TECHNICAL PUBLICATION SJ2006-6

# 2004 STATUS AND TRENDS IN WATER QUALITY AT SELECTED SITES IN THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

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# 2004 STATUS AND TRENDS IN WATER QUALITY AT SELECTED SITES IN THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

by

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and
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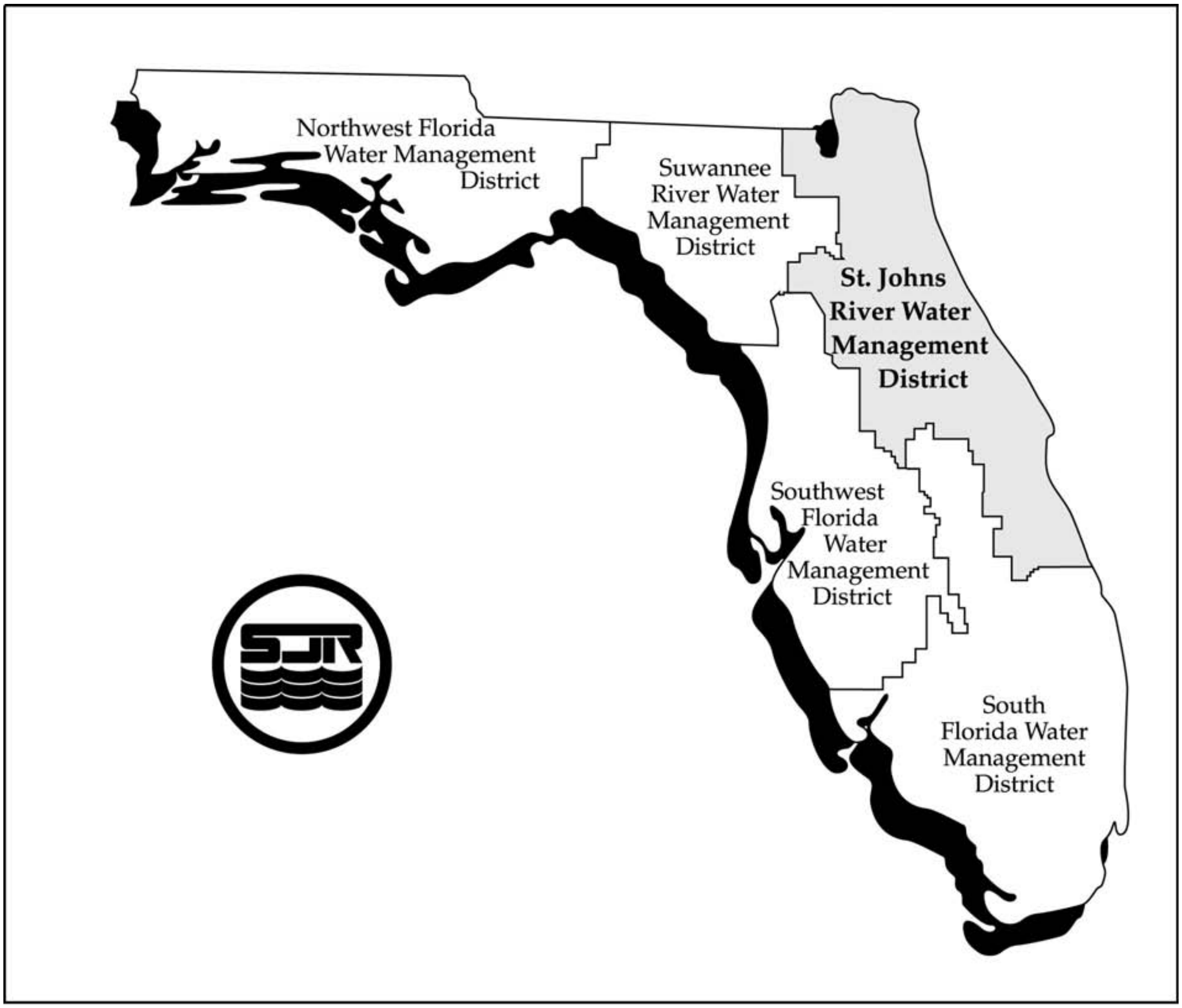
St. Johns River Water Management District
Palatka, Florida
2006




The St. Johns River Water Management District (SJRWMD) was created by the Florida Legislature in 1972 to be one of five water management districts in Florida. It includes all or part of 18 counties in northeast Florida. The mission of SJRWMD is to ensure the sustainable use and protection of water resources for the benefit of the people of the District and the state of Florida. SJRWMD accomplishes its mission through regulation; applied research; assistance to federal, state, and local governments; operation and maintenance of water control works; and land acquisition and management.

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# EXECUTIVE SUMMARY

Ambient water quality data for a variety of water body sampling sites within St. Johns River Water Management District (SJRWMD) were compiled and analyzed to evaluate status and trends. Status results indicate whether water quality at a particular site is good, fair, or poor, while trend results indicate whether water quality has improved, stabilized, or degraded. Most of the ambient sites were last reported-on in 2004. Thirty-four more sites were added for this report. Spring and stream sites were evaluated using a water quality index, while lake and estuarine sites were evaluated using a trophic state index. The water quality index incorporates nutrients, physical constituents, and bacteria, while the trophic state index incorporates nutrients and chlorophyll. Many water bodies lacked sufficient data for either a status or trend assessment. Those sites that had sufficient data had historically been sampled on a regular basis. Most of the sites in the SJRWMD exhibited good or fair water quality, although some sites were degrading. Forty-eight percent of the sites assessed districtwide had good water quality, 31% had fair quality, and 21% had poor quality. Fifty-two percent had a statistically insignificant trend, while 19% were improving, 8% were degrading, and 20% had insufficient data for trend analysis. This study did not consider what factors were responsible for the trends found.

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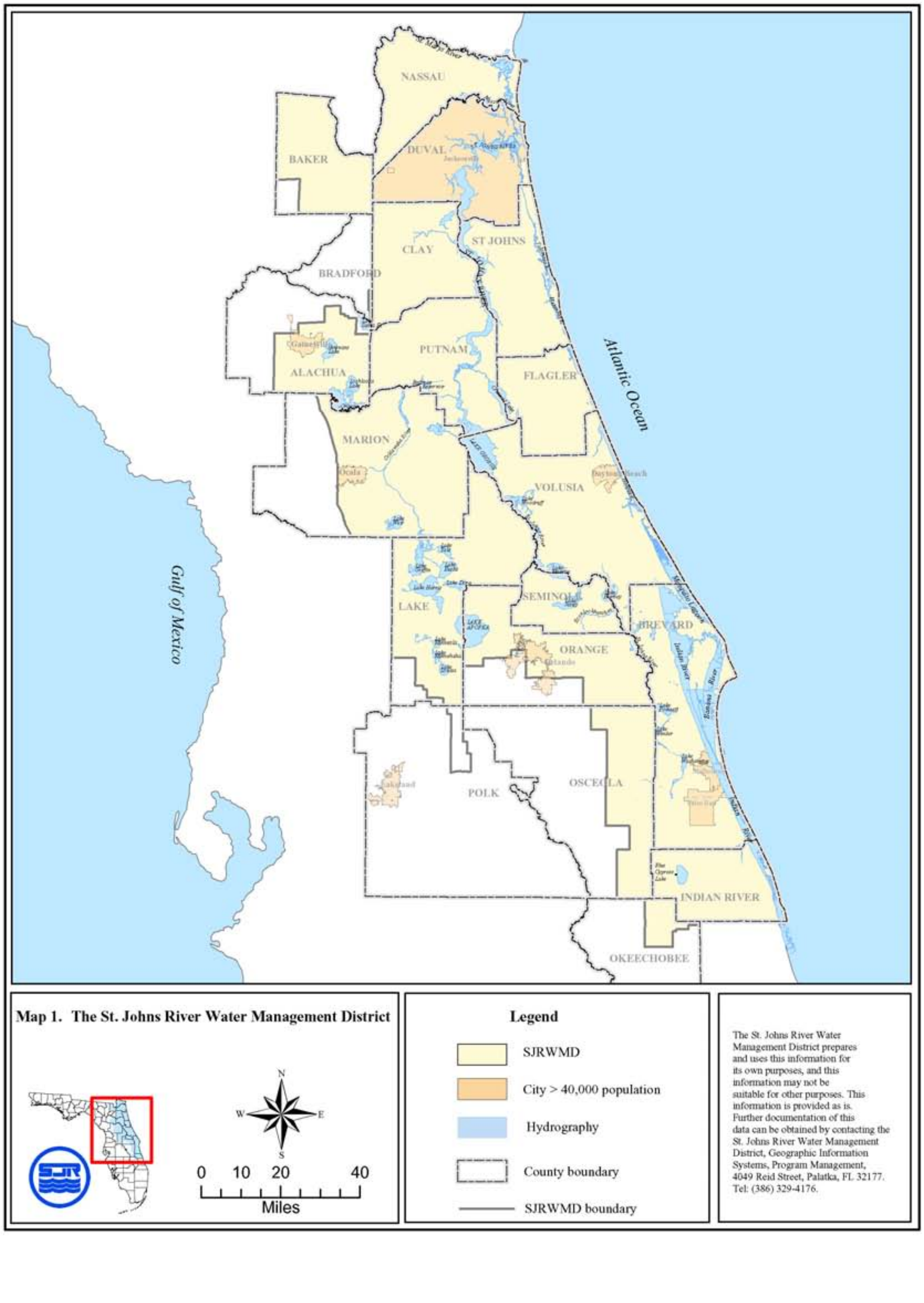
# INTRODUCTION

