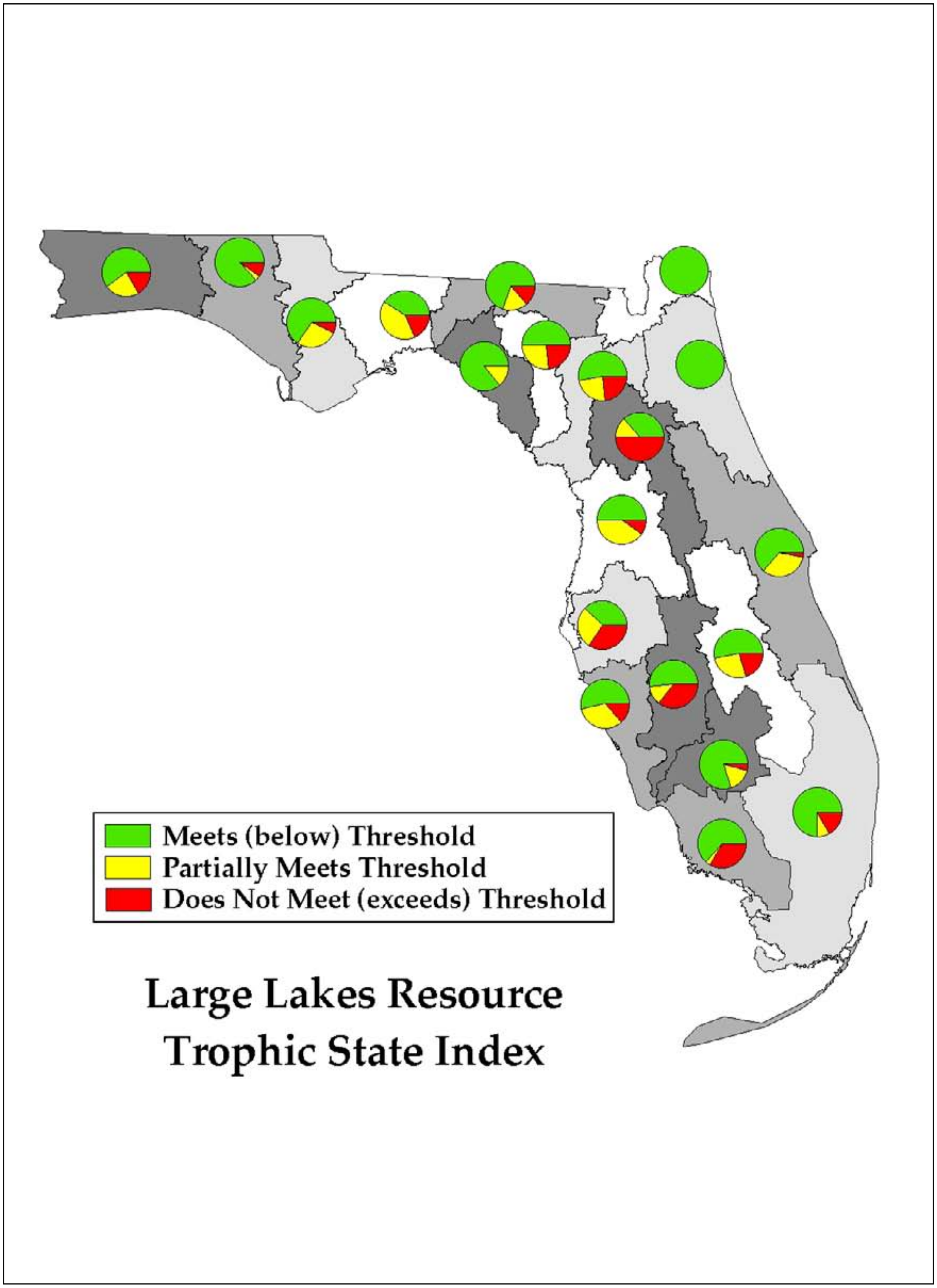


Figure 9. Statewide Summary of Fecal Coliform Assessment for Large Lakes

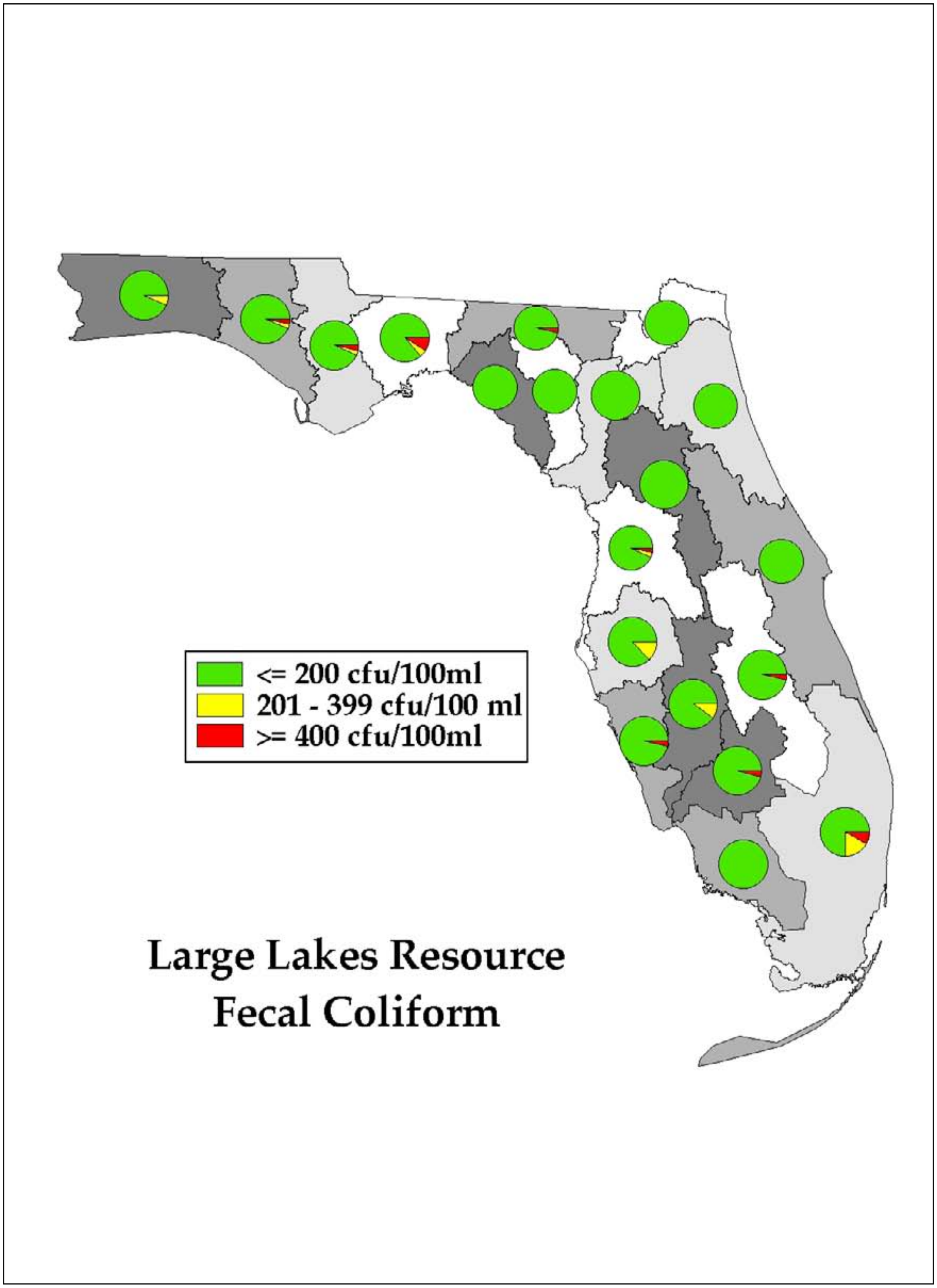


Figure 10. Statewide Summary of Dissolved Oxygen Assessment for Large Lakes

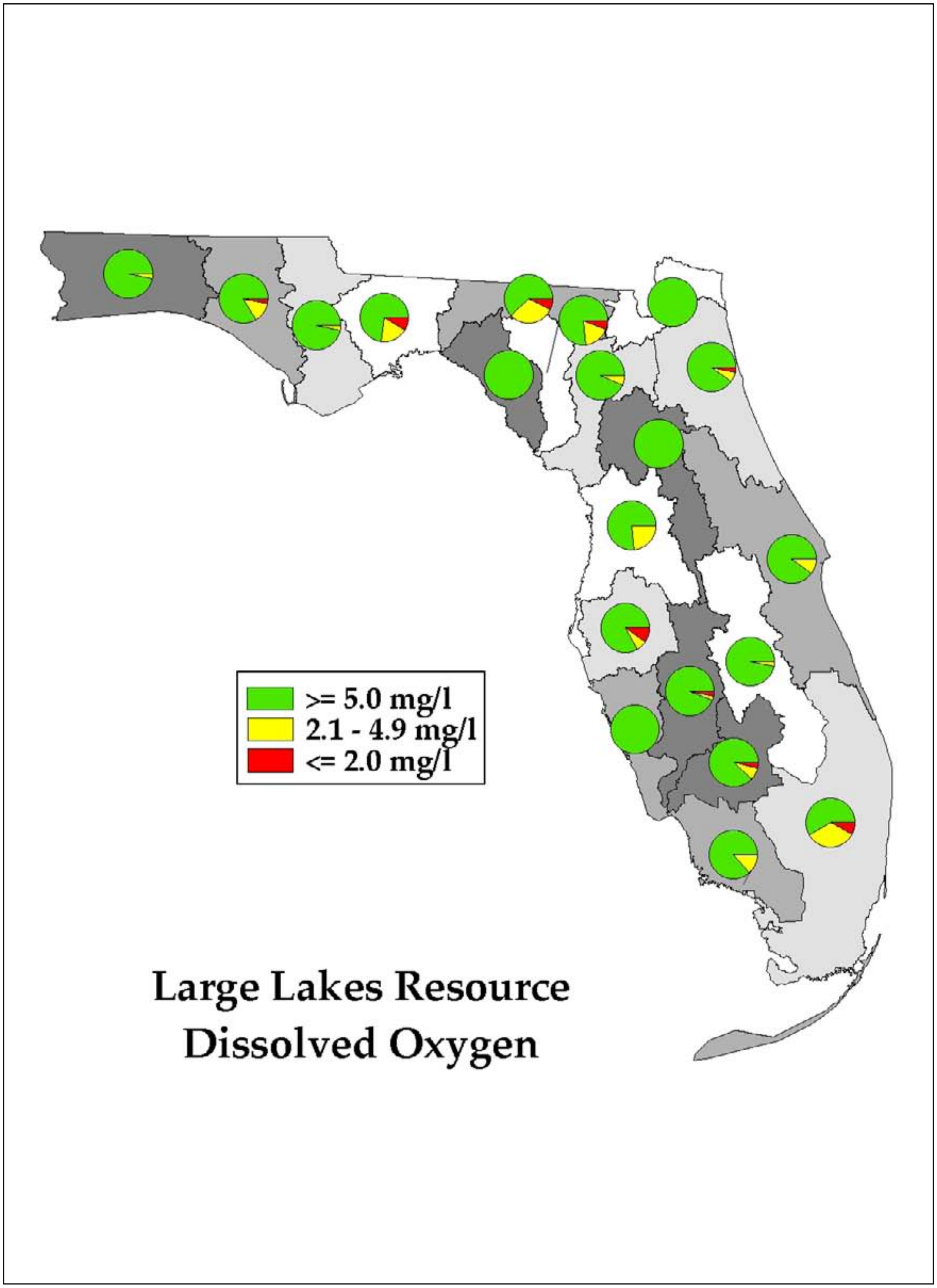


Figure 11. Statewide Summary of Trophic State Index Assessment for Small Lakes

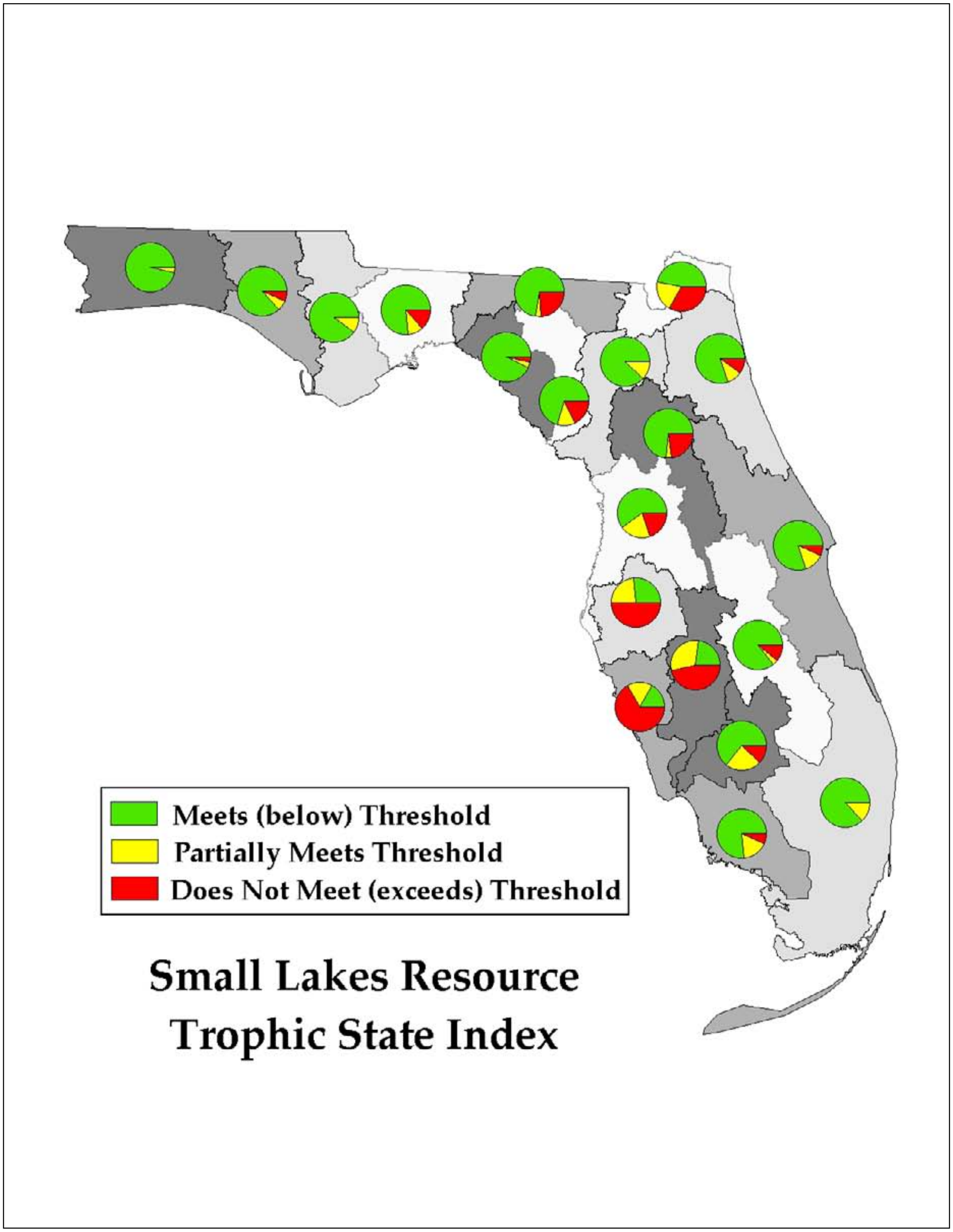


Figure 12. Statewide Summary of Fecal Coliform Assessment for Small Lakes

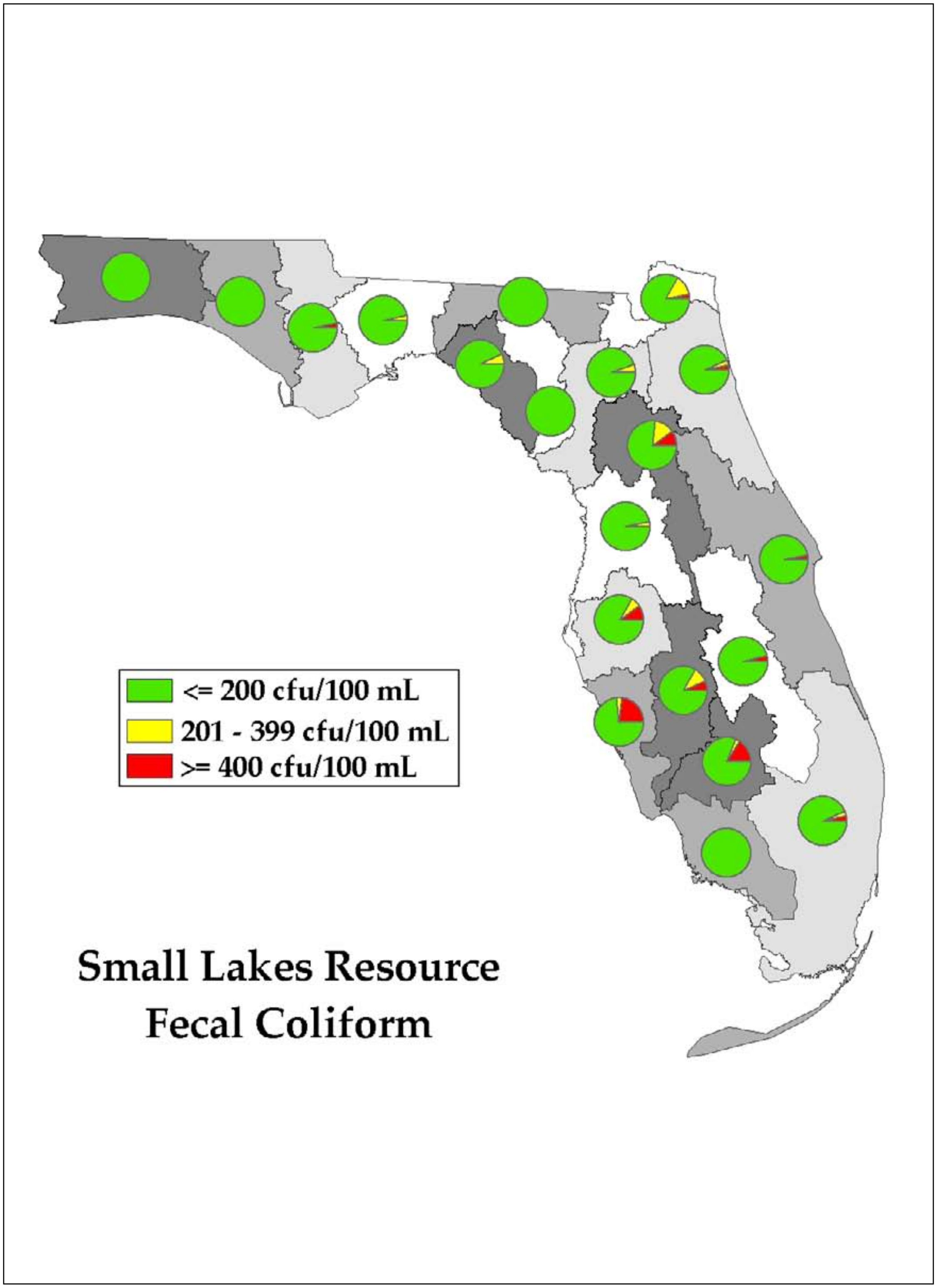


Figure 13. Statewide Summary of Dissolved Oxygen Assessment for Small Lakes

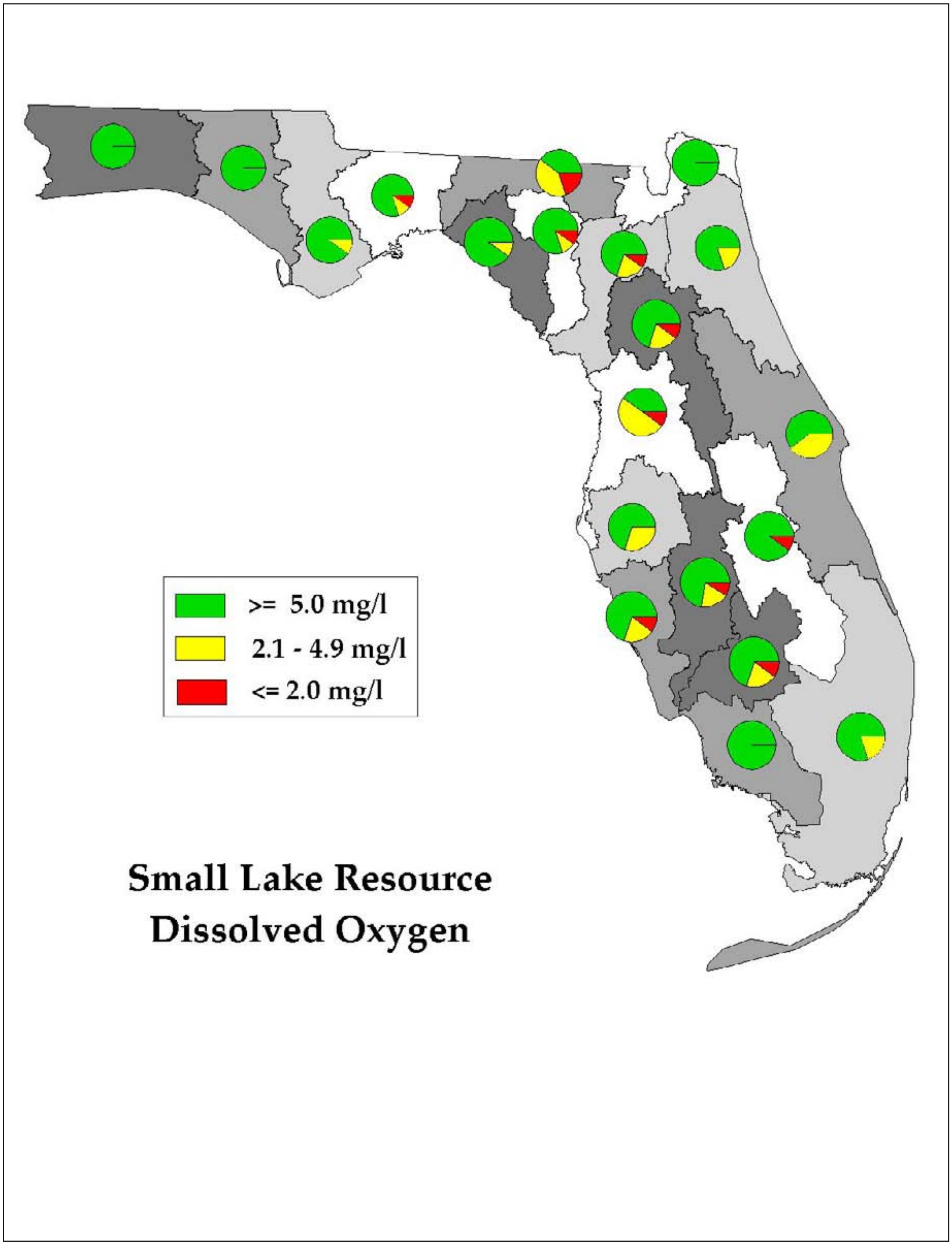


Table 12: Statewide Estimate of the Miles of Rivers and Streams, Square Miles of Large Lakes, and Number of Small Lakes with Calculated Response to Respective Indicators

Resource Type	*Indicator*	*Target Population Size*	*Units*	*Meeting Threshold*	*Partially Meeting Threshold*	*Not Meeting Threshold*
Rivers and Streams	Chla	32,929	miles	26,416	686	5,828
Rivers and Streams	DO	32,929	miles	16,485	11,954	4,490
Rivers and Streams	Fecal	32,929	miles	19,470	4,841	8,619
Large Lakes	DO	1,680	square miles	1,572	93	15
Large Lakes	Fecal	1,680	square miles	1,621	24	35
Large Lakes	TSI	1,680	square miles	914	400	366
Small Lakes	Fecal	10,630	lakes	9,663	389	578
Small Lakes	TSI	10,630	lakes	7,194	1,495	1,941
Small Lakes	DO	10,630	lakes	7,979	2,120	532

** DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chla – Chlorophyll a

Figure 14. Summary of Statewide Condition for Rivers and Streams (Chlorophyll a, Fecal Coliforms, and Dissolved Oxygen)

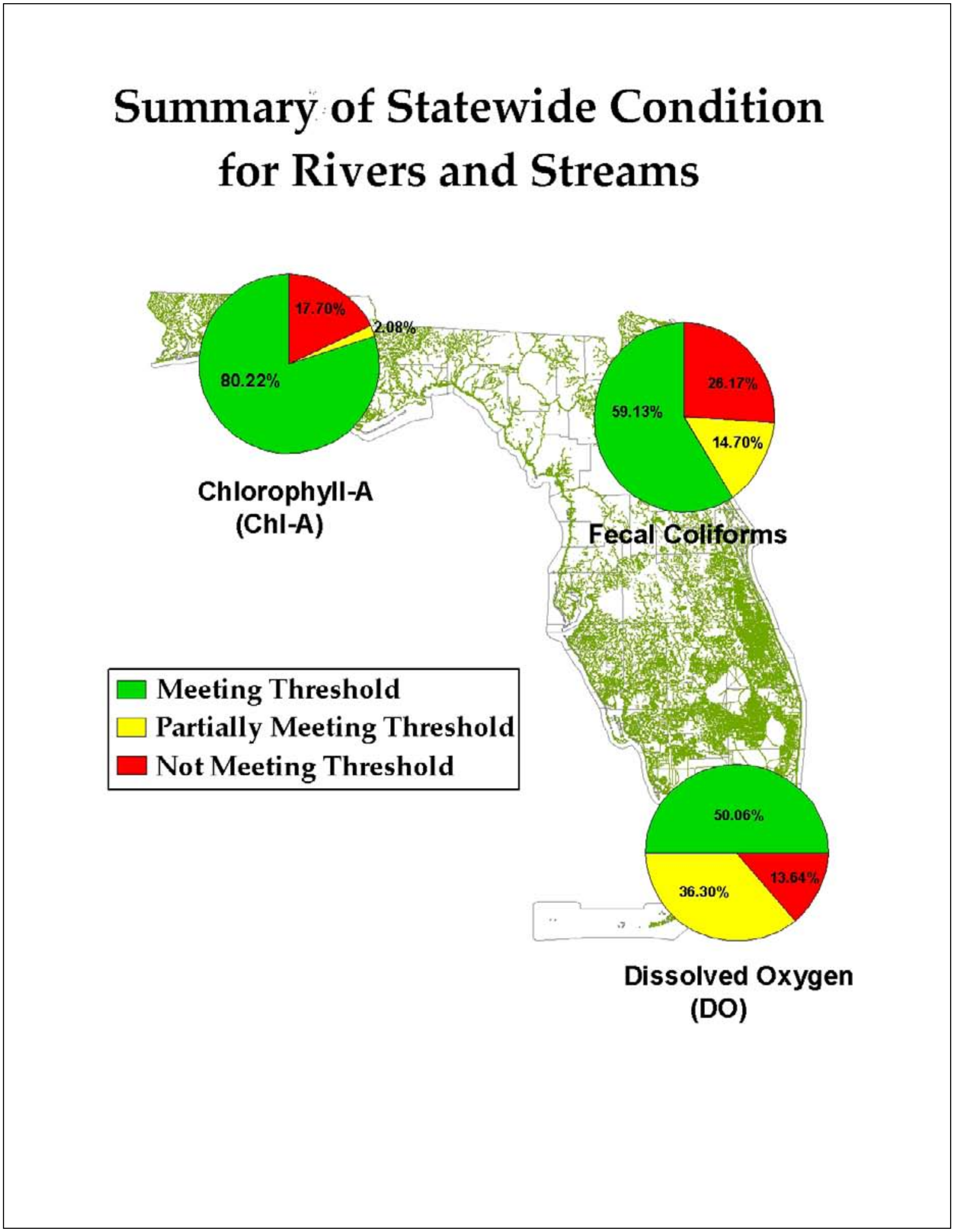


Figure 15. Summary of Statewide Condition for Large Lakes (Trophic State Index, Fecal Coliforms, and Dissolved Oxygen)

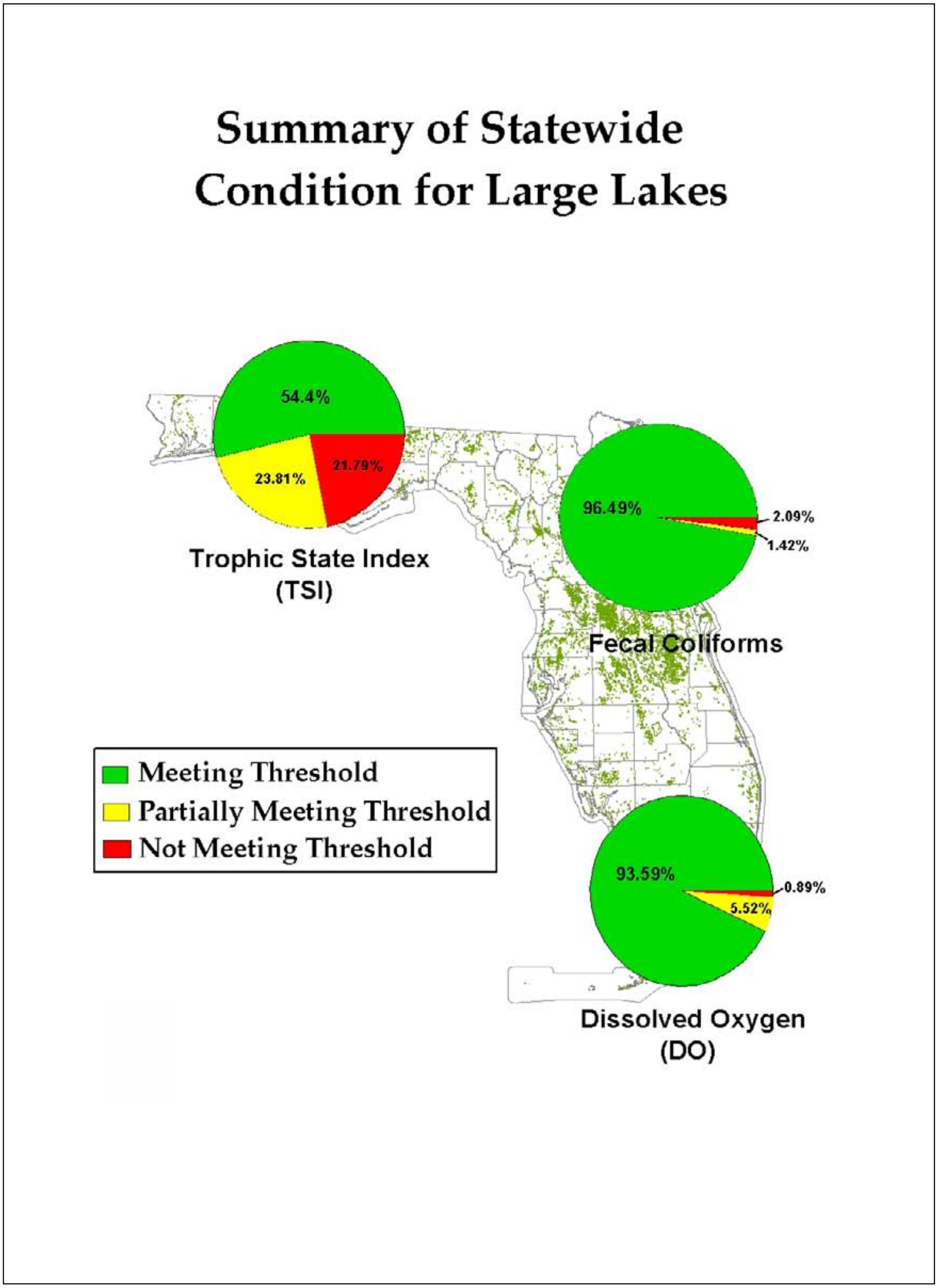
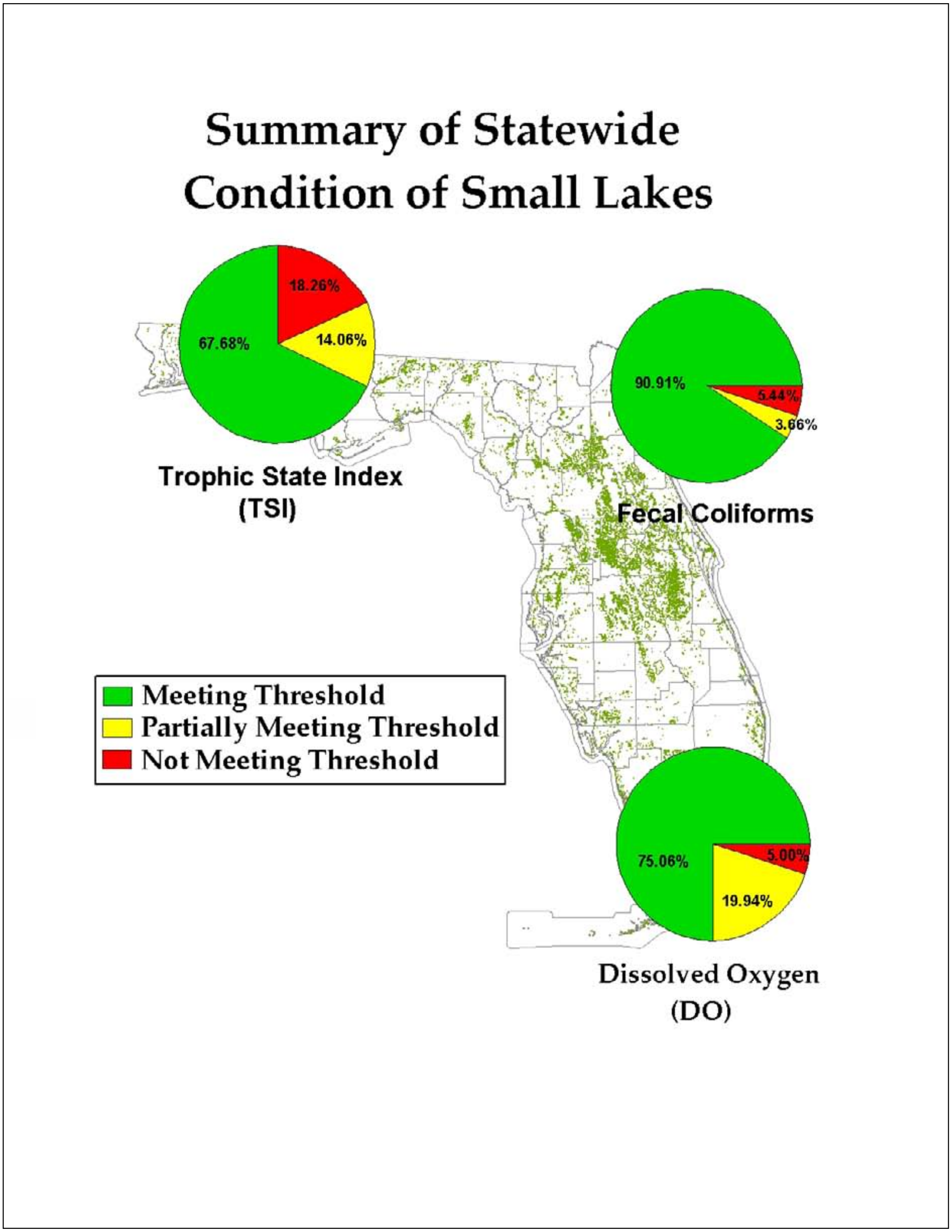


Figure 16. Summary of Statewide Condition for Small Lakes (Trophic State Index, Fecal Coliforms, and Dissolved Oxygen)



Temporal Variability (TV) Monitoring Network

To address temporal variability and trend monitoring issues in Florida's surface waters, FDEP established a Temporal Variability (TV) Monitoring Network in 2000 consisting of surface water (SWTV) and ground water (GWTV) resources. ***Table 13*** lists the analytes sampled at Trend Network sites. The SWTV contains 79 fixed location sites that are sampled monthly ***(Figure 17).*** The sites are located at the lower end or receiving waters of a watershed and are close to flow gauging stations. These sites enable FDEP to obtain chemistry, discharge, and loading data at the point that integrates the land use activities of the watershed.

In addition, some of the SWTV sites are located at or near the state's boundary with Alabama and Georgia. These stations are used to obtain chemistry and loading data for major streams entering Florida. Finally, some of the sites are located in major lakes. Data from the lakes, as well as all of the other SWTV sites, are used to assist in evaluating temporal variability in Florida's surface water resources.

The GWTV consists of 46 fixed monitoring sites, which are used to obtain chemistry and field analyte data in confined and unconfined aquifers ***(Figure 18).*** These data are used to quantify temporal variability in the state's ground water resources and to assist in determining whether the Status Network samples are collected during wet or dry periods. As with the SWTV Network, GWTV sites are sampled by staff at FDEP, 4 of the 5 water management districts, and selected counties, with the samples analyzed in FDEP's Central Laboratory. It is already known that the temporal variance of water chemistry in confined aquifers is much less than that of unconfined aquifers. For this reason, the confined sites are sampled quarterly, and unconfined ground water resources are sampled monthly. Field analytes (pH, DO, specific conductance, and temperature) are collected on all site visits. Additionally, laboratory analytes are collected from wells located within actively sampled Status Network Reporting Units.

The seasonal Kendall's Tau statistical tests used by this trend monitoring program require adequate data points over a long period of record for meaningful analysis. Since the program was initiated in 2000, data are just becoming available, and analysis of the data has been initiated. The results of these investigations of surface water and ground water trends will be presented in future 305(b) reports.