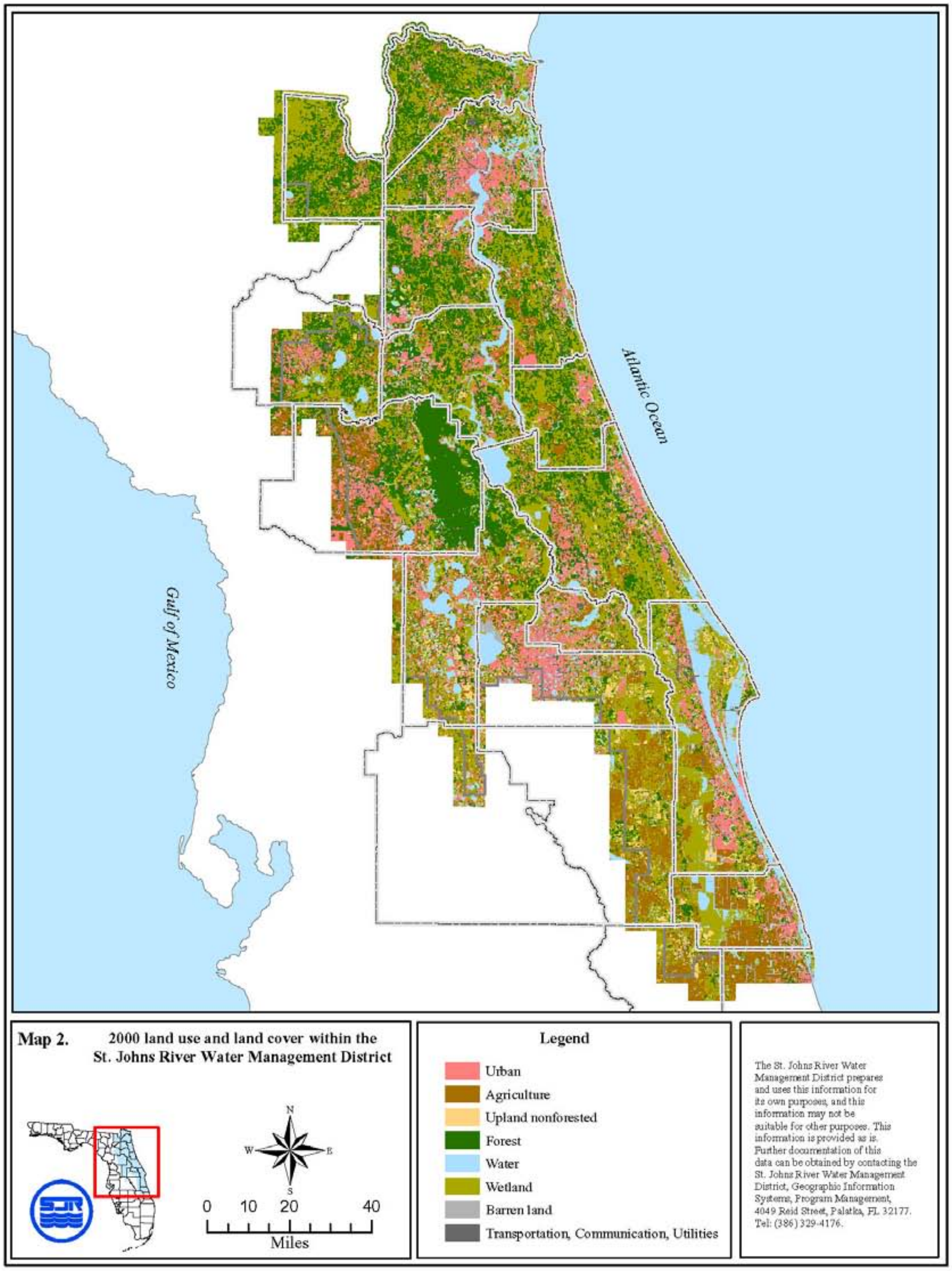
The St. Johns River Water Management District (SJRWMD) is one of five legislatively established water management districts in Florida and comprises approximately 12,600 square miles ($mi^2$) in northeastern and east-central Florida (Map 1). Forest and wetlands comprise over 50% of the land cover, with urban and suburban development, agriculture, and rangeland covering most of the rest. Surface waters comprise slightly more than 9% of the SJRWMD area (Map 2). Although most of the area soils are highly permeable sands, organic soils or clays can be found in lowlands or wetlands. Florida’s landscape is under continuing pressure from urban and suburban development. The current population of 3.5 million (Map 3) is expected to exceed 5 million by 2020 (Vergara 2000). Most of the population is concentrated in the major urban areas, such as Jacksonville, Orlando, Gainesville, Ocala, and a string of cities along the coast from St. Augustine to Vero Beach. Tourism, agriculture, silviculture, and paper manufacturing are just a few of the many economic activities to impact water resources within SJRWMD.

SJRWMD is divided into 10 hydrologic units or major surface water basins to facilitate the planning and management of surface waters (Map 4, Adamus et al. 1997). The surface water basins are subdivisions of hydrologic units established by the U.S. Geological Survey.

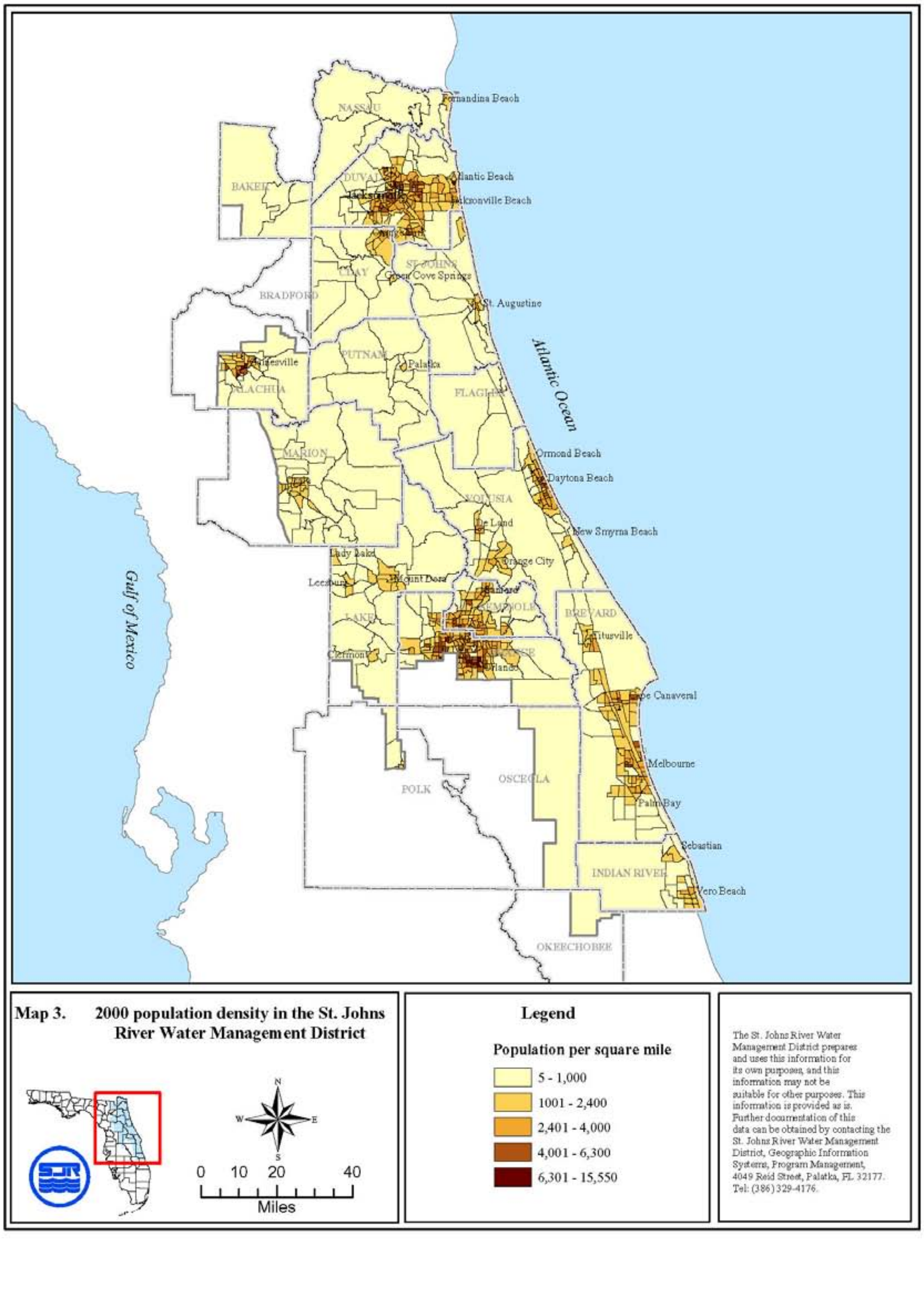
The St. Johns River and its main tributary, the Ocklawaha River, drain approximately 75% of the central SJRWMD area. The St. Johns River flows through four of the 10 major basins: the upper St. Johns River, middle St. Johns River, Lake George, and lower St. Johns River. The St. Johns River headwaters are located in the marshes west of Vero Beach. The river flows northward approximately 310 mi to its mouth east of Jacksonville and drops about 25 feet (ft) over that distance, for an average slope of 0.08 ft / mi. (Morris 1995). Because of the very low gradient, tidal effects occasionally extend about 100 mi upstream. The Florida Department of Environmental Protection (FDEP) has designated the entire St. Johns River, with the exception of Lake Washington and lakes upstream of it (Class 1 water bodies), as a Class 3 water for the recreation, propagation, and maintenance of fish and wildlife. Several large lakes are found along the St. Johns River, including Lake George, Florida’s second-largest lake after Lake Okeechobee.

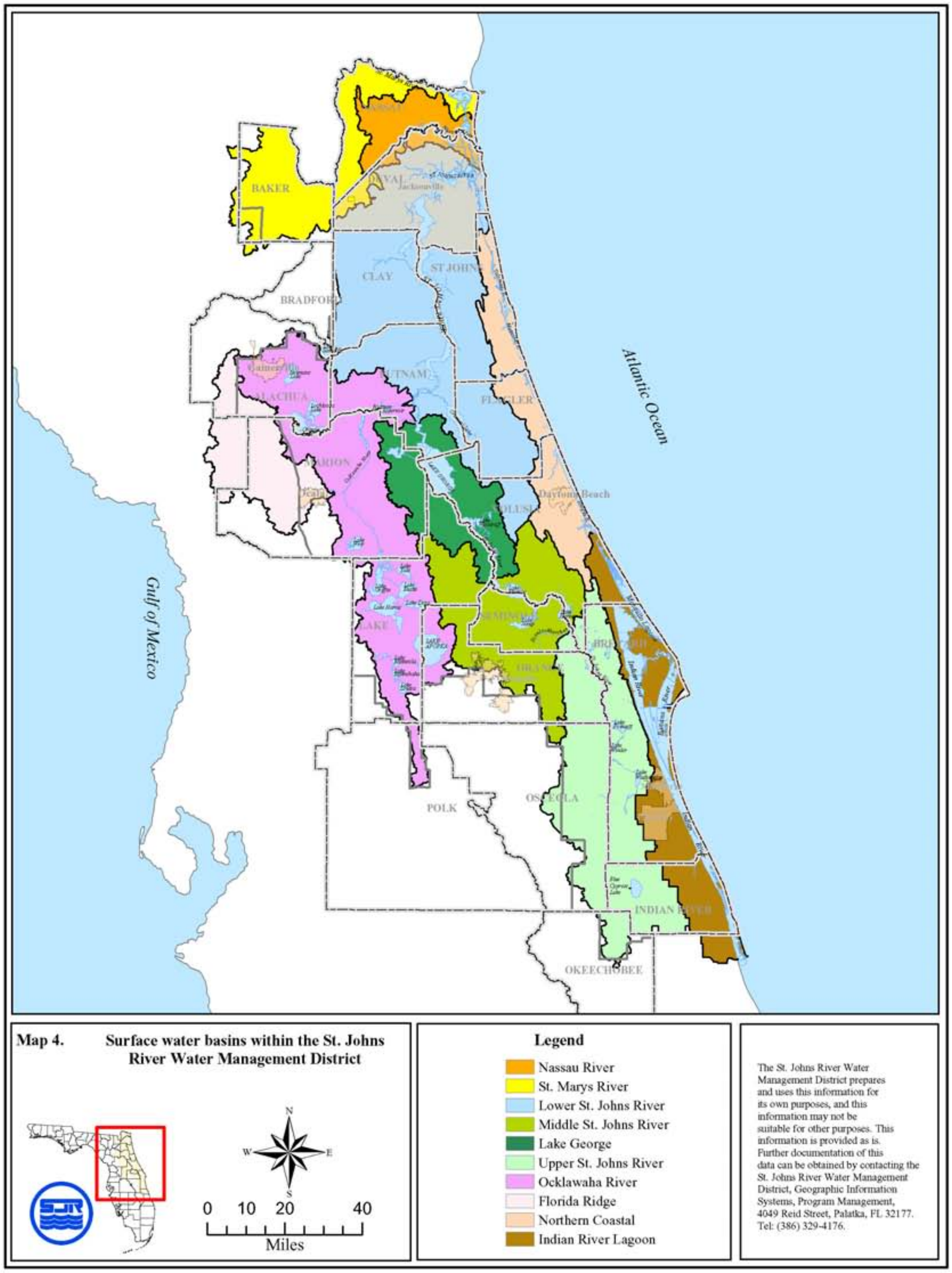



**Map 1. The St. Johns River Water Management District**




**Map 2.** 2000 land use and land cover within the St. Johns River Water Management District


Fernandina Beach
NASSAU
BAKER
Jacksonville Beach
CLAY
Green Cove Springs
BRADFORD
St. Augustine
Atlantic Ocean
Palatka
FLAGLER
MARION
Ormond Beach
Daytona Beach
New Smyrna Beach
Orange City
Leesburg
Sanford
BREVARD
Titusville
LAKE
Cape Canaveral
Melbourne
Palm Bay
POLK
Sebastian
INDIAN RIVER
Vero Beach
OKEECHOBEE
Gulf of Mexico
Map 3. 2000 population density in the St. Johns River Water Management District
N
W
E
S
0 10 20 40
Miles
Legend
Population per square mile
5 - 1,000
1001 - 2,400
2,401 - 4,000
4,001 - 6,300
6,301 - 15,550
The St. Johns River Water Management District prepares and uses this information for its own purposes, and this information may not be suitable for other purposes. This information is provided as is. Further documentation of this data can be obtained by contacting the St. Johns River Water Management District, Geographic Information Systems, Program Management, 4049 Reid Street, Palatka, FL 32177. Tel: (386) 329-4176.




**Map 4.** Surface water basins within the St. Johns River Water Management District

The Indian River Lagoon Basin (IRLB) lies east of the upper St. Johns River. Indian River, Banana River, and the Mosquito Lagoon are all within the IRLB. The Northern Coastal basin (NCB) lies farther north, and contains the Intracoastal Waterway (ICW) and its tributaries from Ponce de Leon Inlet to northern St. Johns County.