Table 13. Trend Network Analyte List for 2003 – 04

Indicator	***"Management" Rivers***	***Small Streams***	***Large Lakes***	***Small Lakes***	***Aquifers***
Calcium	T	T	T	T	D
Magnesium	T	T	T	T	D
Sodium	T	T	T	T	D
Potassium	T	T	T	T	D
Chloride	T	T	T	T	D
Sulfate	T	T	T	T	D
Fluoride	T	T	T	T	D
Alkalinity	T	T	T	T	D
Nitrate + Nitrite	T	T	T	T	D
Ammonia	T	T	T	T	D
Kjeldahl Nitrogen	T	T	T	T	D
Phosphorus	T	T	T	T	D
Orthophosphate	D	D	D	D	D
Organic Carbon	T	T	T	T	T
Dissolved Solids	T	T	T	T	T
Suspended Solids	T	T	T	T	T
Turbidity	T	T	T	T	T
Color	T	T	T	T	T
Total Coliform					
Fecal Coliform	T	T	T	T	T
E. coli					
Enterococci	T	T	T	T	T
Chlorophyll *a*	T	T	T	T	
Water Temperature	X	X	X	X	X
pH	X	X	X	X	X
Specific conductance/ Salinity	X	X	X	X	X
Dissolved Oxygen	X	X	X	X	X
Secchi Depth	X	X	X	X	
Total Depth	X	X	X	X	
Sample Depth	X	X	X	X	
Depth to Water (from Land Surface Elevation)					X
Land Surface Elevation					X

T – Total sample
D – Filtered sample
X – Other sample or measurement

Figure 17. Surface Water Temporal Variability Network Monthly Sampling Locations

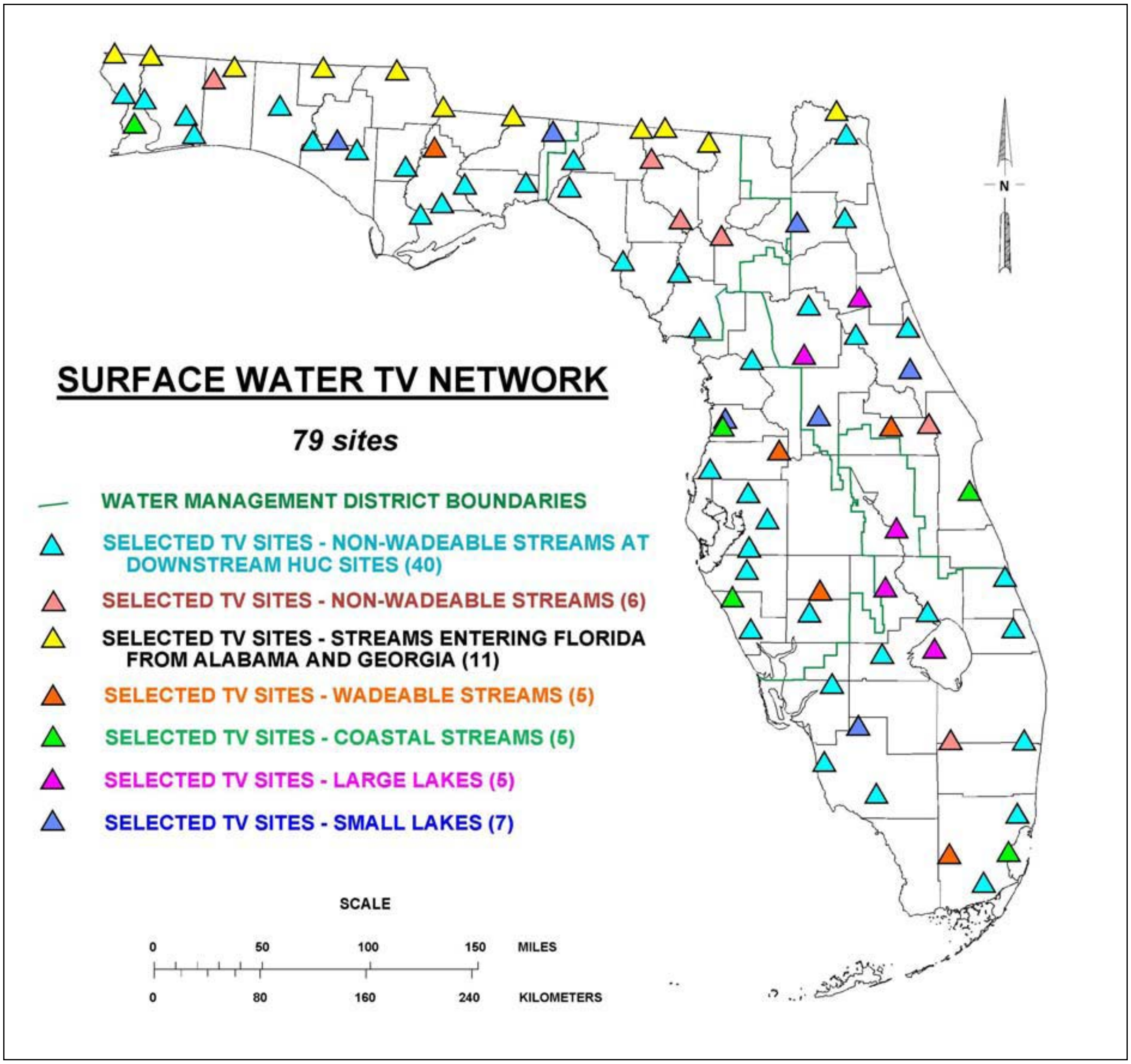
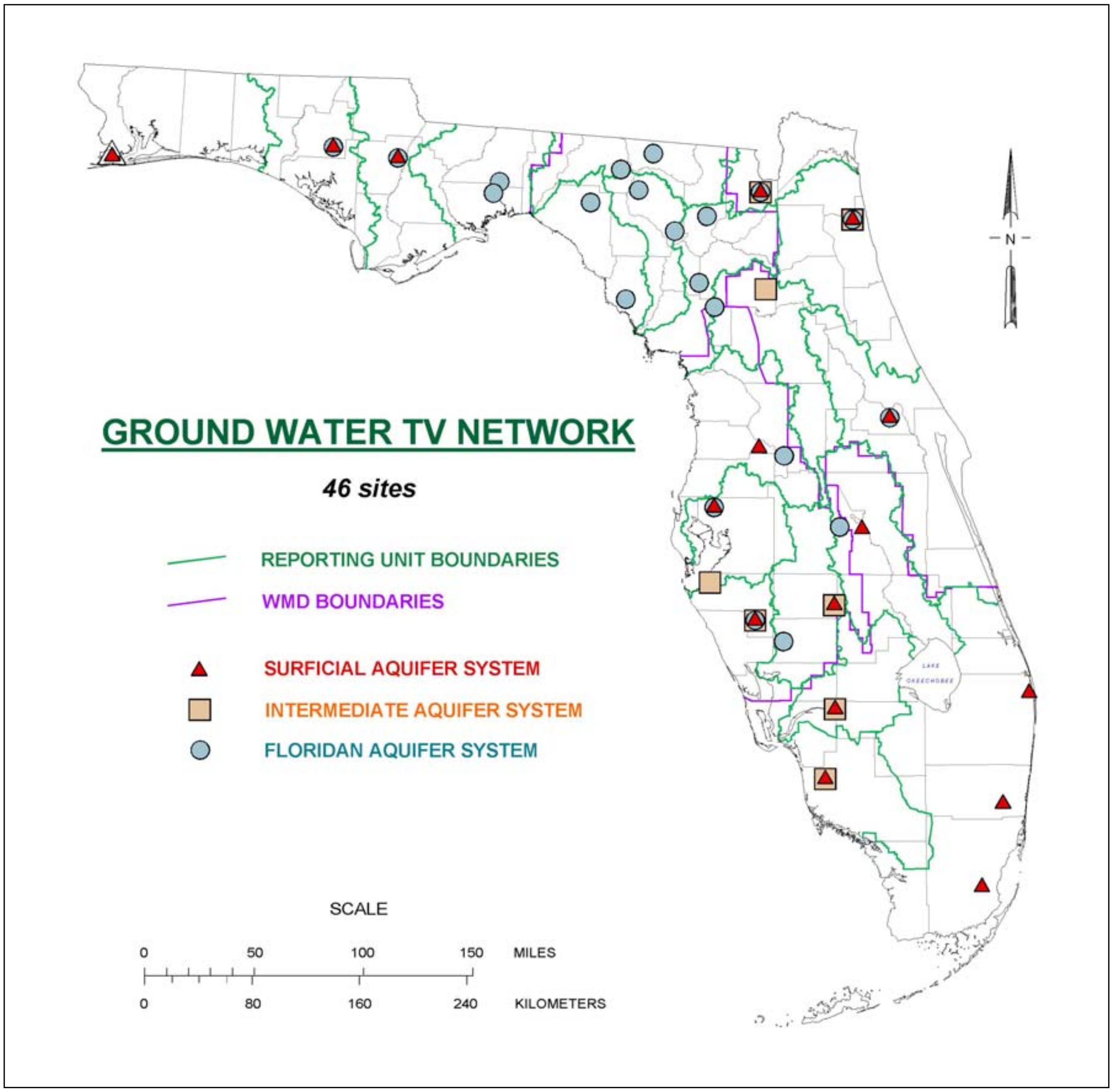


Figure 18. Ground Water Temporal Variability Monitoring Monthly Sampling Locations



Statewide Basin Assessments (Tier II)

This section summarizes statewide surface water quality by indicating whether designated uses have been attained for three waterbody types: rivers and streams, lakes, and estuaries (***Figure 19*** graphically presents the summary information). Water quality trends, by waterbody type, are also summarized. In addition, a wetlands inventory and information on wetlands protection efforts is provided. However, Florida does not assess attainment of designated use for wetlands as it does for other surface waters because water quality in wetlands is not routinely monitored. Wetlands are often associated with rivers and lakes, which are routinely sampled.

The assessment process has been integrated into FDEP's watershed management approach, which rotates through the state's 52 river basins over a 5-year cycle consisting of multiple phases. To implement the watershed cycle, these basins have been divided into 5 groups within each of FDEP's 6 districts statewide. ***Figure 20*** shows the basin groups and the rotating cycle in each FDEP district. ***Figure 21*** provides, as an example, the basins in the Northwest District group. One basin group in each FDEP district will be assessed each year. ***Table 14*** lists the basin groups for the implementation of the cycle. ***Table 15,*** which provides the basin rotation schedule for TMDL development and implementation, shows that it will take 9 years to complete the first full cycle of the state.

As part of the watershed management approach, a Basin Status Report developed for each basin in the state presents a preliminary *Planning List* of potentially impaired waterbodies. Under the Florida Watershed Restoration Act, the Planning List is submitted to the EPA for informational purposes only and is not used to administer or implement any regulatory program. To be placed on the Planning List, waters must meet specific data sufficiency and data quality requirements in the IWR. Developed in cooperation with a Technical Advisory Committee, the rule provides a science-based methodology for identifying impaired waters.

The publication of the Status Report is followed by a period of monitoring and data gathering and, at the end of Phase 2 of the watershed management cycle, by a Water Quality Assessment Report containing a *Verified List* of impaired waterbodies or segments for which TMDLs will be developed. Once adopted, the list is submitted to the EPA under Section 303(d)1.c of the Clean Water Act and becomes the 303(d) list of impaired waters for the basin.

The development process for the Planning and Verified Lists has been completed in two-fifths of the state's basins (the Group 1 and 2 basins). Assessments in the remaining three-fifths of the state (the Group 3, 4, and 5 basins) will be completed over the next three years.

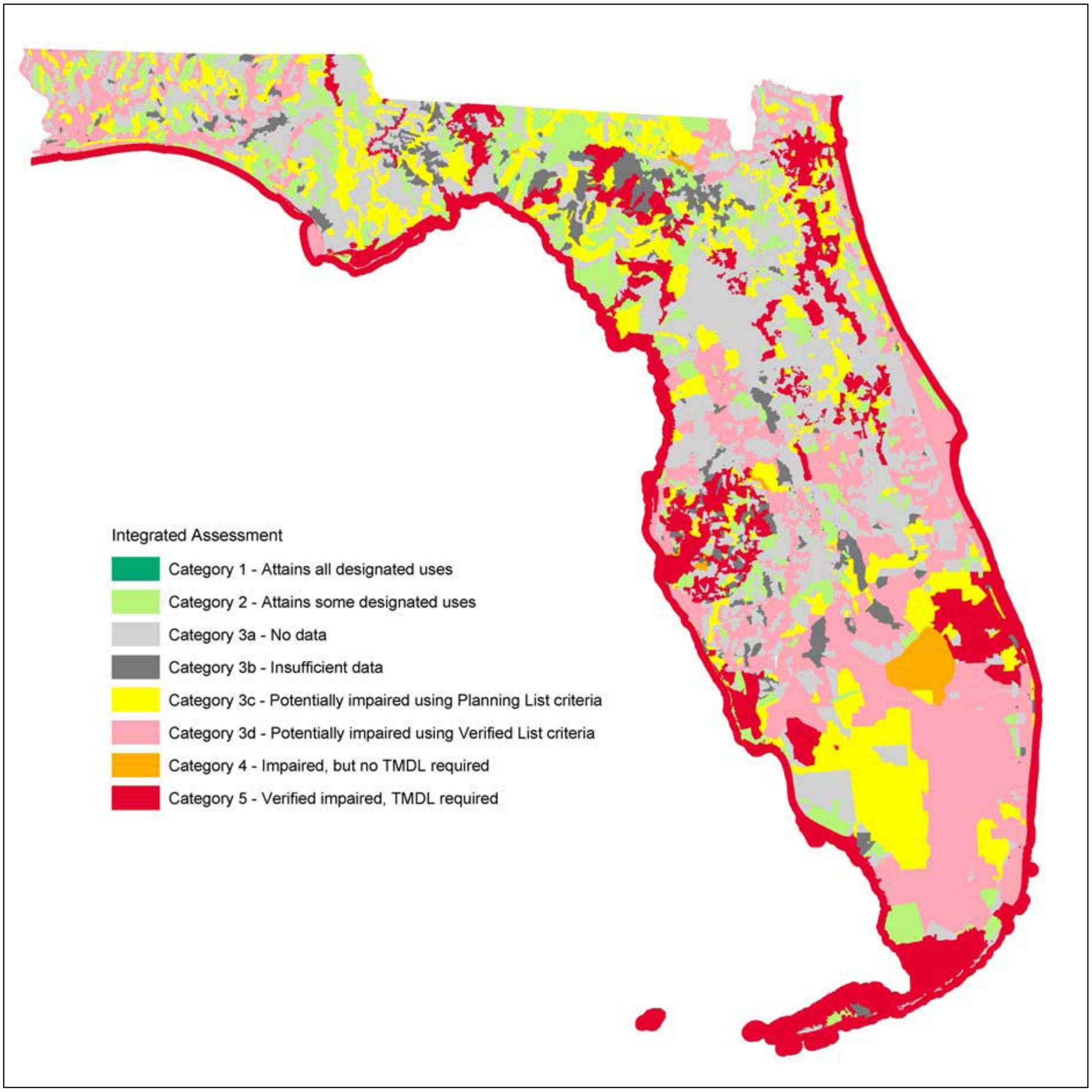
As part of a continuing effort to consolidate and align the 305(b) and 303(d) assessment and reporting requirements, the results of the statewide assessments in this section provide three different types of information. First, the basin assessments completed under the IWR methodology for the Group 1 and 2 basins are summarized. Detailed Assessment Reports in the Appendices provide supporting data on these basins. Second, the 1998 303(d) list of impaired waters for the Group 3, 4, and 5 basins is carried over. Third, preliminary, unverified assessment results are provided for waterbodies in the Group 3, 4, and 5 basins that were ***not*** on the 1998 303(d) list. The summary tables provide detailed breakdowns for these different categories.

Surface waters were assessed using the IWR methodology, which evaluates available quantitative biological data, exceedances of state criteria for conventional pollutants and toxics, data relating to nutrient impairment, beach advisory data, shellfish harvesting classification information, and fish consumption advisory information. The IWR provides specific thresholds for determining if applicable designated uses (aquatic life use, shellfish harvesting or propagation, recreational use, and drinking water use) are being met.

While most of the state's monitoring has historically focused on water chemistry, FDEP has developed bioassessment procedures that more directly assess whether aquatic life use support is being maintained. Bioassessment focuses primarily on assessing the cumulative impacts of nonpoint sources. This type of monitoring should not only increase Florida's ability to monitor more waterbodies, but will also allow for more comprehensive assessments.

Following the national models and using guidance from the EPA, FDEP has made steady progress in developing bioassessment tools for different waterbody types. Bioassessment tools for streams (the Stream Condition Index and BioReconnaissance [BioRecon]) and lakes (the Lake Condition Index) are completed and are well into the implementation phase in many of FDEP's monitoring programs. They are used as one of the indicators of impairment in the statewide basin assessments (Tier II monitoring). The wetland tools are nearing completion. The development of a bioassessment tool for estuaries has long been one of FDEP's goals. Because of the inherent complexities of estuarine systems and the lack of any proven national models, however, an estuarine tool that is applicable statewide has not yet been developed. FDEP is currently recalibrating the Stream Condition Index and BioRecon tools using a Human Disturbance Gradient approach. This important stream recalibration project could provide a potential framework for developing a bioassessment approach in estuarine systems.

Figure 19. Summary Information for Statewide Designated Use Attainment (Showing Impaired, Not Impaired, and Potentially Impaired Surface Waters[11], and Surface Waters with Insufficient Data for Assessment)



[11] Potentially impaired waters in Categories 3c and 3d have not been verified as impaired, and only Category 5 waters are considered on the state's 303(d) list of impaired waters.

Figure 20. Five-Year Rotating Basin Cycle in FDEP's Six Districts

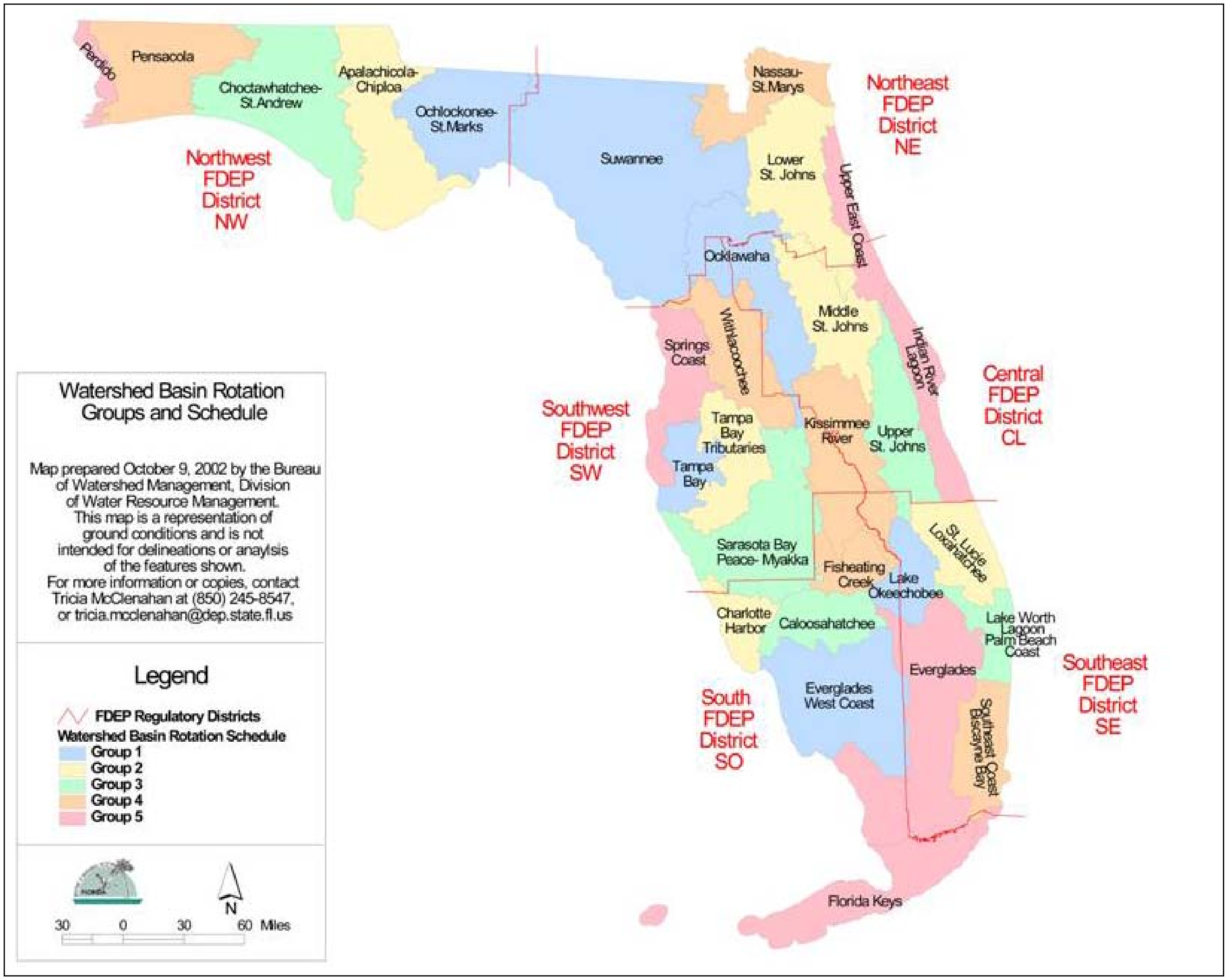


Figure 21. Basins in FDEP's Northwest District

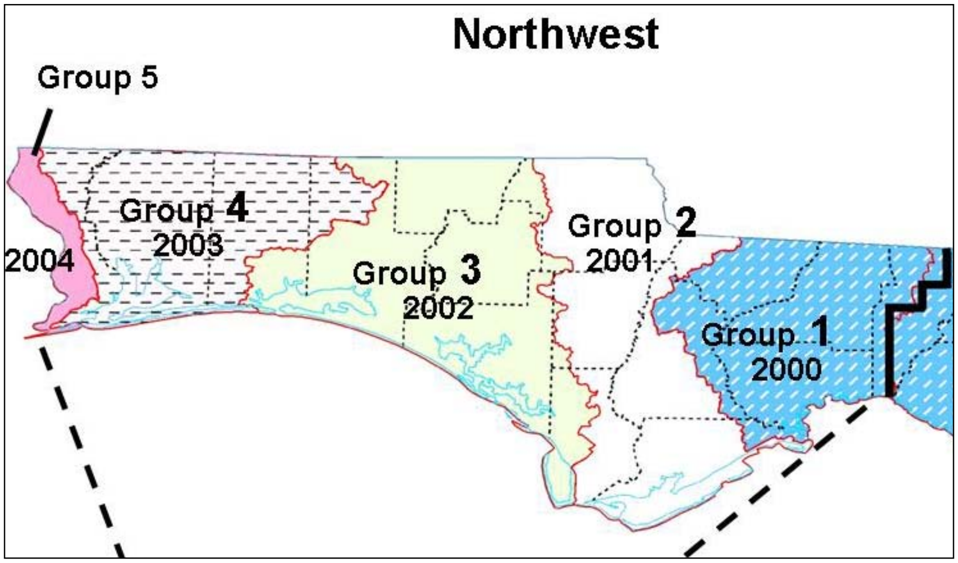


Table 14. Basin Groups for Implementing the Watershed Management Cycle, by FDEP District Office

District	***Group 1 Basins***	***Group 2 Basins***	***Group 3 Basins***	***Group 4 Basins***	***Group 5 Basins***
Northwest	Ochlockonee–St. Marks Rivers	Apalachicola–Chipola Rivers	Choctawhatchee River and Bay and St. Andrew Bay	Pensacola Bay	Perdido River and Bay
Northeast	Suwannee River	Lower St. Johns River	—	St. Marys–Nassau Rivers	Northeast Coast Lagoons
Central	Ocklawaha River	Middle St. Johns River	Upper St. Johns River	Kissimmee River	Indian River Lagoon
Southwest	Tampa Bay	Tampa Bay Tributaries	Sarasota Bay and Peace–Myakka Rivers	Withlacoochee River	Springs Coast
South	Everglades West Coast	Charlotte Harbor	Caloosahatchee River	Fisheating Creek	Florida Keys
Southeast	Lake Okeechobee	St.Lucie–Loxahatchee Rivers	Lake Worth Lagoon/Palm Beach Coast	Southeast Urban Coast	Everglades

Table 15. Basin Rotation Schedule for TMDL Development and Implementation

<table>
<tr><th>Year</th><th>00</th><th>01</th><th>01</th><th>02</th><th>02</th><th>03</th><th>03</th><th>04</th><th>04</th><th>05</th><th>05</th><th>06</th><th>06</th><th>07</th><th>07</th><th>08</th><th>08</th><th>09</th><th>09</th><th>10</th></tr>
<tr><td>Group 1</td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td><td colspan="2">PHASE 3</td><td colspan="2">PHASE 4</td><td colspan="2">PHASE 5</td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td><td colspan="2">PHASE 3</td><td colspan="2">PHASE 4</td><td colspan="2">PHASE 5</td></tr>
<tr><td>Group 2</td><td colspan="2"></td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td><td colspan="2">PHASE 3</td><td colspan="2">PHASE 4</td><td colspan="2">PHASE 5</td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td><td colspan="2">PHASE 3</td><td colspan="2">PHASE 4</td></tr>
<tr><td>Group 3</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td><td colspan="2">PHASE 3</td><td colspan="2">PHASE 4</td><td colspan="2">PHASE 5</td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td><td colspan="2">PHASE 3</td></tr>
<tr><td>Group 4</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td><td colspan="2">PHASE 3</td><td colspan="2">PHASE 4</td><td colspan="2">PHASE 5</td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td></tr>
<tr><td>Group 5</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">PHASE 1</td><td colspan="2">PHASE 2</td><td colspan="2">PHASE 3</td><td colspan="2">PHASE 4</td><td colspan="2">PHASE 5</td><td colspan="2">PHASE 1</td></tr>
<tr><td></td><td colspan="10">1st Five-Year Cycle – High-Priority Waters</td><td colspan="10">2nd Five-Year Cycle – Medium-Priority Waters</td></tr>
</table>

Note: Projected years for Phases 3, 4, and 5 may change due to factors such as accelerated local activities, length of plan development, and legal challenges.

Basin Assessment Overview

The assessment results in this chapter are based on the state's interpretation of federal guidelines for designated use support and the integrated assessment categories defined by the EPA. As discussed earlier in this chapter, designated use is a functional classification assigned to each waterbody in the state. The state's surface water quality standards contain specific criteria for determining whether a waterbody attains (i.e., meets) its designated use. Each assessed waterbody is also placed into a specific category for the EPA's integrated assessment, based on whether enough information is available to determine use attainment.

Integrated Report Categories

The state evaluates water quality and lists waters according to guidance from the EPA. This listing method merges the states' reporting requirements under the Clean Water Act for the Section 305(b) surface water quality reports and Section 303(d) lists of impaired waters. ***Table 16*** describes the water quality listing categories recommended by EPA for the 2004 Integrated Report.

Table 16. Assessment Categories for Waterbodies or Waterbody Segments in the 2004 Integrated Report

Category	*Description*	*Comments*
1	Attaining all designated uses	As described later in this Chapter, Florida does not use this assessment category because a) EPA did not provide guidance on how much data is needed for each designated use to affirmatively conclude that all uses are met, and b) Florida reports the assessment status for each parameter rather than by water body.

Category	***Description***	***Comments***
2	Attaining some designated uses and insufficient or no information or data are present to determine if remaining uses are attained	If attainment is verified for some designated uses of a waterbody or segment, the state will propose partial delisting for the uses attained. Future monitoring will be recommended to determine if remaining uses are attained.
3a	No data and information are present to determine if any designated use is attained	Future monitoring will be recommended to determine if designated uses are attained.
3b	Some data and information are present but not enough to determine if any designated use is attained	Future monitoring will be recommended to gather sufficient information and data to determine if designated uses are attained.
3c	Enough data and information are present to determine that one or more designated uses may not be attained according to the Planning List methodology	This indicates a waterbody or segment is potentially impaired for one or more designated uses. These waters will be prioritized for future monitoring to verify use attainment or impaired status.
3d	Enough data and information are present to determine that one or more designated uses are not attained according to the Verified List methodology	This indicates that a waterbody or segment exceeds Verified List evaluation criteria and may be listed as impaired at the end of Phase 2 of the watershed management cycle. However, the data have not yet been fully evaluated and the waters have not been formally verified as impaired. Further monitoring and analysis may be necessary. **NOTE:** This category is applicable only to the Assessment Report. Waters that pass the Verified List criteria and are adopted by Secretarial Oderare placed in Category 5.
4a	Impaired for one or more designated uses but does not require TMDL development because a TMDL has already been completed	After the EPA approves a TMDL for the impaired waterbody or segment, it will be included in a Basin Management Action Plan to reduce pollutant loading toward attainment of designated use(s).
4b	Impaired for one or more criteria or designated uses but does not require TMDL development because impairment is not caused by a pollutant	This category includes waterbodies or segments that are impaired because of naturally occurring conditions or pollution. The impairment is not caused by specific pollutants.
4c	Impaired for one or more designated uses but does not require TMDL development because the water will attain water quality standards due to existing or proposed measures	Pollutant control mechanisms designed to attain applicable water quality standards within a reasonable time frame are either proposed or in place.

Category	*Description*	*Comments*
5	One or more designated uses is not attained and a TMDL is required	Waterbodies or segments in this category are impaired for one or more designated uses by a pollutant or pollutants. Waters in this category are included on the basin-specific Verified List adopted by FDEP's Secretary as Florida's impaired waters list and submitted to the EPA as Florida's 303(d) list of impaired waters at the end of Phase 2 of the watershed management cycle.

Note: The descriptions in **Table 16,** which are the subject of this report, were used in preparing the Status Reports for Basin Groups 1 through 3 and the Assessment Reports for Basin Groups 1 through 2. However, the descriptions for Category 4 listed above are slightly different than the EPA's description of Category 4 under the integrated assessment. While the definitions are worded slightly differently, the description of EPA Subcategory 4b includes the same waters listed as Subcategory 4c above, and the description of EPA Subcategory 4c includes the same waters listed as Subcategory 4b above. In short, EPA Subcategories 4b and 4c are the same as FDEP's Subcategories 4c and 4b, respectively. FDEP plans to adopt the EPA's subcategories during the Group 3 Verified List development process that formally started in June 2004 with the noticing of draft Verified Lists, but we did not want to change our subcategories during the Group 2 Verified List development process, which was recently completed by Secretarial adoption of the final lists.

Assessment Summary

Total Surface Waters

For the purposes of this assessment, there are two different types of total waters: total waters in the state and total waters assessed. FDEP keeps track of total waters in the state with a waterbody identification system, which includes 6,278 waterbodies that are characterized by waterbody type (stream, lake, or estuary). The assessed waters include those waters for which enough information is available to determine whether they attain their designated use (Category 2 under the EPA's integrated assessment) or do not attain their designated use (EPA Categories 3c, 3d, 4a, 4b, 4c, and 5). ***Tables 17a*** and ***17b*** list the miles and square miles of waters assessed, respectively, for Basin Groups 1 and 2, and for Basin Groups 3, 4, and 5.

Table 17a. Basin Groups 1 and 2, Miles and Square Miles of Waters Assessed

Waterbody Type	*Total Waters, Basin Groups 1 and 2*	*Total Assessed Waters, Basin Groups 1 and 2*
Perennial Rivers (miles)	10,351	4,647
Lakes (square miles)	1,919	1,451
Estuaries (square miles)	1,822	1,601
Coastal (square miles)	1,708	1,708

Table 17b. Basin Groups 3, 4, and 5, Miles and Square Miles of Waters Assessed

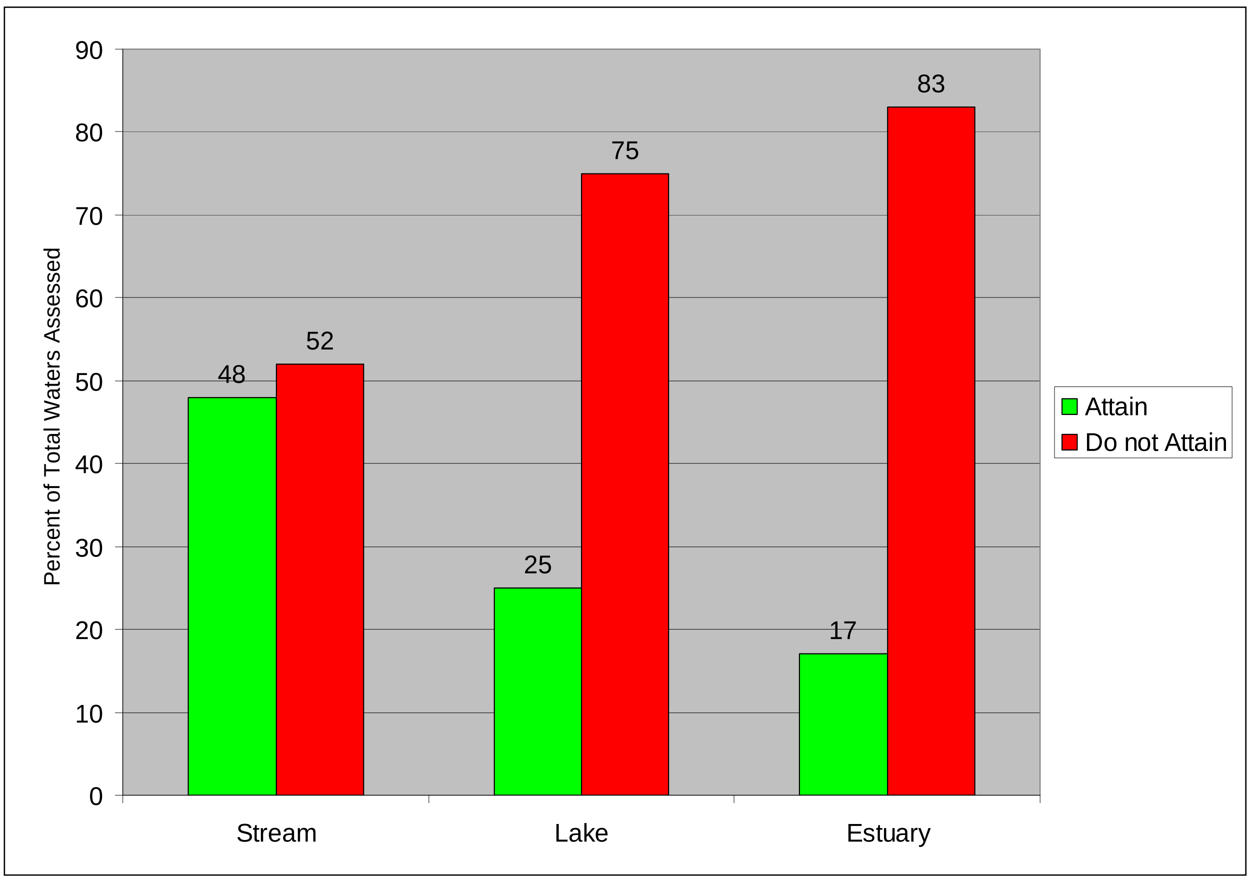
Waterbody Type	*Total Waters, Basin Groups 3, 4, and 5*	*Total Assessed Waters, Basin Groups 3, 4, and 5*
Perennial Rivers (miles)	9,273	5,117
Lakes (square miles)	610	442
Estuaries (square miles)	2,639	2,143
Coastal (square miles)	5050	5050

Surface Waters Meeting Designated Use

For the determination of use support in this report, FDEP assessed 2,736 miles of rivers and streams, 423,488 acres of lakes, and 1,412 square miles of estuaries. These numbers represent the miles assessed in the Group 1 and 2 basins using the Impaired Surface Waters Rule methodology for the Verified List of impaired waters. **Appendix C** describes the assessment methodology. Of the assessed miles,[12] 47 percent of total river miles, 25 percent of total lake areas, and 17 percent of total estuarine areas attain their designated use. It should be noted that the assessment results for lakes are highly impacted by the assessment results of one impaired lake, Lake Okeechobee, which is by far the largest lake in the state. Similarly, the assessment results for estuaries reflect the fact that the entire coastline has been determined to be impaired by mercury, based on fish consumption advisory data.

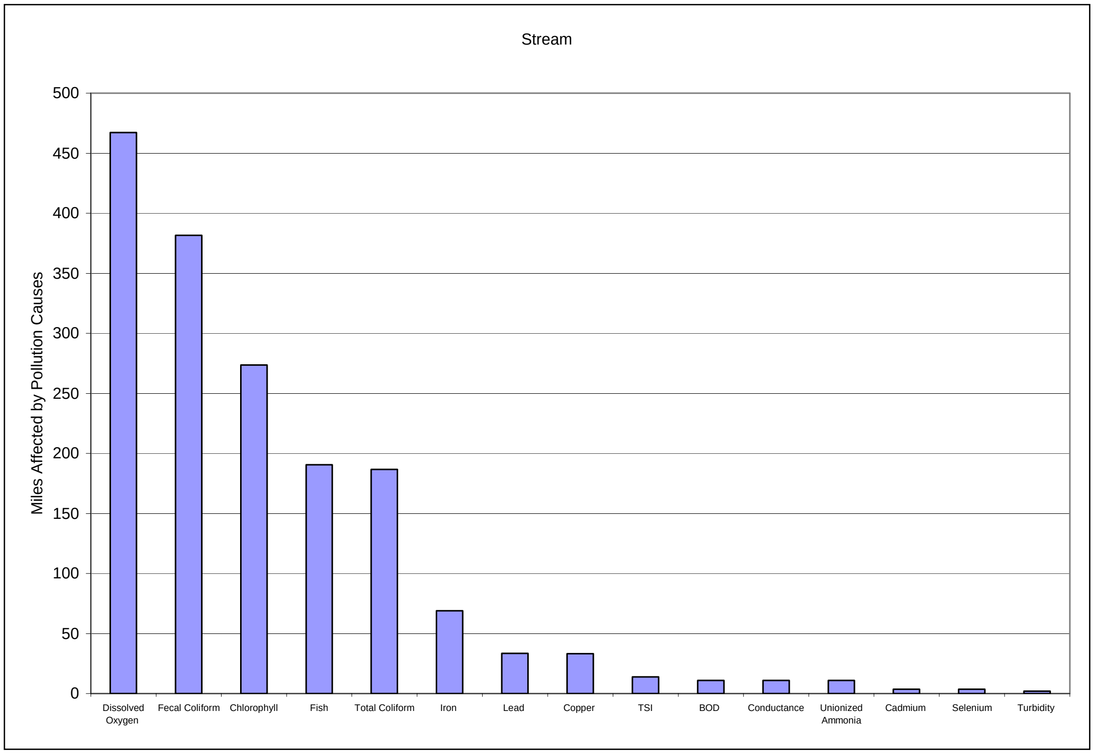
The assessment results are summarized in ***Figure 19***. ***Figure 22*** shows these results by waterbody type (rivers and streams, lakes, and estuaries). ***Figure 23,*** which is a subset of ***Figure 22,*** shows the parameters causing impairment in the Group 1 and 2 basins, by waterbody type. All coastal waters have been assessed to the degree that a fish consumption advisory is in place for selected species, because of excessive concentrations of mercury in fish tissue.