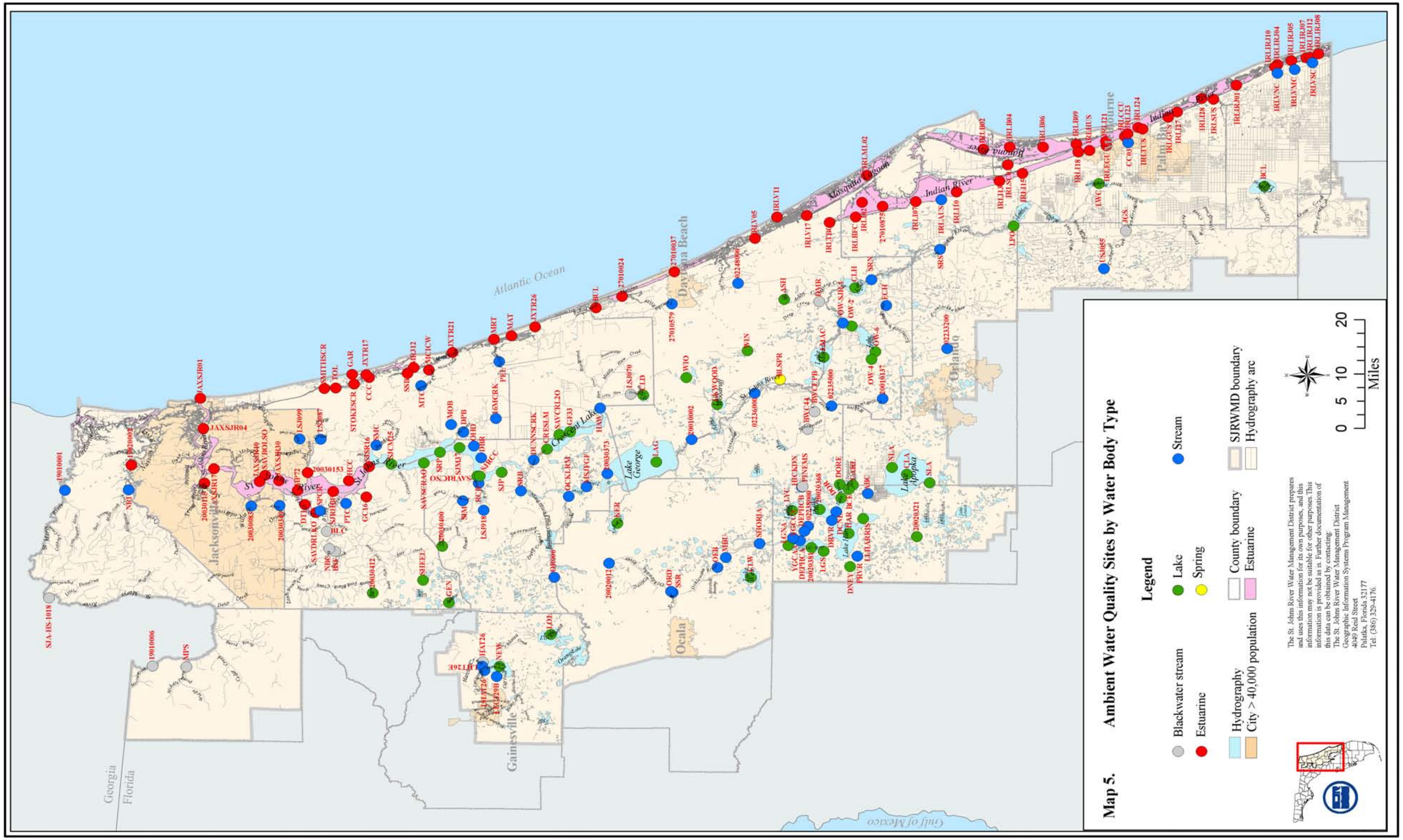
The Ocklawaha and Florida Ridge basins lie west of the St. Johns River. The primary surface water features located in the Ocklawaha basin are Lakes Apopka, Harris, Dora, Eustis, Yale, and Griffin.

The Nassau River Basin and St. Marys River Basin lie north of the St. Johns River and drain most of the SJRWMD's northern area. The Nassau River flows eastward to form part of the boundary between Nassau and Duval counties. The St. Marys River, with more than one-third of its contributing drainage area in Georgia, defines the boundary between Florida and Georgia, for almost the entire length of the river. The land adjoining these two rivers is predominantly forested and is among the most pristine areas of SJRWMD.

Water quality districtwide was last assessed in 2004 (Winkler and Ceric 2004). This assessment is a continuation of that effort and has been undertaken to characterize the status of and trends in water quality for water bodies of the District. In total, 192 water quality monitoring sites, located in lakes, estuaries, streams, and springs, were selected to represent ambient water quality conditions for this assessment (Map 5). Sampling sites were selected to provide a representative cross section of the region, with respect to surrounding land use patterns and the types of water bodies monitored. Many of the monitoring sites were part of the districtwide ambient-monitoring network and were sampled bimonthly. Other sites were part of basin-specific study areas, and the sampling frequency was often higher or lower than the ambient network frequency. Relevant water quality constituent values were obtained and compiled for the assessment. Characterization of these water bodies will allow the District to identify problem areas and to evaluate the success of remedial or mitigation efforts.

## WATER QUALITY

The phrase "water quality" is often used to describe how "good" the water in question is. Surface waters are not naturally pure. They act as a solvent for salts and other compounds, which may originate from sediments, shorelines, or precipitation. For example, rainfall runoff can transport sediments, suspended solids, and contaminants from parking lots, lawns, and other


Map 5. Ambient Water Quality Sites by Water Body Type
Legend
Blackwater stream
Lake
Stream
Estuarine
Spring
Hydrography
County boundary
SJRWMD boundary
City > 40,000 population
Estuarine
Hydrography arc
0 5 10 20
Miles
Atlantic Ocean
Gulf of Mexico
Georgia
Florida
Jacksonville
Gainesville
Ocala
Orlando
Daytona Beach
Lake George
Lake Apopka
Indian River
Mosquito Lagoon

surfaces to surface waters, resulting in nonpoint source pollution. The fact that surface waters contain a multitude of substances means that defining "good" water quality can be problematic.

Nevertheless, in this assessment, water quality generally refers to the amount of impurities in the water. Generally, the fewer impurities in the water, the better the water quality. Most biologists believe that high concentrations of certain substances can have harmful or undesirable effects on plants and animals. For example, high-nutrient concentrations in the water can lead to undesirable levels of algal growth, which ultimately contributes to lower dissolved oxygen in the water column and can result in fish kills. In general, biologists have agreed on the nutrient concentrations that may be considered excessive and such concentrations are reflected in the trophic state index, a measure of water quality. Similar limits have been established by statute for a variety of other water quality constituents, resulting in water quality standards. In this report, poor water quality, when used in reference to a lake or estuary, means water that is considered to have an unhealthy concentration of nutrients, chlorophyll *a* or both. When used in reference to streams, blackwater streams, and springs, poor water quality refers to water considered to have unhealthy concentrations or levels of dissolved oxygen, turbidity, total suspended solids, total organic carbon, total coliform bacteria, fecal coliform bacteria, nutrients, or a combination of these.

Since only the aforementioned constituents were used in this assessment, there are at least two important caveats for interpreting the results. Primarily, good or fair status does not eliminate the possibility that there are other pollutants of concern. For example, none of the samples evaluated for this analysis were tested for pesticides. Secondly, none of these results should be used to determine whether a water body meets its designated use, as defined by the Florida Department of Environmental Protection (FDEP). Under the impaired waters rule, the FDEP has developed an official methodology for analyzing water quality data to determine whether a water body meets its designated use. This report is not intended as a substitute for that methodology or process, but rather as a general overview of water quality throughout SJRWMD.

## WATER QUALITY STATUS AND TRENDS

This report uses both a trophic state index (TSI) and a water quality index (WQI) as the means to assess status and trends in surface water quality. Indices are useful because they allow several different water quality metrics to be combined into a single number. A TSI was used for lakes and estuaries (Huber et al. 1982) and was based on concentrations of chlorophyll *a*, total phosphorus, and total nitrogen. The TSI was developed primarily as a way of classifying lakes according to their eutrophication potential. Lakes with high TSI values are generally considered eutrophic.

A WQI was used for streams, blackwater streams, and springs. The WQI provides a way of standardizing water quality values taken across a broad spectrum of water quality parameters, all of which may use different measurement scales. The WQI is based on concentrations of total suspended solids, dissolved oxygen, total organic carbon, total and fecal coliform bacteria, total phosphorus, total nitrogen, total nitrate / nitrite, and levels of turbidity. Water bodies with high WQIs are considered to have poor water quality.

Water body status was rated as good, fair or poor based on the median of annual seasonal median TSI or WQI, which was calculated by using data reported for the 5-year period from 2000 to 2004. Trends were based on seasonal median values of the TSI or WQI calculated from data reported for the 15-year period from 1990 to 2004. At least 10 years of data from the 15-year period were required in order to calculate a trend. Water body sites were rated as improving or degrading if the trend was statistically significant ($p \leq 0.10$). Many water bodies had insignificant trends. In addition, the Sen's slope method was added to the data analysis routine. Thus, sites were evaluated for the magnitude of the trend as well as for the direction of the trend.