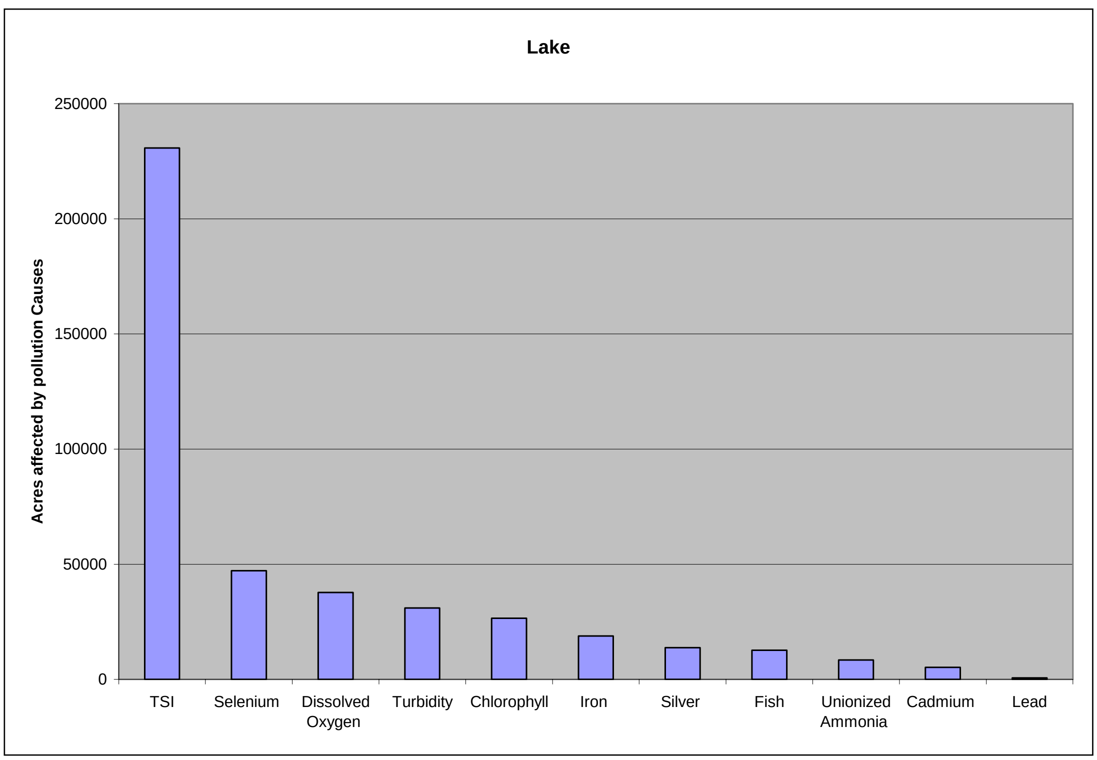
Figure 22. Basin Groups 1 and 2, Percent of Florida Surface Waters that Meet Their Designated Uses (EPA Category 2) or Do Not Meet Their Designated Uses (EPA Category 5)

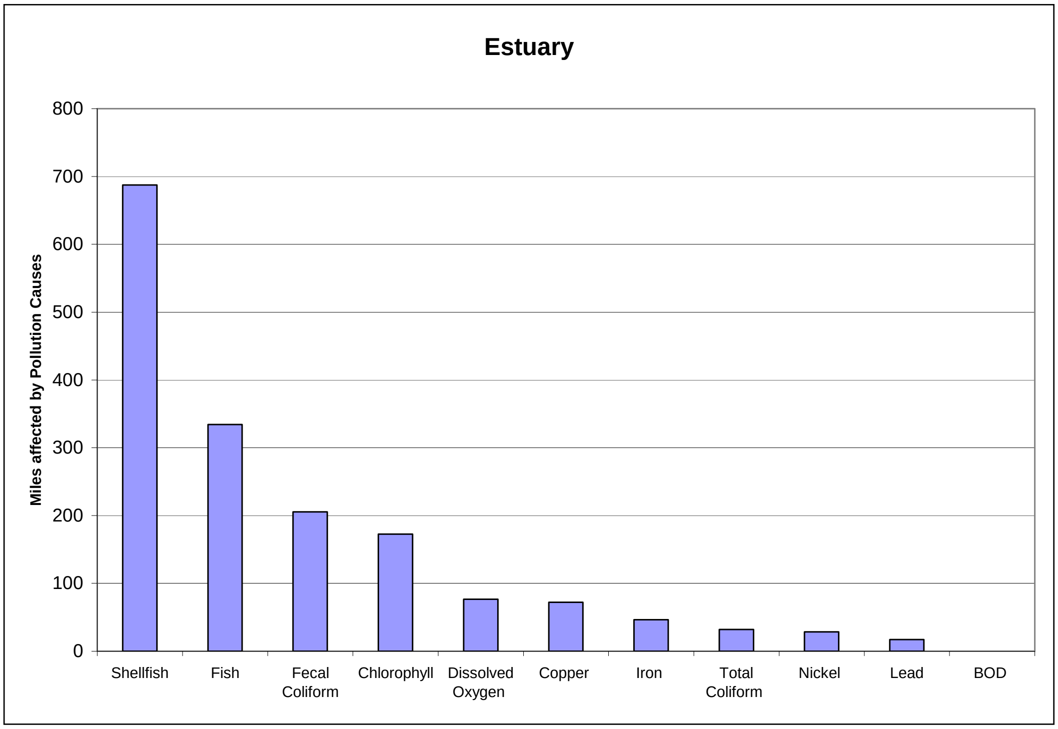


[12] *This figure includes only those waters with sufficient data for assessment of designated uses. Many waters had insufficient data for assessment.*

Figure 23. Pollutants Causing Impairment in the Group 1 and 2 Basins, by Waterbody Type*





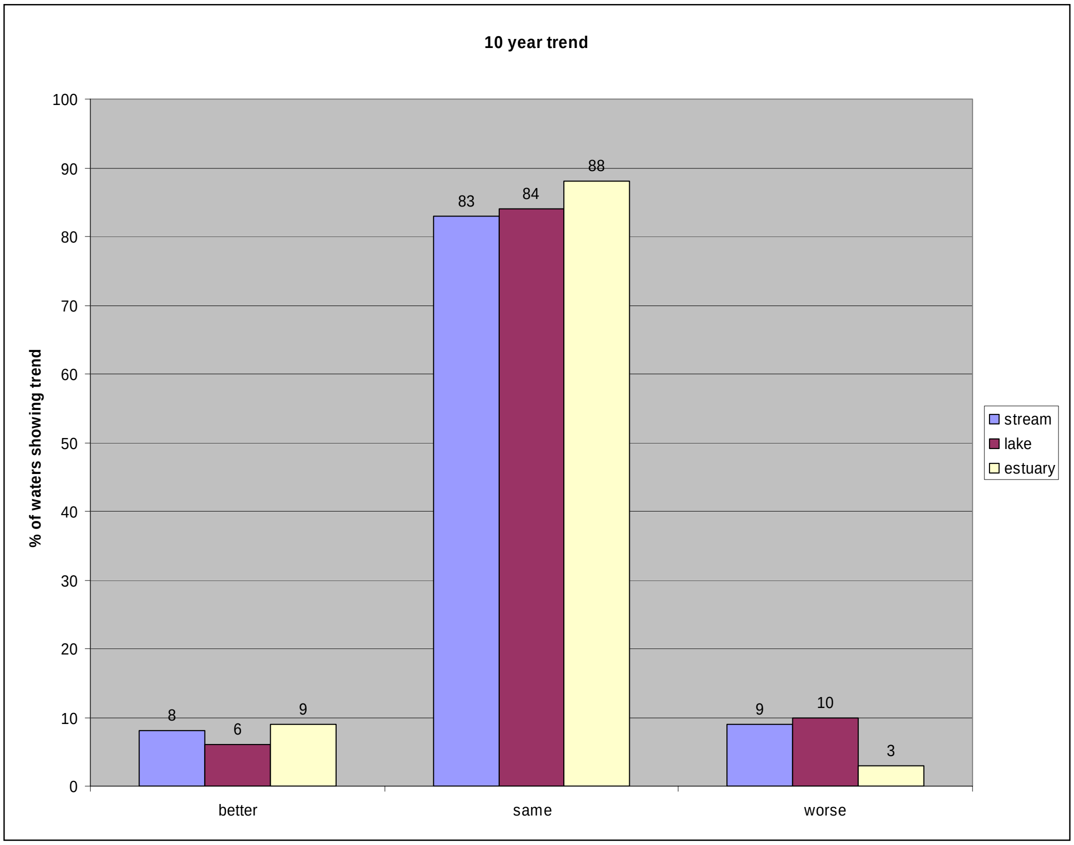


* See **Appendix C** for the Assessment Methodology.

Long-Term Trends

Changes in water quality over time are an important indicator of the health of surface waters. Enough data were available to evaluate long-term trends (1994 – 2003) in water quality for 1,861 streams, lakes, and estuaries. Overall, most (about 81 percent) showed no significant trends, while 8 percent improved and 11 percent worsened (***Figure 24).*** The improvements generally resulted from wastewater treatment plant upgrades or new regional wastewater plants and nonpoint source controls in Tampa, Orlando, and several other cities. One hundred and two waterbodies showed worsening trends caused by both point and nonpoint sources. Possible causes include agriculture and increased land development.

Figure 24. Statewide Long-Term Trends (Ten Years) for Streams, Lakes, and Estuaries



Water quality trends were analyzed using 12 water quality measurements for 1,861 watersheds between 1994 and 2003.[13] The overall trend for each waterbody was determined by comparing improved and degraded water quality measurements. Some waterbodies showed quite strong trends. If a waterbody showed no trends, or just 1 indicator showed a trend (or the number of improved minus degraded trends was 0 or 1), then the trend was classified as "no change."

Public Health Concerns

Bacterial and Mercury Contamination. Assessment results indicate that several human health-related designated uses are not always maintained in Florida's surface waters. Specifically, primary contact and recreation use support and shellfish harvesting use support are sometimes limited by the presence of bacteria in the water column, and fish consumption use support is commonly limited by the presence of mercury in fish tissue. It is important to note, however, that the impairment of these designated uses is based on beach and fish consumption advisories and shellfish bed closures, rather than documented impacts on public health. Florida has extensive monitoring programs that issue beach advisories, shellfish bed closures, and fish consumption advisories when ambient samples reach predetermined thresholds. These thresholds are conservatively designed to protect public health against the potential effects of exposure to bacteria (in water and shellfish) and mercury (in fish tissue).

[13] *A nonparametric correlation analysis (Spearman's Ranked Correlation) was used to analyze the ten-year trend of the annual STORET station medians for each watershed. A more rigorous analysis of trends would have adjusted for flow conditions (periodic droughts and flood).*

Harmful Algal Blooms. Over the last several years, concern has grown in Florida about the potential public health threat from harmful algal blooms (HABs). In general, researchers believe that freshwater algal blooms are increasing in frequency, duration, and magnitude and therefore may be a significant threat to surface drinking water resources and recreational sites (Williams, April 14, 2004). Typically caused by excess nutrients, these blooms may produce toxins that can harm humans through exposure to contaminated fish, dermal contact, and even the inhalation of aerosols. Citizens near the Lower St. Johns River and St. Lucie River Estuary have expressed particular concern about potential blooms of *Pfiesteria piscicida,* which has been documented to cause ulcers in fish and respiratory irritation, skin rashes, and possible neurocognitive disorders in humans in the mid-Atlantic region. *P. piscida* has never been positively identified in the Lower St. Johns, but *Pfiesteria*-like organisms have been found. No *Pfiesteria* or *Pfiesteria*-like events have been documented in Florida.

The FMRI in St. Petersburg monitors HABs as part of its ECOHAB (Ecology and Oceanography of Harmful Algal Blooms in Florida) program. This monitoring primarily focuses on red tide, a brevetoxin that has been linked to numerous marine mammal deaths (in manatees and dolphins) and can cause severe respiratory distress in people who are exposed to a strong red tide event. However, FMRI has also evaluated coastal waters for *Pfiesteria*, and no samples to date have contained this species.

A relatively new issue of concern in Florida is the presence of the toxigenic blue-green algae called cyanobacteria and their production of cyanotoxins. Blooms of cyanobacteria are due, in most part, to high nutrient loads, slow-moving waters, and hot, humid, and stagnant conditions. Cyanotoxins are naturally produced chemicals that can cause liver, brain, and skin toxicity. Several cyanotoxins, namely microcystins and the lyngbyiatoxins, have been implicated as tumor promoters (Williams, April 14, 2004). Cyanobacteria were on the EPA's1998 Contaminant Candidate List, which is used to prioritize research and make regulatory determinations. Since the CCL list was developed, EPA has placed a number of the microcystin toxins on their "Unregulated Contaminant Monitoring Rule – List 3" for a more detailed investigation into these toxins occurrence and health impacts. Although no formal decision has been made to date, this nation-wide monitoring would take place after 2005.

Potentially toxigenic cyanobacteria have been found statewide, including river and stream systems such as the St. Johns, Caloosahatchee, Peace, and Kissimmee Rivers. The Cyanobacteria Survey Project (1999–2001), managed by the Harmful Algal Bloom Task Force at FMRI, indicated that the species of *Microcystis, Anabaena,* and *Cylindrospermopsis* were dominant, while *Aphanizomenon, Planktothrix, Oscillatoria,* and *Lyngbya* were also observed statewide but not as frequently. Cyanotoxins (microcystins, cylindrospermopsin, and anatoxin-a) were also found statewide. A quota of 25 samples was collected per water management district.

A number of waterbodies in Florida are known to have extremely abundant populations of blue-green algae. These include Lakes Seminole and Tarpon in Pinellas County, Lakes Beauclair and Dora in Lake County, Newnans Lake in Alachua County, Lake Jesup in Seminole County, Lake Okeechobee in Okeechobee, Palm Beach, Hendry, and Glades Counties, and numerous others (Williams, April 14, 2004). The first demonstrated case in Florida of human dermatitis related to a freshwater cyanobacteria species, *C. raciborskii,* occurred in Winter Haven on Lake Cannon during the 1990s (King, April 14, 2004).

Frequently, measured concentrations of cyanotoxins have been reported in some post-processed finished water of drinking water facilities in Florida. A few of these concentrations were above the suggested guideline levels. The Cyanobacteria Survey Project of 2000 focused on water treatment plants that produced drinking water from surface waters. Samples (raw and finished water) were collected once a month for approximately 9 months. On 6 occasions, microcystin levels (hepatotoxins) in finished water samples were reported above the 1 microgram per liter (μg/L) World Health Organization (WHO) guideline level (a range of 1 to 10 μg/L). However, these guideline levels have a 1000x safety factor and are based on a lifetime exposure. Further, the sample deviation at these low concentrations raised the issue of quality assurance, particularly considering the then new analytical procedures and lack of lab certification.

There are no WHO guidelines for cylindrospermopsin (which is classified as a hepatotoxin but is a more general tissue toxin) or anatoxin-a (a neurotoxin). However, Australia determined that 1 μg/L for cylindrospermopsin was appropriate due to its genotoxic capabilities. The Cyanobacteria Survey Project found 9 samples of finished water that contained cylindrospermopsin levels between 8 and 97 μg/L. As for anatoxin-a, 2 samples contained levels from 2 to 8 μg/l, and 4 samples contained detectable levels but below an arbitrary level of 1 μg/L (Williams, April 14, 2004). Again quality assurance issues cause the results to be questionable.

Since that study, the Department of Health has established a testing laboratory and certification program for these chemicals and is participating in additional studies of recreational and drinking waters. Several Drinking Water facilities are either monitoring for these substances or are participating in a larger study to evaluate the effectiveness of treatment methodologies to eliminate the toxins. Reports from WHO and other research around the world indicate that conventional treatment processes are effective at eliminating the algae and the toxin, when present. The taste, odor, and color associated with the bloom provide a clear indication of its presence and initiate the use of additional treatment. While these treatment techniques are being used to control the taste, odor, and color of the water, they are also being shown to very effective at removing or degrading the toxins.

Consistent/persistent low levels of microcystins (0.1 to 1.0 μg/L) have been found in the Harris Chain of Lakes in central Florida and in Lake Okeechobee. Eutrophic waterbodies with high blue-green populations are likely to have consistent levels of toxins present, especially during the spring and summer months. Reports indicate that the greatest toxin production (microcystins) is almost always during the late fall and early winter (Williams, April 14, 2004).

River and Stream Assessment

Florida has over 50,000 miles of rivers (***Table 1),*** half of which are ditches and canals. About 19,000 of these miles currently have been identified with GIS mapping techniques, making them available for evaluation using Florida's Waterbody System database ***(Tables 17a and 17b).***

Major dams have been built on the Apalachicola, Ocklawaha, Ochlockonee, Hillsborough, and Withlacoochee (Citrus County) Rivers. The most extreme alterations were damming the Ocklawaha to create the Cross-Florida Barge Canal and channelizing the Kissimmee River. The southern third of Florida's peninsula has been so hydrologically altered that few naturally flowing streams and rivers remain. Most fresh waterbodies in South Florida are canals, which usually support plants and animals more typical of lakes than rivers.

Still, Florida does have several types of natural river systems. In fact, most Florida rivers exhibit characteristics of more than one type of river system, either at different places along their length or at different times of the year. The links between surface water and ground water can also affect natural systems. A good example is the Suwannee River, which originates in the Okefenokee Swamp as a blackwater stream and becomes spring fed south of Ellaville. During periods of high flow, it carries sand and sediments, behaving like a true alluvial stream. During low flow, however, the river's base flow comes from underground springs. These variations in flow affect the river downstream and the receiving estuary. Ground water has higher nitrate concentrations that can affect animals and plants downstream, while the sand and sediments carried by the river during periods of high flow have a different effect on biological life.

In north and northwest Florida, many rivers are alluvial. The Choctawhatchee, Apalachicola, and Escambia best represent this type of river. Common features include a well-developed floodplain, levees, terraces, oxbows, and remnant channels (sloughs) that parallel the active riverbed. Typically, because flows fluctuate more than with other types of rivers, habitats are more diverse.

There are many blackwater streams and rivers in Florida. Blackwater rivers usually have acidic, highly colored, slowly moving waters containing few sediments. These systems typically drain acidic flatwoods or swamps and are low in biological productivity. The upper Suwannee River and the north New River are good examples.

Many major river systems that originate as springs are found in central and north Florida, the Big Bend area of the Gulf Coast, and the southern portion of the Tallahassee Hills. Chemically, these rivers are clear, alkaline, and well buffered, with little temperature variation. They have relatively constant flows and few sediments. Their clear water encourages the growth of submerged plants that provide habitat for diverse animal species. Many spring-fed rivers flow directly into estuaries; the constant temperatures offer protection from temperature extremes to a number of species, including estuarine fish such as spotted seatrout and red drum, and manatees.

Attainment of Designated Use for Rivers and Streams

The determination of whether each waterbody attains its designated use was made by evaluating many different kinds of information, including biological data, criteria exceedances, beach advisories,and posted fish consumption advisories. The methodology in **Appendix C** describes in detail how this determination was made.

Table 18 summarizes overall attainment of designated uses of Florida's rivers and streams. The assessment of Basin Group 1 and 2 waters has been completed, and the results are listed as EPA Categories 2, 3, and 5. The waters in Category 5 either have TMDL determinations in progress or are scheduled for TMDLs. Waters in Category 2 are attaining designated uses, and waters in Category 3 either have no or limited data, or are on the Planning List and require more data for the final determination of impairment.

Table 18. Attainment Status for Streams (Total Miles of Use Support)

Integrated Report Category*	Attainment Status by Basin Rotation Group		Total Miles, Basin Groups 1 through 5
	Basin Groups 1 and 2	Basin Groups 3, 4, and 5	
2	1,306	782	2,088
3a	4,645	3,849	8,494
3b	778	308	1,086
3c	2,163	740	2,903
3d	0	3,595	3,595
4a	0	0	0
4b	13	0	13
4c	14	0	0
5	1,430	0	1,403
Total	**10,351**	**9,273**	**19,624**

***** Florida's 305(b)/303(d) Integrated Report categories are as follows:
1 – This category is not used by Florida.
2 – Attains some designated uses;
3a – No data and information are available to determine if any designated use is attained;
3b – Some data and information are available, but they are insufficient for determining if any designated use is attained;
3c – Meets Planning List criteria and is potentially impaired for one or more designated uses;
3d – Enough data and information are available to determine that one or more designated uses is not attained, but the waterbody has not been verified as impaired;

4a – Is impaired for one or more designated uses and the TMDL is complete;
4b – Is impaired for one or more designated uses but no TMDL is required because the impairment is not caused by a pollutant;
4c – Is impaired for one or more designated uses, but no TMDL is required because an existing or proposed pollutant control mechanism provides reasonable assurance that the water will attain standards in the future; and
5 – Water quality standards are not attained and a TMDL is required.

Tables 19.a and ***19.b*** list river miles that attain or fail to attain specific uses such as aquatic life, primary contact (swimming and recreation), fish consumption, and drinking water. Florida's criteria do not distinguish between protecting aquatic life, the protection of fish and wildlife populations, and recreational uses; these are all included in Class III water quality standards. Class I waters must also protect general human health, aquatic life, and allow for the protection of fish and wildlife, as well as recreational uses.

Table 19.a. Basin Groups 1 and 2, Attainment Status by Use Support for Streams (Miles)

Integrated Report Category*	Designated Use			
	Aquatic Life	Drinking Water	Fish and Shellfish	Primary Contact
2	1,670	21	509	1,660
3a	15	5	4,623	4,640
3b	811	21	1	639
3c	1,714	3	819	440
4a	0	0	0	0
4b	13	0	0	0
4c	326	0	0	0
5	694	38	238	716

Table 19.b. Basin Groups 3, 4, and 5, Attainment Status by Use Support for Streams (Miles)

EPA Category*	Designated Use			
	Aquatic Life	Drinking Water	Fish and Shellfish	Primary Contact
2	918	36	221	1,072
3a	4,083	49	6,034	4,821
3b	364	18	0	904
3c	692	0	0	96
3d	995	97	797	158

***** Florida's 305(b)/303(d) Integrated Report categories are as follows:
1 – This category is not used by Florida
2 – Attains some designated uses;
3a – No data and information are available to determine if any designated use is attained;
3b – Some data and information are available, but they are insufficient for determining if any designated use is attained;
3c – Meets Planning List criteria and is potentially impaired for one or more designated uses;
3d – Enough data and information are available to determine that one or more designated uses is not attained, but the waterbody has not been verified as impaired;
4a – Is impaired for one or more designated uses and the TMDL is complete;
4b – Is impaired for one or more designated uses but no TMDL is required because the impairment is not caused by a pollutant;
4c – Is impaired for one or more designated uses, but no TMDL is required because an existing or proposed pollutant control mechanism provides reasonable assurance that the water will attain standards in the future; and
5 – Water quality standards are not attained and a TMDL is required.

Attainment of Designated Use for Drinking Water for Rivers and Streams

Surface waters supply only about 13 percent of Florida's drinking water. Of 7,200 public drinking water systems, 19 obtain their water from surface water. An additional 26 systems wholly or partially purchase water from these 19 systems. Because it is expensive to operate a surface water system (given that filtration and advanced disinfection are costly), most are large.

To determine attainment for drinking water use, the data for all Class I rivers and lakes in the state were examined as previously described. ***Tables 19.a*** and ***19.b*** summarize the causes and acreages of waterbodies not attaining drinking water use for rivers and streams.

Causes of Nonattainment of Designated Use for Rivers and Streams

For each waterbody that has been identified as impaired (nonattainment of its designated use), the causes (such as nutrients and oxygen-demanding substances) are identified. ***Table 20*** summarizes the causes of nonattainment of designated use in rivers and streams.

Table 20. Basin Groups 1 and 2, Causes of Nonattainment of Designated Use (Rivers and Streams)

Cause	*Number of Waterbody Segments*	*Miles Impaired*
Nutrients (Chlorophyll)	42	247
Biology	1	5
Cadmium	1	4
Conductivity	1	11
Dissolved oxygen/BOD	93	543
Fish–mercury	7	238
Iron	14	69
Lead	6	34
Nutrients (Historical chlorophyll)	4	29
Fecal coliform	99	580
Total coliform	60	425
Turbidity	1	2
Unionized ammonia	1	11
Copper	5	33

Trends in Stream Water Quality

Trends in Florida streams between 1994 and 2003 were analyzed. Of the streams surveyed, 814 had sufficient data for trend analysis. Of these 814 streams, 52 were improving, 50 were declining, and 712 showed no trend ***(Table 21).***

Table 21. Statewide Trends in Streams

Status	Number of Waterbody Segments	Length (Miles)
Surveyed	814	7,362
Improving	52	597
Stable	712	6,078
Degrading	50	686

Lake Assessment

Florida has 7,712 public lakes with a surface area greater than or equal to 10 acres. Of these, 601 had water quality monitoring data, representing a total of 1,342,720 acres ***(Table 22).***

Attainment of Designated Use for Lakes

Florida lakes are designated as either Class I (public drinking water supply) or Class III (wildlife and/or recreational use). Although this report assesses a relatively small number of lakes, they represent close to 80 percent of the state's lake surface area. In deciding whether individual lakes attain their designated use, the methodology previously described was used.

Table 22. Total Lake Waters (acres) in Florida

Total lake acres	1,618,360
Significant public acres	1,618,360
Number of lakes greater than 10 acres	7,712
Area assessed (acres)	1,211,456

Note: It was assumed that all lakes are public access, by definition.

Table 23 summarizes attainment of designated use of Florida's lakes. The impaired category included lakes that are verified impaired and will require the development of a TMDL as previously defined.

Table 23. Summary of Attainment Status for Lakes (Acres of Use Support)

Integrated Report Category*	Attainment Status by Basin Rotation Group		Total Acres, Basin Groups 1 through 5
	Basin Groups 1 and 2	Basin Groups 3, 4, and 5	
2	105,664	45,248	150,912
3a	250,752	69,696	320,448
3b	35,008848	37,696	72,704
3c	137,152	16,064	153,216
3d	0	221,696	221,696
4a	381,568	0	381,568
5	317,824	0	317,824
Total	**1,227,968**	**390,400**	**1,618,368**

***** Florida's 305(b)/303(d) Integrated Report categories are as follows:
- **1** – This category is not used by Florida;
- **2** – Attains some designated uses;
- **3a** – No data and information are available to determine if any designated use is attained;
- **3b** – Some data and information are available, but they are insufficient for determining if any designated use is attained;
- **3c** – Meets Planning List criteria and is potentially impaired for one or more designated uses;
- **3d** – Enough data and information are available to determine that one or more designated uses is not attained, but the waterbody has not been verified as impaired;
- **4a** – Is impaired for one or more designated uses and the TMDL is complete;
- **4b** – Is impaired for one or more designated uses but no TMDL is required because the impairment is not caused by a pollutant;
- **4c** – Is impaired for one or more designated uses, but no TMDL is required because an existing or proposed pollutant control mechanism provides reasonable assurance that the water will attain standards in the future; and
- **5** – Water quality standards are not attained and a TMDL is required.

Tables 24.a and ***24.b*** list the total lake areas that attain or fail to attain specific uses such as aquatic life, primary contact (swimming and recreation), fish consumption, and drinking water. Florida's standards and criteria do not distinguish between protecting aquatic life, as well as the protection of fish and wildlife populations, and recreational uses; these are all included in Class III water quality standards. Class I waters must also protect aquatic life, and allow for the protection of fish and wildlife, and recreational uses.

Table 24.a. Basin Groups 1 and 2, Attainment Status by Use Support for Lakes (Acres)

Integrated Report Category*	Designated Use			
	Aquatic Life	Drinking Water	Fish and Shellfish	Primary Contact
2	120,704	34,304	471,552	194,560
3a	0	0	250,752	250,752
3b	38,848	0	0	73,216
3c	86,464	339,328	117,184	3,136
4a	381,568	0	0	0
5	310,464	0	12,672	0

Table 24.b. Basin Groups 3, 4, and 5, Attainment Status by Use Support for Lakes (Acres)

Integrated Report Category*	Designated Use			
	Aquatic Life	Drinking Water	Fish and Shellfish	Primary Contact
2	48,448	0	11,456	52,224
3a	72,000	768	201,024	116,352
3b	37,824	0	0	109,568
3c	16,064	0	0	0
3d	104,000	10,112	65,856	192

***** Florida's 305(b)/303(d) Integrated Report categories are as follows:
- **1** – This category is not used by Florida;
- **2** – Attains some designated uses;
- **3a** – No data and information are available to determine if any designated use is attained;

3b – Some data and information are available, but they are insufficient for determining if any designated use is attained;
3c – Meets Planning List criteria and is potentially impaired for one or more designated uses;
3d – Enough data and information are available to determine that one or more designated uses is not attained, but the waterbody has not been verified as impaired;
4a – Is impaired for one or more designated uses and the TMDL is complete;
4b – Is impaired for one or more designated uses but no TMDL is required because the impairment is not caused by a pollutant;
4c – Is impaired for one or more designated uses, but no TMDL is required because an existing or proposed pollutant control mechanism provides reasonable assurance that the water will attain standards in the future; and
5 – Water quality standards are not attained and a TMDL is required.

Attainment of Designated Use for Drinking Water for Lakes and Reservoirs

Tables 24.a and ***24.b*** summarize the causes and acreages of lakes and reservoirs not attaining drinking water use.

Causes of Nonattainment of Designated Use for Lakes

Table 25 summarizes causes of nonattainment of designated use in lakes.

Lake Okeechobee, a Class 1 waterbody, was designated as impaired by the Florida Legislature in 1999, and the DEP completed and adopted by rule a TMDL for Total Phosphorus for the lake in 2001. The entire TMDL (140 metric tons/year) is allocated to nonpoint sources. This is based on an in-lake target restoration goal of 40 parts per billion (ppb). Lake Okeechobee has subsequently been verified as impaired for coliforms, dissolved oxygen, iron, and unionized ammonia.

Table 25. Basin Groups 1 and 2, Causes of Nonattainment of Designated Use (Lakes)

Cause	*Number of Waterbodies*	*Size (Acres)*
Cadmium	1	5,248
Dissolved oxygen	16	48,192
Iron	2	18,880
Lead	2	1,280
Mercury–fish	10	12,672
Chlorophyll	4	26,560
Selenium	1	1,984
Silver	1	13,760
Trophic State Index	41	92,544
Unionized ammonia	2	9,216
Turbidity	5	31,616
Total coliform	2	1,728
Fecal coliform	4	5,760
Historical chlorophyll	51	153,920

Trends in Lake Water Quality

Trends in Florida lakes between 1994 and 2003 were analyzed, and there were sufficient data for trend analysis for 789 lakes. Of these 789 lakes, 89 were improving, 141 were declining, and 559 showed no trend ***(Table 26).***

Table 26. Statewide Trends in Significant Publicly Owned Lakes

Status	***Number of Waterbodies***	***(Size) Acres***
Surveyed	789	1,206,592
Improving	89	70,976
Stable	559	1,017,152
Degrading	141	118,464

Water quality improved in most Florida lakes after new regulations removed the majority of point source discharges — mainly wastewater effluent — in the 1970s and 1980s. The change was most obvious in the Orlando area when effluent discharges were eliminated from the headwaters of Lakes Howell, Jesup, and Harney, which had serious water quality problems.

Freshwater Sediment Contamination

In healthy aquatic environments, sediments provide critical habitat for many organisms. However, theycan also accumulate contaminants. Knowledge of existing sediment quality is important for environmental managers, especially in restoration and dredging projects. However, periodic water quality monitoring cannot fully assess aquatic ecosystems, as it is not usually designed to assess the cumulative impact of contaminants.

To provide information about sediment quality, FDEP released a statistical tool in 2002 that provides information on metals enrichment in freshwater sediments. It estimates anthropogenic impacts bynormalizing sediment metal concentrations to aluminum and iron in the sediment. In January 2003, FDEP also released a document, *Interpretative Tool for the Assessment of Metal Enrichment in Florida Freshwater Sediment,* that provides guidance in the interpretation of freshwater sediment chemistry data as it relates to biological impact at a site from sediment contaminants. The document is available at http://www.dep.state.fl.us/water/monitoring/index.htm#seds. These freshwater sediment guidelines were developed with the same weight-of-evidence statistical approach used to develop the 1994 coastal sediment quality guidelines, which are discussed in the estuarine assessment that follows.

In 2004, FDEP, in conjunction with the water management districts, will conduct a survey of lake sediments in the Group 1 basins. FDEP's Central Laboratory will analyze trace metals, major elements, nutrients, and organic contaminants, and FDEP's Monitoring Section will then apply the sediment quality assessment tools to the resulting data set.

Estuarine and Coastal Assessment

With over 8,000 coastal miles, Florida is second only to Alaska in amount of coastline. The state's west coast alone contains almost 22 percent of the Gulf Coast estuarine acreage in the United States. ***Table 27*** shows the state's total estuarine and ocean shore waters.

Table 27. Total Estuarine and Ocean Shore Waters in Florida

Total estuarine area (square miles)	4,460
Assessed area (square miles)	3,743
Coastal shoreline area (square miles)	6,758
Surveyed shoreline area (square miles)	6,758

Florida's estuaries are some of the nation's most diverse and productive. They include embayments, low- and high-energy tidal salt marshes, lagoons or sounds behind barrier islands, vast mangrove swamps, coral reefs, oyster bars, and tidal segments of large river mouths.

The Atlantic coast of Florida from the mouth of the St. Marys River to Biscayne Bay is a high-energy shoreline bordered by long stretches of barrier islands, behind which lie highly saline lagoons. This 350-mile stretch of coast contains only 18 river mouths and inlets. Biscayne Bay spans the transition from high- to low-energy shorelines, which are more typical of Florida's west coast.

At the southern end of the state lie Florida Bay and the Ten Thousand Islands, both of which are dominated by mangrove islands fronting expansive freshwater marshes on the mainland. Many tidal creeks and natural passes connect the islands and marshes. Historically, the area's fresh water came mainly from sheet flow across the Everglades.

Florida's west coast has low relief, and the continental shelf extends seaward for many miles. Unlike the east coast, numerous rivers, creeks, and springs contribute to estuarine habitats. Generally, the west coast's estuaries are well-mixed systems with classically broad variations in salinity. They often lie behind low-energy barrier islands or at the mouths of rivers that discharge into salt marshes or mangrove-fringed bays. The Big Bend coast from the Anclote Keys north to Apalachee Bay is low-energy marsh shoreline. While it does not conform to the classical definition of an estuary, its flora and fauna are typically estuarine. Many freshwater rivers and streams feeding the shoreline here are either spring runs or receive significant quantities of spring water. The Florida Panhandle from Apalachee Bay west to Pensacola Bay comprises high-energy barrier islands, with sand beaches fronting the Gulf of Mexico.

Major coastal and estuarine habitats vary from northern to southern Florida. Salt marshes dominate from Apalachicola Bay to Tampa Bay and from the Indian River Lagoon north to the Georgia state line. West of Apalachicola Bay, estuaries have few salt marshes. Mangrove swamps dominate the southern Florida coast. There are about 6,000 coral reefs between the city of Stuart on the Atlantic Coast south and west to the Dry Tortugas, while seagrasses are most abundant from Tarpon Springs to Charlotte Harbor, and from Florida Bay to Biscayne Bay.

Unfortunately, human activities have affected many of the state's estuaries, even though they remain an important ecological and economic resource. Population growth and associated development pressures have contributed to their deterioration, since about three-fourths of new Florida residents choose coastal locations for their new homes. Sediments in many urban estuaries such as Tampa Bay, the St. Johns River Estuary, and Pensacola Bay contain heavy metals and organic contaminants. Continued habitat losses from dredging and filling and construction also threaten the viability of the fisheries in these areas. Consumption advisories have been issued because tissues in a number of fish species contain excessive concentrations of mercury. In Florida Bay, algal blooms and extensive mangrove and seagrass dieoffs are important concerns. They likely stem from extensive channeling and hydrologic modifications in the watershed that have reduced freshwater flows to the bay. The lack of flushing from hurricanes, high water temperatures, and high salinity have exacerbated the problems in recent years.

Attainment of Designated Use for Estuaries

Florida's estuarine and coastal areas are either Class II waters (shellfish harvesting or propagation) or Class III waters (recreational and wildlife use). ***Tables 28.a*** and ***28.b*** list the total areas and attainment of designated use for estuaries and coastal waters. Decisions on whether individual estuaries attain their designated use are based on the IWR methodology described in **Appendix C.**

Table 28.a. Summary of Attainment Status for Estuaries (Square Miles of Use Support)

Integrated Report Category*	Attainment Status by Basin Rotation Group		Total Square Miles, Basin Groups 1 through 5
	Basin Groups 1 and 2	Basin Groups 3, 4, and 5	
2	242	334	576
3a	193	367	560
3b	10	129	139
3c	206	141	347
3d	0	1,668	1,668
4c	0	0	0
5	1170	0	1170
Total	**1,822**	**2,639**	**4,460**

Table 28.b. Summary of Attainment Status for Coastal Waters (Square Miles of Use Support)

Integrated Report Category*	Total Square Miles, Basin Groups 1 through 5		Total Square Miles, Basin Groups 1 through 5
	Basin Groups 1 and 2	Basin Groups 3, 4, and 5	
2	0	0	0
3a	0	0	0
3b	0	0	0
3c	0	0	0
3d	0	0	0
4b	0	0	0
5	1,708	5,050	6,758
Total	**1,708**	**5,050**	**6,758**

***** Florida's 305(b)/303(d) Integrated Report categories are as follows:
- **1** – This category is not used by FloridaAttains all designated uses;
- **2** – Attains some designated uses;
- **3a** – No data and information are available to determine if any designated use is attained;
- **3b** – Some data and information are available, but they are insufficient for determining if any designated use is attained;
- **3c** – Meets Planning List criteria and is potentially impaired for one or more designated uses;
- **3d** – Enough data and information are available to determine that one or more designated uses is not attained, but the waterbody has not been verified as impaired;
- **4a** – Is impaired for one or more designated uses and the TMDL is complete;
- **4b** – Is impaired for one or more designated uses but no TMDL is required because the impairment is not caused by a pollutant;
- **4c** – Is impaired for one or more designated uses, but no TMDL is required because an existing or proposed pollutant control mechanism provides reasonable assurance that the water will attain standards in the future; and
- **5** – Water quality standards are not attained and a TMDL is required.

Only 17 percent of the state's assessed estuaries attain their designated use. However, it should be noted that this low percentage of waters meeting their designated uses is primarily due to fish consumption advisories that have been issued for kingfish and shark for Florida's Atlantic and Gulf coastline. ***Tables 29.a*** and ***29.b*** identify the total estuarine areas that attain different levels of designated use specified by the EPA. ***Tables 30.a*** and ***30.b*** identify attainment status by use support for coastal waters.

Table 29.a. Basin Groups 1 and 2, Attainment Status by Use Support for Estuaries (Square Miles)

Integrated Report Category*	Designated Use		
	Aquatic Life	Fish and Shellfish	Primary Contact
2	918	6	1,147
3a	5	188	193
3b	32	0	24
3c	254	46	21
4c	141	0	0
5	276	934	226

Table 29.b. Basin Groups 3, 4, and 5, Attainment Status by Use Support for Estuaries (Square Miles)

Integrated Report Category *	Designated Use		
	Aquatic Life	Fish and Shellfish	Primary Contact
2	405	0	622
3a	367	1,465	593
3b	138	0	104
3c	135	0	24
3d	469	50	172

Table 30a. Basin Groups 1 and 2, Attainment Status for Coastal Waters (Square Miles of Use Support)

Integrated Report Category *	Designated Use		
	Aquatic Life	Fish and Shellfish	Primary Contact
2	0	0	0
3a	0	0	0
3b	0	0	0
3c	0	0	0
4b	0	0	0
5	0	1,708	0

Table 30b. Basin Groups 3, 4, and 5, Attainment Status by Use Support for Coastal Waters (Square Miles)

Integrated Report Category *	Designated Use		
	Aquatic Life	Fish and Shellfish	Primary Contact
2	0	0	0
3a	0	0	0
3b	0	0	0

3c	0	0	0
3d	0	5,050	0

***** The EPA's 305(b)/303(d) Integrated Report categories are as follows:
- **1** – This category is not used by Florida;
- **2** – Attains some designated uses;
- **3a** – No data and information are available to determine if any designated use is attained;
- **3b** – Some data and information are available, but they are insufficient for determining if any designated use is attained;
- **3c** – Meets Planning List criteria and is potentially impaired for one or more designated uses;
- **3d** – Enough data and information are available to determine that one or more designated uses is not attained, but the waterbody has not been verified to be impaired;
- **4a** – Is impaired for one or more designated uses and the TMDL is complete;
- **4b** – Is impaired for one or more designated uses but no TMDL is required because the impairment is not caused by a pollutant;
- **4c** – Is impaired for one or more designated uses, but no TMDL is required because an existing or proposed pollutant control mechanism provides reasonable assurance that the water will attain standards in the future; and
- **5** – Water quality standards are not attained and a TMDL is required.

Florida's standards and criteria do not distinguish between protecting aquatic life, the protection of fish and wildlife populations, and recreational uses, all of which are included in Class III standards.

Tables 29.a, 29.b, 30.a, and ***30.b*** were generated by identifying the square miles of attainment or nonattainment of designated use for each of Florida's water quality standards. The areas for aquatic life, swimming, and secondary contact were obtained for Class III waters. The same total area was used for each of these categories. The square miles listed for shellfishing are different because Class II areas were combined to identify the shellfish-harvesting areas.

Causes of Nonattainment of Designated Use for Estuaries

Table 31 lists the square miles of estuaries that do not meet their designated use and the causes of impairment.

Table 31. Basin Groups 1 and 2, Cause of Nonattainment of Designated Use (Estuaries)

Cause	*Number of Estuary Segments*	*Area (Square Miles)*
Fecal coliform	20	221
Bacteria (in shellfish)	27	708
Copper	14	134
Dissolved oxygen	27	86
Iron	7	65
Lead	3	17
Mercury–fish	18	474
Nickel	5	41
BOD	1	.1
Total coliform	13	47
Chlorophyll	36	145
Historical chlorophyll	3	29

Trends in Estuarine Water Quality

Trends in Florida estuaries between 1994 and 2003 were analyzed. For the estuary segments surveyed, 258 had sufficient data for trend analysis. Of these 258 estuary segments, 17 were improving, 7 were declining, and 234 showed no trend ***(Table 32).***

Table 33. Statewide Trends in Estuaries

Status	***Number of Estuary Segments***	***Square Miles***
Surveyed	258	3,153
Improving	17	278
Stable	234	2,788
Degrading	7	87

Estuarine and Marine Sediment Contamination

Florida's unique geologic and hydrologic features make its surface water and ground water relatively vulnerable to contamination. Sediment and soil contamination is particularly important to water quality, because surface and subsurface sediments, ground water, and surface water interact extensively. Sediment contamination is also crucial because of the state's extensive estuaries and their use as fisheries.

Although Florida currently has no criteria for heavy metals or toxic organics in sediments, FDEP's Coastal Zone Management Section (CZMS) studied estuarine sediments to assess current conditions, develop tools to identify contaminated areas, and provide background information to develop future sediment criteria.

The initial study collected and interpreted data on natural background concentrations of selected metals, including arsenic, cadmium, chromium, copper, mercury, lead, zinc, cadmium, barium, iron, lithium, manganese, silver, titanium, and vanadium.[14] The study was later expanded to include five classes of organic contaminants: chlorinated hydrocarbons (pesticides), polycyclic aromatic hydrocarbons, polychlorinated biphenyls, phenolic hydrocarbons, and aliphatic hydrocarbons.[15]

The CZMS sediment database contains information collected from 700 sites by FDEP, 42 sites by the National Oceanic and Atmospheric Administration's National Status and Trends Program, and 33 sites in the St. Johns River by Mote Marine Laboratory (a private marine research facility in Sarasota). The data came from 3 different surveys. From 1983 to 1984, sediments were collected as part of the Deepwater Ports Project from sites near dense population centers and close to commercial channels and ship berths. A second survey, from 1985 to 1991, assessed sites where contamination was expected because of flows from tributaries and local land use practices. The third survey examined sites in relatively remote or unimpacted areas.

Once the data were collected, the group developed tools using metal-to-aluminum ratios to identify estuarine and marine sites contaminated with cadmium, lead, arsenic, zinc, lead, nickel, chromium, and copper. Ratios greater than 1 indicate potential contamination. Mercury was evaluated against a

[14] *This effort culminated in the release of the document,* A Guide to Interpretation of Metal Concentrations in Estuarine Sediments *(Florida Department of Environmental Regulation, April 1988).*
[15] *The expanded database is summarized in* Florida Coastal Sediment Contaminants Atlas *(Florida Department of Environmental Protection, 1994).*

maximum concentration associated with uncontaminated estuarine sediments. Metal contamination above background levels was most often seen for cadmium, mercury, lead, and zinc. Polycyclic aromatic hydrocarbons were found in about 70 percent of the samples tested for organic chemicals. Of this group, fluoranthene and pyrene were found in more than 50 percent of the samples. Not surprisingly, more contaminants were found in urban watersheds than in rural or undeveloped watersheds.

While contaminant levels in estuarine and marine sediments can be measured, the effects of specific concentrations of metals or organic chemicals on aquatic life are not completely understood. Because of the difficulty of interpreting the data, FDEP developed guidelines for assessing sediment quality rather than sediment criteria. The guidelines provide ranges of concentrations that could cause a specific level or intensity of biological effects.

Using data from 20 different areas of Florida, FDEP developed preliminary guidelines for 34 priority contaminants in coastal and marine sediments.[16] Data from acute toxicity tests were used mainly because little information exists on chronic effects. Three ranges of effects were defined for each contaminant: probable, possible, and minimal. These are interpreted, respectively, as concentrations that always have an effect, frequently have an effect, and rarely or never have an effect. The guidelines for 28 substances have a high or moderate degree of reliability. The guidelines for all 34 substances, used collectively, predict the potential effects of contaminated marine and estuarine sediments on biological communities.[17]

Although the guidelines are a valuable tool, it is recommended that they be used with other tools and assessment procedures. Direct cause and effect should not be inferred. They also do not replace dredging disposal criteria or formal procedures, nor are they meant to be sediment quality criteria or numeric attainment levels for cleaning up Superfund sites.

Wetlands Inventory and Wetlands Protection

Although some background data are collected for issuing permits (particularly for wastewater discharged to wetlands) and restoration programs may require water quality data, Florida does not have a comprehensive wetlands monitoring network. This section provides an inventory of major wetlands and historical coverage of wetlands in the state, the development of wetlands water quality standards, and wetlands management and protection efforts.

Major Wetland Systems

Because of its low elevation and peninsular nature, Florida has many varied types of wetlands, including estuarine spartina and mangrove marshes, as well as freshwater sawgrass marshes, cypress swamps, and floodplain marshes. Wetlands comprise almost one-third of the state. The following are the largest and most important in the state:

- *The Everglades and the adjacent Big Cypress Swamp. Including the Water Conservation Areas (diked portions of the original Everglades system) and excluding the developed coastal ridge, this system extends from about 20 miles south of Lake Okeechobee to Florida Bay.*
- *The Green Swamp in the state's central plateau.*
- *The Big Bend coast from the St. Marks River to the (South) Withlacoochee River.*
- *Vast expanses of spartina marsh between the Nassau and St. Mary's Rivers.*
- *The system of the St. Johns River marshes. Before alteration by humans, all but the northernmost one-fifth of the river basin was an extensive freshwater system of swamps,*

[16] This approach was adapted from recommendations by Long and Morgan, 1990.
[17] For a complete discussion of methodology, see MacDonald, 1994.

marshes and lakes.[18] *Even today, half of the length of the St. Johns River is actually marsh, and in many respects it functions like a northern-flowing Everglades.*

- *The headwaters and floodplains of many rivers throughout the state, especially the Apalachicola, Suwannee, St. Johns, Ocklawaha, Kissimmee, and Peace Rivers.*

Historical Wetlands Coverage in Florida

Although information on the historical extent of Florida's wetlands is limited, one researcher estimates that the state lost as many as 46 percent of its original wetlands between the 1780s and the 1980s ***(Table 33*** contains estimates of Florida's historical wetlands).

Table 33. Historical Estimates of Wetlands in Florida

Period	*Wetlands Acreage*	*Source*
circa 1780	20,325,013	*Dahl, 1990*
mid-1950s	12,779,000	*Hefner, 1986*
mid-1970s	11,334,000	*Hefner, 1986*
mid-1970s	11,298,600	*Frayer and Hefner, September 1991*
1979–80	11,854,822	*U.S. Fish and Wildlife Service, January 1984*
circa 1980	11,038,300	*Dahl, 1990*

Development of Wetlands Water Quality Standards

Since wetlands are considered waters of the state, they are regulated under the same standards as other surface waters, and the same five functional classifications described earlier also apply. The state's policy for preventing wetlands degradation is set out in Section 403.918, F.S., and in Rules 62-302.300 and 62-4.242, F.A.C. Proposed permits that may degrade wetlands must be clearly in the public interest. More stringent tests apply to activities that may degrade wetlands in OFWs. Finally, an extremely rigorous nondegradation policy covers Outstanding National Resource Waters.[19]

Florida's rules already contain qualitative and quantitative biological criteria such as dominance of nuisance species and biological integrity. The state has spent the past 10 years developing procedures for assessing biological communities in streams and lakes, defining relevant ecoregions, and identifying relatively pristine reference sites. Similar work and procedures for wetlands are under early development.

Integrity of Wetlands Resources

Table 34 summarizes the acreage of affected wetlands (regulated by FDEP and the water management districts) from 1985 to 1993. Implementing the Environmental Resource Permit Program, adopting a unified approach to defining wetlands, and sharing information between FDEP and the water management districts will substantially reduce the problems identified in future reports. When evaluating the information in Table 3.4, the following should be considered:

1. *The numbers reflected only wetlands permits and did not measure overall trends. Wetlands lost to nonpermitted or exempt activities were not tracked.*

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[18] Kushlan, 1990.
[19] Although this last designation, created in 1989, applies to Everglades and Biscayne National Parks, it has not been confirmed by the Florida legislature.

2. *Some minimal overlap occurred where FDEP and the water management districts both issued permits.*

3. *The water management districts used different measurements to determine jurisdictional wetlands during this period.*

4. *Not all figures were verified by field inspections or remote-sensing techniques.*

Table 34. Wetlands Acreage Affected by Permitted Activities, 1985–93

Agency	***Wetlands Acreage***			
	Lost	***Created***	***Preserved***	***Improved***
FDEP	7,827	39,272	20,900	123,843
Water Management Districts				
Northwest Florida	187	170	1,986	0
Suwannee River	188	45	7,343	0
St. Johns River	4,351	8,719	65,256	14,028
Southwest Florida	4,293	3,409	30,549	1,254
South Florida	13,658	11,532	73,135	20,893
Totals	**30,504**	**63,147**	**199,169**	**160,018**

Lost – Wetlands destroyed.
Created – Wetlands created from uplands or nonjurisdictional wetlands connected to jurisdictional wetlands.
Preserved – Jurisdictional wetlands legally entered into some type of conservation easement.
Improved – Poor-quality jurisdictional wetlands enhanced by activities such as improved flow and the removal of exotic species.

Wetlands Management and Protection

The state's wetlands protection programs are well established in Florida's statutes, regulations, and policies. The 1984 Warren S. Henderson Wetlands Protection Act formally recognized the value of the state's wetlands in protecting water quality and biological resources. The act regulated permitting and required the tracking of affected wetlands and the creation of a wetlands inventory.[20] Wetlands protection was amended in 1993 to provide a unified statewide approach to defining wetlands and to streamline permitting into a single Environmental Resource Permitting Program for regulating point and nonpoint pollution, as well as water quantity. Enforcing the Environmental Resource Permit relies heavily on public awareness. Although each district has its own enforcement officers, the public reports many violations. Public education occurs through several state pamphlets and documents, technical and regulatory workshops, and newspaper coverage. The press has done a good job of reporting on wetlands issues.

Florida uses its own methodology (Rule 62-340, F.A.C.), rather than the federal methodology, to define the boundaries of wetlands and other surface waters. This approach, designed specifically for Florida wetlands communities, determines the landward extent of wetlands and other surface waters. It applies to both isolated and contiguous wetlands, with some exceptions in northwest Florida, and must be used by all local, state, and regional governments.

Numerous programs are working to restore both freshwater and estuarine wetlands — most notably, the Everglades system. Over 40,000 acres of filtration marshes, known as stormwater treatment areas, are

[20] *Because of a variety of funding and contract problems, the inventory has not yet been created.*

being built to reduce the phosphorus in agricultural runoff entering the Everglades. Filtration marshes are also being used in the Ocklawaha River and Upper St. Johns River Basins*.*

Comprehensive mapping is essential to assessing the extent of Florida's wetlands and how human activities affect them. Both the U.S. Fish and Wildlife Service and the Florida Game and Fresh Water Fish Commission (now called the Florida Fish and Wildlife Conservation Commission) have mapped wetlands. Local governments have also carried out mapping to comply with local comprehensive land use plans. Several programs to map estuarine seagrasses have begun under the National Estuary Program and the state's SWIM Program in the Indian River Lagoon, Tampa Bay, and Sarasota Bay. In addition, FDEP continues to develop its GIS capabilities to track the wetlands management program.

Land acquisition is crucial to wetlands preservation. The state has bought wetlands and other environmentally sensitive lands since 1963, mainly through the Conservation and Recreation Lands (CARL) Program, administered by FDEP, and the Save Our Rivers (SOR) Program, administered by the water management districts. Both are funded primarily by the documentary stamp tax on the transfer of property. Additional funding comes from the Preservation 2000 (P-2000) Trust Fund. In addition to outright land purchases, the state and water management districts can enter into agreements where the owner retains use of the property with certain restrictions such as conservation easements, the purchase of development rights, leasebacks, and sale with reserved life estates.

Florida's five water management districts regulate agriculture and silviculture under Chapter 373, F.S. Permit applicants must show that they will not harm wetlands (including isolated wetlands) of five acres or larger. A state committee advises the districts on silvicultural BMPs in hardwood forested wetlands. The districts also administer permits for surface water and ground water withdrawals (consumptive use permitting) under Part II, Chapter 373, F.S.

Mitigation is often used to offset otherwise unpermittable wetlands impacts. Accepted by rule since 1984 under Part III, Rule 62-312, F.A.C., mitigation includes the restoration, enhancement, creation, or preservation of wetlands, other surface waters, or uplands. The amount of land to be mitigated, called the mitigation ratio (mitigation ratio = land mitigated/land affected) is based on the quality of the area affected, its function, and the ability of mitigation to replace those functions. Ratios generally range from 1.5:1 to 4:1 for created or restored marshes, 2:1 to 5:1 for created or restored swamps, 4:1 to 20:1 for wetlands enhancement, 10:1 to 60:1 for wetlands preservation, and 3:1 to 20:1 for uplands preservation. These mitigation ratios were replaced in 2004 by the statewide Uniform Wetlands Mitigation Assessment Method (UMAM).

FDEP adopted rules governing mitigation banks in 1994 under Rule 62-342, F.A.C. A mitigation bank is a large area set aside for preservation or restoration. Permit applicants can, for a fee, withdraw mitigation credits to offset damage to wetlands functions. Mitigation credits are the increase in ecological value from restoring, creating, enhancing, or preserving wetlands.

CHAPTER 3: GROUND WATER QUALITY ASSESSMENT

Overview

Integrating Ground Water into Watershed Management

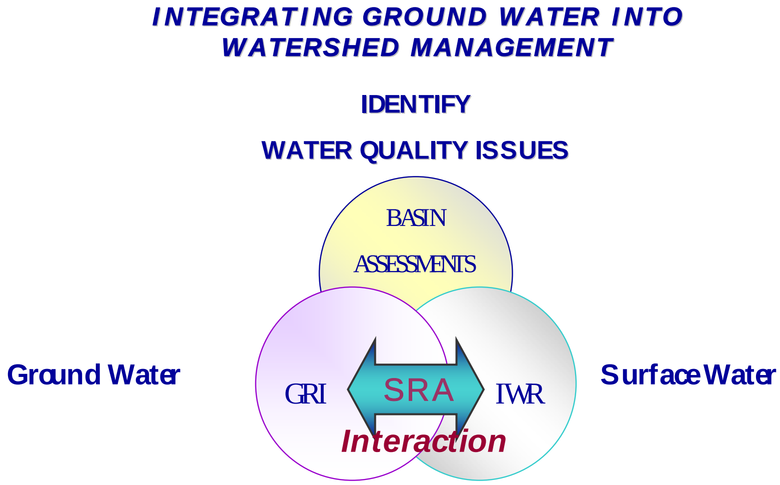
Integrating ground water into FDEP's watershed management approach has required an expansion in the approaches for both monitoring design and data analysis to include ground water–surface water issues. The majority of ground water protection efforts in the past emphasized land use and aquifer vulnerability, investigating and remediating local point sources of contamination to protect potable water supplies. Nonpoint source–related activities centered on monitoring subregional ground water resources affected by agricultural practices and developing agricultural BMPs to reduce the levels of nitrate in ground water.

Integrating ground water into watershed protection, however, has required an additional consideration with regard to ground water contributions to surface waterbodies (base flow). The water quality of base flow is now also considered an equally important ground water use to ensure the support of aquatic life in surface waterbodies. This is particularly important in Florida, where ground water contributions to surface water can provide 80 percent of the total flow. Identifying and quantifying ground water contributions where substances with extensive natural or anthropogenic abundances in geological deposits coexist with high percentages of base flow are also important in evaluating impaired surface waterbodies.

Assessing ground water quality in every basin in the state has required the development of new screening tools to evaluate the resource for drinking water supplies and contributions to surface waterbodies (Harrington *et al.,* 2004). The Ground Water Resource Index (GRI) was developed to evaluate water quality in aquifers used for potable supply and is based on primary and secondary ground water standards (based on human health effects and aesthetics) or guidance levels, where applicable. The Ground Water–Surface Water Relational Assessment (SRA) was developed to evaluate ground water quality from the perspective of an aquifer's contribution of base flow to surface water. It uses threshold reference values related to aquatic life use support–based water quality criteria for surface waters. The findings of GRI and SRA screening evaluations are by design conservative and do not necessarily indicate that ground water problems exist. However, these screening tools provide an indication of potential issues that justify more detailed evaluations. ***Figure 25*** illustrates FDEP's approach in evaluating ground water using these assessment tools.

This statewide 305(b) report contains a generalized, statewide evaluation of ground water quality using the GRI and SRA screening tools. Basin-specific evaluations will be performed according to the statewide schedule using the watershed approach. In subsequent phases, more detailed evaluations will be performed where ground water quality issues are identified.

Figure 25. Florida's Ground Water Assessment Approach



GROUND WATER RESOURCE INDEX (GRI)

Potable Water

Highest designated use of ground water

The GRI is used to evaluate ground water quality on basinwide and subregional scales to identify broad areas where ground water standards or guidance concentrations are not being met. It uses parameters that have a ground water standard or guidance concentration within the following contaminant groups: nutrients, biologicals, metals, organics, and saline waters.

The GRI is based on the percent of wells that exceed a ground water standard or guidance concentration for a specific parameter and is calculated with and without aquifer stratification. FDEP's ground water data from recent and historical monitoring programs are considered in the evaluation.

GROUND WATER–SURFACE WATER RELATIONAL ASSESSMENT (SRA)

Base Flow

Base flow that supports aquatic life

The SRA is used to evaluate ground water to identify broad areas where surface water criteria or reference values indicate there is a potential to adversely impact surface water. The priority is to assess the potential for ground water influence on impaired/potentially impaired surface waters under Florida's Impaired Surface Waters Rule (IWR) methodology.

The SRA is initially based on the percent of wells that exceed surface water standards or conditions necessary to support aquatic life. Information such as hydrogeology, geochemistry, surface water quality and hydrology, and land use are also considered to evaluate local ground-water-to–surface-water interaction.

Ground Water Standards

Ground water quality standards protect the designated use of ground water used for potable supply needs and are used as a reference to determine when contamination occurs (Rule 62-520, F.A.C.). They also provide a framework for the state's various ground water protection programs to achieve their goals. Primary numeric standards are established to protect public health, natural systems, and drinking water sources. Secondary numeric standards are established to protect the aesthetic nature of ground water, e.g., taste and odor considerations. The standards also include narrative "minimum criteria" that provide guidance in preventing contamination from substances not listed in the numeric criteria. Florida maintains a list of guidance concentration levels that are used as screening tools for interpreting the narrative minimum criteria.

Florida's ground water is categorized into five designated use classes.

- ***Class F-I*** *— Potable water use; ground water in a single source aquifer that has a total dissolved solids content of less than 3,000 mg/L and was specifically reclassified as Class F-I by the Environmental Regulation Commission.*
- ***Class G-I*** *— Potable water use; ground water in single source aquifers with a total dissolved solids content of less than 3,000 mg/L.*
- ***Class G-II*** *— Potable water use; ground water in aquifers with a total dissolved solids content of less than 10,000 mg/L.*
- ***Class G-III*** *— Nonpotable water use; ground water in unconfined aquifers with a total dissolved solids content of 10,000 mg/L or greater; or with a total dissolved solids content of 3,000 - 10,000 mg/L and either has been reclassified as having no reasonable potential as a future source of drinking water, or has been designated as an exempted aquifer.*
- ***Class G-IV*** *— Nonpotable water use; ground water in confined aquifers with a total dissolved solids content of 10,000 mg/L or greater.*

Assessment Summary

Ground Water Data Sources

FDEP established a ground water quality monitoring network in 1984, under the authority and direction of the 1983 Water Quality Assurance Act. From 1984–1999, the Background Network was maintained to establish the background and baseline ground water quality of major aquifer systems in Florida. In 1999, FDEP initiated a probabilistic sampling Status Network to assess water quality over areas defined as reporting units. Since FDEP initiated the watershed management approach in 2000, ground water quality assessment units now correspond with the state's basins. The Status Network and Background Network, as well as the other sources described in ***Table 35***, were the data sources used to assess ground water quality in this chapter (Maddox *et al.,* 1992; Copeland *et al.,* 1999). ***Figures 26*** and ***27*** show the statewide distribution of Status and Background Network wells. Although the Background Network and Status Network differ in purpose, design, number of stations, period of sampling and bias toward contamination, these two sampling programs are the only available FDEP data with representative statewide coverage.

Table 35. Summary of Ground Water Data Sources

Monitoring Network or Program	Period	Description
Status Network	1999–ongoing	Statewide network of over 1,100 water wells per cycle. Main source of data used in statewide assessment. Probabilistic sampling network for surface water and ground water data started with a 4-year cycle (1999) with reporting units and changed to a 5-year cycle (2004) with watershed basins. Sample locations are randomly selected from a list frame of wells. Stations in a reporting unit or basin: 30 unconfined and 30 confined aquifers. Data to characterize water quality on a basinwide scale, and parameters monitored correspond with those targeted in surface water evaluation.
Background Network	1985–99	Statewide network of 1,600 water wells and monitoring wells to spatially monitor general background water quality of local aquifers (surficial, intermediate, and Floridan). On average, each well was sampled once every 3 years for an extensive list of analytes.
Temporal Variability (TV) Subnetwork	1985–99	Initially included 188 wells sampled monthly to quarterly to quantify seasonal and long-term temporal changes in ground water quality. Number of TV wells decreased to 38 over the period of the project.
Ground Water Temporal Variability (GWTV) Subnetwork	1999–ongoing	Current temporal network consists of 46 wells statewide. Designed to help correlate Status Network results with seasonal hydrological variations, estimate temporal variance of analytes.
Very Intense Study Area (VISA) Network	1989–99	Network monitored the effects of land uses on ground water quality in 23 selected areas of the state. Individual VISAs consisted of approximately 20 wells sampled 3 times over an 11-year period. Sampled for a targeted list of analytes..
FDOH/FDEP Water Supply Restoration Program — Private Well Sampling Program	Ongoing	Private well data collected in investigations of potential ground water contamination, maintained in an FDEP Water Supply Restoration Program (WSRP) database. Parameter list is variable, depending on contaminants of concern.
FDOH Private Water Well Quality Survey	1986–97	Survey investigated statewide water quality from private drinking water wells. Included 50 private wells per county (distributed geographically and from all major local potable aquifers) for an extensive list of analytes. Coverage included 40 percent of the state before funding ended.

Figure 26. Status Network Monitoring Locations

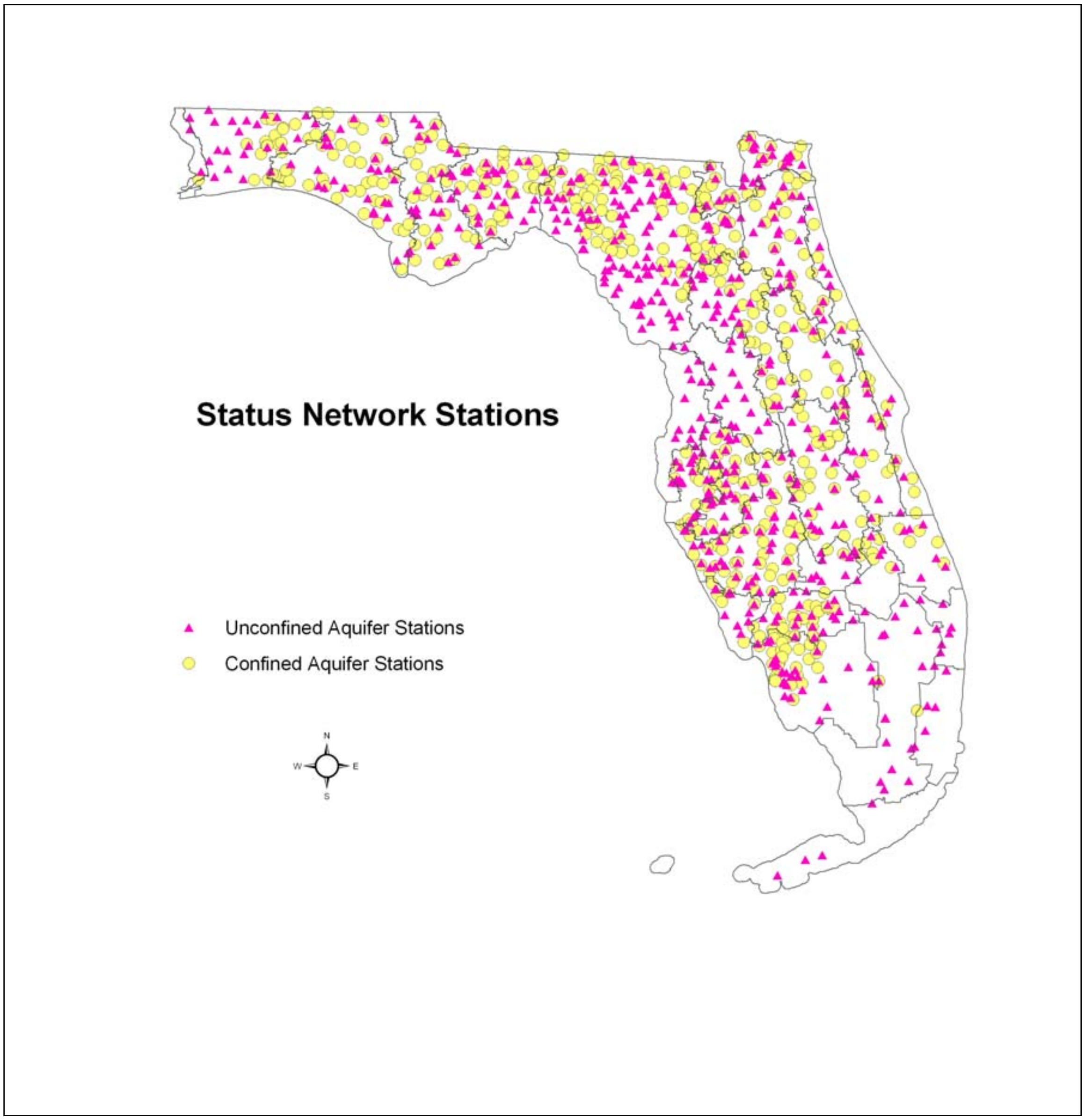
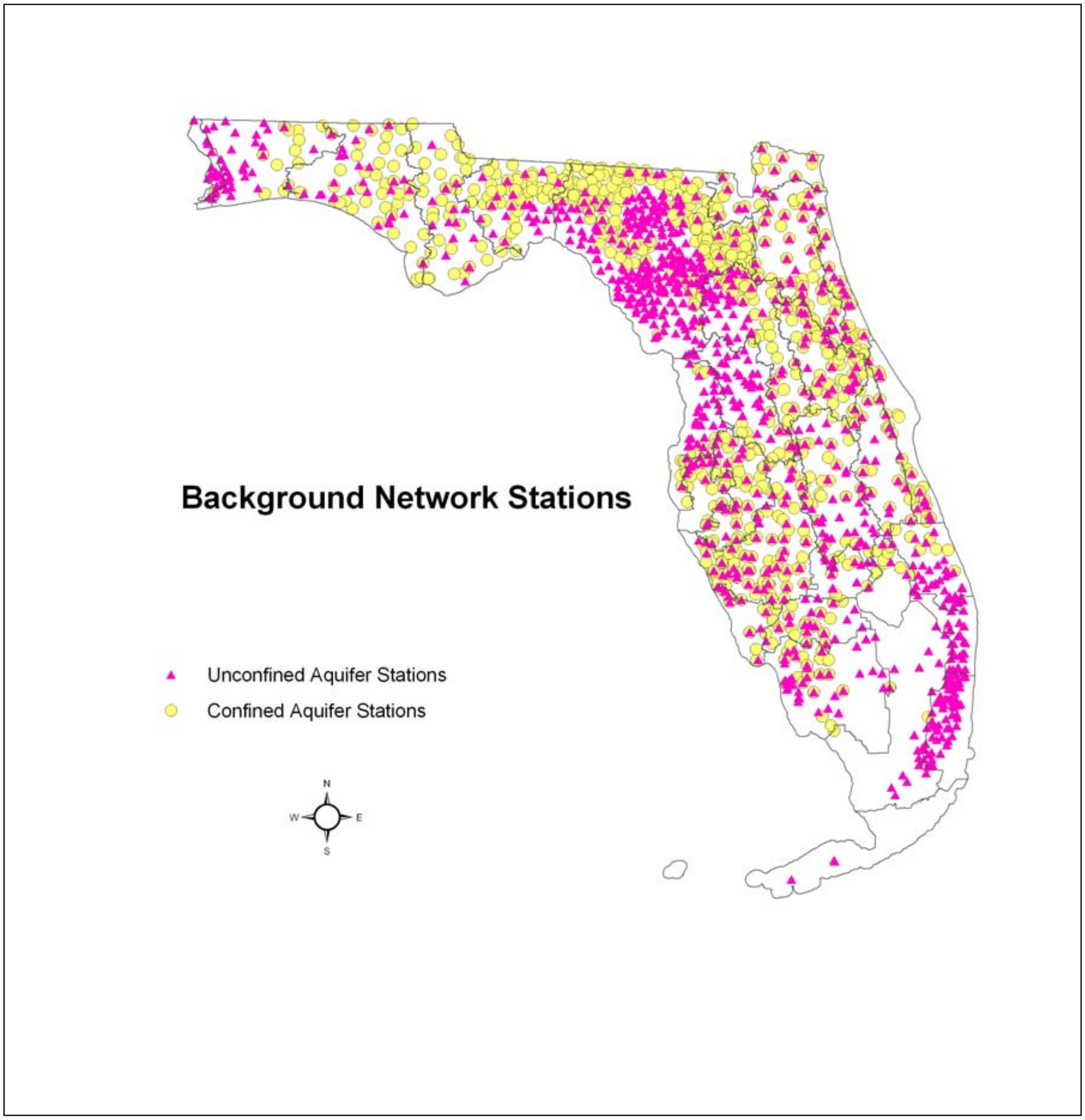


Figure 27. Background Network Monitoring Locations



Basin Assessment Methodology

FDEP's ground water data were assessed using a comprehensive approach that included five major evaluation categories: nutrients, biologicals, metals, organics, and saline waters. In addition, this chapter includes a discussion of several analytes that are important parameters used to evaluate ground water–surface water interaction, and are not included in other evaluation categories. ***Table 36*** summarizes the categories and specific analytes.

Table 36. Ground Water Assessment Categories and Parameters

Evaluation Category	Parameters Evaluated
Nutrients	Nitrate + Nitrite-Nitrogen, and Total Phosphorus
Biologicals	Total Coliform and Fecal Coliform
Metals	Primary Metals (Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, and Thallium) Selected Secondary Metals (Aluminum, Copper, Iron, Manganese, Silver, Strontium, Vanadium, and Zinc)
Organics	Volatile and Semivolatile Organics, and Pesticides
Saline Waters	Sodium, Chloride, Sulfate, Total Dissolved Solids, and Specific Conductance
Ground Water–Surface Water Interaction	Total Dissolved Solids, Total Organic Carbon, Specific Conductance, Dissolved Oxygen, and others as appropriate

Notes: The main source of data used is the Status Network, supplemented by Background Network data. GRI evaluation for nitrate + nitrite, all metals, organics, and saline waters parameters. SRA evaluation for all nutrients, biologicals, metals, and select saline waters parameters. Parameters listed in the Ground Water–Surface Water Interaction category are indicator parameters that were not evaluated.

This chapter contains the findings of a preliminary statewide evaluation of ground water data. The data were assessed using the Ground Water Resource Index and the Ground Water–Surface Water Relational Assessment screening tools, as described below. This preliminary step focuses on identifying possible ground water conditions in an individual basin, related to the evaluation categories listed above that may need to be evaluated further. Potential issues (identified where one or more parameters within an evaluation category exceeds a GRI or SRA threshold in more than 10 percent of the wells) will be evaluated further in individual basin assessments conducted in accordance with the state's basin rotation schedule.

Ground Water Resource Index

To assess the potential significance of a ground water quality issue in a basin, a Ground Water Resource Index (GRI) screening tool was developed to identify statistically significant exceedances of human health–based ground water standards or guidance concentrations. For a specific parameter, this index is based on the percent of well samples that exceed the applicable ground water MCL or, in the absence of an MCL or when an MCL cannot be directly related to the data, an appropriate risk indicator. Risk indicators include the following: (1) ground water MCLs that apply to total constituent concentrations that are used for evaluating data from dissolved constituent analyses; (2) using the MCL for total coliform for evaluating fecal coliform data (for which there currently is no ground water standard); (3) using published ground water guidance concentrations for other constituents without MCLs; and (4) evaluating water quality based on future proposed changes to a ground water standard (e.g., the MCL for arsenic will change from 50 to 10 μg/L).

The GRI evaluations are conducted for individual analytes and for grouped analytes when appropriate (i.e., nitrate and nitrite; cumulative statistics for organic analytes). Specific treatments may differ for each contaminant group and are detailed in each of the respective assessment subsections in this chapter. In this preliminary screening, the GRI for a parameter is calculated by aquifer type (i.e., confined or unconfined), but may be conducted by specific aquifer at a later date. Within a basin, if samples from more than 10 percent of the wells exceed MCLs or risk indicators, further evaluation may be warranted. Potential parameters of concern identified in this preliminary evaluation will be addressed further when individual basins are assessed (following the schedule for the state's watershed management cycle).

Ground Water–Surface Water Relational Assessment

The Ground Water–Surface Water Relational Assessment (SRA) tool was developed to identify areas where ground water discharges to surface water have the potential to result in or contribute to the impairment of surface waterbodies. The SRA screening phase identifies ground water concentrations that exceed surface water "adverse impact" thresholds within the state's basins. Potential basinwide issues are indicated where SRA thresholds for specific parameters are exceeded in more than 10 percent of the wells in a basin. The SRA thresholds are screening values that are intended to identify the concentrations of analytes in ground water that would be of concern to surface water. These values are based on surface water quality criteria, probable effects levels (PEL), known aquatic toxicity values, and/or appropriate guidance levels (i.e., nutrients) ***and are intentionally conservative***. The proposed SRA thresholds used for this screening process are listed in **Table D.1** of **Appendix D** and provided in the following by-category discussions in this chapter. In basin-specific evaluations conducted as part of the watershed management cycle, Planning and Verified Lists of impaired surface waterbodies and associated pollutants are reviewed for each basin and compared with the results of the SRA. Where similar pollutants or analytes occur, the potential for discharge from ground water to surface water may be further assessed.

Statewide Ground Water Assessments

Ground water data have been organized into contaminant groups for the assessments. ***Table 37*** summarizes GRI and SRA screening results from all basins in the state. **Appendix D** provides data to support the GRI and SRA assessments. Further details on the locations of ground water stations and statistics that were used for this statewide assessment are available on FDEP's Ground Water Protection Web site at http://www.floridagroundwater.org.

Table 37. Statewide Summary of Ground Water Resource Indicators and Surface Water Relational Assessment Findings

Basin	**Nutrients**		**Biologicals**		**Primary Metals***		**Secondary Metals***		**Salinity**		**Organics**	
	Unconfined	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*
Apalachicola–Chipola	S	S	G		S	GS	GS	GS				
Caloosahatchee	S	S	G	G	GS	GS	GS	GS	GS	GS		
Charlotte Harbor	S	S	G		GS	GS	GS	GS	GS	GS		
Choctawhatatchee–St. Andrew	S	S			GS	GS	GS	GS				
Everglades	S		G		S	GS	GS	GS	GS	GS		
Everglades West Coast	S	S	G		GS	GS	GS	GS	GS	GS		
Fisheating Creek	S				GS	S	GS	GS	GS			
Florida Keys					GS		GS		GS			
Indian River Lagoon					GS	GS	GS	GS	GS	GS		
Kissimmee River	G	S	G		GS	GS	GS	GS		GS		
Lake Okeechobee		S			S	S	GS	GS		GS		
Lake Worth Lagoon–Palm Beach Coast	S				GS		GS		G			
Lower St. Johns					GS	GS	GS	GS		G		
Middle St. Johns	S		G		GS	GS	GS	GS		G		
Nassau–St. Marys	S	S	G		GS	GS	GS	GS				
Ochlockonee–St. Marks	S	S	G	G	GS	S	GS	GS				
Ocklawaha	S	S	G	G	GS	GS	GS	GS				
Pensacola	S				GS	GS	GS	GS				
Perdido	S				GS	GS	GS	GS				
Sarasota Bay–Peace–Myakka	S		G	G	GS	GS	GS	GS	G	GS		
Southeast Coast–Biscayne Bay	S		G		GS		GS		G	GS		
Springs Coast	S		G		GS	GS	GS	GS	GS			
St. Lucie–Loxahatchee	S				GS	GS	GS	GS	GS	GS		
Suwannee	S	S	G	G	S`	S	GS	GS				
Tampa Bay	S	S	G	G	GS	GS	GS	GS	GS	GS		
Tampa Bay Tributaries	S	S	G	G	GS	GS	GS	GS	G			
Upper East Coast	S				GS	GS	GS	GS	GS	GS		
Upper St. Johns					GS	GS	GS	GS	GS	GS		
Withlacoochee	S				GS	GS	GS	GS				

G = More than 10 percent of wells exceed Ground Water Resource Index (GRI) screening thresholds.
S = More than 10 percent of wells exceed Ground Water–Surface Water Relational Assessment (SRA) screening thresholds.
* = ***Table 38*** provides results for individual metals.
Blank cells = Fewer than 10 percent of wells exceed GRI and SRA screening thresholds.
Hatched cells = No data.

Nutrients

Nitrate and phosphorus were evaluated as part of the nutrients screening, using the parameters noted in ***Table 36.*** Data from the Status Network were used in the evaluation of nitrate + nitrite (filtered as N), and data from the Background Network were used in the evaluation of total (unfiltered) phosphorus (total phosphorus, or TP). Statewide, there were 529 unconfined-aquifer wells and 523 confined-aquifer wells evaluated for nitrate + nitrite, and 355 unconfined-aquifer wells and 282 confined-aquifer wells evaluated for TP. For both parameters, the maximum values from each well were used, thus producing worst-case results. ***Figure 28*** summarizes the results for the GRI and SRA screening of ground water samples for confined- and unconfined-aquifer wells. This summary figure is based on a more detailed spreadsheet presented in **Appendix D**.

GRI Analysis. Only nitrate + nitrite was included in the GRI nutrient evaluation, because there is no ground water MCL for TP. The GRI threshold for nitrate + nitrate, based on its MCL, is 10 mg/L. Only in 1 basin, the Kissimmee, were more than 10 percent of the wells above the GRI screening threshold. In the Kissimmee Basin, 17 percent (3 out of 23) of the unconfined-aquifer wells had maximum concentrations exceeding the nitrate + nitrite MCL. There were no basins where wells in confined aquifers exceeded the GRI screening threshold for nitrate + nitrite. The Kissimmee Basin was also identified as having TP and pesticide issues that are discussed later in this report.

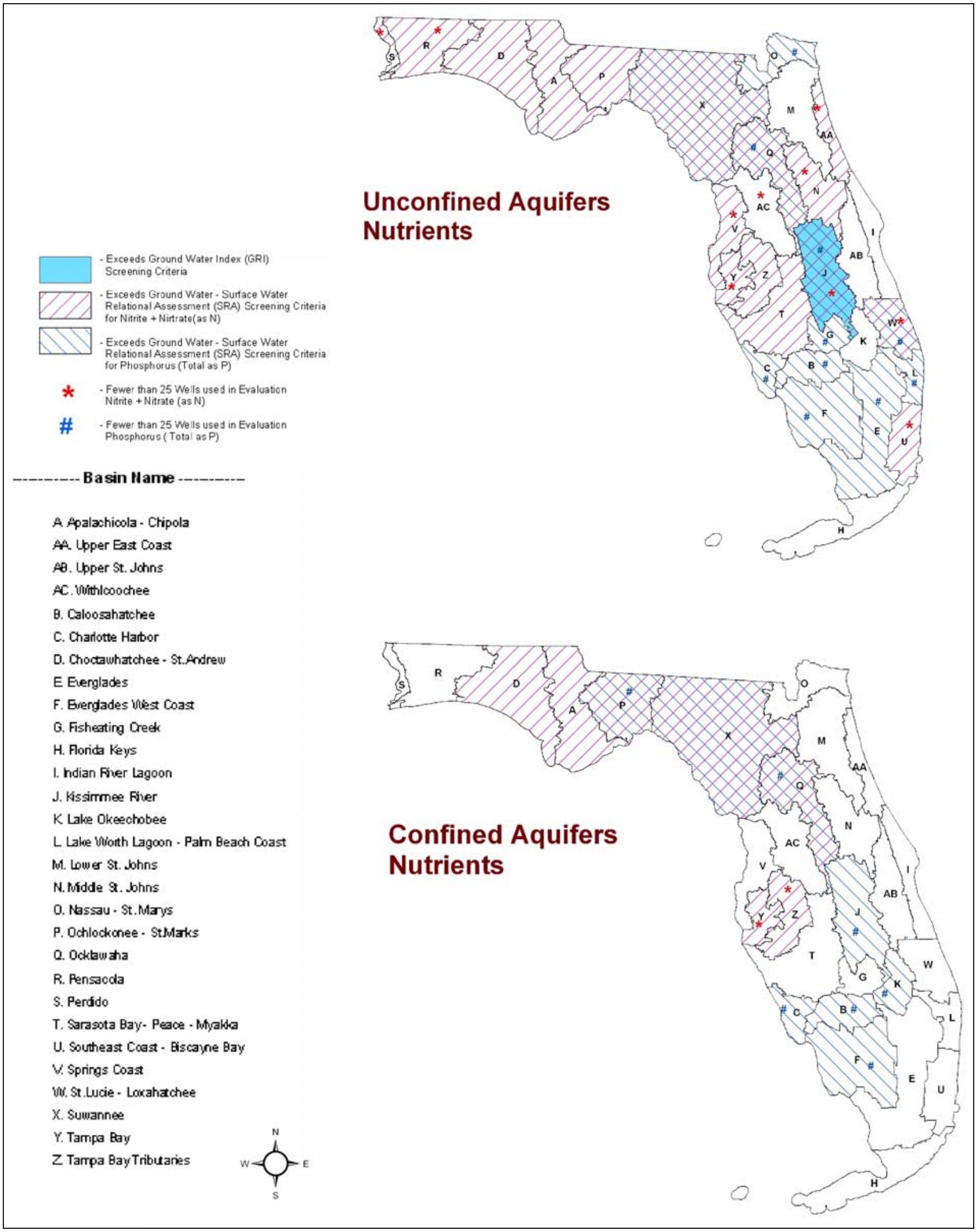
SRA Analysis. Both nitrate + nitrite and TP were included in the SRA for nutrients. The proposed SRA thresholds for nitrate + nitrite and phosphorus are conservative (protective) guidance levels derived from a statistical analysis of the trophic status of Florida lakes. To maintain an annual average lake chlorophyll concentration of 10 ug/L or lower (to maintain “good” lake condition), the total nitrogen should be 0.45 mg/L or lower, and the total phosphorus should be 0.025 mg/L or lower, depending on which is the limiting nutrient. Examined individually, nitrate and/or phosphorus screening levels may be considerably higher, depending on the type of surface water and area of the state. Where potential issues are suggested, this conservative screening would be followed by more basin- and waterbody-specific evaluations to assess more accurately the potential for adverse impacts to surface waters.