# METHODS

### Sample Collection

Water quality samples were collected using standard techniques (SJRWMD 1999). Most of the samples were "grab" samples, which were obtained when the sampler physically placed a sample bottle in the water at 0.5 meter (m) depth in an inverted position and then righted the bottle to fill it. Samples were also collected using a Van Dorn sampler or a pump, when appropriate. Samples were preserved, placed on ice, and shipped to the analytical laboratory for analysis.

## DATA COMPILATION

Water quality data from 192 ambient stations were compiled into a SAS data set. All of the data came from a central, in-house, SJRWMD Environmental Database, which served as the local repository for data collected by the various sampling programs throughout SJRWMD. This is a major change from the 2004 report, when all the data were compiled from separate, project-specific databases. The central database allows easier access to data that was stored in a standardized format. Although a large number of constituents were available, the indices only required those listed in Table 1. The SJRWMD laboratory analyzed many of the samples; others were analyzed by contracted laboratories.

### Sample Depth

Since most sampling stations did not have profile data, values from depths greater than 1 m were excluded.

### Comment Codes

Field samplers often associate letter codes with data to indicate the type (i.e. ambient, experimental, etc.) of sample obtained and its depth. This information was used to help determine if the data could be used (Table 2).

Samples that had no sample code, or the "unknown" code associated with them, were assumed ambient. In addition, analytical labs used letter codes to qualify the data. Table 3 lists those qualifier codes considered acceptable for the analysis.

Table 1. Water quality constituents used in the assessment

| Constituents | Units | STORET code* |
|---|---|---|
| Chlorophyll *a* | µg/L | 32210 |
| Dissolved Oxygen | mg/L | 299 |
| Fecal Coliforms | #CFU/100 mL | 31616 |
| Nitrate/Nitrite | mg/L as N | 630 |
| Total Coliforms | #CFU/100 mL | 31505 |
| Total Nitrogen | mg/L as N | 600 |
| Total Organic Carbon | mg/L as C | 680 |
| Total Phosphorus | mg/L as P | 665 |
| Total Suspended Solids | mg/L | 530 |
| Turbidity | NTU | 82079 |

*STORET code is an EPA STORET database analyte identification number
Note:
µg/L = micrograms per liter
mg/L = milligrams per liter
CFU = colony forming units
NTU = nephelometric turbidity units

Table 2. Acceptable data sample codes

| Sample Code | Description |
|---|---|
| COM | composite samples |
| GRAB | grab samples |
| P series | vertical profile samples |
| SPT series | split samples |
| TO series | horizontal transect samples |
| TIME series | time series samples |
| VERT-INT | vertically integrated samples |

A sample with no associated remark code was assumed a valid, useful data point.

## Data Combination

Certain sampling stations and station names were evaluated in addition to comment codes. Over the years, some stations had been discontinued, but were then resampled under a different station name. In addition, currently sampled station names located at the same site were identified and the data were combined (Table 4). The associated sample collection dates for some stations were also known to be incorrect, and these were not used in the analysis.

Table 3. Acceptable data qualifier codes

| Data Code | Description |
|---|---|
| A | average of 2 or more samples |
| B | results based on colony counts outside the acceptable range |
| I | reported value is between the lab MDL and the lab PQL |
| K | actual value is known to be less than value given |
| L | actual value is known to be higher than value given |
| M | presence of material verified but not quantified |
| Q | sample held beyond accepted holding time |
| Q1–5 | sample held 1–5 days beyond accepted holding time |
| R | significant rain in the past 48 hours |
| T | value reported is less than lab detection limit |
| U | material analyzed for but not detected |
| V | analyte detected in blank and sample at >2x MDL (replaced by < code) |
| W | value is less than lowest reportable under the T-code |
| > | field blank analyte value is more than 2x MDL (SJRWMD internal code) |

Note:
MDL = method detection limit
PQL = practical quantitation limit

## Period of Record

For this assessment, trends required at least 10 years of data reported during the last 15 years. Thus any sample data obtained before Jan. 1, 1990, were excluded from the analysis. Status results were based on the most recent 5 years of data, which means data reported since Jan. 1, 2000.

## Additional Data Checks

Values that were missing or greater than 88000 were excluded, because some labs indicate a null value with the number string 88888.888. Any data values deemed erroneous after an in-house data review by database managers were excluded. The daily mean for any duplicate constituent values was calculated, so that no more than one constituent value would appear for any given day.

Table 4. Available site names for selected ambient sites

| Site Location | Available Site Names |
|---|---|
| Hatchet Creek at State Road (SR) 26 | 02240800, HAT26 |
| St. Johns River at SR 16 | PI54, SJSR16 |
| Ocklawaha River at Hwy 21 | 20020404, OR006 |
| Lake Eustis | EUS, 20020368 |
| Wolf Creek at SR 419 bridge | NWOLF, USJ918 |
| Orange Lake | OLK, OLC |
| Lake Griffin | LGC, 20020381 |
| St. Johns River at Palatka | PA32, SJP |
| St. Johns River at Buffalo Bluff | BB22, SRB |
| St. Johns River at Racy Point | FP44, SRP |
| Bivens Arm Lake | OR908, BIVARM |
| Hogtown Creek at SW 2nd Avenue | HOG30, HOGSW2ND |
| Little Lake Harris | LLHARRIS, LHAR |
| Holiday Springs | HOLSPA, HOLIDSPG |
| Lake Harris | 20020377, HAR |
| Lake Yale | 20020371, LYC |
| St. Johns River near Picolata | SJWSIL, PI52, SJCM25 |

### Outlier Analysis

Outliers are data values that greatly exceed the normal range of values for a particular constituent and station. Outliers were screened using a simple range-checking procedure modified from a "hinge method" (Hoaglin et al. 1983). To derive the acceptable range, a data set for each site and constituent was compiled. For data sets with at least six values, the twenty-fifth percentile (p25), seventy-fifth percentile (p75) and interquartile range (IQR) were calculated. A low- and a high-range limit were calculated as

$$\textit{high-range limit} = p75 + (IQR*10)$$
$$\textit{low-range limit} = p25 - (IQR*10)$$

Outliers were rejected if they exceeded either range limit. Any pH values less than 0 or greater than 14 were also excluded.

## WATER BODY CATEGORIZATION

Water bodies were grouped into one of five different categories for this assessment (Map 5). Categorization was important, as it would determine which index would be used. The TSI was applied only to lakes and estuaries, while the WQI was applied to streams, blackwater streams, and springs. A blackwater stream differs from a stream in that it has acidic, highly colored, slow-moving waters and typically drains flatwoods or swamps and is not biologically very productive (Hand et al. 2000). It was not always obvious which category applied to a given site.

Some of the sites had a database-specific number code indicating whether they were a lake or stream. However, many sites were not labeled in any way and these were assigned a lake or stream designation based on their location. Further evaluation of the sample site data provided guidance as to whether a lake or stream site should actually be considered estuarine, or whether a stream site should be considered as a blackwater stream site.

Further data evaluation meant that the median of annual median values for color, pH, conductivity, and chlorides were calculated, and a new water body category appropriately assigned. For example, stream and lake sites were evaluated to determine whether they should actually be considered as estuarine sites. If the median of annual median conductivity was greater than 5,000 micromhos per centimeter (µmhos/cm), or if the median of annual median chloride was greater than 1,500 milligrams per liter (mg/L), then the lake or stream was evaluated as an estuary. These cutoff values are used to differentiate freshwaters from marine waters in the Florida Water Quality Standards (Chapter 62-302, *F.A.C.*; see also FDEP 1996). Additionally, the median of annual median color and pH were calculated for streams and, if color was greater than 275 PCU and the pH was less than 6, the stream was recategorized as a blackwater stream (FDEP 1996). The results were reviewed by various basin experts. If they determined—based on vegetation, benthic organism assemblage, and professional opinion—that a water body category should be recategorized, it was. For example, many St. Johns River sites north of Green Cove Springs were originally analyzed as lakes, but after a review by basin experts, the sites were recategorized and analyzed as estuarine sites.

## TOTAL NITROGEN

Both the TSI and WQI incorporate total nitrogen. However, total nitrogen (TN) was rarely measured at most of the sites. Ammonia, total Kjehldahl nitrogen (TKN), and total nitrate/nitrite ($NO_x$) were usually available. TKN and total $NO_x$ were summed for an estimate of total nitrogen. If total $NO_x$ was missing, then dissolved $NO_x$ was used in its place, if it was available. If TKN was missing, total nitrogen was not calculated, since TKN comprises most of the TN for these water bodies.