In 17 basins, over 10 percent of the wells in unconfined aquifers exceeded the SRA screening threshold for nitrate + nitrite (0.45 mg/L). These data suggest that nitrate + nitrite is commonly found above the SRA threshold in unconfined aquifers throughout the state and warrants further evaluation where ground and surface waters interact and there is evidence of nutrient-related surface water impairment. The largest number and highest percentage of unconfined-aquifer wells exceeding the nitrate + nitrite threshold were found in the Ocklawaha Basin. For confined aquifers, 7 basins exceeded the SRA screening threshold for nitrate + nitrite. The Ocklawaha and the Ochlockonee–St. Marks Basins shared the highest exceedance frequency rate for confined aquifers, each with 23 percent (7 of 30 wells) over the SRA nitrate threshold. Since the potential for interaction between confined ground water and surface waterbodies is usually low, the SRA exceedances must be looked at on a basin-specific scale to evaluate their significance. Regions within the Ocklawaha and Ochlockonee-St. Marks Basins have confined aquifer discharge to surface water via natural springs.

Twelve basins also exceeded the SRA threshold for total phosphorus (0.025 mg/L). Unlike nitrate, which is known to be principally anthropogenic in origin, phosphate is naturally abundant in many areas of the state. The incidence of TP above SRA thresholds in 11 basins within the unconfined aquifers and 8 basins within the confined aquifers may largely reflect the areas where phosphate occurs naturally. Regardless, the availability of TP to surface waterbodies via ground water may contribute to eutrophication.

For this analysis, 20 basins had fewer than 25 Status Network wells to evaluate nitrate + nitrite, and all but 2 had fewer than 25 Background Network wells to evaluate TP. These are also identified in ***Figure 24;*** they represent a minimum dataset necessary for an issue statement.

Figure 28. Ground Water Assessment for Nutrients



Biologicals

Total Coliform. Data in the Status Network were used in the evaluation of total coliform, which has an MCL and GRI threshold of 4 colonies per 100 milliliters of water (#/100 mL). Statewide, 266 unconfined-aquifer and 277 confined-aquifer wells were evaluated. Maximum values from each well were used in the evaluations, thus providing conservative results. ***Figure 29*** summarizes the results for the GRI screening of ground water samples from confined and unconfined aquifers. This summary figure is based on more a detailed spreadsheet presented in **Appendix D**.

The screening results for unconfined aquifers showed that 12 basins exceeded the GRI total coliform threshold. The Ocklawaha Basin contained the highest percentage and the highest number of unconfined-aquifer wells exceeding the GRI threshold. For confined aquifers, 7 basins exceeded the GRI threshold, with the highest percentage and number found in the Sarasota–Peace–Myakka Basin.

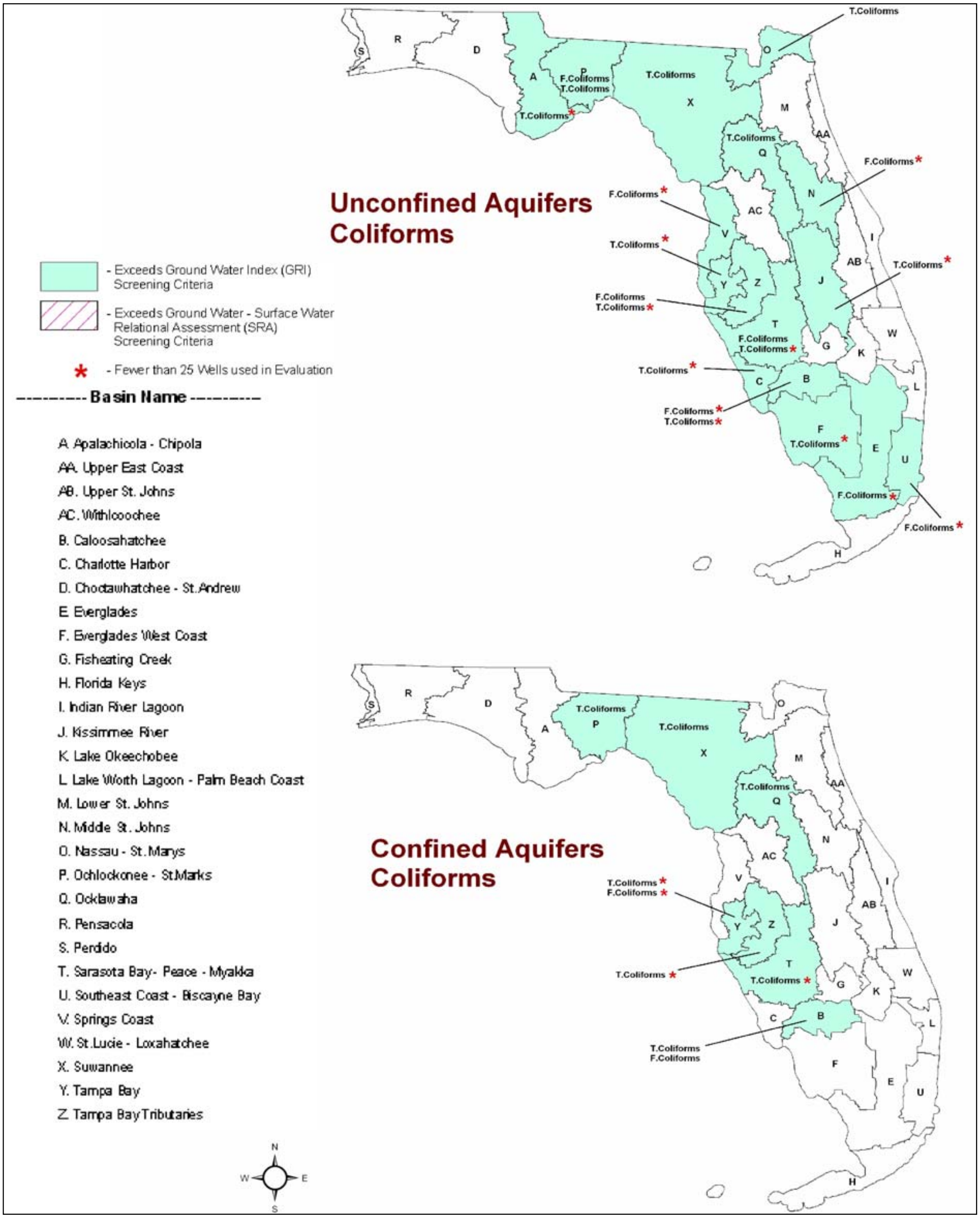
The SRA screening for wells in both unconfined and confined aquifers identified no basinwide issues. There were no basins with a greater than 10 percent exceedance of the total coliform SRA screening threshold of 1,000 #/100 mL (based on the total coliform surface water standard). Data sufficiency was a problem in basins where there were fewer than 25 Status Network wells. These are also identified in ***Figure 29.***

Fecal Coliform. Data in the Status Network were also evaluated for fecal coliform. Statewide, 595 unconfined-aquifer and 525 confined-aquifer wells were used in this evaluation, which used maximum values from each well. ***Figure 29*** summarizes the results for the GRI screening of ground water samples from confined and unconfined aquifers. This summary figure is based on a more detailed spreadsheet presented in **Appendix D**. The GRI threshold for fecal coliform is 4 #/100 mL, which is a risk indicator value based on the total coliform MCL.

For unconfined aquifers, the data indicate that 8 basins had more than 10 percent of wells above the GRI threshold. The Ochlockonee–St. Marks Basin had the highest percentage and number of unconfined-aquifer wells exceeding the GRI threshold. For confined aquifers, 2 basins may have significant issues based on the number of well samples above the GRI threshold. None of the basins exceeded the SRA threshold for fecal coliform, 400 #/100mL, which is based on the surface water standard. ***Figure 29*** also identifies data sufficiency problems.

Discussion of Bacterial Contamination Issues. Of all water quality issues evaluated, bacterial contamination, as indicated by elevated total and/or fecal coliform counts, is the most prevalent issue in ground water samples collected from the Status Network monitoring wells. Over one-third of the basins had significant exceedances of the GRI screening thresholds for total and/or fecal coliform, indicating that there could be public health issues in some of these cases. However, the significance of these findings must still be determined. High bacterial counts may be due to improper well construction (e.g., the absence of, or faulty, sanitary seals on residential wells), infrequent maintenance of water well systems (which include well and water storage and distribution systems), improper on-site disposal of domestic or animal wastes, or flooding and surface water infiltration of the water system. These considerations highlight the fact that individual well assessments are necessary, and that in all probability, bacterial issues are localized and may not be an issue outside of the individual wells themselves.

Figure 29. Ground Water Assessment for Biologicals



Metals

For the GRI and SRA screening, 17 metals of interest were selected that have either a ground water standard and/or surface water threshold. The analytes for the ***primary*** metals evaluation included antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, and thallium. These primary metals may present a risk to human health and/or to aquatic organisms, depending on their concentration. The analytes for the ***secondary*** metals evaluation included aluminum, copper, iron, manganese, silver, strontium, vanadium, and zinc. The secondary metals affect the aesthetic properties of potable water and may also present a risk to aquatic organisms, depending on their concentration.

Table 38 presents the GRI and SRA thresholds for primary and secondary metals, along with data summaries for all basins. The Background Network is FDEP's primary source of ambient metals data and should reflect natural ground water quality. The GRI and SRA screening thresholds were used to identify metals that may be significant. Both screenings are intentionally conservative because they use the maximum (worst case) value, rather than the average value from each well. Some metals identified in this analysis have recently been added to the analyte list for the next sampling cycle of the Status Network (2004–09). Further evaluations may be conducted for priority metals, based on the statewide results.

The Background Network data used for the metals evaluation included data from 879 and 913 wells representing unconfined and confined aquifers, respectively. ***Figures 13*** and ***14*** summarize data for metals in ground water samples from unconfined and confined aquifers that are above GRI and/or SRA criteria, noting where data sufficiency was a problem (i.e., basins with fewer than 25 wells having data). These summary figures are based on more detailed spreadsheets presented in **Appendix D**. The results reflect where well water was found to contain metals above the ground water MCLs/risk levels or surface water thresholds. These occurrences could be due to the metals' natural abundance, actual ground water contamination, or sampling/well construction problems. Several of these metals, in particular mercury, have historically had sampling and laboratory quality assurance problems.

Primary and Secondary Metals GRI Analysis. The screening of primary metals data for unconfined and confined aquifers indicates that lead is the metal with the most frequent exceedance of GRI thresholds, and is potentially a concern in basins where it exceeds the threshold in more than 10 percent of wells. The GRI screening results show that potentially significant levels of lead are present in 23 basins for unconfined-aquifer monitoring wells and 21 basins for confined-aquifer monitoring wells. Other metals identified as statistically significant in the unconfined-aquifer wells included cadmium in 7 basins and mercury in 3 basins. Cadmium, mercury, and thallium occurred at potentially significant levels relative to the GRI thresholds in confined-aquifer wells, but in only 1 or 2 basins. Because the MCL for arsenic is anticipated to be lowered from 50 to 10 μg/L in the near future, the arsenic data were also analyzed using a risk indicator threshold of 10 μg/L. Using this 10 μg/L threshold, 10 basins would have potential arsenic GRI exceedances in a significant number of wells. These data are shown as risk indicators in the tables included in **Appendix D**, since the current MCL remains at 50 μg/L.

The evaluation of secondary metals data for the unconfined and confined aquifers indicated that aluminum, iron, and manganese are ubiquitous, exceeding their screening thresholds (based on secondary MCLs) in unconfined and confined aquifers in most basins. Iron and manganese frequently create nuisance problems in residential and some public water systems in parts of the state where they are naturally abundant. Notably, strontium was identified as significant in confined-aquifer wells, being above its GRI risk indicator threshold in 16 basins (risk indicators are used for strontium and vanadium because they do not have MCLs)..

Primary and Secondary Metals SRA Analysis. Several metals are common and may be found naturally in both unconfined and confined aquifers at levels that exceed proposed SRA thresholds. Of course, other factors must be considered to determine if these levels would actually be available to surface water. ***Figures 29a*** and ***29b*** and the metals tables in ***Appendix D*** summarize the results of the SRA screening.

Unconfined aquifer data for the following metals and basins were most noteworthy (i.e., above thresholds in more than 10 percent of wells): iron and lead (all basins), copper and zinc (27 basins), mercury (26 basins), cadmium (24 basins), and manganese and silver (20 basins). Several of the same metals were common in confined aquifers, including copper, iron, and lead (25 basins); zinc (24 basins); mercury (21 basins); and cadmium (18 basins).

Table 38. Summary of Evaluations for Primary and Secondary Metals

	Primary Metals																						Secondary Metals														
	Antimony		**Arsenic**		**Barium**		**Beryllium**		**Cadmium**		**Chromium**		**Lead**		**Mercury**		**Nickel**		**Selenium**		**Thallium**		**Aluminum**		**Copper**		**Iron**		**Manganese**		**Silver**		**Strontium**		**Vanadium**		**Zinc**	
GRI threshold (mg/L)*	**6**		**50**		**2000**		**4**		**5**		**100**		**15**		**2**		**100**		**50**		**2**		**200**		**1000**		**300**		**50**		**100**		**4200**		**49**		**5000**	
SRA threshold (mg/L)*	**14**		**50**		**1000**		**0.008**		**0.38**		**27.7**		**0.54**		**0.012**		**8.3**		**5**		**1.7**		**1500**		**2.85**		**300**		**1090**		**0.07**		**NA**		**NA**		**37**	
Basin	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*
Apalachicola–Chipola			G				S		S	S	S		S	G S	S	S							G		S	S	G S	G S	G S	G S		S					S	S
Caloosahatchee			G							S			G S	G S	S	S	S	S	S				G		S	S	G S	G S	G	G				G			S	S
Charlotte Harbor			G						S	S			G S	G S	S	S				S			G		S	S	G S	G S	G	G S	S	S	G	G	G		G S	G S
Choctawhatchee– St. Andrew			G				S		S	S			G S	G S	S	S	S	S					G S	G	S	S	G S	G S	G	G	S	S		G			S	S
Everglades						S							S	G S	S	S			S				G S	G		S	G S	G S	G	G	S			G			S	S
Everglades West Coast							S		S	S	S		G S	G S	S	S							G	G S	S	S	G S	G S	G S	G S	S						S	S
Fisheating Creek									G S				G S	S	S		S						G		S	S	G S	G S	G S		S			G			G S	S
Florida Keys			G						G S				S										G		S		G S						G					
Indian River Lagoon							S		S	G S			G S	G S	S	S							G S		S	S	G S	G S	G S	G	S	S		G			S	S
Kissimmee River			G						S				G S	G S	S	S	S	S					G	G	S	S	G S	G S	G S		S	S		G			S	S
Lake Okeechobee									S				S	S									G S		S	S	G S	G S						G			S	S
Lake Worth Lagoon– Palm Beach Coast													G S		S		S						G		S		G S		G								S	
Lower St. Johns			G						S	S	S		G S	G S	S	S							G S	G	S	S	G S	G S	G	G S	S	S		G			S	S

	Primary Metals																						Secondary Metals															
	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Lead		Mercury		Nickel		Selenium		Thallium		Aluminum		Copper		Iron		Manganese		Silver		Strontium		Vanadium		Zinc	
GRI threshold (mg/L)*	**6**		**50**		**2000**		**4**		**5**		**100**		**15**		**2**		**100**		**50**		**2**		**200**		**1000**		**300**		**50**		**100**		**4200**		**49**		**5000**	
SRA threshold (mg/L)*	**14**		**50**		**1000**		**0.008**		**0.38**		**27.7**		**0.54**		**0.012**		**8.3**		**5**		**1.7**		**1500**		**2.85**		**300**		**1090**		**0.07**		**NA**		**NA**		**37**	
Basin	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*	*Unconfined*	*Confined*
Middle St. Johns									S	S	S		G S	G S	S	S	S	S					G S	G	S	S	G S	G S	G S	G S	S	S					S	S
Nassau–St. Marys									S	S			G S	G S	G S	G S							G S		S	S	G S	G S	G S	G	S	S					S	S
Ochlockonee–St. Marks									G S				S	S	S	S	S						G S		S	S	G S	G S	G S	G	S						S	S
Ocklawaha									S	S			G S	G S	S	S	S						G S	G	S	S	G S	G S	G S	G S	S	S					S	S
Pensacola			G						G S	S	S	S	G S	G S	G S	G S	S	S					G S	G	S	S	G S	G S	G S		S	S					S	S
Perdido									S	S	S	G S	G S	S	S	S	S	S					G S	G S	S	S	G S	G S	G S								S	S
Sarasota Bay–Peace–Myakka			G						S	S	S		G S	G S	S	S	S	S					G S	G	S	S	G S	G S	G S	G S	S	S		G	G		S	S
Southeast Coast–Biscayne Bay									S				G S	S	S				S				G		S		G S		G S		S						S	
Springs Coast									S	S			G S	G S	S	S	S			S			G	G	S	S	G S	G S	G S	G S		S		G			S	S
St. Lucie–Loxahatchee									S				G S	G S	S		S	S		S		G S	G S		S	S	G S	G S	G					G			S	
Suwannee													S	S	S	S		S					G	G	S	S	G S	G S	G S	G							S	S
Tampa Bay			G				S		G S	S			G S	G S	S	S							G S		S	S	G S	G S	G S	G S	S	S		G			G S	S
Tampa Bay Tributaries							S		G S	S	S		G S	G S	S	S	S	S	S				G S		S	S	G S	G S	G S	G S	S	S		G			S	S

Primary Metals

	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Lead		Mercury		Nickel		Selenium		Thallium	
GRI threshold (mg/L)*	**6**		**50**		**2000**		**4**		**5**		**100**		**15**		**2**		**100**		**50**		**2**	
SRA threshold (mg/L)*	**14**		**50**		**1000**		**0.008**		**0.38**		**27.7**		**0.54**		**0.012**		**8.3**		**5**		**1.7**	
Basin	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***
Upper East Coast					S				S	S	S	S	G S	G S	S	S	S			S		
Upper St. Johns									G S	G S			G S	G S	G S		S			S		
Withlacoochee									S	S			G S	G S	S	S	S	S				

Secondary Metals

	Aluminum		Copper		Iron		Manganese		Silver		Strontium		Vanadium		Zinc	
GRI threshold (mg/L)*	**200**		**1000**		**300**		**50**		**100**		**4200**		**49**		**5000**	
SRA threshold (mg/L)*	**1500**		**2.85**		**300**		**1090**		**0.07**		**NA**		**NA**		**37**	
Basin	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***	***Unconfined***	***Confined***
Upper East Coast	G S	G	S	S	G S	G S	G S	G S	S	S		G			S	S
Upper St. Johns	G S	G	S	S	G S	G S	G S	G	S	S		G			S	S
Withlacoochee	G S	G	S	S	G S	G S	G S	G S	S						S	S

Notes:
G = More than 10 percent of wells exceed Ground Water Resource Index (GRI) screening thresholds.
S = More than 10 percent of wells exceed Ground Water–Surface Water Relational Assessment (SRA) screening thresholds.
Blank cells = Fewer than 10 percent of wells exceed GRI and SRA screening thresholds.
Hatched cells = No data.

Figure 30a. Ground Water Assessment for Primary Metals

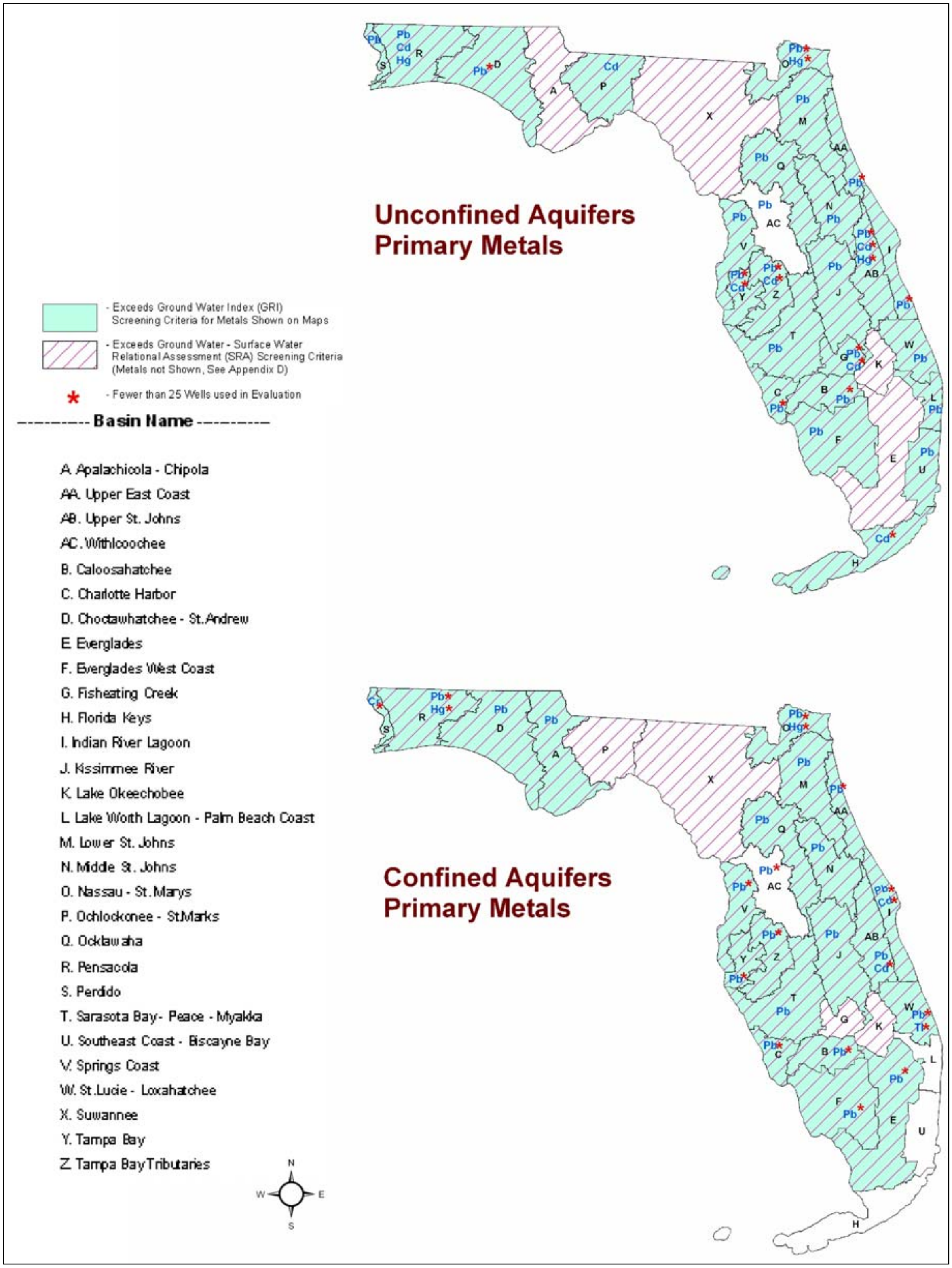
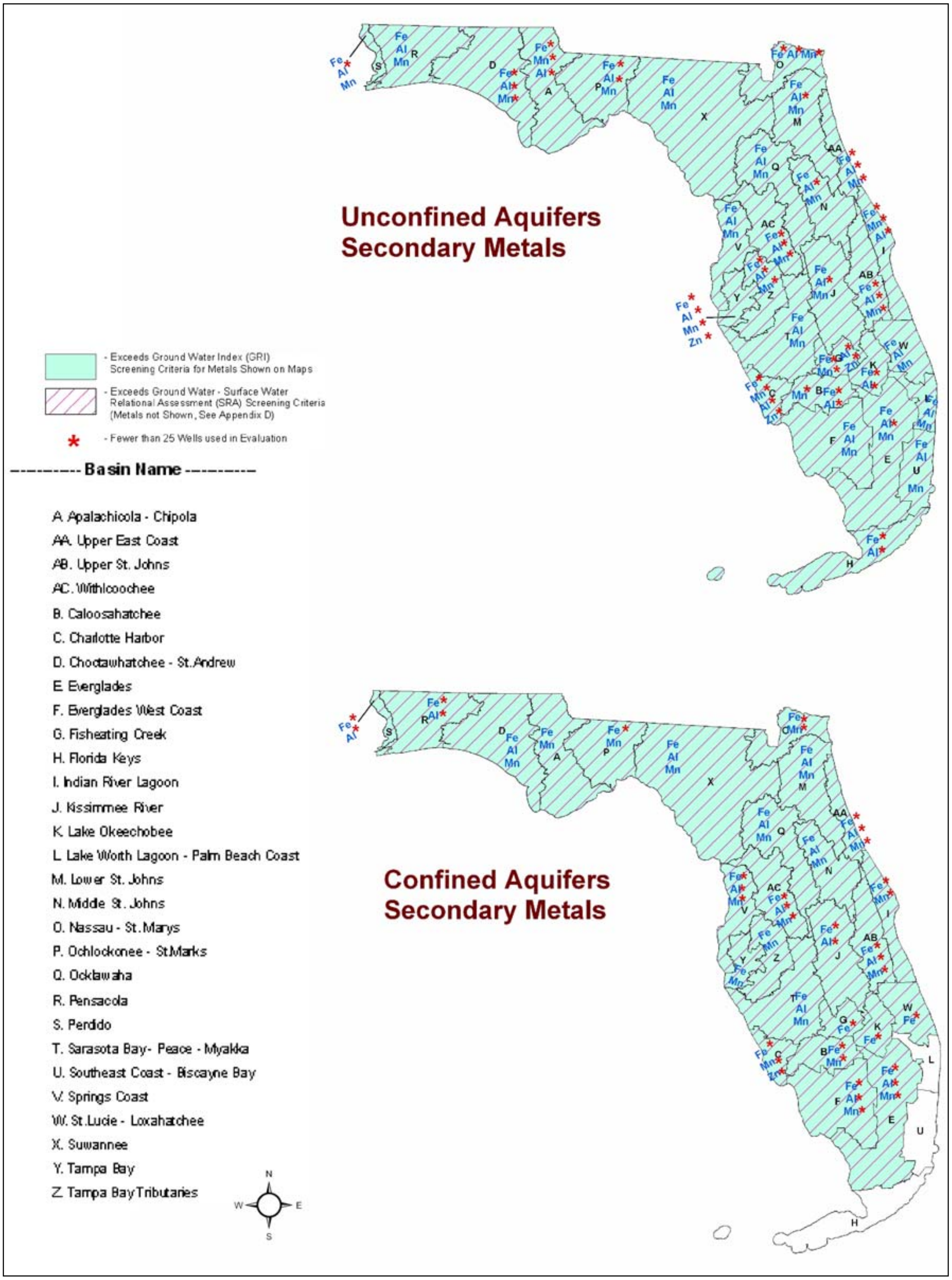


Figure 30b. Ground Water Assessment for Secondary Metals



Organics

This evaluation included organic chemical data from the Background and VISA Networks. These chemicals included volatile organics, semivolatile organics, and pesticides (the complete list is available at floridagroundwater.org). Historically, the detection of volatile/semivolatile compounds has been limited to close proximity to point sources such as industrial facilities, waste sites, and petroleum storage facilities, all of which are typically found in urban settings. Pesticides may be associated with point sources (e.g., blending facilities and disposal sites), but they also may exist as nonpoint source contaminants in agricultural as well as urban areas. The detection of organic chemical contamination associated with point sources is particularly challenging with a random network of monitoring wells. The characterization of nonpoint issues is somewhat more likely with this kind of monitoring. As a further qualification, existing monitoring data only represent pesticide-related compounds that have historically been applied and do not include active ingredients for pesticides registered for use in Florida after 1993.

The dataset contained detections of only a few organic chemicals. Detected compounds may correlate with land use in the vicinity of the wells and many occur close to point sources. As expected, none of the basins had a greater than 10 percent incidence of samples exceeding a ground water MCL or guidance concentration.

From this data review, the two most commonly detected compounds in the volatile/semivolatile suite were benzene and vinyl chloride. Samples from the Pensacola Basin area had the greatest number of volatile/semivolatile organics that exceeded their respective GRI thresholds. These samples were collected as part of a VISA project to monitor the distribution of ground water contaminants in an industrial area containing known contaminant sources.

The majority of the pesticide detections were found in samples collected from the Kissimmee Basin, with the most commonly detected pesticide in the database that exceeded its GRI threshold being ethylene dibromide (EDB), a nematocide and fuel additive that is now banned from use. Notably, the Kissimmee Basin was the only basin in the state where nitrate was a potentially significant issue (see the nutrient assessment discussion earlier in this chapter). No detections of any of the more commonly used pesticides such as malathion were recorded, and only one detection of endosulfan sulfate was found (in the Southeast Coast–Biscayne Bay Basin).

These data do not reflect any statewide or basinwide issues with organic chemicals in ground water. Localized ground water problems do exist, however, and indicate the need for more targeted monitoring in land use areas where these contaminants are likely to be found, particularly where source water may be threatened.

Saline Waters

Data from the Status Network were used to evaluate the potential intrusion of saltwater in coastal areas, as well as the upconing of brackish water from deeper aquifers in inland areas of the state caused by overpumping or well construction problems. The state's water management districts are responsible for monitoring and protecting against saltwater intrusion. This evaluation reflects, for the most part, some of the areas already known to have saline ground water. For this evaluation, 595 unconfined-aquifer wells and 525 confined-aquifer wells from the Status Network were used. Evidence of saltwater intrusion may be manifested in 1 or more parameters. This evaluation included dissolved sodium, dissolved chloride, and dissolved sulfate data from the Status Network that were compared against GRI thresholds based on MCLs. ***Figure 31*** summarizes the results for the GRI screening of ground water samples for confined and unconfined-aquifer wells. This summary figure is based on a more detailed spreadsheet presented in **Appendix D**.

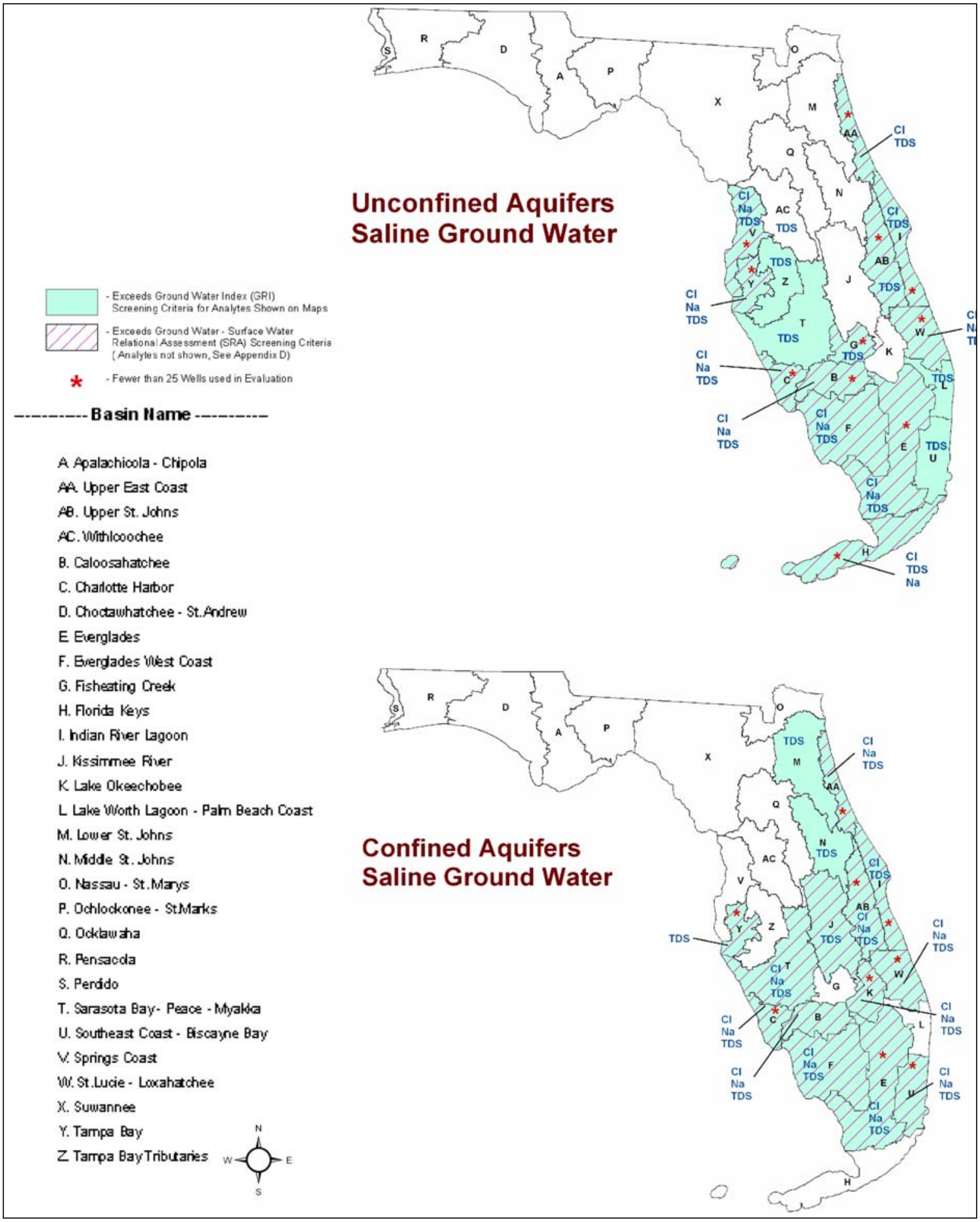
For unconfined aquifers, an analysis of the data indicated that more than 10 percent of the samples exceeded GRI screening thresholds in 8 basins that include coastal areas. The highest percentage of unconfined-aquifer wells indicative of saline waters was found in the Florida Keys and Everglades Basins. The remaining basins with wells exceeding these thresholds were also in coastal areas.

For the confined aquifers, 10 basins had more than 10 percent of the well samples above GRI screening thresholds. However, the interpretation of this screening requires knowledge of the state's hydrogeology, since confined aquifers in many basins naturally contain highly mineralized water. Thus the results of this initial screening should not be interpreted to mean there are significant issues related to saltwater intrusion in confined aquifer in these basins.

The potential for saltwater aquifers to affect surface waterbodies adversely was evaluated using total sulfate and total chloride data from the Background Network wells and specific conductance data from Status Network wells. The SRA thresholds for chloride and specific conductance used in the evaluation were 250,000 mg/L and 1,275 microohms per centimeter (µmhos/cm). Sulfate was used as an indicator parameter, but has no SRA threshold concentration. More than 10 percent of the unconfined-aquifer well samples in 10 basins exceeded SRA screening criteria. These included many of the same coastal basins that exceeded GRI criteria. On further analysis, few of these basins have the potential for the discharge of brackish water from a confined aquifer to surface water, even though several exceeded some of the parameter thresholds.

Data sufficiency was a problem in basins where there were fewer than 25 Status Network wells. There were fewer than 25 unconfined aquifer wells in 18 basins and fewer than 25 confined-aquifer wells in approximately 19 basins. These are also identified in ***Figure 31.***

Figure 31. Ground Water Assessment for Saline Waters



Surface-Water-to-Ground-Water Indicators

While the SRA is used to identify where the flow from ground water to surface water may be of concern, the reverse hydrologic condition can also exist. A hydrologic interaction where surface water can affect ground water is usually located in areas of aquifer recharge. Reversals between aquifer recharge and discharge can vary seasonally or over longer wet and dry hydroperiods, depending on the local hydrogeology.

Certain parameters were selected to help identify local areas where ground water concentrations are atypical and more characteristic of surface water. The parameters selected exhibit a wide discrepancy in typical values between surface water and ground water. In conjunction with other information, chemical signatures associated with total dissolved solids, specific conductance, total organic carbon, and DO—as well as other parameters, such as bacteria, in ground water samples—will help identify where flux is occurring between surface waterbodies and adjacent aquifers. While difficult to interpret on a statewide scale, these indicator parameters will be routinely included in more detailed and case-specific evaluations. The tables in **Appendix D** contain statewide data tabulated for Status Network and Background Network wells.

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APPENDICES

Appendix A: Summary Information on Surface Waters in the Status Monitoring Network

Table A.1. Explanation of Terms Used in Summary Tables for Assessment of Status Network Basins

<table>
<tr><th>Term</th><th>Explanation</th></tr>
<tr><td>Resource Type</td><td>The status surface water network design focuses on the following three resource types:
Rivers and streams were combined into a single resource for this cycle.
Small Lakes are 1 to 9.9 hectares (ha.) in size.
Large Lakes are 10 ha. or greater.</td></tr>
<tr><td>Indicators</td><td>Indicators include the following:
Rivers and Streams: Chla and Fecal coliforms.
Small Lakes and Large Lakes: TSI and Fecal coliforms.
Large and Small Lakes and Combined river/stream resources: DO.</td></tr>
<tr><td>Target Population Size</td><td>The total resource extent on GIS base maps used as sampling frame, after adjustments for incorrect classifications. This consists of sites that can be sampled, dry sites, and inaccessible sites.</td></tr>
<tr><td>Sampled Population Size</td><td>This is the subset of the target population available for sampling (accessible and not dry). The extent to which the sampled population approximates the target population is unknown; caution should be used when extending inferences about the sampled population to the target population.</td></tr>
<tr><td>Units</td><td>Rivers and streams were measured as length in kilometers.
Small lakes were sampled as an individual point, or lake unit.
Large lakes were measured as area in hectares.</td></tr>
<tr><td># Sites Sampled</td><td>Desired sample size was 30 for each resource and basin. Stream and river resources were merged for data analysis; hence the larger sample sizes.</td></tr>
</table>

Meeting Threshold	TSI thresholds are color-based: • For samples with color less than or equal to 40 PCU, thresholds is less than or equal to = 40. • For samples with color less than 40 PCU, threshold is less than or equal to 60. • Chla threshold is less than or equal to 16 µg/L. • DO is 5.0 mg/L or above. • Fecal coliforms are less than 200 CFU.
Partially Meeting Threshold	TSI: • For samples with color less than or equal to 40 PCU, threshold is 40-50. • For samples with color greater than 40 PCU, threshold is 60-70. • Chla: 16-20 µg/L. • DO: 2.0-5.0 mg/L. • Fecal coliforms: 200-400 CFU.
Not Meeting Threshold	TSI: • For samples with color less than or equal to 40 PCU, threshold is greater than50. • For samples with color greater than 40 PCU, threshold is greater than70. • Chla: Greater than 20 µg/L. • DO: Below 2.0 mg/L. • Fecal coliforms: Greater than 400 CFU.
Date (Index Period)	Period during which samples were collected.
Precision	Not calculated at this time.
% Confidence	Confidence is the range of error margins about the proportions with alpha = 0.05 and 0.5 < p < 0.9, for sample size n.

Chla – Chlorophyll a
DO – Dissolved oxygen
TSI – Trophic State Index
PCU – Platinum cobalt units
µg/L – Micrograms per liter
mg/L – Milligrams per liter
CFU – Colony-forming units

Table A.2. Status Network Summary Information for the Ochlockonee–St. Marks Basin Study Unit (Project ID NWFWMD-A)

Resource Type	*Indicator**	*Target Population Size*	*Units*	*Number Sites Sampled*	*Percent Meeting Threshold*	*Percent Partially Meeting Threshold*	*Percent Not Meeting Threshold*	*Date (Index Period)*	*Precision*	*Percent Confidence*	*Target Population Size*	*Units*
Rivers and Streams	Chla	1,307.5	miles	60	96.9%	1.5%	1.5%	Apr-Sep 2000		9-15	2,104.2	kilometers
Rivers and Streams	DO	1,307.5	miles	60	52.2%	31.4%	16.4%	Apr-Sep 2000		9-15	2,104.2	kilometers
Rivers and Streams	Fecal	1,307.5	miles	60	60.3%	21.8%	17.9%	Apr-Sep 2000		9-15	2,104.2	kilometers
Large Lakes	DO	35.2	square miles	22	72.7%	18.2%	9.1%	Jun-Aug 2000		10-18	9,109.0	hectares
Large Lakes	Fecal	35.2	square miles	22	86.4%	4.5%	9.1%	Jun-Aug 2000		10-18	9,109.0	hectares
Large Lakes	TSI	35.2	square miles	22	40.9%	40.9%	18.2%	Jun-Aug 2000		10-18	9,109.0	hectares
Small Lakes	Fecal	357.0	lakes	30	96.7%	3.3%	0.0%	Mar-May 2000		9-15	357.0	lakes
Small Lakes	TSI	357.0	lakes	30	76.7%	10.0%	13.3%	Mar-May 2000		9-15	357.0	lakes
Small Lakes	DO	357.0	lakes	30	80.0%	10.0%	10.0%	Mar-May 2000		9-15	357.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.3. Status Network Summary Information for the Apalachicola River Basin Study Unit (Project ID NWFWMD-B)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***% Confidence***	***Target Population Size***	***Units***
Rivers Only	Chla	176.7	miles	28	100.0%	0.0%	0.0%	Apr-Sep 2001		9-16	284.4	kilometers
Rivers Only	DO	176.7	miles	28	100.0%	0.0%	0.0%	Apr-Sep 2001		9-16	284.4	kilometers
Rivers Only	Fecal	176.7	miles	28	100.0%	0.0%	0.0%	Apr-Sep 2001		9-16	284.4	kilometers
Large Lakes	DO	11.6	square miles	30	96.7%	3.3%	0.0%	Jun-Aug 2001		9-15	3,009.0	hectares
Large Lakes	Fecal	11.6	square miles	30	93.3%	3.3%	3.3%	Jun-Aug 2001		9-15	3,009.0	hectares
Large Lakes	TSI	11.6	square miles	29	65.5%	27.6%	6.9%	Jun-Aug 2001		9-15	3,009.0	hectares
Small Lakes	Fecal	157.0	lakes	30	96.7%	0.0%	3.3%	Mar-May 2001		9-15	157.0	lakes
Small Lakes	TSI	157.0	lakes	30	90.0%	10.0%	0.0%	Mar-May 2001		9-15	157.0	lakes
Small Lakes	DO	157.0	lakes	30	90.0%	10.0%	0.0%	Mar-May 2001		9-15	157.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.4. Status Network Summary Information for the Choctawhatchee River Basin Study Unit (Project ID NWFWMD-C)

Resource Type	Indicator*	Target Population Size	Units	Number Sites Sampled	Percent Meeting Threshold	Percent Partially Meeting Threshold	Percent Not Meeting Threshold	Date (Index Period)	Precision	Percent Confidence	Target Population Size	Units
Rivers and Streams	Chla	2,204.8	miles	60	94.0%	0.0%	6.0%	Apr-Sep 2002		9-15	3,548.1	kilometers
Rivers and Streams	DO	2,204.8	miles	60	81.0%	16.0%	3.0%	Apr-Sep 2002		9-15	3,548.1	kilometers
Rivers and Streams	Fecal	2,204.8	miles	60	78.0%	13.0%	9.0%	Apr-Sep 2002		9-15	3,548.1	kilometers
Large Lakes	DO	16.2	square miles	30	83.3%	13.3%	3.3%	Jun-Aug 2002		9-15	4,201.0	hectares
Large Lakes	Fecal	16.2	square miles	30	96.7%	3.3%	0.0%	Jun-Aug 2002		9-15	4,201.0	hectares
Large Lakes	TSI	16.2	square miles	30	86.7%	3.3%	10.0%	Jun-Aug 2002		9-15	4,201.0	hectares
Small Lakes	Fecal	340.0	lakes	30	100.0%	0.0%	0.0%	Mar-May 2002		9-15	340.0	lakes
Small Lakes	TSI	340.0	lakes	30	86.7%	6.7%	6.7%	Mar-May 2002		9-15	340.0	lakes
Small Lakes	DO	340.0	lakes	30	100.0%	0.0%	0.0%	Mar-May 2002		9-15	340.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.5. Status Network Summary Information for the Western Panhandle Basins Study Unit (Project ID NWFWMD-D)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	3,213.4	miles	60	100.0%	0.0%	0.0%	Apr-Sep 2003		9-15	5,171.2	kilometers
Rivers and Streams	DO	3,213.4	miles	60	84.1%	12.9%	2.9%	Apr-Sep 2003		9-15	5,171.2	kilometers
Rivers and Streams	Fecal	3,213.4	miles	60	79.6%	11.8%	8.6%	Apr-Sep 2003		9-15	5,171.2	kilometers
Large Lakes	DO	2.4	square miles	30	96.7%	3.3%	0.0%	Jun-Aug 2003		9-15	627.0	hectares
Large Lakes	Fecal	2.4	square miles	30	93.3%	6.7%	0.0%	Jun-Aug 2003		9-15	627.0	hectares
Large Lakes	TSI	2.4	square miles	30	60.0%	23.3%	16.7%	Jun-Aug 2003		9-15	627.0	hectares
Small Lakes	Fecal	286.0	lakes	30	96.7%	0.0%	3.3%	Mar-May 2003		9-15	286.0	lakes
Small Lakes	TSI	286.0	lakes	30	96.7%	3.3%	0.0%	Mar-May 2003		9-15	286.0	lakes
Small Lakes	DO	286.0	lakes	30	100.0%	0.0%	0.0%	Mar-May 2003		9-15	286.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.6. Status Network Summary Information for the Lower Suwannee River Basin Study Unit (Project ID SRWMD-A)

Resource Type	Indicator*	Target Population Size	Units	Number Sites Sampled	Percent Meeting Threshold	Percent Partially Meeting Threshold	Percent Not Meeting Threshold	Date (Index Period)	Precision	Percent Confidence	Target Population Size	Units
Rivers and Streams	Chla	178.2	miles	22	100.0%	0.0%	0.0%	Apr-Sep 2000		10-18	286.8	kilometers
Rivers and Streams	DO	178.2	miles	22	69.8%	24.9%	5.2%	Apr-Sep 2000		10-18	286.8	kilometers
Rivers and Streams	Fecal	178.2	miles	22	100.0%	0.0%	0.0%	Apr-Sep 2000		10-18	286.8	kilometers
Large Lakes	DO	4.0	square miles	17	76.5%	17.6%	5.9%	Jun-Aug 2000		12-20	1,026.0	hectares
Large Lakes	Fecal	4.0	square miles	17	100.0%	0.0%	0.0%	Jun-Aug 2000		12-20	1,026.0	hectares
Large Lakes	TSI	4.0	square miles	17	52.9%	23.5%	23.5%	Jun-Aug 2000		12-20	1,026.0	hectares
Small Lakes	Fecal	369.0	lakes	17	100.0%	0.0%	0.0%	Mar-May 2000		12-20	369.0	lakes
Small Lakes	TSI	369.0	lakes	17	70.6%	11.8%	17.6%	Mar-May 2000		12-20	369.0	lakes
Small Lakes	DO	369.0	lakes	17	82.4%	5.9%	11.8%	Mar-May 2000		12-20	369.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.7. Status Network Summary Information for the Santa Fe–Waccasassa Basin Study Unit (Project ID SRWMD-B)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	489.5	miles	34	87.0%	2.6%	10.5%	Apr-Sep 2001		9-15	787.7	kilometers
Rivers and Streams	DO	489.5	miles	33	40.3%	40.7%	19.0%	Apr-Sep 2001		9-15	787.7	kilometers
Rivers and Streams	Fecal	489.5	miles	34	68.8%	2.6%	28.6%	Apr-Sep 2001		9-15	787.7	kilometers
Large Lakes	DO	11.6	square miles	30	93.3%	6.7%	0.0%	Jun-Aug 2001		9-15	3,001.0	hectares
Large Lakes	Fecal	11.6	square miles	30	100.0%	0.0%	0.0%	Jun-Aug 2001		9-15	3,001.0	hectares
Large Lakes	TSI	11.6	square miles	30	50.0%	26.7%	23.3%	Jun-Aug 2001		9-15	3,001.0	hectares
Small Lakes	Fecal	210.0	lakes	17	94.1%	5.9%	0.0%	Mar-May 2001		12-20	210.0	lakes
Small Lakes	TSI	210.0	lakes	17	88.2%	11.8%	0.0%	Mar-May 2001		12-20	210.0	lakes
Small Lakes	DO	210.0	lakes	17	70.6%	17.7%	11.8%	Mar-May 2001		12-20	210.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.8. Status Network Summary Information for the Northern Highlands Basin Study Unit (Project ID SRWMD-C)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	653.2	miles	60	98.45%	0.00%	1.55%	Apr-Sep 2003		9-15	1,051.1	kilometers
Rivers and Streams	DO	653.2	miles	60	69.58%	27.31%	3.11%	Apr-Sep 2003		9-15	1,051.1	kilometers
Rivers and Streams	Fecal	653.2	miles	60	79.58%	7.99%	12.43%	Apr-Sep 2003		9-15	1,051.1	kilometers
Large Lakes	DO	3.6	square miles	29	62.1%	31.0%	6.9%	Jun-Aug 2003		9-15	945.0	hectares
Large Lakes	Fecal	3.6	square miles	30	96.7%	0.0%	3.3%	Jun-Aug 2003		9-15	945.0	hectares
Large Lakes	TSI	3.6	square miles	30	70.0%	16.7%	13.3%	Jun-Aug 2003		9-15	945.0	hectares
Small Lakes	Fecal	218.0	lakes	29	100.0%	0.0%	0.0%	Mar-May 2003		9-15	218.0	lakes
Small Lakes	TSI	218.0	lakes	29	72.4%	3.4%	24.1%	Mar-May 2003		9-15	218.0	lakes
Small Lakes	DO	218.0	lakes	29	41.4%	41.4%	17.2%	Mar-May 2003		9-15	218.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.9. Status Network Summary Information for the Coastal Rivers Basin Study Unit (Project ID SRWMD-D)

Resource Type	Indicator*	Target Population Size	Units	Number Sites Sampled	Percent Meeting Threshold	Percent Partially Meeting Threshold	Percent Not Meeting Threshold	Date (Index Period)	Precision	Percent Confidence	Target Population Size	Units
Rivers and Streams	Chla	420.6	miles	41	95.3%	0.0%	4.7%	Apr-Sep 2002		9-15	676.9	kilometers
Rivers and Streams	DO	420.6	miles	41	31.8%	36.8%	31.4%	Apr-Sep 2002		9-15	676.9	kilometers
Rivers and Streams	Fecal	420.6	miles	41	87.4%	12.6%	0.0%	Apr-Sep 2002		9-15	676.9	kilometers
Large Lakes	DO	0.3	square miles	21	100.0%	0.0%	0.0%	Jun-Aug 2002		11-18	87.0	hectares
Large Lakes	Fecal	0.3	square miles	21	100.0%	0.0%	0.0%	Jun-Aug 2002		11-18	87.0	hectares
Large Lakes	TSI	0.3	square miles	21	85.7%	14.3%	0.0%	Jun-Aug 2002		11-18	87.0	hectares
Small Lakes	Fecal	68.0	lakes	27	92.6%	7.4%	0.0%	Mar-May 2002		9-16	68.0	lakes
Small Lakes	TSI	68.0	lakes	27	92.6%	3.7%	3.7%	Mar-May 2002		9-16	68.0	lakes
Small Lakes	DO	68.0	lakes	27	88.9%	7.4%	3.7%	Mar-May 2002		9-16	68.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.10. Status Network Summary Information for the Nassau Basin Study Unit (Project ID SJRWMD-A)

Resource Type	Indicator*	Target Population Size	Units	Number Sites Sampled	Percent Meeting Threshold	Percent Partially Meeting Threshold	Percent Not Meeting Threshold	Date (Index Period)	Precision	Percent Confidence	Target Population Size	Units
Rivers and Streams	Chla	685.5	miles	41	95.2%	0.0%	4.8%	May Oct 2001		9-15	1,103.1	kilometers
Rivers and Streams	DO	685.5	miles	41	26.7%	51.9%	21.5%	May Oct 2001		9-15	1,103.1	kilometers
Rivers and Streams	Fecal	685.5	miles	41	72.8%	10.7%	16.4%	May Oct 2001		9-15	1,103.1	kilometers
Large Lakes	DO	4.3	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2001		9-15	1,102.0	hectares
Large Lakes	Fecal	4.3	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2001		9-15	1,102.0	hectares
Large Lakes	TSI	4.3	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2001		9-15	1,102.0	hectares
Small Lakes	Fecal	74.0	lakes	30	83.3%	13.3%	3.3%	Jul-Sep 2001		9-15	74.0	lakes
Small Lakes	TSI	74.0	lakes	30	46.7%	20.0%	33.3%	Jul-Sep 2001		9-15	74.0	lakes
Small Lakes	DO	74.0	lakes	30	100.0%	0.0%	0.0%	Jul-Sep 2001		9-15	74.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.11. Status Network Summary Information for the Lower St. Johns River Basin Study Unit (Project ID SJRWMD-B)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	863.3	miles	60	91.1%	0.0%	8.9%	May-Oct 2002		9-15	1,389.3	kilometers
Rivers and Streams	DO	863.3	miles	60	63.9%	28.4%	7.6%	May-Oct 2002		9-15	1,389.3	kilometers
Rivers and Streams	Fecal	863.3	miles	60	39.9%	22.9%	37.2%	May-Oct 2002		9-15	1,389.3	kilometers
Large Lakes	DO	45.9	square miles	30	90.0%	6.7%	3.3%	Oct-Dec 2002		9-15	11,895.0	hectares
Large Lakes	Fecal	45.9	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2002		9-15	11,895.0	hectares
Large Lakes	TSI	45.9	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2002		9-15	11,895.0	hectares
Small Lakes	Fecal	590.0	lakes	30	93.3%	3.3%	3.3%	Jul-Sep 2002		9-15	590.0	lakes
Small Lakes	TSI	590.0	lakes	30	80.0%	10.0%	10.0%	Jul-Sep 2002		9-15	590.0	lakes
Small Lakes	DO	590.0	lakes	30	83.3%	16.7%	0.0%	Jul-Sep 2002		9-15	590.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.12. Status Network Summary Information for the Upper St. Johns River Basin Study Unit (Project ID SJRWMD-C)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	3,416.5	miles	60	73.9%	3.3%	22.8%	May-Oct 2003		9-15	5,498.0	kilometers
Rivers and Streams	DO	3,416.5	miles	60	31.3%	41.5%	27.2%	May-Oct 2003		9-15	5,498.0	kilometers
Rivers and Streams	Fecal	3,416.5	miles	60	47.4%	6.4%	46.3%	May-Oct 2003		9-15	5,498.0	kilometers
Large Lakes	DO	173.8	square miles	30	90.0%	10.0%	0.0%	Oct-Dec 2003		9-15	45,027.0	hectares
Large Lakes	Fecal	173.8	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2003		9-15	45,027.0	hectares
Large Lakes	TSI	173.8	square miles	30	63.3%	33.3%	3.3%	Oct-Dec 2003		9-15	45,027.0	hectares
Small Lakes	Fecal	1,192.0	lakes	30	96.7%	0.0%	3.3%	Jul-Sep 2003		9-15	1,192.0	lakes
Small Lakes	TSI	1,192.0	lakes	30	80.0%	13.3%	6.7%	Jul-Sep 2003		9-15	1,192.0	lakes
Small Lakes	DO	1192.0	lakes	30	63.3%	36.7%	0.0%	Jul-Sep 2003		9-15	1192.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.13. Status Network Summary Information for the Ocklawaha River Basin Study Unit (Project ID SJRWMD-D)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	412.2	miles	51	80.5%	2.4%	17.2%	May-Oct 2000		9-15	663.4	kilometers
Rivers and Streams	DO	412.2	miles	51	60.9%	33.3%	5.7%	May-Oct 2000		9-15	663.4	kilometers
Rivers and Streams	Fecal	412.2	miles	51	52.6%	22.2%	25.2%	May-Oct 2000		9-15	663.4	kilometers
Large Lakes	DO	218.4	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2000		9-15	56,573.0	hectares
Large Lakes	Fecal	218.4	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2000		9-15	56,573.0	hectares
Large Lakes	TSI	218.4	square miles	30	36.7%	13.3%	50.0%	Oct-Dec 2000		9-15	56,573.0	hectares
Small Lakes	Fecal	673.0	lakes	30	77.0%	13.0%	10.0%	Jul-Sep 2000		9-15	673.0	lakes
Small Lakes	TSI	673.0	lakes	30	73.3%	3.3%	23.3%	Jul-Sep 2000		9-15	673.0	lakes
Small Lakes	DO	673.0	lakes	30	73.3%	16.7%	10.0%	Jul-Sep 2000		9-15	673.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.14. Status Network Summary Information for the Withlacoochee River Basin Study Unit (Project ID SWFWMD-A)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	799.7	miles	60	91.4%	0.0%	8.6%	May-Oct 2003		9-15	1,286.9	kilometers
Rivers and Streams	DO	799.7	miles	60	11.9%	37.1%	50.9%	May-Oct 2003		9-15	1,286.9	kilometers
Rivers and Streams	Fecal	799.7	miles	60	69.6%	16.5%	13.9%	May-Oct 2003		9-15	1,286.9	kilometers
Large Lakes	DO	30.6	square miles	30	76.7%	23.3%	0.0%	Oct-Dec 2003		9-15	7,926.0	hectares
Large Lakes	Fecal	30.6	square miles	30	93.3%	3.3%	3.3%	Oct-Dec 2003		9-15	7,926.0	hectares
Large Lakes	TSI	30.6	square miles	30	50.0%	40.0%	10.0%	Oct-Dec 2003		9-15	7,926.0	hectares
Small Lakes	Fecal	482.0	lakes	30	96.7%	3.3%	0.0%	Jul-Sep 2003		9-15	482.0	lakes
Small Lakes	TSI	482.0	lakes	30	60.0%	20.0%	20.0%	Jul-Sep 2003		9-15	482.0	lakes
Small Lakes	DO	482.0	lakes	30	40.0%	46.7%	13.3%	Jul-Sep 2003		9-15	482.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.15. Status Network Summary Information for the Greater Tampa Bay Basin Study Unit (Project ID SWFWMD-B)

Resource Type	Indicator*	Target Population Size	Units	Number Sites Sampled	Percent Meeting Threshold	Percent Partially Meeting Threshold	Percent Not Meeting Threshold	Date (Index Period)	Precision	Percent Confidence	Target Population Size	Units
Rivers and Streams	Chla	972.8	miles	60	75.1%	1.7%	23.2%	May-Oct 2000		9-15	1,565.5	kilometers
Rivers and Streams	DO	972.8	miles	60	41.4%	45.2%	13.4%	May-Oct 2000		9-15	1,565.5	kilometers
Rivers and Streams	Fecal	972.8	miles	60	51.5%	16.7%	31.8%	May-Oct 2000		9-15	1,565.5	kilometers
Large Lakes	DO	35.5	square miles	30	83.3%	6.7%	10.0%	Oct-Dec 2000		9-15	9,186.0	hectares
Large Lakes	Fecal	35.5	square miles	30	86.7%	13.3%	0.0%	Oct-Dec 2000		9-15	9,186.0	hectares
Large Lakes	TSI	35.5	square miles	29	37.9%	27.6%	34.5%	Oct-Dec 2000		9-15	9,186.0	hectares
Small Lakes	Fecal	689.0	lakes	30	83.3%	6.7%	10.0%	Jul-Sep 2000		9-15	689.0	lakes
Small Lakes	TSI	689.0	lakes	30	26.7%	23.3%	50.0%	Jul-Sep 2000		9-15	689.0	lakes
Small Lakes	DO	689.0	lakes	30	70.0%	26.7%	3.3%	Jul-Sep 2000		9-15	689.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.16. Status Network Summary Information for the Manasota–Myakka River Basin Study Unit (Project ID SWFWMD-C)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	1,247.0	miles	60	69.6%	0.0%	30.4%	May Oct 2001		9-15	2,006.8	kilometers
Rivers and Streams	DO	1,247.0	miles	60	50.0%	37.6%	12.4%	May Oct 2001		9-15	2,006.8	kilometers
Rivers and Streams	Fecal	1,247.0	miles	60	53.1%	6.7%	40.3%	May Oct 2001		9-15	2,006.8	kilometers
Large Lakes	DO	11.7	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2001		9-15	3,039.0	hectares
Large Lakes	Fecal	11.7	square miles	30	96.7%	0.0%	3.3%	Oct-Dec 2001		9-15	3,039.0	hectares
Large Lakes	TSI	11.7	square miles	30	53.3%	33.3%	13.3%	Oct-Dec 2001		9-15	3,039.0	hectares
Small Lakes	Fecal	617.0	lakes	30	73.3%	3.3%	23.3%	Jul-Sep 2001		9-15	617.0	lakes
Small Lakes	TSI	617.0	lakes	30	16.7%	16.7%	66.7%	Jul-Sep 2001		9-15	617.0	lakes
Small Lakes	DO	617.0	lakes	30	66.7%	23.3%	10.0%	Jul-Sep 2001		9-15	617.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.17. Status Network Summary Information for the Peace River Basin Study Unit (Project ID SWFWMD-D)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	2,715.0	miles	59	73.9%	0.3%	25.9%	May-Oct 2002		9-15	4,369.2	kilometers
Rivers and Streams	DO	2,715.0	miles	60	48.6%	36.1%	15.3%	May-Oct 2002		9-15	4,369.2	kilometers
Rivers and Streams	Fecal	2,715.0	miles	60	33.0%	25.0%	42.0%	May-Oct 2002		9-15	4,369.2	kilometers
Large Lakes	DO	67.9	square miles	31	93.5%	3.2%	3.2%	Oct-Dec 2002		9-15	17,588.0	hectares
Large Lakes	Fecal	67.9	square miles	31	90.3%	9.7%	0.0%	Oct-Dec 2002		9-15	17,588.0	hectares
Large Lakes	TSI	67.9	square miles	31	51.6%	12.9%	35.5%	Oct-Dec 2002		9-15	17,588.0	hectares
Small Lakes	Fecal	770.0	lakes	30	83.3%	10.0%	6.7%	Jul-Sep 2002		9-15	770.0	lakes
Small Lakes	TSI	770.0	lakes	30	23.3%	30.0%	46.7%	Jul-Sep 2002		9-15	770.0	lakes
Small Lakes	DO	770.0	lakes	30	76.7%	16.7%	6.7%	Jul-Sep 2002		9-15	770.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.18. Status Network Summary Information for the Kissimmee–Okeechobee Basin Study Unit (Project ID SFWMD-A)

Resource Type	*Indicator**	*Target Population Size*	*Units*	*Number Sites Sampled*	*Percent Meeting Threshold*	*Percent Partially Meeting Threshold*	*Percent Not Meeting Threshold*	*Date (Index Period)*	*Precision*	*Percent Confidence*	*Target Population Size*	*Units*
Rivers and Streams	Chla	2,382.6	miles	43	43.6%	12.6%	43.8%	May-Oct 2000		9-15	3,834.2	kilometers
Rivers and Streams	DO	2,382.6	miles	43	55.5%	24.6%	19.9%	May-Oct 2000		9-15	3,834.2	kilometers
Rivers and Streams	Fecal	2,382.6	miles	43	40.5%	25.0%	34.4%	May-Oct 2000		9-15	3,834.2	kilometers
Large Lakes	DO	928.7	square miles	30	96.7%	3.3%	0.0%	Oct-Dec 2000		9-15	240,586.0	hectares
Large Lakes	Fecal	928.7	square miles	30	96.7%	0.0%	3.3%	Oct-Dec 2000		9-15	240,586.0	hectares
Large Lakes	TSI	928.7	square miles	30	53.3%	26.7%	20.0%	Oct-Dec 2000		9-15	240,586.0	hectares
Small Lakes	Fecal	543.0	lakes	28	96.4%	0.0%	3.6%	Jul-Sep 2000		9-16	543.0	lakes
Small Lakes	TSI	543.0	lakes	28	85.7%	3.6%	10.7%	Jul-Sep 2000		9-16	543.0	lakes
Small Lakes	DO	543.0	lakes	28	89.3%	3.6%	7.1%	Jul-Sep 2000		9-16	543.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.19. Status Network Summary Information for the Southeast Florida Basin Study Unit (Project ID SFWMD-B)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***Percent Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	7,832.3	miles	60	70.1%	2.8%	27.2%	May-Oct 2003		9-15	12,604.3	kilometers
Rivers and Streams	DO	7,832.3	miles	60	25.6%	62.2%	12.2%	May-Oct 2003		9-15	12,604.3	kilometers
Rivers and Streams	Fecal	7,832.3	miles	60	49.0%	18.3%	32.7%	May-Oct 2003		9-15	12,604.3	kilometers
Large Lakes	DO	66.9	square miles	12	58.3%	33.3%	8.3%	Oct-Dec 2003		14-24	17,332.0	hectares
Large Lakes	Fecal	66.9	square miles	12	75.0%	16.7%	8.3%	Oct-Dec 2003		14-24	17,332.0	hectares
Large Lakes	TSI	66.9	square miles	12	75.0%	8.3%	16.7%	Oct-Dec 2003		14-24	17,332.0	hectares
Small Lakes	Fecal	2,357.0	lakes	30	93.3%	3.3%	3.3%	Jul-Sep 2003		9-15	2,357.0	lakes
Small Lakes	TSI	2,357.0	lakes	30	86.7%	13.3%	0.0%	Jul-Sep 2003		9-15	2,357.0	lakes
Small Lakes	DO	2357.0	lakes	30	80.0%	16.7%	3.3%	Jul-Sep 2003		9-15	2357.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.20. Status Network Summary Information for the Everglades–West Coast Basin Study Unit (Project ID SFWMD-C)

Resource Type	Indicator*	Target Population Size	Units	Number Sites Sampled	Percent Meeting Threshold	Percent Partially Meeting Threshold	Percent Not Meeting Threshold	Date (Index Period)	Precision	% Confidence	Target Population Size	Units
Rivers and Streams	Chla	565.8	miles	60	60.9%	3.2%	35.8%	May-Oct 2002		9-15	910.5	kilometers
Rivers and Streams	DO	565.8	miles	60	55.8%	31.2%	12.9%	May-Oct 2002		9-15	910.5	kilometers
Rivers and Streams	Fecal	565.8	miles	60	76.1%	10.1%	13.7%	May-Oct 2002		9-15	910.5	kilometers
Large Lakes	DO	8.0	square miles	30	86.7%	13.3%	0.0%	Oct-Dec 2002		9-15	2,082.0	hectares
Large Lakes	Fecal	8.0	square miles	30	100.0%	0.0%	0.0%	Oct-Dec 2002		9-15	2,082.0	hectares
Large Lakes	TSI	8.0	square miles	30	63.3%	3.3%	33.3%	Oct-Dec 2002		9-15	2,082.0	hectares
Small Lakes	Fecal	308.0	lakes	30	100.0%	0.0%	0.0%	Jul-Sep 2002		9-15	308.0	lakes
Small Lakes	TSI	308.0	lakes	30	76.7%	16.7%	6.7%	Jul-Sep 2002		9-15	308.0	lakes
Small Lakes	DO	308.0	lakes	30	96.7%	0.0%	3.3%	Jul-Sep 2002		9-15	308.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Table A.21. Status Network Summary Information for the Caloosahatchee–Fisheating Creek Basin Study Unit (Project ID SFWMD-D)

Resource Type	***Indicator****	***Target Population Size***	***Units***	***Number Sites Sampled***	***Percent Meeting Threshold***	***Percent Partially Meeting Threshold***	***Percent Not Meeting Threshold***	***Date (Index Period)***	***Precision***	***% Confidence***	***Target Population Size***	***Units***
Rivers and Streams	Chla	2,392.9	miles	42	88.9%	5.4%	5.7%	May Oct 2001		9-15	3,850.8	kilometers
Rivers and Streams	DO	2,392.9	miles	42	72.1%	25.2%	2.7%	May Oct 2001		9-15	3,850.8	kilometers
Rivers and Streams	Fecal	2,392.9	miles	42	79.1%	2.4%	18.5%	May Oct 2001		9-15	3,850.8	kilometers
Large Lakes	DO	2.9	square miles	25	88.0%	8.0%	4.0%	Oct-Dec 2001		10-16	758.0	hectares
Large Lakes	Fecal	2.9	square miles	25	96.0%	0.0%	4.0%	Oct-Dec 2001		10-16	758.0	hectares
Large Lakes	TSI	2.9	square miles	25	80.0%	16.0%	4.0%	Oct-Dec 2001		10-16	758.0	hectares
Small Lakes	Fecal	330.0	lakes	25	80.0%	4.0%	16.0%	Jul-Sep 2001		10-16	330.0	lakes
Small Lakes	TSI	330.0	lakes	25	64.0%	24.0%	12.0%	Jul-Sep 2001		10-16	330.0	lakes
Small Lakes	DO	330.0	lakes	25	68.0%	24.0%	8.0%	Jul-Sep 2001		10-16	330.0	lakes

* DO – Dissolved oxygen
Fecal – Fecal coliform
TSI – Trophic State Index
Chl*a* – Chlorophyll *a*

Appendix B: Legislative and Regulatory Background

Clean Water Act

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]).

Section 305(b) of the Clean Water Act 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 Florida. This initial assessment provides a common factual basis for identifying information sources and major issues, and for determining the future changes, strategies, and actions needed to preserve, protect, and/or restore water quality. Understanding the physical framework of each basin allows the development of a science-based methodology for assessing water quality and an accurate picture of the waters that are most impaired or vulnerable to contamination.

Section 303(d) of the Clean Water Act requires states to submit to the EPA lists of surface waters that do not meet applicable water quality standards and establish total maximum daily loads (TMDLs) for each of these waters on a schedule. A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and meet all of its designated uses (see the sidebar below on Florida's surface water quality classifications for a listing of these classifications). A waterbody that does not meet its designated use is defined as *impaired*.

FLORIDA'S SURFACE WATER QUALITY CLASSIFICATIONS

Florida's water quality standards program, the foundation of the state's program of water quality management, designates the "present and future most beneficial uses" of the waters of the state (Subsection 403.061[10], F.S.). Water quality criteria, expressed as numeric or narrative limits for specific parameters, describe the water quality necessary 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 class)*

Florida Watershed Restoration Act

In 1998, the EPA settled a lawsuit with the environmental group Earthjustice over Florida's TMDL Program. The Consent Decree resulting from the lawsuit requires all TMDLs on the state's 1998 Section 303(d) list of impaired waters to be developed in 13 years. If the state fails to develop the TMDLs, the EPA is required to do so.

In response to concerns about the TMDL lawsuit and in recognition of the important role that TMDLs play in restoring state waters, the 1999 Florida legislature enacted the Florida Watershed Restoration Act (Chapter 99-223, Laws of Florida). The act clarified FDEP's statutory authority to establish TMDLs, required FDEP to develop a methodology for identifying impaired waters, specified that FDEP could develop TMDLs only for waters on a future state list of impaired waters developed using this new methodology, and directed FDEP to establish an Allocation Technical Advisory Committee to address the allocation process for TMDLs. The act also declared Lake Okeechobee impaired and, as required under the TMDL Consent Decree, allowed the state to develop a TMDL for the lake (see the sidebar below for a description of the legislation's major provisions).

THE FLORIDA WATERSHED RESTORATION ACT

The Florida Watershed Restoration Act contains the following major provisions:

- *Establishes that the 303(d) list submitted to the EPA in 1998 is for planning purposes only.*
- *Requires FDEP to adopt 303(d) listing criteria (that is, the methodology used to define impaired waters) by rule.*
- *Requires FDEP to verify impairment and then establish a Verified List for each basin. FDEP 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 FDEP's Secretary to adopt TMDL allocations by rule. The legislation requires FDEP 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 pollutants 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 FDEP to develop basin plans to implement TMDLs, coordinating with the water management districts, the Florida Department of Agriculture and Consumer Services (FDACS), 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 FDEP and FDACS 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 FDEP verifies their effectiveness, then implementation will provide a presumption of compliance with water quality standards.*
- *Directs FDEP 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.*

Determining Impairment Based on the State's Impaired Surface Waters Rule

Section 303(d) of the federal Clean Water Act and the Florida Watershed Restoration Act describe impaired waters as those waterbodies or waterbody segments that do not meet applicable water quality standards. "Impairment" is a broad term that includes designated uses, water quality criteria, the Florida antidegradation policy, and moderating provisions (see the sidebar below for an explanation of these terms).

The state's Identification of Impaired Surface Waters Rule (Rule 62-303, Florida Administrative Code [F.A.C.]) was developed in cooperation with a Technical Advisory Committee and adopted by the Florida Environmental Regulation Commission on April 26, 2001. It provides a science-based methodology for evaluating water quality data in order to identify impaired waters, and it establishes specific criteria for impairment based on chemical parameters, the interpretation of narrative nutrient criteria, biological impairment, fish consumption advisories, and ecological impairment. The complete text of the rule is available at http://www.dep.state.fl.us/water/tmdl/docs/AmendedIWR.pdf.

The Impaired Surface Waters Rule also establishes thresholds for data sufficiency and data quality, including the minimum sample size required and the number of exceedances of the applicable water quality standard for a given sample size that identify a waterbody as impaired. The number of exceedances is based on a statistical approach designed to provide greater confidence that the outcome of the water quality assessment is correct. **Waters that are identified as impaired through the Impaired Surface Waters Rule are prioritized for TMDL development and implementation**.

EXPLANATION OF TERMS

- ***Designated uses,*** *discussed in an earlier sidebar, comprise the five classifications applied to each of the state's surface waterbodies.*
- ***Water quality criteria*** *comprise numeric or narrative limits of pollutants.*
- ***The Florida Antidegradation Policy*** *(Sections 62-302.300 and 62-4.242, F.A.C.) recognizes that pollution that causes or contributes to new violations of water quality standards or to the continuation of existing violations is harmful to the waters of the state. Under this policy, the permitting of new or previously unpermitted existing discharges is prohibited where the discharge is expected to reduce the quality of a receiving water below the* ***classification*** *established for it. Any lowering of water quality caused by a new or expanded discharge to surface waters must be in the public interest (that is, the benefits of the discharge to public health, safety, and welfare must outweigh any adverse impacts on fish and wildlife or recreation). Further, the permittee must demonstrate that other disposal alternatives (for example, reuse) or pollution prevention are not economically and technologically reasonable alternatives to the surface water discharge.*
- ***Moderating provisions*** *(provided in Subsection 62-302.300[10] and Rules 62-4 and 62-6, F.A.C., and described in Sections 62-302.300, 62-4.244, 62-302.800, 62-4.243, F.A.C., and Sections 403.201 and 373.414, Florida Statutes [F.S.]) include mixing zones, zones of discharge, site-specific alternative criteria, exemptions, and variances. These provisions are intended to moderate the* ***applicability*** *of water quality standards where it has been determined that, under certain special circumstances, the social, economic, and environmental costs of such* ***applicability*** *outweigh the benefits.*

Determining impairment in individual waterbodies takes place in two phases. First, in each river basin FDEP evaluates the existing water quality data, using the methodology prescribed in the Impaired Surface Waters Rule, to determine whether waters are potentially impaired. Waters found to be potentially impaired are included on a *Planning List* for further assessment under Subsections 403.067(2) and (3), F.S. As required by Subsection 403.067(2), F.S., the Planning List is not used to administer or implement any regulatory program. It is submitted to the EPA for informational purposes only.

The second step is to assess waters on the Planning List under Subsection 403.067(3), F.S., as part of FDEP's watershed management approach (described in the next section). FDEP carries out additional data gathering and strategic monitoring, focusing on these potentially impaired waters, and determines — using the methodology in Part III, Section 62-303.400, F.A.C. — if a waterbody is, in fact, impaired and if the impairment is caused by pollutant discharges.

An Assessment Report is produced containing the results of this updated evaluation and a *Verified List* of impaired waters. The criteria for the Verified List are more stringent than those for the Planning List. FDEP is required to develop TMDLs for waters on the Verified List under Subsection 403.067(4), F.S. A watershed management plan (called a Basin Management Action Plan, or BMAP) to reduce the amount of pollutants that cause impairments must also be produced and implemented.

The Verified List is adopted by Secretarial Order in accordance with the Florida Watershed Restoration Act. Once adopted, the list is submitted to the EPA for approval as the state's Section 303(d) list of impaired waters for the basin.

The Watershed Management Approach

FDEP's statewide approach to water resource management, called the watershed management approach, is the framework for identifying impaired waters and developing and implementing TMDLs, as required by the federal and state governments (Section 303[d] of the federal Clean Water Act and the Florida Watershed Restoration Act). As discussed earlier, TMDLs must be developed for all waters that do not meet applicable water quality standards and are thus defined as "impaired waters."

The watershed management approach does not focus on individual causes of pollution. Instead, each basin is assessed as an entire functioning system, and aquatic resources are evaluated from a basinwide perspective that considers the cumulative effects of human activities. Water resources are managed on the basis of natural boundaries, such as river basins, rather than political or regulatory boundaries. Federal, state, regional, tribal, and local governments 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. Extensive public participation in the decision-making process is crucial.

The approach is not new, nor does it compete with or replace existing programs. Rather than relying on single solutions to water 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.

By promoting the management of entire natural systems and addressing the cumulative effects of human activities on a watershed basis, this approach is intended to protect and enhance the ecological structure, function, and integrity of Florida's watersheds. It provides a framework for setting priorities and focusing FDEP'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 encourages accountability for achieving water quality improvements through improved monitoring and the establishment of TMDLs.

The Watershed Management Cycle

As part of the watershed management approach, TMDLs are developed, and the corresponding load reductions allocated, as part of a watershed management cycle, which rotates through the state's 52 basins (51 HUCs plus the Florida Keys) over a 5-year cycle. To implement the watershed cycle, the state's river basins have been divided into 5 groups within each of FDEP's 6 districts statewide, and each district will assess 1 basin each year. ***Figure 3*** in Chapter 3 shows the basin groups and the rotating cycle in FDEP's districts; ***Figure 4*** provides, as an example, the basins in FDEP's Northwest District;

Table 9 shows the basin groups for implementing the cycle; and ***Table 10*** lists the basin rotation schedule for TMDL development and implementation. Extensive public participation is crucial throughout the cycle's five phases, which are as follows:

- ***Phase 1: Watershed Evaluation.*** *This information is 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 and a strategic monitoring plan are developed.*
- ***Phase 2: Strategic Monitoring.*** *Monitoring is conducted to help verify whether waters are, in fact, impaired and to collect the data needed to calibrate and verify models for TMDL development. Monitoring also is conducted to determine whether waters on the 1998 303(d) list are impaired or not. At the end of the second phase, an Assessment Report is produced, containing an updated and more thorough assessment of water quality, associated biological resources, and current restoration plans and projects. Waters that are verified as being impaired are placed on a basin-specific list of impaired waters that are adopted by FDEP through a Secretarial Order. This Verified List is submitted to the EPA as the state's Section 303(d) list of impaired waters for the basin.*
- ***Phase 3: Development and Adoption of TMDLs.*** *TMDLs for priority-impaired waters in the watershed are 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 using the criteria in the Impaired Surface Waters Rule, Rule 62-303, F.A.C.*
- ***Phase 4: Development of Basin Management Action Plans.*** *A BMAP is developed specifying how pollutant loadings from point and nonpoint sources of pollution will be allocated and reduced to meet TMDL requirements. The plans will include regulatory and nonregulatory (i.e., voluntary), structural and nonstructural improvements. The involvement and support of affected stakeholders in this phase is especially critical.*
- ***Phase 5: Implementing Basin Management Action Plans.*** *Implementation of the activities specified in the BMAP begins.*

The watershed management cycle is an iterative, or repeated, 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. FDEP also will track the implementation of scheduled restoration activities, whether required or voluntary, to ensure continued progress towards meeting the TMDLs.