## INDICES

Water quality was assessed using indices. Indices provide a convenient way of evaluating a number of different water quality measurements. Although individual constituents could be evaluated, it can be difficult to interpret results. For example, an examination of nutrients at a site may reveal an increasing trend in total phosphorus (TP) and a decreasing trend in total nitrogen (TN) concentrations. Such results make it difficult to summarize water quality conditions. An index can be helpful in overcoming this type of problem. The two indices used in this assessment were a trophic state index for lakes and estuaries and a water quality index for streams, blackwater streams, and springs. These indices are primarily based on indices used in the FDEP 305b reporting process (FDEP 1996). However, others have used indices as well (Cude 2001, Stambuk-Giljanovic 1999). In Oregon, temperature, dissolved oxygen, biological oxygen demand, pH, ammonia, nitrate, total phosphorus, total solids and fecal coliforms were all combined into the Oregon Water Quality Index (OWQI). The purpose of the index was to provide a simple and concise method for expressing the ambient water quality of Oregon’s streams. According to Cude (2001) the OWQI improves comprehension of general water quality issues, communicates water quality status, and illustrates the need for and effectiveness of protective practices. However, the OWQI cannot be used to determine the quality of water for specific uses, nor should it be used to provide information about water quality without considering all appropriate chemical, biological, and physical data, as well as all health hazards.

The indices used in this report are admittedly dated and could stand revision. However, there is no current and widely accepted classification scheme for Florida’s waters (of which the author is aware) that could serve as the basis for a revised index. In addition, there have not been revisions to the indices themselves to reflect newer analytical techniques, sampling methods, or the wide availability of information on geomorphology and land use. These appear to be water resources subject areas suitable for further scientific research.

### Trophic State Index

The trophic state index (TSI) was originally developed by Carlson (1977). FDEP was interested in using TSI methodology to characterize lake quality throughout Florida. In a study commissioned by FDEP, Brezonik (1976) pointed out that a TSI would be helpful in conveying lake quality information to the public and that it would be useful in comparing overall trophic conditions between lakes. Additionally, TSI could help scientists to evaluate the direction and rate of trophic change and it could be used to develop empirical models of trophic conditions as functions of watershed “enrichment” factors. In other words, an index would be useful in evaluating cultural eutrophication. Indicators that change with eutrophication include total nitrogen, total phosphorus, chlorophyll *a*, conductivity, total dissolved solids, dissolved oxygen, Secchi depth, and some or all of these should be included in a TSI. Since primary productivity results in eutrophication and primary productivity correlates well with chlorophyll *a* and nutrients, an index can be based on nutrients and chlorophyll *a*. Such an index was developed (Huber et al. 1982) and is the index used in this assessment, with some modifications. Under the original index, a lake is considered to be impaired if the Secchi depth is less than 1 m, chlorophyll is greater than 20 micrograms per liter (µg/L), total phosphorus is greater than 50 µg/L, or total nitrogen is greater than 1 milligram per liter (mg/L) (Table 5). A TSI of 60 or higher would generally indicate poor water quality. Estuaries were also evaluated using the TSI, but the comparison scale is 10 points lower than that for lakes (FDEP 1996).

Table 5. Concentration limits for key nutrients and chlorophyll *a* in lakes (from Huber et al. 1982)

| Constituent | Problem level | Corresponding TSI |
|---|---|---|
| Secchi Depth | <1 m | 60 |
| Chlorophyll *a* | >20µg/L | 60 |
| Total Phosphorus | >50µg/L | 69 |
| Total Nitrogen | >1mg/L | 60 |

Note: TSI = trophic state index
M = meter
µg/L = micrograms per liter
mg/L = milligrams per liter

Although the TSI was originally calculated using chlorophyll *a*, TN, TP, and Secchi depth, the Secchi depth was not used in this assessment because many Florida waters are naturally dark from blackwater stream inputs (FDEP 1996). As a result, low Secchi measurements may not necessarily indicate eutrophic conditions.

The equations used in this assessment are, therefore, based only on total phosphorus, total nitrogen, and chlorophyll *a*. Overall TSI for a given water body site was determined by averaging results from these constituent-based TSI equations (see Huber et al. 1982).

The chlorophyll trophic state index (TSIchl) was used for all lakes and estuaries where chlorophyll data were available, shown as

$$TSIchl = 16.8 + 14.4 * \log(chl\_a) \qquad \text{(uncorrected chlorophyll } a\text{)}$$

Nutrient TSI equations were also used. No overall TSI was calculated unless TN and TP were available. A TN/TP ratio was calculated to determine whether the lake was phosphorus-limited, nitrogen-limited, or neither. The TN/TP ratio was calculated using the median of annual median TN and TP for each lake or estuary. If the ratio was less than 10, then the lake was considered nitrogen-limited. In that case, the overall TSI was based on the average of TSIchl and the total nitrogen-limited TSI (TSItnn), expressed as

$$TSItnn = 10*(5.96 + 2.15*\log TN) \qquad \text{(TN as mg/L nitrogen)}$$

If the ratio was greater than 30, the lake was phosphorus-limited, and the overall TSI was based on the average of TSIchl and the total phosphorus-limted TSI (TSItpp), expressed as

$$TSItpp = 10*[2.36*\log(TP*1000)-2.38] \qquad \text{(TP as µg/L phosphorus)}$$

The TP was multiplied by 1000 to convert the mg/L reported by the lab to µg/L, as required for the equation. Finally, if the ratio was between 10 and 30, then an average of the nutrient-balanced total phosphorus TSI (TSItp) and the nutrient-balanced total nitrogen TSI (TSItn) was calculated, and the overall TSI was the average of that result and TSIchl, expressed as

$$TSItp = 10[1.86*\log(TP*1000)-1.84]$$
$$TSItn = 10[5.6 + 1.98\log(TN)]$$

Lakes with ratios between 10 and 30 were thought to respond to concentration changes in either total nitrogen or phosphorus (Huber et al. 1982; Smith 1982). An overall TSI was calculated at each site on each day where sufficient data existed for the calculation. In other words, daily raw nutrient and chlorophyll *a* data were converted to a daily TSI and all further calculations incorporated the daily TSI.

One problem encountered when using raw daily data in the TSI equations was that negative results were occasionally reported by the analytical laboratory. Negative numbers occur when the laboratory gets results that are less than zero on the analytical machine's calibration curve. Since negative numbers are not defined in the logarithmic terms of the equations, SAS produces a missing result when attempting such a calculation. The missing result was set to 0 in these cases to avoid losing data points that reflect low concentrations of total phosphorus, total nitrogen, or chlorophyll *a*.

## Water Quality Index

The WQI used in this assessment was originally based on a U.S. Environmental Protection Agency (EPA) STORET product, produced by Ray Peterson (EPA Region 10), in 1980. FDEP modified the index and then correlated the "new" Florida WQI with Peterson's EPA National Profiles Index (NPI). The EPA's NPI combined dissolved oxygen, pH, bacteria, nutrients, turbidity, and inorganic and organic toxics into a single index, ranging from 0 to 100. Index values less than 30 indicated good water quality; those between 30 and 60, fair quality; and over 60, poor quality. The index values were based on graphs of water quality criteria, which were a synthesis of national criteria, state standards, literature values, and professional judgment (Wenzel and McVety 1986). When FDEP correlated the Florida WQI with the EPA index, the cutoff ranges moved slightly. Thus for the Florida WQI, index values less than 45 were considered good; those between 45 and 60, fair; and those over 60, poor quality.

The underlying concept behind the WQI is that different constituents contribute to water quality and that these constituents can be grouped into appropriate classes. The following equally weighted constituent classes comprise the WQI: water clarity, dissolved oxygen, oxygen demanding substances, nutrients, bacteria, and macroinvertebrate diversity (Table 6). To derive the overall WQI for a site, an index value for each class must first be calculated by converting the constituent raw data to a percentile value. The mean of all such percentile values within each class became the index value for that class. For example, to determine an index value for the water clarity class, raw data values for both turbidity and total suspended solids were converted to a percentile. The mean of the two percentiles became the index value for the water clarity component of the WQI for a given day.

Table 6. Florida water quality index classes

| Class | Constituents |
|---|---|
| Water clarity | turbidity, total suspended solids |
| Dissolved oxygen | dissolved oxygen |
| Oxygen-demanding substances | total organic carbon, biochemical oxygen demand, chemical oxygen demand |
| Nutrients | total nitrogen, total phosphorus, nitrate and nitrite |
| Bacteria | total coliforms and fecal coliforms |
| Macroinvertebrate diversity | natural substrate, artificial substrate, Beck's biotic index |

An overall daily WQI was calculated as an average of all classes for which data were available. Although the overall WQI could be based on a single class, the index becomes more representative as more classes are present. For this assessment, at least two classes were required in order to calculate an overall WQI.