Appendix C: Surface Water Assessment Methodology

The Impaired Surface Waters Rule

To identify impaired waters in each of the state's river basins, FDEP evaluates water quality data using the science-based methodology in the Identification of Impaired Surface Waters Rule (Rule 62-303, Florida Administrative Code [F.A.C.]). The rule establishes specific criteria and thresholds for impairment, in addition to data sufficiency and data quality requirements. The methodology described in the rule is based on a statistical approach designed to provide greater confidence that the outcome of the water quality assessment is correct. The complete text of the Impaired Surface Waters Rule is available at http://www.dep.state.fl.us/water/tmdl/docs/AmendedIWR.pdf.

As part of the watershed management approach, for each river basin in the state FDEP will follow the methodology in Section 62-303.300, F.A.C., to develop a Planning List of potentially impaired waters to be assessed under Subsections 403.067(2) and (3), Florida Statutes (F.S.). The methodology for developing the Planning List includes an evaluation of aquatic life use support, primary contact and recreational use support, fish shellfish consumption use support, drinking water use support, and protection of human health. Data older than 10 years cannot be used to evaluate water quality criteria exceedances for the Planning List. As required by Subsection 403.067(2), F.S., the Planning List will not be used to administer or implement any regulatory program, and is submitted to the U.S. Environmental Protection Agency (EPA) for informational purposes only.

After further assessment, using the methodology in Part III, Section 62-303.400, F.A.C., FDEP will determine if waters on the Planning List are, in fact, impaired and if the impairment is caused by pollutant discharges. These waters are placed on a Verified List. The criteria for the Verified List are more stringent than those for the Planning List. Data older than 7.5 years should not be used to verify impairment. The Verified List will be adopted by Secretarial Order and forwarded to the EPA for approval as Florida's Section 303(d) list of impaired waters. FDEP will develop total maximum daily loads (TMDLs) for these waters under Subsection 403.067(4), F.S.

Assessment of Designated Use Attainment

While the designated uses of a given waterbody are established using the surface water quality classification system described previously, it is important to note that the EPA uses slightly different terminology in its description of designated uses. Because FDEP is required to provide use attainment status for both the state's 305(b) report and the state's 303(d) list of impaired waters, FDEP uses EPA terminology when assessing waters for use attainment. The water quality evaluations and decision processes for listing impaired waters that are defined in Florida's Impaired Surface Waters Rule are based on the following designated use attainment categories:

Aquatic Life Use Support-Based Attainment
Primary Contact and Recreation Attainment
Fish and Shellfish Consumption Attainment
Drinking Water Use Attainment and Protection of Human Health

Table B.1 summarizes the designated uses assigned to Florida's various surface water classifications.

Table B.1. Designated Use Attainment Categories for Surface Waters in Florida

Designated Use Attainment Category Used in Impaired Surface Waters Rule Evaluation	***Applicable Florida Surface Water Classification***
Aquatic Life Use Support-Based Attainment	Class I, II, and III
Primary Contact and Recreation Attainment	Class I, II, and III
Fish and Shellfish Consumption Attainment	Class II
Drinking Water Use Attainment	Class I
Protection of Human Health	Class I, II, and III

Data Sources

FDEP's assessment of water quality for each basin statewide includes an analysis of quantitative data from a variety of sources, many of which are readily available to the public. These sources include the EPA's Legacy and modernized STOrage and RETrieval (STORET) databases, the U.S. Geological Survey (USGS), FDEP, the Florida Department of Health (FDOH), the water management districts, local governments, and volunteer monitoring groups.

Historically, FDEP carried out statewide water quality assessments using data available in the EPA's Legacy STORET Database; STORET makes up approximately 60 percent of the statewide data used in the Impaired Surface Waters Rule assessment. The Legacy STORET Database is a repository of data collected and uploaded by numerous organizations through 1999. The Legacy STORET Database can be accessed at http://www.dep.state.fl.us/water/storet/index.htm

In 2000, the EPA created a modernized version of STORET that included new features designed to address data quality assurance/quality control concerns (the new STORET Web site is available at www.epa.gov/storet/).

Approximately 35 percent of the data used in the assessment under the Impaired Surface Waters Rule was provided by individual organizations that for various reasons, such as time constraints or resource limitations, were not able to enter their data into the national database. The organizations providing the largest datasets include the St. Johns River Water Management District and the USGS. Several of these databases are readily available to the public via the Internet: the South Florida Water Management District at http://www.envirobase.usgs.gov/, the USGS at http://water.usgs.gov/, and Florida LakeWatch at http://lakewatch.ifas.ufl.edu/.

FDEP created the Impaired Surface Waters Rule Database in 2002 to evaluate data simultaneously in accordance with the Impaired Surface Waters Rule methodology for every basin in the state, based on the appropriate data "window." For the Verified List assessment, the window is 7.5 years (for the Impaired Surface Waters Rule Database), and the Planning List assessment window is 10 years. ***Table B.2*** shows the periods of record for the Verified and Planning Lists for Florida's 5 basin groups.

The evaluation of water quality in the state's basins also includes some qualitative information. These sources are described in the Basin Status Reports and Assessment Reports for each basin, which are available at http://www.dep.state.fl.us/water/tmdl/stat_rep.htm.

Table B.2: Data Used in Developing the Planning and Verified Lists, First Basin Rotation Cycle

Basin Group	***Reporting***	***Period of Data Record Used in Impaired Surface Waters Rule Evaluation***
Group 1	Planning List	January 1, 1989 – December 31, 1998
	Verified List	January 1, 1995 – June 30, 2002
Group 2	Planning List	January 1, 1991 – December 31, 2000
	Verified List	January 1, 1996 – June 30, 2003
Group 3	Planning List	January 1, 1992 – December 31, 2001
	Verified List	January 1, 1997 – June 30, 2004
Group 4	Planning List	January 1, 1993 – December 31, 2002
	Verified List	January 1, 1998 – June 30, 2005
Group 5	Planning List	January 1, 1994 – December 31, 2003
	Verified List	January 1, 1999 – June 30, 2006

Note: Typically, a 10-year data record is used for the development of the Planning Lists, and a 7.5-year record is used for the Verified Lists.

To determine the status of surface water quality in individual river basins in Florida, three categories of data—chemistry data, biological data, and fish consumption advisories—were evaluated to determine potential impairments for the four designated use attainment categories discussed earlier: aquatic life, primary contact and recreation, fish and shellfish consumption, and drinking water use and protection of human health.

Aquatic Life Based Attainment

The Impaired Surface Waters Rule follows the principle of independent applicability. A waterbody is listed for potential impairment of aquatic life use support based on exceedances of any one of four types of water quality indicators (numeric water quality criteria, nutrient thresholds, biological thresholds, and toxicity data).

Exceedances of Numeric Water Quality Criteria

Only ambient surface water quality stations were included in the assessment of impairment. Water quality information from point sources or wells was excluded. Monitoring stations were classified as one of three waterbody types—stream, lake, or estuary. The assessments included the following parameters:

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

The requirements for placing waters on the Planning List included a minimum of 10 temporally independent samples from the 10-year period of record**,** unless there were 3 exceedances of water quality or 1 exceedance of an acute toxicity criterion in a 3-year period. The screening methodology for the Verified List requires at least 20 samples from the last 5 years preceding the Planning List assessment. For most parameters, an exceedance is recorded any time the measured value is higher than the applicable water quality criterion by any amount. However, for the DO criterion, which is expressed as a minimum numeric value, an "exceedance" is recorded whenever the measured value is lower than the applicable DO criterion.

To determine if a water should be placed on the Planning List for each parameter, the chemical data were analyzed using a computer program written to assess the data, based on criteria established in the Impaired Surface Waters Rule, 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 are not included. They will be further examined while additional data are collected during Phase 2 of the watershed management cycle. Data analysis and statistical summaries of segments with waterbody identification numbers (WBIDs), waterbody types, and parameters obtained from the STORET Database were conducted using Access, SAS statistical software, and ArcView GIS applications.

The data for metals and conventional parameters were compared with the state surface water quality criteria in Section 62-302.530, F.A.C. (the Impaired Surface Waters Rule). The rule contains a table of sample numbers versus exceedances. A waterbody 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. To be placed on the Verified List, at least a 90 percent confidence rate was required.

Exceedances of Nutrient Thresholds

The state currently has a narrative nutrient criterion instead of a numeric value for nutrient thresholds. The narrative criterion states, “In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna.” The Impaired Surface Waters Rule provides an interpretation of the narrative nutrient criterion. In general, the Trophic State Index (TSI) and the annual mean chlorophyll *a* values are the primary means for assessing whether a waterbody should be assessed further for nutrient impairment.

The rule also considers other information that might indicate an imbalance in flora or fauna due to nutrient enrichment, such as algal blooms, excessive macrophyte growth, a decrease in the distribution (either in density or aerial coverage) of seagrasses or other submerged aquatic vegetation, changes in algal species richness, and excessive diel oxygen swings.

Potential nutrient impairment was evaluated by calculating annual mean chlorophyll *a* values for estuaries and streams and the TSI for lakes. For lakes, the TSI was calculated using chlorophyll *a*, total phosphorus, and total nitrogen measurements. Direct evidence of imbalances of flora and fauna in waterbodies was also considered in the evaluation of nutrient impairments.

In estuarine areas, a water was considered nutrient enriched if the annual mean chlorophyll *a* values were greater than 11 micrograms per liter (μg/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 μg/L or if the annual mean increased by more than 50 percent over historical values for at least two consecutive years.

A lake with a mean color greater than 40 platinum cobalt units (PCUs) was considered nutrient enriched if the annual mean TSI exceeded 60. A lake with a mean color less than or equal to 40 PCUs 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 2000 period, or if TSI measurements were 10 units higher than historical values.

Exceedances of Biological Thresholds

Bioassessments were carried out for streams, lakes, canals, and rivers using the Impaired Surface Waters Rule as guidance and following FDEP's standard operating procedures, which provide definitions and specific methods for the generation and analysis of bioassessment data. These are referenced in the individual bioassessment data tables contained in the Basin Status Reports. The purpose behind using a 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 Planning and Verified List assessments, 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. Data on community structure and function from waters of unknown quality in the same region as reference waters were compared with the expected scores of metrics to evaluate their biological integrity.

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 and 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 Planning and Verified Lists. The data included sites designated as test and background sites for National Pollutant Discharge Elimination System (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 *[Definition: Of, on, or relating to the banks of a natural course of water.])* buffer zone widths) was not available at the time of reporting, it was not included. However, this information is instrumental in pinpointing the causes for failed bioassessment metrics and will be included in future reporting.

The data used to develop the Planning and Verified Lists were obtained from FDEP's Biological Database (SBIO) and the EPA's STORET Water Quality Database, where it could be substantiated that the data were generated in compliance with the bioassessment standard operating procedures referenced in the Impaired Surface Waters Rule (Section 62-303.330, F.A.C.).

The data from these databases are used without regard to the randomness of sample site selection. For the purposes of the Basin Status Reports, 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.

Lake Condition Index. The scoring of the individual metrics of the Lake Condition Index (LCI), except percent Diptera, was 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 in 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 Diversity Index score; Hulbert Index score; and percent Dipteran individuals. LCI calculations were only provided for clear lakes (< 20 PCUs). As macroinvertebrate-based indices have not been shown to assess colored lakes in Florida accurately (> 20 PCUs), they have been excluded from bioassessments. A poor or very poor rating based on the average score constituted a failed bioassessment, based on the Impaired Surface Waters Rule.

Stream Condition Index. A total Stream Condition Index (SCI) score was calculated by adding the scores of the seven metrics in the method: 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. A poor or very poor rating based on the total score constituted a failed bioassessment, based on the Impaired Surface Waters Rule. The Basin Status Reports contain definitions and specific methods for the generation and analysis of bioassessment data.

BioRecon. To establish an impairment rating based on BioRecon data, three metrics were used: the Florida Index score, total number of taxa, and total number of EPT taxa. If all three metrics failed to meet thresholds, the water was deemed "impaired" based on the Impaired Surface Waters Rule.

Biological Integrity Standard. Quantitative data, generated through the use of Hester-Dendy artificial substrate samplers, were used to calculate Shannon-Wiener Diversity Index scores for paired background and test sites, as specified in the Biological Integrity Standard, Subsection 62-302.530(11), F.A.C. One failure of the standard meant that a waterbody segment was listed as potentially impaired. (The Hester-Dendy data were not used in the 2004 assessment.)

Evaluation of Toxicity Data. Although the Impaired Surface Waters Rule describes the use of toxicity data for the assessment of aquatic life-based attainment, no ambient toxicity data are available for assessment and this metric was not used.

Primary Contact and Recreation Attainment

For Class I, II, or III waters, a waterbody was potentially impaired if the following criteria were met:

- *The waterbody segment did not meet the applicable water quality criteria for bacteriological quality,*
- *The waterbody segment included a bathing area that was closed by a local health department or county government for more than 1 week or more than once during a calendar year based on bacteriological data,*
- *The waterbody segment included a bathing area for which a local health department or county government issued closures, advisories, or warnings totaling 21 days or more during a calendar year based on bacteriological data, or*
- *The waterbody segment included a bathing area that was closed or had advisories or warnings for more than 12 weeks during a calendar year based on previous bacteriological data or on derived relationships between bacteria levels and rainfall or flow.*

Fish and Shellfish Consumption Attainment

For Class I, II, or III waters, a waterbody was potentially impaired if it did not meet the applicable Class II water quality criteria for bacteriological quality, or if a fish consumption advisory had been issued. Fish consumption advisories were based on the FDOH's "limited consumption" or "no consumption" advisories for surface waters because of high levels of mercury in fish tissue. In addition, for Class II waters, waterbody segments that had been approved for shellfish harvesting but were downgraded to a more restrictive classification were listed as potentially impaired.

Drinking Water Attainment and Protection of Human Health

For Class I waters, a waterbody was potentially impaired if it did not meet the applicable Class I water quality criteria.

Appendix D: Ground Water Supporting Data

Table D.1. Ground Water and Surface Water Threshold Reference Values

Analyte	FDEP Water Quality Criteria									Proposed Threshold Reference Value
	Ground Water		Surface Water							
	Primary	Secondary	Class I Potable	Class II Shell-fish	Class III Fresh	Class III Marine	Class IV Agricul-tural	Class V Fresh	Class V Marine	
Aluminum		200		1500		1500				1500
Antimony	6		14	4300	4300	4300				14
Arsenic	50		50	50	50	50	50	50	50	50
Barium	2000		1000							1000
Beryllium	4		0.0077 a/ave.	0.13 a/ave.	0.13 a/ave.	0.13 a/ave.	100 [2]			0.0077
Cadmium	5		0.38 - 3.37 [1]	9.3	0.38 - 3.37 [1]	9.3				0.38
Chromium	100		27.7 - 268.2 [1]		27.7 - 268.2 [1]		66.50 - 644.20 [1]	66.50 - 644.20 [1]		27.7
Copper		1000	2.85 - 30.50 [1]	2.9	2.85 - 30.50 [1]	2.9	500		500	2.85
Iron		300	300	300	1000	300	1000			300
Lead	15		0.54 - 18.57 [1]	5.6	0.54 - 18.57 [1]	5.6	50		50	0.54
Manganese		50		100						100
Mercury	2		0.012	0.025	0.012	0.025	0.2		0.2	0.012
Nickel	100		16.1 - 168.5 [1]	8.3	16.1 - 168.5 [1]	8.3	100			8.3
Selenium	50		5	71	5	71				5
Silver		100	0.07		0.07					0.07
Thallium	2		1.7	6.3	6.3	6.3				1.7
Zinc		5000	37.0 - 387.8 [1]	86	37.0 - 387.8 [1]	86	1,000		1,000	37.0
Nitrate – N Total (mg/L)[5,6]	10		10 [7]							0.45
Nitrate + Nitrite - N (mg/L) [5]	10		10 [7]							0.45
Phosphorus Total (mg/L)[5]										0.025

Analyte	*FDEP Water Quality Criteria*									*Proposed Threshold Reference Value*
	Ground Water		***Surface Water***							
	Primary	***Secondary***	***Class I Potable***	***Class II Shell-fish***	***Class III Fresh***	***Class III Marine***	***Class IV Agricul-tural***	***Class V Fresh***	***Class V Marine***	
Unionized Ammonia			20		20					20
Turbidity (NTU)			29 [3]	29 [3]	29 [3]	29 [3]	29 [3]	29 [3]	29 [3]	29
Total Alkalinity (mg/L as $CaCO_3$)			20		20		600			20
Fluoride Total	4,000	2,000	1500	1500	10000	5000	10000		10000	1500
Chloride Total		250,000	250,000	10% bkgd		10% bkgd			10% bkgd	250,000
Conductivity Field Microμmhos/cm			1275 [4]		1275 [4]		1275 [4]		4000	1275
pH – lower boundary (SU)		6.5	6	6.5	6	6.5		5		<6
pH - upper boundary (SU)		8.5	8.5	8.5	8.5	8.5		9.5		>8.5
DO Probe (mg/L)			5	4	5	4	4		0.1	<4
Total Coliforms (#/100 mL)	4		2400/1000	230	2400/1000	2400/1000				1000
Fecal Coliforms (#/100 mL)			800/200	800	800/200	800/200				400
E. Coli (#/100 mL)										235
Enterococci (#/100 mL)										61

Notes:

All units in micrograms per liter (μg/L) unless otherwise noted.
1 – Equation calculation– Hardness estimate at 25 and 40.
2 – In waters with a hardness in milligrams per liter (mg/L) of calcium carbonate of less than 250 and shall not exceed 500 in harder waters
3 – Above natural background conditions.
4 – Or greater than 50 percent natural background.
5 – Proposed thresholds for nitrate, nitrate + nitrite, phosphorus derived from statewide evaluation of chlorophyll in lakes used in 305(b) assessments. On average, to maintain a lake chlorophyll concentration of 10 μg/L or lower (to maintain "good" lake condition), total nitrogen of 0.45 mg/L or total phosphorus of 0.025 mg/L or lower should be maintained, depending on which is the limiting nutrient.
6 – Filtered samples and results from laboratory methods reporting combined nitrate + nitrite (as N) or nitrate (as N) apply to this reference value.
7 – Or that concentration that exceeds the nutrient criterion.
8 – Proposed thresholds for E. coli and enterococci derived from single sample maxima at the 75th percentile (from EPA 1986 ambient water quality criteria for bacteria).

Table D.2. Status Network, Cycle 1 Analytical Parameters

FDEP Code	***Parameter***
10	Water Temperature
76	Turbidity
81	Color
94	Specific Conductance, Field
95	Specific Conductance
299	Oxygen, Dissolved, Field
406	pH, Field
530	Total Suspended Solids (TSS)
608	Ammonia, Dissolved (as N)
623	Ammonia + Organic Nitrogen, Dissolved
631	Nitrate + Nitrite, Dissolved (as N)
666	Phosphorus, Dissolved (as P)
671	Orthophosphate, Dissolved (as P)
680	Organic Carbon, Total
915	Calcium, Dissolved
925	Magnesium, Dissolved
930	Sodium, Dissolved
935	Potassium, Dissolved
941	Chloride, Dissolved
946	Sulfate, Dissolved
950	Fluoride, Dissolved
29801	Alkalinity, Dissolved (as CaCO3)
31501	Coliform, Total (MF)
31616	Coliform, Fecal (MF)
31648	Escherichia coli, Membrane Filter
31649	Enterococci, Membrane Filter
70300	Total Dissolved Solids (TDS measured)
72109	Depth to Water (from mpe)
73675	Purge Volume
84147	Microlanduse Category
99994	Water Column Height

Note: Not every analyte was sampled uniformly across the state.

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Table D.3. Data Used in Nutrients Evaluation

	Ground Water Resource Index (GRI)				***Ground Water–Surface Water Relational Assessment (SRA)***							
	Nitrite + Nitrate (Filtered as N)				***Nitrite + Nitrate (Filtered as N)***				***Phosphorus Total (as P)***			
	Status Network Risk Indicators				*Status Network SRA Thresholds*				*Background Network SRA Thresholds*			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***
Apalachicola–Chipola	27	0%	29	0%	27	**30%**	29	**21%**	ND	ND	ND	ND
Caloosahatchee	19	0%	27	0%	19	0%	27	0%	5	**100%**	5	**20%**
Charlotte Harbor	10	0%	6	0%	10	10%	6	0%	1	**100%**	3	**67%**
Choctawhatchee–St. Andrew	28	0%	40	0%	28	**18%**	40	**13%**	ND	ND	ND	ND
Everglades	19	0%	2	0%	19	0%	2	0%	8	**25%**	ND	ND
Everglades West Coast	32	0%	28	0%	32	3%	28	4%	11	**73%**	7	**29%**
Fisheating Creek	10	0%	3	0%	10	0%	3	0%	4	**100%**	1	0%
Florida Keys	3	0%	ND	ND	3	0%	ND	ND	ND	ND	ND	ND
Indian River Lagoon	5	0%	6	0%	5	0%	6	0%	ND	ND	ND	ND
Kissimmee River	23	**13%**	26	0%	23	**17%**	26	4%	7	**100%**	5	**20%**
Lake Okeechobee	4	0%	6	0%	4	0%	6	0%	ND	ND	3	**67%**
Lake Worth Lagoon–Palm Beach Coast	6	0%	ND	ND	6	0%	ND	ND	7	**100%**	ND	ND
Lower St. Johns	24	0%	24	0%	24	4%	24	0%	ND	ND	ND	ND
Middle St. Johns	8	0%	14	7%	8	**25%**	14	7%	ND	ND	ND	ND
Nassau–St. Marys	29	0%	29	0%	29	7%	29	0%	1	**100%**	5	**0%**
Ochlockonee–St. Marks	29	3%	30	0%	29	**28%**	30	**23%**	1	0%	10	**30%**
Ocklawaha	27	4%	30	0%	27	**56%**	30	**23%**	16	**69%**	18	**72%**
Pensacola	24	0%	19	0%	24	**42%**	19	0%	ND	ND	ND	ND
Perdido	2	0%	1	0%	2	**100%**	1	0%	ND	ND	ND	ND
Sarasota Bay–Peace–Myakka	45	4%	51	2%	45	**13%**	51	2%	ND	ND	ND	ND
Southeast Coast–Biscayne Bay	6	0%	2	0%	6	**17%**	2	0%	52	12%	ND	ND
Springs Coast	13	0%	ND	ND	13	**23%**	ND	ND	ND	ND	ND	ND
St. Lucie–Loxahatchee	6	0%	5	0%	6	**17%**	5	0%	6	**100%**	2	0%

	Ground Water Resource Index (GRI)				*Ground Water–Surface Water Relational Assessment (SRA)*							
	Nitrite + Nitrate (Filtered as N)				*Nitrite + Nitrate (Filtered as N)*				*Phosphorus Total (as P)*			
	Status Network Risk Indicators				*Status Network SRA Thresholds*				*Background Network SRA Thresholds*			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***
Suwannee	113	2%	94	0%	113	**28%**	94	**20%**	236	**14%**	223	**14%**
Tampa Bay	22	5%	13	0%	22	**14%**	13	**15%**	ND	ND	ND	ND
Tampa Bay Tributaries	26	8%	22	0%	26	**27%**	22	**14%**	ND	ND	ND	ND
Upper East Coast	6	0%	6	0%	6	**17%**	6	0%	ND	ND	ND	ND
Upper St. Johns	12	0%	10	0%	12	0%	10	0%	ND	ND	ND	ND
Withlacoochee	17	0%	ND	ND	17	**41%**	ND	ND	ND	ND	ND	ND
STATEWIDE AVERAGE	**595**	**2%**	**523**	**0%**	**595**	**20%**	**523**	**10%**	**355**	**25%**	**282**	**20%**

ND = No data

GRI Threshold > 10 percent
(yellow highlighting)

SRA Threshold > 10 percent
(yellow highlighting)

Note: Highlighted values indicate that more than 10 percent of the wells in a basin exceed the GRI or SRA thresholds.

Nitrate + Nitrite Risk Threshold = 10 mg/L

Nitrate + Nitrite SRA Criterion = 0.45 mg/L

Total Phosphorus SRA Criterion = 0.025 mg/L

Data used in this analysis have been released by FDEP's Watershed Monitoring and Data Management (WMDM) Section and are untrimmed for outliers.

Table D.4. Data Used in Biologicals Evaluation

	Ground Water Resource Index (GRI)								***Ground Water–Surface Water Relational Assessment (SRA)***							
	Fecal Coliforms Status Network Risk Indicators *				***Total Coliforms Status Network MCL Exceedances***				***Fecal Coliforms Status Network SRA Thresholds***				***Total Coliforms Status Network SRA Thresholds***			
Type of Aquifer	*Unconfined*		*Confined*		*Unconfined*		*Confined*		*Unconfined*		*Confined*		*Unconfined*		*Confined*	
Basin	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***
Apalachicola–Chipola	27	4%	30	0%	17	**12%**	30	7%	27	4%	30	0%	17	0%	30	0%
Caloosahatchee	19	**11%**	27	**11%**	18	**22%**	25	**20%**	19	0%	27	0%	18	6%	25	0%
Charlotte Harbor	10	0%	6	0%	9	**22%**	5	0%	10	0%	6	0%	9	0%	5	0%
Choctawhatchee–St. Andrew	28	7%	40	0%	ND	ND	ND	ND	28	0%	40	0%	ND	ND	ND	ND
Everglades	19	**11%**	2	0%	ND	ND	ND	ND	19	0%	2	0%	ND	ND	ND	ND
Everglades West Coast	32	3%	28	0%	2	**50%**	ND	ND	32	0%	28	0%	2	0%	ND	ND
Fisheating Creek	10	0%	3	0%	10	0%	3	0%	10	0%	3	0%	10	0%	3	0%
Florida Keys	3	0%	ND	ND	ND	ND	ND	ND	3	0%	ND	ND	ND	ND	ND	ND
Indian River Lagoon	5	0%	6	0%	ND	ND	ND	ND	5	0%	6	0%	ND	ND	ND	ND
Kissimmee River	23	4%	26	0%	23	**17%**	26	8%	23	0%	26	0%	23	0%	26	0%
Lake Okeechobee	4	0%	6	0%	4	0%	6	0%	4	0%	6	0%	4	0%	6	0%
Lake Worth Lagoon–Palm Beach Coast	6	0%	ND	0%	ND	ND	ND	ND	6	0%	ND	ND	ND	ND	ND	ND
Lower St. Johns	24	8%	24	0%	ND	ND	ND	ND	24	0%	24	0%	ND	ND	ND	ND
Middle St. Johns	8	**13%**	14	0%	ND	ND	1	0%	8	0%	14	0%	ND	ND	1	0%
Nassau–St. Marys	29	3%	29	0%	29	**10%**	29	3%	29	0%	29	0%	29	0%	29	0%
Ochlockonee–St. Marks	29	**24%**	30	10%	29	**45%**	30	**17%**	29	3%	30	0%	29	7%	30	0%
Ocklawaha	27	4%	30	3%	27	**56%**	30	**17%**	27	0%	30	0%	27	0%	30	0%

	Ground Water Resource Index (GRI)								Ground Water–Surface Water Relational Assessment (SRA)							
	Fecal Coliforms Status Network Risk Indicators *				Total Coliforms Status Network MCL Exceedances				Fecal Coliforms Status Network SRA Thresholds				Total Coliforms Status Network SRA Thresholds			
Type of Aquifer	*Unconfined*		*Confined*		*Unconfined*		*Confined*		*Unconfined*		*Confined*		*Unconfined*		*Confined*	
Basin	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***
Pensacola	24	4%	19	0%	ND	ND	ND	ND	24	0%	19	0%	ND	ND	ND	ND
Perdido	2	0%	1	0%	ND	ND	ND	ND	2	0%	1	0%	ND	ND	ND	ND
Sarasota Bay–Peace–Myakka	45	**13%**	51	4%	16	**25%**	23	**30%**	45	0%	51	0%	16	6%	23	0%
Southeast Coast–Biscayne Bay	6	**33%**	2	0%	ND	ND	ND	ND	6	0%	2	0%	ND	ND	ND	ND
Springs Coast	13	**15%**	ND	ND	ND	ND	ND	ND	13	0%	ND	ND	ND	ND	ND	ND
St. Lucie–Loxahatchee	6	0%	5	0%	ND	ND	ND	ND	6	0%	5	0%	ND	ND	ND	ND
Suwannee	113	5%	95	1%	48	**19%**	34	**15%**	113	1%	95	0%	48	2%	34	0%
Tampa Bay	22	9%	13	**15%**	11	**18%**	13	**23%**	22	0%	13	0%	11	0%	13	0%
Tampa Bay Tributaries	26	**15%**	22	0%	23	**35%**	22	**14%**	26	0%	22	0%	23	4%	22	0%
Upper East Coast	6	0%	6	0%	ND	ND	ND	ND	6	0%	6	0%	ND	ND	ND	ND
Upper St. Johns	12	0%	10	0%	ND	ND	ND	ND	12	0%	10	0%	ND	ND	ND	ND
Withlacoochee	17	6%	ND	ND	ND	ND	ND	ND	17	0%	ND	ND	ND	ND	ND	ND
STATEWIDE	**595**	**8%**	**525**	**2%**	**266**	**25%**	**277**	**14%**	**595**	**8%**	**252**	**0%**	**266**	**2%**	**277**	**0%**

ND = No data

MCL = Maximum contaminant level

* **"Risk Indicator"** used because Fecal coliform does not have a ground water standard or MCL.

Data used in this analysis have been released by FDEP's Watershed Monitoring and Data Management (WMDM) Section and are untrimmed for outliers

GRI Threshold > 10 percent (yellow highlighting)

SRA Threshold > 10 percent (yellow highlighting)

Note: Highlighted values indicate that more than 10 percent of the wells in a basin exceed the GRI or SRA thresholds.

Total Coliform MCL = 4 colonies/mL

Total Coliform SRA Criteria = 1000 colonies/mL

Fecal Coliform Risk Limit = 4 colonies/mL

Fecal Coliform SRA Criteria = 400 colonies/mL

Table D.5.a. Data Used in Evaluation of Primary Metals

	Ground Water Resource Index (GRI) for Primary Metals (see notes at end of table)															
	Total Antimony MCL Exceedances				***Total Arsenic MCL Exceedances***				***Total Arsenic Risk Indicators (using 10 g/L)***				***Total Barium MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Apalachicola–Chipola	13	0%	28	0%	14	0%	43	0%	14	**14%**	43	2%	14	0%	43	0%
Caloosahatchee	4	0%	6	0%	19	0%	20	0%	19	**21%**	20	0%	18	0%	20	0%
Charlotte Harbor	5	0%	12	0%	8	0%	17	0%	8	**25%**	17	0%	8	0%	17	0%
Choctawhatchee–St. Andrew	16	0%	30	0%	21	0%	46	0%	21	**14%**	46	0%	21	0%	46	0%
Everglades	8	0%	ND	ND	29	0%	4	0%	29	7%	4	0%	28	0%	4	0%
Everglades West Coast	13	0%	13	0%	38	0%	23	0%	38	8%	23	0%	35	0%	22	0%
Fisheating Creek	1	0%	ND	ND	7	0%	6	0%	7	0%	6	0%	7	0%	5	0%
Florida Keys	3	0%	ND	ND	4	0%	ND	ND	4	**25%**	ND	ND	4	0%	ND	ND
Indian River Lagoon	6	0%	13	0%	11	0%	19	0%	11	0%	19	0%	11	0%	19	0%
Kissimmee River	13	0%	16	0%	37	0%	25	0%	37	**11%**	25	0%	27	0%	22	0%
Lake Okeechobee	5	0%	3	0%	5	0%	7	0%	5	0%	7	0%	5	0%	7	0%
Lake Worth Lagoon–Palm Beach Coast	13	0%	ND	ND	50	2%	ND	ND	50	8%	ND	ND	36	0%	ND	ND
Lower St. Johns	8	0%	16	0%	27	0%	52	2%	27	**15%**	52	4%	27	0%	53	2%
Middle St. Johns	23	0%	55	0%	31	0%	74	0%	31	10%	74	3%	32	0%	78	0%
Nassau–St. Marys	1	0%	4	0%	12	0%	24	0%	12	0%	24	0%	12	0%	23	0%
Ochlockonee–St. Marks	20	0%	58	0%	27	0%	113	0%	27	7%	113	5%	27	0%	117	0%

	Ground Water Resource Index (GRI) for Primary Metals (see notes at end of table)															
	Total Antimony MCL Exceedances				***Total Arsenic MCL Exceedances***				***Total Arsenic Risk Indicators (using 10 g/L)***				***Total Barium MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Ocklawaha	30	0%	35	0%	52	0%	54	4%	52	2%	54	6%	52	0%	55	0%
Pensacola	2	0%	1	0%	45	2%	12	0%	45	**18%**	12	0%	45	0%	12	0%
Perdido	ND	ND	ND	ND	27	4%	2	0%	27	7%	2	0%	27	0%	2	0%
Sarasota Bay–Peace–Myakka	17	0%	26	0%	50	4%	108	0%	50	**20%**	108	3%	50	0%	106	0%
Southeast Coast–Biscayne Bay	ND	ND	ND	ND	116	0%	ND	ND	116	3%	ND	ND	104	0%	ND	ND
Springs Coast	29	0%	17	0%	32	0%	20	0%	32	9%	20	5%	32	0%	20	0%
St. Lucie–Loxahatchee	23	0%	4	0%	42	0%	8	0%	42	5%	8	0%	39	0%	8	0%
Suwannee	95	0%	120	0%	296	0%	286	0%	296	5%	286	2%	275	0%	283	0%
Tampa Bay	9	0%	24	0%	17	6%	37	0%	17	**18%**	37	3%	16	0%	35	0%
Tampa Bay Tributaries	14	0%	30	0%	17	0%	44	0%	17	0%	44	0%	17	0%	44	0%
Upper East Coast	5	0%	12	0%	12	0%	20	0%	12	0%	20	5%	14	7%	23	0%
Upper St. Johns	13	0%	15	0%	17	0%	16	0%	17	6%	16	0%	17	0%	16	0%
Withlacoochee	39	0%	10	0%	46	0%	13	0%	46	2%	13	0%	46	0%	13	0%
STATEWIDE	**428**	**0%**	**548**	**0%**	**1109**	**1%**	**1093**	**0%**	**1109**	**7%**	**1093**	**2%**	**1046**	**0%**	**1093**	**0%**

	Ground Water Resource Index (GRI) for Primary Metals (see notes at end of table)															
	Total Beryllium MCL Exceedances				***Total Cadmium MCL Exceedances***				***Total Chromium MCL Exceedances***				***Total Lead MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Apalachicola–Chipola	13	0%	28	0%	14	0%	43	9%	14	7%	43	2%	14	7%	43	**33%**
Caloosahatchee	4	0%	6	0%	19	0%	20	0%	19	0%	20	0%	19	**42%**	20	**20%**
Charlotte Harbor	5	0%	12	0%	8	0%	16	0%	8	0%	17	0%	8	**38%**	17	**24%**
Choctawhatchee–St. Andrew	16	0%	30	0%	21	10%	46	9%	21	0%	46	0%	21	**24%**	46	**11%**
Everglades	8	0%	ND	ND	27	0%	4	0%	29	0%	4	0%	29	10%	4	**25%**
Everglades West Coast	13	0%	13	0%	36	6%	22	0%	38	3%	23	0%	38	**45%**	23	**26%**
Fisheating Creek	1	0%	ND	ND	7	**14%**	6	0%	7	0%	6	0%	7	**14%**	6	0%
Florida Keys	3	0%	ND	ND	4	**25%**	0	0%	4	0%	ND	ND	4	0%	ND	ND
Indian River Lagoon	6	0%	13	0%	11	0%	18	11%	11	0%	19	0%	11	**36%**	18	**28%**
Kissimmee River	13	0%	15	0%	36	6%	21	0%	37	0%	25	0%	37	**51%**	25	**24%**
Lake Okeechobee	5	0%	3	0%	5	0%	3	0%	5	0%	7	0%	5	0%	7	0%
Lake Worth Lagoon–Palm Beach Coast	13	0%	ND	ND	44	0%	0	0%	50	0%	ND	ND	50	**26%**	ND	ND
Lower St. Johns	8	0%	16	0%	27	7%	57	9%	27	0%	57	0%	27	**67%**	57	**54%**
Middle St. Johns	23	0%	55	0%	32	6%	78	6%	32	9%	78	1%	32	**59%**	78	**55%**
Nassau–St. Marys	1	0%	4	0%	13	8%	24	8%	13	0%	24	0%	13	**31%**	24	**29%**
Ochlockonee–St. Marks	20	0%	58	0%	27	**11%**	119	4%	26	0%	118	0%	26	4%	117	8%
Ocklawaha	30	3%	35	0%	53	6%	51	0%	53	2%	55	2%	53	**25%**	55	**31%**

	Ground Water Resource Index (GRI) for Primary Metals (see notes at end of table)															
	Total Beryllium MCL Exceedances				***Total Cadmium MCL Exceedances***				***Total Chromium MCL Exceedances***				***Total Lead MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Pensacola	2	0%	1	0%	45	**18%**	12	8%	45	7%	12	0%	45	**47%**	12	**17%**
Perdido	ND	ND	ND	ND	27	7%	2	0%	27	7%	2	**50%**	27	**19%**	2	0%
Sarasota Bay–Peace–Myakka	17	0%	26	0%	50	8%	108	3%	50	4%	108	0%	50	**40%**	108	**36%**
Southeast Coast–Biscayne Bay	ND	ND	ND	ND	130	3%	0	0%	130	1%	ND	ND	130	**45%**	ND	ND
Springs Coast	29	0%	17	0%	32	0%	20	0%	32	0%	20	0%	32	**53%**	20	**25%**
St. Lucie–Loxahatchee	23	0%	4	0%	35	3%	6	0%	42	0%	8	0%	42	**31%**	8	**13%**
Suwannee	95	0%	120	0%	294	2%	286	0%	297	0%	286	0%	297	8%	283	8%
Tampa Bay	9	0%	24	0%	16	**19%**	37	0%	17	0%	37	0%	16	**44%**	37	**30%**
Tampa Bay Tributaries	14	0%	30	0%	17	**18%**	44	7%	17	6%	44	0%	17	**65%**	44	**50%**
Upper East Coast	5	0%	12	0%	14	0%	23	4%	14	7%	23	4%	13	**62%**	23	**48%**
Upper St. Johns	13	0%	15	0%	17	**18%**	16	**13%**	17	0%	16	0%	17	**59%**	15	**20%**
Withlacoochee	39	0%	10	0%	46	0%	13	8%	46	0%	13	0%	46	**39%**	13	**46%**
STATEWIDE	**428**	**0%**	**547**	**0%**	**1107**	**5%**	**1095**	**3%**	**1128**	**2%**	**1111**	**0%**	**1126**	**30%**	**1105**	**25%**

	Ground Water Resource Index (GRI) for Primary Metals (see notes at end of table)															
	Total Mercury MCL Exceedances				Total Nickel MCL Exceedances				Total Selenium MCL Exceedances				Total Thallium MCL Exceedances			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Apalachicola–Chipola	14	0%	43	2%	14	0%	43	0%	14	0%	43	0%	13	0%	28	0%
Caloosahatchee	19	0%	18	0%	15	0%	17	0%	18	0%	20	0%	4	0%	6	0%
Charlotte Harbor	8	0%	17	0%	8	0%	16	0%	8	0%	17	0%	5	0%	12	0%
Choctawhatchee–St. Andrew	21	5%	46	9%	21	0%	46	0%	19	0%	46	0%	16	6%	30	0%
Everglades	27	0%	4	0%	25	0%	4	0%	26	0%	4	0%	8	0%	0	0%
Everglades West Coast	30	0%	18	0%	31	0%	20	0%	34	0%	22	0%	13	0%	13	0%
Fisheating Creek	6	0%	5	0%	6	0%	4	0%	7	0%	3	0%	1	0%	0	0%
Florida Keys	4	0%	ND	ND	4	0%	ND	ND	4	0%	ND	ND	3	0%	0	0%
Indian River Lagoon	11	9%	19	0%	8	0%	15	0%	10	0%	15	0%	6	0%	13	0%
Kissimee River	36	0%	20	0%	21	0%	18	0%	24	0%	22	0%	13	0%	15	0%
Lake Okeechobee	5	0%	4	0%	5	0%	3	0%	5	0%	7	0%	5	0%	3	0%
Lake Worth Lagoon–Palm Beach Coast	45	0%	ND	ND	31	0%	ND	ND	41	0%	ND	ND	13	0%	0	0%
Lower St. Johns	27	4%	57	9%	25	0%	44	0%	21	0%	46	0%	8	0%	16	0%
Middle St. Johns	31	0%	78	3%	31	0%	73	0%	24	0%	67	0%	23	0%	55	0%
Nassau–St. Marys	13	**23%**	22	**14%**	11	0%	22	0%	9	0%	21	0%	1	0%	4	0%
Ochlockonee–St. Marks	24	0%	106	0%	21	0%	65	0%	27	0%	116	0%	20	0%	58	0%
Ocklawaha	53	0%	55	0%	48	0%	54	0%	51	0%	53	0%	30	0%	35	0%

	Ground Water Resource Index (GRI) for Primary Metals (see notes at end of table)															
	Total Mercury MCL Exceedances				***Total Nickel MCL Exceedances***				***Total Selenium MCL Exceedances***				***Total Thallium MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Pensacola	45	**20%**	12	**17%**	45	0%	12	0%	39	0%	12	0%	2	0%	1	0%
Perdido	27	7%	2	0%	27	0%	2	0%	27	0%	2	0%	ND	ND	0	0%
Sarasota Bay–Peace–Myakka	50	2%	107	0%	46	0%	101	0%	48	0%	104	0%	17	6%	26	0%
Southeast Coast–Biscayne Bay	130	0%	ND	ND	101	0%	ND	ND	115	0%	ND	ND	ND	ND	0	0%
Springs Coast	32	0%	20	0%	30	0%	17	0%	32	0%	20	0%	29	0%	17	6%
St. Lucie–Loxahatchee	39	0%	6	0%	33	0%	6	0%	39	0%	8	0%	23	0%	4	**25%**
Suwannee	195	0%	180	0%	184	0%	198	0%	294	0%	282	0%	95	0%	120	0%
Tampa Bay	16	6%	37	0%	12	0%	32	0%	17	0%	37	0%	9	0%	24	0%
Tampa Bay Tributaries	17	0%	44	0%	16	0%	39	0%	17	0%	39	0%	14	0%	30	0%
Upper East Coast	14	7%	23	4%	11	0%	20	0%	11	0%	17	6%	5	0%	12	0%
Upper St. Johns	17	**12%**	16	0%	16	0%	16	0%	16	0%	16	0%	13	0%	15	0%
Withlacoochee	46	2%	13	0%	41	0%	10	0%	45	0%	13	0%	39	0%	10	0%
STATEWIDE	**1002**	**2%**	**972**	**2%**	**887**	**0%**	**897**	**0%**	**1042**	**0%**	**1052**	**0%**	**428**	**0%**	**547**	**0%**

ND – No data

* – Risk indicator for arsenic based on 10 µg/L

Highlighted values (in yellow) exceed GRI or SRA thresholds (>10 percent wells exceeding specific analyte threshold reference values).

MCL – Maximum contaminant level

Table D.1 presents analyte threshold reference values for the GRI and SRA.

Source: The data used in this analysis have been released by FDEP's Watershed Monitoring and Data Management (WMDM) Section and are untrimmed for outliers.

Table D.5.b. Data Used in Evaluation of Secondary Metals

	Ground Water Resource Index (GRI) for Secondary Metals (see notes at end of table)															
	Total Aluminum MCL Exceedances				***Total Boron MCL Exceedances***				***Total Copper MCL Exceedances***				***Total Iron MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Apalachicola–Chipola	13	**69%**	34	9%	ND	ND	ND	ND	14	0%	43	0%	14	**64%**	43	**60%**
Caloosahatchee	15	**33%**	17	6%	ND	ND	ND	ND	19	0%	20	0%	19	**95%**	20	**55%**
Charlotte Harbor	8	**38%**	16	6%	ND	ND	ND	ND	8	0%	17	0%	8	**100%**	17	**29%**
Choctawhatchee–St. Andrew	20	**55%**	36	**11%**	ND	ND	ND	ND	21	0%	46	0%	21	**62%**	46	**57%**
Everglades	24	**29%**	4	**25%**	ND	ND	ND	ND	29	0%	4	0%	28	**57%**	4	**25%**
Everglades West Coast	28	**21%**	15	**20%**	ND	ND	ND	ND	38	0%	23	0%	38	**95%**	23	**61%**
Fisheating Creek	6	**17%**	4	0%	ND	ND	ND	ND	7	0%	6	0%	7	**86%**	6	**50%**
Florida Keys	4	**25%**	0	0%	ND	ND	ND	ND	4	0%	ND	ND	4	**25%**	ND	ND
Indian River Lagoon	7	**86%**	14	7%	ND	ND	ND	ND	11	0%	19	0%	11	**91%**	19	**68%**
Kissimmee River	21	**62%**	18	**17%**	ND	ND	ND	ND	37	3%	25	0%	37	**76%**	24	**67%**
Lake Okeechobee	5	**40%**	3	0%	ND	ND	ND	ND	5	0%	7	0%	5	**40%**	7	**86%**
Lake Worth Lagoon–Palm Beach Coast	26	**50%**	0	0%	ND	ND	ND	ND	50	0%	ND	ND	50	**78%**	ND	ND
Lower St. Johns	24	**67%**	43	**16%**	ND	ND	ND	ND	27	4%	57	0%	28	**96%**	59	**64%**
Middle St. Johns	24	**79%**	64	**20%**	ND	ND	ND	ND	32	0%	78	0%	32	**91%**	78	**69%**
Nassau–St. Marys	11	**82%**	22	9%	ND	ND	ND	ND	13	0%	24	0%	13	**85%**	24	**42%**
Ochlockonee–St. Marks	20	**60%**	59	10%	ND	ND	ND	ND	23	0%	92	0%	22	**86%**	70	**44%**
Ocklawaha	35	**37%**	42	**12%**	ND	ND	ND	ND	53	0%	55	0%	53	**43%**	55	**51%**

	Ground Water Resource Index (GRI) for Secondary Metals (see notes at end of table)															
	Total Aluminum MCL Exceedances				***Total Boron MCL Exceedances***				***Total Copper MCL Exceedances***				***Total Iron MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Pensacola	39	**28%**	10	**20%**	ND	ND	ND	ND	45	2%	12	0%	45	**78%**	12	**42%**
Perdido	19	**53%**	2	**100%**	ND	ND	ND	ND	27	0%	2	0%	27	**74%**	2	**100%**
Sarasota Bay–Peace–Myakka	44	**57%**	99	**11%**	ND	ND	ND	ND	50	0%	108	0%	50	**90%**	108	**51%**
Southeast Coast–Biscayne Bay	52	**13%**	0	0%	ND	ND	ND	ND	132	0%	ND	ND	112	**88%**	ND	ND
Springs Coast	30	**33%**	17	**12%**	ND	ND	ND	ND	32	0%	20	0%	32	**75%**	20	**65%**
St. Lucie–Loxahatchee	33	**36%**	6	0%	ND	ND	ND	ND	42	0%	8	0%	42	**81%**	8	**38%**
Suwannee	158	**28%**	165	**13%**	ND	ND	ND	ND	297	0%	285	0%	297	**62%**	286	**42%**
Tampa Bay	11	**64%**	31	6%	ND	ND	ND	ND	17	0%	37	0%	17	**94%**	37	**49%**
Tampa Bay Tributaries	16	**69%**	39	5%	ND	ND	ND	ND	17	0%	44	0%	17	**76%**	44	**61%**
Upper East Coast	11	**55%**	18	**11%**	ND	ND	ND	ND	14	0%	23	0%	14	**100%**	23	**74%**
Upper St. Johns	16	**63%**	16	**19%**	ND	ND	ND	ND	17	0%	16	0%	17	**82%**	16	**63%**
Withlacoochee	41	**24%**	10	**20%**	ND	ND	ND	ND	46	2%	1071	0%	46	**83%**	13	**77%**
STATEWIDE	**761**	**41%**	**804**	**12%**	**0**	**0%**	**0**	**0%**	**1127**	**0%**	**1084**	**0%**	**1106**	**75%**	**1064**	**53%**

	Ground Water Resource Index (GRI) for Secondary Metals (see notes at end of table)															
	Total Manganese MCL Exceedances				***Total Silver MCL Exceedances***				***Total Strontium MCL Exceedances***				***Total Tin MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Apalachicola–Chipola	14	**36%**	43	**21%**	14	0%	43	0%	13	0%	35	9%	ND	ND	ND	ND
Caloosahatchee	19	**16%**	20	**15%**	18	0%	20	0%	15	7%	17	**47%**	ND	ND	ND	ND
Charlotte Harbor	8	**25%**	17	**12%**	8	0%	17	0%	8	**13%**	16	**69%**	ND	ND	ND	ND
Choctawhatchee–St. Andrew	21	**14%**	46	**11%**	21	0%	46	0%	21	0%	39	**13%**	ND	ND	ND	ND
Everglades	29	**17%**	4	**25%**	28	0%	4	0%	24	0%	4	**100%**	ND	ND	ND	ND
Everglades West Coast	38	**26%**	23	**13%**	35	0%	22	0%	28	0%	15	0%	ND	ND	ND	ND
Fisheating Creek	7	**29%**	6	0%	7	0%	5	0%	6	0%	4	**75%**	ND	ND	ND	ND
Florida Keys	4	0%	ND	ND	4	0%	0	0%	4	**50%**	0	0%	ND	ND	ND	ND
Indian River Lagoon	11	**36%**	19	**11%**	11	0%	19	0%	11	0%	19	**32%**	ND	ND	ND	ND
Kissimmee River	37	**46%**	25	8%	27	0%	22	0%	21	0%	18	**11%**	ND	ND	ND	ND
Lake Okeechobee	5	0%	7	0%	5	0%	7	0%	5	0%	3	**67%**	ND	ND	ND	ND
Lake Worth Lagoon–Palm Beach Coast	50	**12%**	ND	ND	36	0%	0	0%	26	0%	0	0%	ND	ND	ND	ND
Lower St. Johns	27	**33%**	57	**37%**	27	0%	53	2%	27	0%	54	**11%**	ND	ND	ND	ND
Middle St. Johns	32	**44%**	78	**35%**	32	0%	78	1%	32	0%	77	4%	ND	ND	ND	ND
Nassau–St. Marys	13	**23%**	24	**21%**	12	0%	23	0%	12	0%	22	0%	ND	ND	ND	ND
Ochlockonee–St. Marks	23	**30%**	95	**14%**	27	0%	118	0%	20	0%	61	0%	ND	ND	ND	ND
Ocklawaha	53	**26%**	55	**20%**	53	0%	55	0%	38	0%	46	0%	ND	ND	ND	ND

	Ground Water Resource Index (GRI) for Secondary Metals (see notes at end of table)															
	Total Manganese MCL Exceedances				***Total Silver MCL Exceedances***				***Total Strontium MCL Exceedances***				***Total Tin MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Pensacola	45	**58%**	12	8%	45	0%	12	0%	39	0%	10	0%	ND	ND	ND	ND
Perdido	27	**48%**	2	0%	27	0%	2	0%	19	0%	2	0%	ND	ND	ND	ND
Sarasota Bay–Peace–Myakka	50	**24%**	108	**21%**	50	0%	107	0%	46	4%	101	**64%**	ND	ND	ND	ND
Southeast Coast–Biscayne Bay	132	**40%**	ND	ND	104	0%	ND	ND	52	0%	0	0%	ND	ND	ND	ND
Springs Coast	32	**38%**	20	**35%**	32	0%	20	0%	30	3%	17	**12%**	ND	ND	ND	ND
St. Lucie–Loxahatchee	42	**14%**	8	0%	39	0%	8	0%	33	3%	6	**100%**	ND	ND	ND	ND
Suwannee	297	**29%**	284	**26%**	275	0%	282	0%	159	1%	167	0%	ND	ND	ND	ND
Tampa Bay	17	**29%**	37	**19%**	17	0%	37	0%	12	8%	32	**41%**	ND	ND	ND	ND
Tampa Bay Tributaries	17	**35%**	44	**30%**	17	0%	44	0%	16	0%	39	**26%**	ND	ND	ND	ND
Upper East Coast	14	**50%**	23	**39%**	14	0%	23	4%	14	7%	23	**13%**	ND	ND	ND	ND
Upper St. Johns	17	**53%**	16	**13%**	17	0%	16	0%	17	6%	16	**38%**	ND	ND	ND	ND
Withlacoochee	46	**37%**	13	**31%**	46	0%	13	0%	42	5%	10	0%	ND	ND	ND	ND
STATEWIDE	**1127**	**32%**	**1086**	**22%**	**1048**	**0%**	**1096**	**0%**	**790**	**2%**	**853**	**19%**	**0**	**0%**	**0**	**0%**

	Ground Water Resource Index (GRI) for Secondary Metals (see notes at end of table)							
	Total Vanadium MCL Exceedances				Total Zinc MCL Exceedances			
Type of Aquifer	**Unconfined**		**Confined**		**Unconfined**		**Confined**	
Basin	**Total Wells**	**% Over MCL**	**Total Wells**	**% Over MCL**	**Total Wells**	**% Over MCL**	**Total Wells**	**% Over MCL**
Apalachicola–Chipola	13	0%	28	4%	14	0%	43	0%
Caloosahatchee	4	0%	6	0%	19	0%	20	0%
Charlotte Harbor	5	**20%**	12	0%	8	**13%**	17	**12%**
Choctawhatchee–St. Andrew	16	6%	30	0%	21	5%	46	0%
Everglades	8	0%	ND	ND	28	0%	4	0%
Everglades West Coast	13	8%	13	0%	38	5%	23	4%
Fisheating Creek	1	0%	ND	ND	7	**14%**	6	0%
Florida Keys	3	0%	ND	ND	4	0%	ND	ND
Indian River Lagoon	6	0%	13	0%	10	10%	19	0%
Kissimmee River	13	0%	16	0%	37	0%	25	0%
Lake Okeechobee	5	0%	3	0%	5	0%	7	0%
Lake Worth Lagoon–Palm Beach Coast	13	0%	ND	ND	50	0%	ND	ND
Lower St. Johns	8	0%	16	0%	27	7%	56	9%
Middle St. Johns	23	0%	55	0%	25	0%	68	1%
Nassau–St. Marys	1	0%	4	0%	13	0%	24	0%
Ochlockonee–St. Marks	20	5%	58	0%	22	0%	71	0%
Ocklawaha	30	3%	35	3%	53	0%	54	0%

	Ground Water Resource Index (GRI) for Secondary Metals (see notes at end of table)							
	Total Vanadium MCL Exceedances				***Total Zinc MCL Exceedances***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***
Pensacola	2	0%	1	0%	45	0%	12	0%
Perdido	ND	ND	ND	ND	27	0%	2	0%
Sarasota Bay–Peace–Myakka	17	**12%**	26	0%	50	4%	108	1%
Southeast Coast–Biscayne Bay	ND	ND	ND	ND	112	0%	0	0%
Springs Coast	29	0%	17	0%	32	3%	18	0%
St. Lucie–Loxahatchee	23	9%	4	0%	42	5%	8	0%
Suwannee	95	0%	120	0%	297	1%	284	0%
Tampa Bay	9	0%	24	0%	17	**12%**	37	0%
Tampa Bay Tributaries	14	7%	30	0%	17	6%	44	5%
Upper East Coast	5	0%	12	0%	14	0%	21	0%
Upper St. Johns	13	0%	15	0%	15	0%	15	0%
Withlacoochee	39	0%	10	0%	46	0%	13	0%
STATEWIDE	**428**	**2%**	**548**	**0%**	**1095**	**2%**	**1045**	**1%**

ND – No data

Highlighted values (in yellow) exceed GRI or SRA thresholds (>10 percent wells exceeding specific analyte threshold reference values).

MCL – Maximum contaminant level

Table D.1 presents analyte threshold reference values for the GRI and SRA.

Source: The data used in this analysis have been released by FDEP's Watershed Monitoring and Data Management (WMDM) Section and are untrimmed for outliers.

Table D.6. Metals in Basins that Exceed SRA Thresholds

Basin	***UNCONFINED***	***UNCONFINED***	***CONFINED***	***CONFINED***
	Primary Metals Exceeding SRA Thresholds	***Secondary Metals Exceeding SRA Thresholds***	***Primary Metals Exceeding SRA Thresholds***	***Secondary Metals Exceeding SRA Thresholds***
Apalachicola	Be,Cd,Cr,Pb,Hg	Cu,Fe, Mn, Zn	Cd,Pb,Hg	Cu,Fe,Mn,Ag,Zn
Caloosahatchee	Pb,Hg,Ni,Se	Cu,Fe,Zn	Cd,Pb,Hg,Ni	Cu,Fe,Zn
Charlotte Harbor	Cd,Pb,Hg	Cu,Fe,Ag, Zn	Cd,Pb,Hg,Se	Cu,Fe,Mn,Ag,Zn
Choctawhatchee–St. Andrew	Be,Cd,Pb,Hg,Ni	Al,Cu,Fe,Ag,Zn	Cd,Pb,Hg,Ni	Cu,Fe,Ag,Zn,
Everglades	Pb,Hg,Se	Fe,Ag,Zn	Ba,Pb,Hg	Cu,Fe,Zn
Everglades West Coast	Be,Cd,Cr,Pb,Hg	Cu,Fe,Mn,Ag,Zn	Cd,Pb,Hg	Al,Cu,Fe,Mn,Zn
Fisheating Creek	Cd,Pb,Hg,Ni	Cu,Fe,Mn,Ag,Zn	Pb	Cu,Fe,Zn
Florida Keys	Cd,Pb	Cu,Fe		
Indian River Lagoon	Be,Cd,Pb,Hg	Al,Cu,Fe,Mn,Ag,Zn	Cd,Pb,Hg	Cu,Fe,Ag,Zn
Kissimmee River	Cd,Pb,Hg,Ni	Cu,Fe,Mn,Ag,Zn	Pb,Hg,Ni	Cu,Fe,Ag,Zn
Lake Okeechobee	Cd,Pb	Al,Cu,Fe,	Pb,	Cu,Fe,Zn
Lake Worth Lagoon–Palm Beach Coast	Pb,Hg,Ni	Cu,Fe,Zn		
Lower St. Johns	Cd,Cr,Pb,Hg,	Al,Cu,Fe,Ag,Zn	Cd,Pb,Hg	Cu,Fe,Mn,Ag,Zn
Middle St. Johns	Cd,Cr,Pb,Hg,Ni	Al,Cu,Fe,Mn,Ag,Zn	Cd,Hg,Hg,Ni	Cu,Fe,Mn,Ag,Zn
Nassau–St. Marys	Cd,Pb,Hg	Al,Cu,Fe,Mn,Ag,Zn	Cd,Pb,Hg	Cu,Fe,Ag,Zn
Ochlochonee–St. Marks	Cd,Pb,Hg,Ni	Al,Cu,Fe,Mn,Ag,Zn	Pb,Hg	Cu,Fe,Zn
Ochlawaha	Cd,Pb,Hg,Ni	Al,Cu,Fe,Mn,Ag,Zn	Cd,Pb,Hg	Cu,Fe,Mn,Ag,Zn
Pensacola	Cd,Cr,Pb,Hg,Ni	Al,Cu,Fe,Mn,Ag,Zn	Cd,Cr,Pb,Hg,Ni	Cu,Fe,Ag,Zn
Perdido	Cd,Cr,Pb,Hg,Ni	Al,Cu,Fe,Mn,Zn	Cd,Cr,Pb,Hg,Ni	Al,Cu,Fe,Zn
Sarasota Bay–Peace–Myakka	Cd,Cr,Pb,Hg,Ni	Al,Cu,Fe,Mn,Ag,Zn	Cd,Pb,Hg,Ni	Cu,Fe,Mn,Ag,Zn
Southeast Coast–Biscayne Bay	Cd,Pb,Hg,Se	Cu,Fe,Mn,Ag,Zn		
Springs Coast	Cd,Pb,Hg,Ni	Cu,Fe,Mn,Zn	Cd,Pb,Hg,Se	Cu,Fe,Mn,Ag,Zn
St. Lucie–Loxahatchee	Cd,Pb,Hg,Ni	Al,Cu,Fe,Mn,Zn	Pb,Ni,Se,Tl	Cu,Fe,
Suwannee	Pb,Hg	Cu,Fe,Mn	Pb,Hg,Ni	Cu,Fe,Zn
Tampa Bay	Be,Cd,Pb,Hg	Al,Cu,Fe,Mn,Ag,Zn	Cd,Pb,Hg	Cu,Fe,Mn,Ag,Zn
Tampa Bay Tributaries	Be,Cd,Cr,Pb,Hg,Ni,Se	Al,Cu,Fe,Mn,Ag,Zn	Cd,Pb,Hg,Ni	Cu,Fe,Mn,Ag,Zn
Upper East Coast	Ba,Cd,Cr,Pb,Hg,Ni	Al,Cu,Fe,Mn,Ag,Zn	Cd,Cr,Pb,Hg,Se	Cu,Fe,Mn,Ag,Zn
Upper St. Johns	Cd,Pb,Hg,Ni	Al,Cu,Fe,Mn,Ag,Zn	Cd,Pb,Se	Cu,Fe,Ag,Zn
Withlacoochee	Cd,Pb,Hg,Ni	Al,Cu,Fe,Mn,Ag,Zn	Cd,Pb,Hg,Ni	Cu,Fe,Mn,Zn

Al – Aluminum
Ag – Silver
Ba – Barium
Be – Beryllium
Cd – Cadmium
Cr – Chromium
Cu – Copper
Fe – Iron
Mn – Manganese
Pb – Lead
Hg – Mercury
Ni – Nickel
Se – Selenium
Tl – Thallium
Zn – Zinc

Table D.7.a. Data Used in Saline Water Evaluation (Ground Water Resource Index)

	Ground Water Resource Index (GRI)															
	Total Dissolved Solids (Measured)				***Sulfate (Filtered)***				***Sodium (Filtered)***				***Chloride (Filtered)***			
	Status Network MCL Exceedances				***Status Network Risk Indicators ****				***Status Network Risk Indicators ****				***Status Network Risk Indicators ****			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over MCL***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***	***Total Wells***	***% Over Risk***
Apalachicola–Chipola	27	0%	30	7%	27	0%	29	0%	27	0%	30	0%	27	0%	30	0%
Caloosahatchee	19	**26%**	27	**56%**	19	5%	26	**27%**	19	**16%**	27	**41%**	19	**11%**	26	**42%**
Charlotte Harbor	10	**50%**	6	**100%**	10	0%	6	**33%**	10	**30%**	6	**100%**	10	**30%**	6	**100%**
Choctawhatchee–St. Andrew	28	0%	40	**3%**	28	0%	40	0%	28	0%	40	5%	28	0%	40	3%
Everglades	19	**74%**	2	**100%**	19	**16%**	2	**100%**	19	**32%**	2	**100%**	19	**26%**	2	**100%**
Everglades West Coast	32	**50%**	28	**39%**	32	3%	28	**25%**	32	**19%**	28	**21%**	32	**22%**	28	**21%**
Fisheating Creek	10	**30%**	3	0%	10	0%	3	0%	10	10%	3	0%	10	10%	3	0%
Florida Keys	3	**100%**	ND	ND	3	**33%**	ND	ND	3	**67%**	ND	ND	3	**100%**	ND	ND
Indian River Lagoon	5	**40%**	6	**67%**	5	0%	6	0%	5	0%	6	33%	5	**20%**	6	**50%**
Kissimmee River	23	4%	26	**12%**	23	0%	26	8%	23	0%	26	8%	23	0%	26	8%
Lake Okeechobee	4	0%	6	**83%**	4	0%	6	**67%**	4	0%	6	**67%**	4	0%	6	**67%**
Lake Worth Lagoon–Palm Beach Coast	6	**33%**	ND	ND	6	0%	ND	ND	6	0%	ND	ND	6	0%	ND	ND
Lower St. Johns	24	4%	24	**17%**	23	0%	24	**13%**	24	4%	24	4%	24	4%	24	4%
Middle St. Johns	8	0%	14	**14%**	8	0%	14	0%	8	0%	14	0%	8	0%	14	0%
Nassau–St. Marys	29	3%	29	7%	29	0%	28	4%	29	0%	29	7%	29	0%	28	7%
Ochlockonee–St. Marks	29	0%	30	0%	29	0%	30	0%	29	0%	30	0%	29	0%	30	0%
Ocklawaha	27	4%	30	3%	27	0%	30	0%	27	0%	30	0%	27	0%	30	3%
Pensacola	24	0%	19	5%	24	0%	19	0%	23	0%	19	5%	24	0%	19	5%
Perdido	2	0%	1	0%	2	0%	1	0%	2	0%	1	0%	2	0%	1	0%

	Ground Water Resource Index (GRI)															
	Total Dissolved Solids (Measured)				Sulfate (Filtered)				Sodium (Filtered)				Chloride (Filtered)			
	Status Network MCL Exceedances				Status Network Risk Indicators *				Status Network Risk Indicators *				Status Network Risk Indicators *			
Type of Aquifer	**Unconfined**		**Confined**		**Unconfined**		**Confined**		**Unconfined**		**Confined**		**Unconfined**		**Confined**	
Basin	**Total Wells**	**% Over MCL**	**Total Wells**	**% Over MCL**	**Total Wells**	**% Over Risk**	**Total Wells**	**% Over Risk**	**Total Wells**	**% Over Risk**	**Total Wells**	**% Over Risk**	**Total Wells**	**% Over Risk**	**Total Wells**	**% Over Risk**
Sarasota Bay–Peace–Myakka	45	**18%**	51	**45%**	45	4%	51	**22%**	45	2%	51	**20%**	45	4%	51	**22%**
Southeast Coast–Biscayne Bay	6	**17%**	2	**100%**	6	0%	2	**100%**	6	0%	2	**100%**	6	0%	2	**100%**
Springs Coast	13	**31%**	ND	ND	13	8%	ND	ND	13	**23%**	ND	ND	13	**23%**	ND	ND
St. Lucie–Loxahatchee	6	**33%**	5	**100%**	6	**33%**	5	0%	6	**17%**	5	**80%**	6	**17%**	5	**80%**
Suwannee	113	6%	95	1%	113	3%	95	1%	113	1%	95	0%	113	1%	95	0%
Tampa Bay	22	**59%**	13	**38%**	22	**18%**	13	**31%**	22	**14%**	13	0%	22	**23%**	13	8%
Tampa Bay Tributaries	26	**12%**	22	9%	26	0%	22	5%	26	0%	22	5%	26	0%	22	5%
Upper East Coast	6	**33%**	6	**67%**	6	0%	6	**50%**	6	0%	6	**50%**	6	**17%**	6	**50%**
Upper St. Johns	12	**25%**	10	**40%**	12	0%	10	10%	12	8%	10	**20%**	12	0%	10	**40%**
Withlacoochee	17	**12%**	ND	ND	17	6%	ND	ND	17	0%	ND	ND	17	0%	ND	ND
STATEWIDE	595	**17%**	525	**20%**	594	**3%**	522	**9%**	594	**5%**	525	**12%**	595	**6%**	523	**13%**

ND = No data

MCL = Maximum contaminant level

*** "Risk Indicator"** used because Fecal coliform does not have a ground water standard or MCL.

GRI Threshold > 10 percent (yellow highlighting)

Note: Highlighted values indicate that more than 10 percent of the wells in a basin exceed the GRI threshold.

The data used in this analysis have been released by FDEP's Watershed Monitoring and Data Management (WMDM) Section and are untrimmed for outliers.

Sulfate MCL = 250 mg/L

Sodium MCL = 160 mg/L

TDS MCL = 500 mg/L

Chloride MCL = 250 mg/L

Table D.7.b. Data Used in Saline Water Evaluation (Ground Water–Surface Water Relational Assessment)

	Ground Water–Surface Water Relational Assessment (SRA)							
	Chloride (Filtered) Status Network SRA Thresholds				Specific Conductance Status Network SRA Thresholds			
Type of Aquifer	**Unconfined**		**Confined**		**Unconfined**		**Confined**	
Basin	**Total Wells**	**% Over SRA**	**Total Wells**	**% Over SRA**	**Total Wells**	**% Over SRA**	**Total Wells**	**% Over SRA**
Apalachicola–Chipola	27	0%	30	0%	27	0%	30	0%
Caloosahatchee	19	**11%**	26	**42%**	19	**11%**	27	**41%**
Charlotte Harbor	10	**30%**	6	**100%**	10	**30%**	6	**100%**
Choctawhatchee–St. Andrew	28	0%	40	3%	28	0%	40	0%
Everglades	19	**26%**	2	**100%**	19	**42%**	2	**100%**
Everglades West Coast	32	**22%**	28	**21%**	32	**31%**	28	**32%**
Fisheating Creek	10	10%	3	0%	10	**30%**	3	0%
Florida Keys	3	**100%**	ND	ND	3	**100%**	ND	ND
Indian River Lagoon	5	**20%**	6	**50%**	5	**50%**	6	**50%**
Kissimmee River	23	0%	26	8%	23	0%	26	**12%**
Lake Okeechobee	4	0%	6	**67%**	4	0%	6	**67%**
Lake Worth Lagoon–Palm Beach Coast	6	0%	ND	ND	6	0%	ND	ND
Lower St. Johns	24	4%	24	4%	23	4%	24	8%
Middle St. Johns	8	0%	14	0%	8	0%	14	7%
Nassau–St. Marys	29	0%	28	7%	29	0%	29	7%
Ochlockonee–St. Marks	29	0%	30	0%	29	0%	30	0%
Ocklawaha	27	0%	30	3%	27	0%	30	0%
Pensacola	24	0%	19	5%	24	0%	19	0%
Perdido	2	0%	1	0%	2	0%	1	0%

	Ground Water–Surface Water Relational Assessment (SRA)							
	Chloride (Filtered)				Specific Conductance			
	Status Network SRA Thresholds				Status Network SRA Thresholds			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***
Sarasota Bay–Peace–Myakka	45	4%	51	**22%**	45	7%	51	**27%**
Southeast Coast–Biscayne Bay	6	0%	2	**100%**	6	0%	2	**100%**
Springs Coast	13	**23%**	ND	ND	13	**31%**	ND	ND
St. Lucie–Loxahatchee	6	**17%**	5	**80%**	6	**33%**	5	**80%**
Suwannee	113	1%	95	0%	113	3%	95	0%
Tampa Bay	22	**23%**	13	8%	22	**36%**	13	**31%**
Tampa Bay Tributaries	26	0%	22	5%	26	4%	22	5%
Upper East Coast	6	**17%**	6	**50%**	6	**17%**	6	**67%**
Upper St. Johns	12	0%	10	**40%**	12	**17%**	10	**40%**
Withlacoochee	17	0%	ND	ND	17	6%	ND	ND
STATEWIDE	595	**6%**	523	**13%**	594	**9%**	525	**14%**

ND = No data

SRA Threshold > 10 percent (yellow highlighting)

Note: Highlighted values indicate that more than 10 percent of the wells in a basin exceed the SRA threshold.

Chloride SRA = 250 mg/L

Specific Conductance SRA = 1275 µmhos/cm

The data used in this analysis have been released by FDEP's Watershed Monitoring and Data Management (WMDM) Section and are untrimmed for outliers.

Table D.8. Data Used in Evaluation of Surface Water–Ground Water Interaction

	Ground Water–Surface Water Relational Assessment (SRA)											
	pH ***Status Network SRA Thresholds***				***Turbidity*** ***Status Network SRA Thresholds***				***Specific Conductance*** ***Status Network SRA Thresholds***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***
Apalachicola–Chipola	27	78%	30	0%	27	11%	30	7%	27	59%	30	80%
Caloosahatchee	19	37%	27	4%	19	11%	27	4%	19	100%	27	100%
Charlotte Harbor	10	20%	6	0%	10	10%	6	0%	10	100%	6	100%
Choctawhatchee–St. Andrew	28	93%	40	13%	28	7%	40	0%	28	46%	39	82%
Everglades	19	16%	2	0%	19	5%	2	0%	18	100%	2	100%
Everglades West Coast	32	19%	28	4%	32	16%	28	4%	32	100%	28	100%
Fisheating Creek	10	50%	3	0%	10	10%	3	0%	10	100%	3	100%
Florida Keys	3	0%	0		3	0%	0		3	100%		
Iian River Lagoon	5	60%	6	0%	5	0%	6	0%	5	80%	6	100%
Kissimmee River	23	65%	26	4%	23	9%	23	0%	19	95%	24	92%
Lake Okeechobee	4	75%	5	0%	4	0%	5	0%	3	100%	5	100%
Lake Worth Lagoon–Palm Beach Coast	6	0%	0		6	33%	0		6	100%		
Lower St. Johns	24	63%	24	0%	24	33%	24	8%	12	92%	10	90%
Middle St. Johns	8	100%	14	0%	8	13%	13	0%	24	75%	24	88%
Nassau–St. Marys	29	55%	29	0%	29	0%	29	4%	8	88%	14	100%
Ochlockonee–St. Marks	29	69%	30	3%	29	24%	30	3%	29	100%	29	97%
Ocklawaha	27	44%	30	7%	27	0%	25	0%	28	64%	30	70%
Pensacola	24	100%	19	11%	24	8%	19	0%	26	54%	28	82%

	Ground Water–Surface Water Relational Assessment (SRA)											
	pH				***Turbidity***				***Specific Conductance***			
	Status Network SRA Thresholds				***Status Network SRA Thresholds***				***Status Network SRA Thresholds***			
Type of Aquifer	***Unconfined***		***Confined***		***Unconfined***		***Confined***		***Unconfined***		***Confined***	
Basin	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***	***Total Wells***	***% Over SRA***
Perdido	2	100%	1	100%	2	0%	1	0%	24	21%	19	100%
Sarasota Bay–Peace–Myakka	45	69%	52	0%	45	24%	51	4%	2	50%	1	100%
Southeast Coast–Biscayne Bay	6	17%	2	50%	6	0%	2	0%	45	100%	52	96%
Springs Coast	13	23%	0		13	16%	0		6	100%	2	100%
St. Lucie–Loxahatchee	6	50%	5	0%	6	17%	5	0%	13	85%		
Suwannee	110	41%	94	5%	113	5%	93	12%	6	100%	4	100%
Tampa Bay	22	50%	13	8%	22	9%	13	8%	113	77%	90	79%
Tampa Bay Tributaries	26	73%	22	0%	25	40%	19	0%	21	95%	13	92%
Upper East Coast	6	50%	6	0%	6	17%	6	0%	26	85%	22	86%
Upper St. Johns	12	25%	10	0%	12	25%	10	10%	6	100%	6	100%
Withlacoochee	17	24%	0		17	18%	0		17	76%		
STATEWIDE	**592**	**53%**	**524**	**4%**	**594**	**13%**	**510**	**5%**	**586**	**80%**	**514**	**89%**

ND = No data

Note: Highlighted values indicate that more than 10 percent of the wells in a basin exceed the GRI or SRA thresholds.

The data used in this analysis have been released by FDEP's Watershed Monitoring and Data Management (WMDM) Section and are untrimmed for outliers.

SRA Threshold > 10 percent (yellow highlighting)

pH SRA Criterion = < 6 or > 8.5

Specific Conductance Criterion = 1275 µmhos/cm for fresh waters

Turbidity SRA Criterion = 29 NTU

Dissolved Oxygen SRA Criterion = < 4 mg/L

Total Chloride SRA Criterion = 250,000 µg/L

	Ground Water– Surface Water Relational Assessment (SRA)							
	Dissolved Oxygen				Total Chloride			
	Status Network SRA Thresholds				Background Network SRA Thresholds			
Type of Aquifer	**Unconfined**		**Confined**		**Unconfined**		**Confined**	
Basin	**Total Wells**	**% Over SRA**	**Total Wells**	**% Over SRA**	**Total Wells**	**% Over SRA**	**Total Wells**	**% Over SRA**
Apalachicola–Chipola	5	20%	41	0%	5	20%	41	0%
Caloosahatchee	16	13%	19	63%	16	13%	19	63%
Charlotte Harbor	5	40%	13	77%	5	40%	13	77%
Choctawhatchee–St. Andrew	5	0%	42	2%	5	0%	42	2%
Everglades	12	0%	1	100%	12	0%	1	100%
Everglades West Coast	29	7%	20	40%	29	7%	20	40%
Fisheating Creek	6	17%	4	25%	6	17%	4	25%
Florida Keys								
Indian River Lagoon	5	0%	14	43%	5	0%	14	43%
Kissimmee River	26	0%	24	17%	26	0%	24	17%
Lake Okeechobee			7	57%			7	57%
Lake Worth Lagoon–Palm Beach Coast	26	0%			26	0%		
Lower St. Johns	13	0%	36	19%	13	0%	36	19%
Middle St. Johns	16	13%	47	17%	16	13%	47	17%
Nassau–St. Marys	4	50%	9	22%	4	50%	9	22%
Ochlockonee–St. Marks	9	0%	32	0%	9	0%	32	0%
Ocklawaha	32	0%	36	3%	32	0%	36	3%
Pensacola	39	0%	12	8%	39	0%	12	8%
Perdido	27	0%	2	0%	27	0%	2	0%
Sarasota Bay–Peace–Myakka	34	6%	74	14%	34	6%	74	14%
Southeast Coast–Biscayne Bay	107	3%	0		107	3%	0	

	Ground Water– Surface Water Relational Assessment (SRA)							
	Dissolved Oxygen				Total Chloride			
	Status Network SRA Thresholds				Background Network SRA Thresholds			
Type of Aquifer	Unconfined		Confined		Unconfined		Confined	
Basin	Total Wells	% Over SRA	Total Wells	% Over SRA	Total Wells	% Over SRA	Total Wells	% Over SRA
Springs Coast	25	12%	16	44%	25	12%	16	44%
St. Lucie–Loxahatchee	16	13%	6	83%	16	13%	6	83%
Suwannee	124	3%	111	0%	124	3%	111	0%
Tampa Bay	11	0%	20	60%	11	0%	20	60%
Tampa Bay Tributaries	13	0%	33	0%	13	0%	33	0%
Upper East Coast	9	44%	22	23%	9	44%	22	23%
Upper St. Johns	12	33%	9	33%	12	33%	9	33%
Withlacoochee	36	0%	12	0%	36	0%	12	0%
STATEWIDE	**662**	**5%**	**662**	**16%**	**662**	**5%**	**662**	**16%**

ND = No data

Note: Highlighted values indicate that more than 10 percent of the wells in a basin exceed the GRI or SRA thresholds.

The data used in this analysis have been released by FDEP's Watershed Monitoring and Data Management (WMDM) Section and are untrimmed for outliers.

SRA Threshold > 10 percent (yellow highlighting)

pH SRA Criterion = < 6 or > 8.5

Specific Conductance Criterion = 1275 μmhos/cm for fresh waters

Turbidity SRA Criterion = 29 NTU

Dissolved Oxygen SRA Criterion = < 4 mg/L

Total Chloride SRA Criterion = 250,000 μg/L

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