To use the cutoff values associated with the Florida WQI, the SJRWMD data needed conversion to the same percentile distribution used by the FDEP. In other words, without converting to the same percentile scale, the qualitative cutoff values would be inappropriate for SJRWMD data. To determine the appropriate percentiles, Minitab was used for a best-fit regression for each constituent, using data points found in Table 2-5 of the 1996 FDEP 305b report (see Table 7).

SJRWMD data were adjusted to fit the FDEP distribution as shown in Table 7 so that the qualitative cutoff points for poor, fair, and good water quality could be applied. This regression provides a rough estimate of the cumulative distribution function for each constituent. In some cases, log-transformed data from Table 7 provided the best-fit equation. All equations had minima and maxima, so limits were put on the upper and lower ranges of input values (not unprecedented; see Cude 2001).

**For dissolved oxygen,**

$$DO_{index} = 0.657360*(value^3) - 11.8029*(value^2) + 50.0321*value + 28.2168$$

for values < 2.8, the index = 90, and

for values > 9.2, the index = 1; $r^2$ = 99.9; $r^2$ adj. = 99.8

Table 7. Percentile distribution of 1996 FDEP ambient water quality data

| Constituent* | Units | P10 | P20 | P30 | P40 | P50 | P60 | P70 | P80 | P90 |
|---|---|---|---|---|---|---|---|---|---|---|
| Turbidity | JTU | 1.5 | 3 | 4 | 4.5 | 5.2 | 8.8 | 12.2 | 16.5 | 21 |
| TSS | mg/L | 2 | 3 | 4 | 5.5 | 6.5 | 9.5 | 12.5 | 18 | 26.5 |
| DO | mg/L | 8 | 7.3 | 6.7 | 6.3 | 5.8 | 5.3 | 4.8 | 4. | 3.1 |
| BOD | mg/L | 0.8 | 1 | 1.1 | 1.3 | 1.5 | 1.9 | 2.3 | 3.3 | 5.1 |
| COD | mg/L | 16 | 24 | 32 | 38 | 46 | 58 | 72 | 102 | 146 |
| TOC | mg/L | 5 | 7 | 9.5 | 12 | 14 | 17.5 | 21 | 27.5 | 37 |
| TN | mg/L | 0.55 | 0.75 | 0.9 | 1 | 1.2 | 1.4 | 1.6 | 2 | 2.7 |
| $NO_x$ | mg/L | 0.01 | 0.03 | 0.05 | 0.07 | 0.10 | 0.14 | .20 | 0.32 | 0.64 |
| TP | mg/L | 0.02 | 0.03 | 0.05 | 0.07 | 0.09 | 0.16 | 0.24 | 0.46 | 0.89 |
| Total coliform | #/100ml | 100 | 150 | 250 | 425 | 600 | 1100 | 1600 | 3700 | 7600 |
| Fecal coliform | #/100ml | 10 | 20 | 35 | 55 | 75 | 135 | 190 | 470 | 960 |

*Note: BOD = biochemical oxygen demand; COD = chemical oxygen demand; DO = dissolved oxygen; $NO_x$ = nitrate and nitrite; TN = total nitrogen; TOC = total organic carbon; TP = total phosphorus; TSS = total suspended solids

**For total suspended solids,**

$$TSS_{index} = 0.0105882*(value^3) - 0.612914*(value^2) + 12.6748*value - 12.3346$$

for values < 1.0229, the index = 0, and
for values > 29.5, the index = 100; $r^2$ = 99.7; $r^2$ adj. = 99.6

**For total nitrogen,**

$$TN_{index} = -1.26550*(value^3) - 11.5127*(value^2) + 86.7858*value - 35.7678$$

for values < 0.43895, the index = 0, and
for values > 2.7, the index = 90; r2 = 99.6; r2 adj. = 99.4

**For nitrite and nitrate,**

$$NO_{x\ index} = 1200.32*(value^3) - 1464.71*(value^2) + 579.148*value + 4.66934$$

for values < 0.00058 the index = 5, and
for values > 0.68535 the index = 100; r2 = 99.9; r2 adj. = 99.8

**For total phosphorus,**

$$TP_{index} = -8.01647*(log10(value))^3 - 31.0489*(log10(value))^2 + 17.9150*log10(value) + 90.4962$$

for values < 0.012975 the index = 0,
and for values > 1.85 the index = 93; r2 = 99.7; r2 adj. = 99.5

**For total organic carbon,**

$$TOC_{index} = 0.0007096*value^3 - 0.119937*value^2 + 6.42497*value - 19.6830$$

for values < 3.2579 the index = 0,
and for values > 44 the index = 91; r2 = 99.9; r2 adj. = 99.8

**For total coliform,**

$$TC_{index} = -4.17749*(log10(value))^3 + 29.5153*(log10(value))^2 - 19.4043*log10(value) - 35.4442;$$

for values < 60, the index = 0,
and for values > 23000, the index = 95; $r^2$ = 99.8; $r^2$ adj. = 99.7

**For fecal coliform,**

$$FC_{index} = -10.8087*(log10(value))^3 + 59.9267*(log10(value))^2 - 59.4367*log10(value) + 19.8947;$$

for values < 3.9, the index = 3,
and for values > 1250, the index = 90; $r^2$ = 99.6; $r^2$ adj. = 99.4

**For turbidity,**

$$Turbidity_{index} = 0.0202426*value^3 - 0.894427value^2 + 14.7368*value - 12.0948;$$

for values < 0.86528, the index = 0,
and for values > 23.003, the index = 100; $r^2$ = 98.4; $r^2$ adj. = 97.4

These equations were used to calculate a percentile (index value) that relates the constituent concentration to the FDEP distribution for which the cutoff values were relevant.

The constituents were then assigned to their proper class (Table 6). However, depending on the type of water body, the class did not always contain the same group of constituents (Table 8). For example, the water clarity class contains both total suspended solids and turbidity and was used for all waters. However, the dissolved oxygen class was used only for streams, since springs and blackwater streams are naturally low in dissolved oxygen (FDEP 1996). Including the dissolved oxygen class in blackwater streams and springs would inappropriately increase the overall index for those types of water

Table 8. Water quality index constituents used by water body type

| Constituent | Stream | Blackwater Stream | Spring |
|---|---|---|---|
| Turbidity | Y | Y | Y |
| Total suspended solids (TSS) | Y | Y | Y |
| Dissolved oxygen (DO) | Y | N | N |
| Total organic carbon (TOC) | Y | N | Y |
| Total phosphorus (TP) | Y | Y | Y |
| Total nitrogen (TN) | Y | N | N |
| Nitrate and nitrite ($NO_x$) | N | Y | Y |
| Total and Fecal coliforms | Y | Y | Y |

Note: DO = dissolved oxygen; $NO_x$ = nitrate and nitrite; TN = total nitrogen; TOC = total organic carbon; TP = total phosphorus; TSS = total suspended solids

bodies, making them appear worse than they actually are. Similarly, total organic carbon was not used for blackwater streams, since they have naturally high concentrations of total organic carbon (FDEP 1996). However, since there are few anthropogenic sources of total organic carbon, inclusion of this analyte in the WQI was questionable. Nevertheless, the total organic carbon component of the oxygen-demanding-substances class was retained for the sake of consistency.

Although total phosphorus was used for all water body types, total nitrogen was used only for streams, while nitrate / nitrite was used only for blackwater streams and springs. Total nitrogen is comprised of both organic nitrogen (TKN) and inorganic nitrogen ($NO_x$). Blackwater streams have naturally high concentrations of organic nitrogen, and using TKN as an estimate of TN would make these appear to be worse than they really are. Thus, $NO_x$ was used instead to estimate TN. Streams have naturally low concentrations of TKN and $NO_x$, but both can be increased by pollution. Therefore, TN was used in the index. Unpolluted springs also have naturally low concentrations of both organic and inorganic nitrogen, but pollution can increase $NO_x$, and it is important to adequately characterize these (FDEP 1996). Spring-fed streams may also benefit from the use of $NO_x$ in the WQI calculation to ascertain contamination, but for the sake of consistency that was not done.

All of these WQI and TSI daily calculations resulted in a data set that was further analyzed for status and then for trend.

## SEASONAL MEDIANS CALCULATION

SJRWMD has a warm-temperate climate. Summers tend to be hot and wet, while winters are mild and dry. Rao et al. (1989) found that most rainfall in the District occurred during the months of June through October, which is the wet season. Conversely, they found the dry season to run from November through May. An examination of the data set for this assessment showed uneven sampling frequencies across years and seasons. In order to reduce the effects of these uneven frequencies, seasonal median values were used for status and trend analysis. Daily index values were assigned to either the wet or dry season and then a median of those values was calculated. Dry season daily index values that occurred in November or December were assigned to the dry season (January–May) of the subsequent year. The Wilcoxon rank-sum test function in PROC NPAR1WAY (SAS) was used to determine whether seasonality existed at a given station ($p \leq 0.1$). Sites exhibiting seasonality were analyzed for trend by using the seasonal Mann-Kendall test.

## DETERMINING STATUS

Status calculations were based on the 5 years of data reported from January 1, 2000, to December 31, 2004. The median of all seasonal median trophic state or water quality index values over the 5-year period became the overall index used to rate a given water body. A qualitative rating was then assigned based on the median value (Table 9).

Table 9. Index cutoff values by water body type

| Water Body | Good | Fair | Poor |
|---|---|---|---|
| Lake | index <60 | 60 index <70 | index 70 |
| Estuary | index <50 | 50 index <60 | Index 60 |
| Stream, blackwater stream, spring | index <45 | 45 index <60 | Index 60 |

## DETERMINING TREND

Trend determination indicates whether water quality is changing over time at a particular site. The Mann-Kendall test, a nonparametric test, was used for this assessment. The seasonal Kendall test, a modification of the Mann-Kendall test, was used for data sets that had seasonality. The period of record for trend determination was the 15-year period from January 1, 1990, to

December 31, 2004. Ideally, all sites would have data for each year of the period, but this often was not the case. Thus, at least 10 years of data from this period were selected in order to attenuate the effects of drought cycles and to ensure that sufficient data were available to analyze trends (see also Cude 2001).

### Mann-Kendall Trend Test

The Mann-Kendall test did not require normally distributed data and was well-suited for analyzing data sets that had missing, tied, or left-censored data (Gilbert 1987, Cude 2001). The test first ranked all seasonal median observations by date order. Then, the difference between each successive value was calculated, and the sum of the signs of those differences was evaluated as the Kendall sum statistic, or K. This process was repeated in an iterative fashion until all possible differences were evaluated. The number of observations was important in determining the critical value for comparison with the Kendall K. For a data set with less than 4 observations, no critical values were available. For data sets with 40 or fewer observations, the probability associated with the Kendall K was found in "Upper-Tail Probabilities for the Null Distribution of the Kendall K Statistic" (Table A.30, Hollander and Wolfe 1999). If the data set had more than 40 observations, a z-score was calculated based on the K statistic and the variance. The z-score was calculated according to one of the following (Gilbert 1987):

$$Z = K - 1/\sqrt{(\text{variance } K)} \qquad \text{for } K > 0$$
$$Z = 0 \qquad \text{for } K = 0$$
$$Z = K + 1/\sqrt{(\text{variance } K)} \qquad \text{for } K < 0$$

The z-score was then compared to critical values from a normal distribution table ($p \leq 0.1$). If the Kendall K was positive, that meant that the seasonal median index values were, in general, increasing over time, which meant a degrading trend. If the Kendall K was negative, then the trend was improving, since in that case, index values were decreasing over time.

### Seasonal Kendall Trend Test

The Seasonal Kendall test was based on the same principle as the Mann-Kendall test, but the variance calculation was more complicated. The variance equation accounts for the number of tied values and the number of groups of tied values across all years in each season. Additionally, the variance equation accounts for the number of years in each season that had multiple data and the number of multiple data in each year. After ranking the seasonal median values as before, the number of values per season was calculated. The variance was calculated for each site and a z-score calculated as before. For the seasonal test, all z-scores were evaluated using the normal probability table ($p \leq 0.1$).

### Sen's Slope Estimate

The Sen's slope is an estimate of the magnitude of the trends. It was calculated as the median value of all individual slope estimates within the station's data series. Upper and lower 95% confidence intervals were also calculated for each slope estimate (Gilbert 1987).

# RESULTS AND DISCUSSION

Status and trends were assessed for 192 sites located in nine major drainage basins within the SJRWMD (Map 6). Details on these sites can be found in Appendix A, Table A1. Status results for each station can be found in Appendix A, Table A2 and trend results for each station are in Appendix A, Table A3.

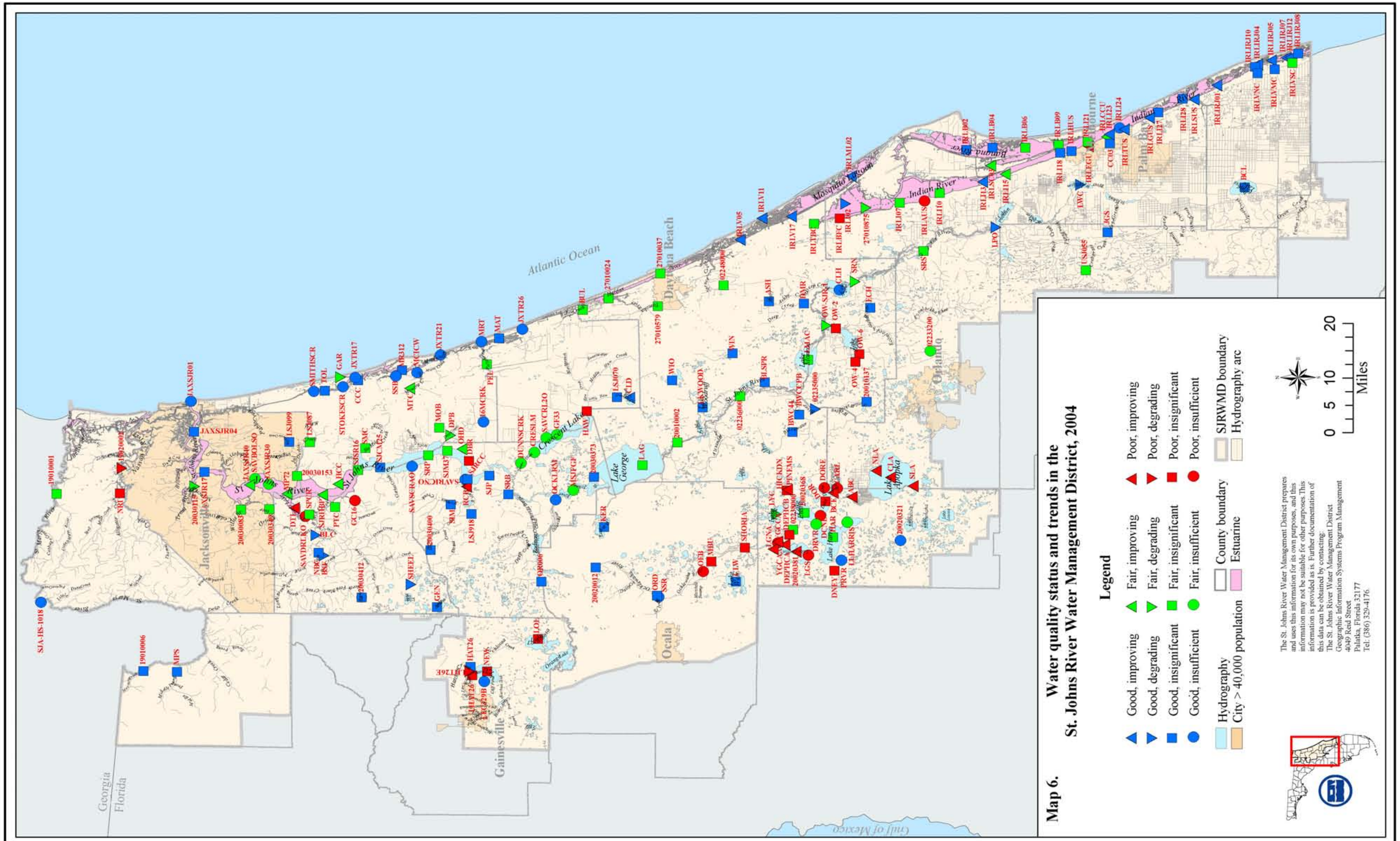
## ST. MARYS RIVER BASIN

The St. Marys River drains southeastern Georgia and northeastern Florida and serves as a state boundary. The river drains an extensive tidal marsh system in its lower reaches. The headwaters drain much of the Okefenokee swamp (Hand et al. 2000) and terminate at the Intracoastal Waterway (ICW), where tidal influences cause reverse flows on a regular basis. The size of St. Marys Basin is about 1,580 mi², with about 952 mi² within SJRWMD. Land cover is predominantly upland forests used for silviculture (Figure 1).

| General Land Use Classes | Area, mi² | % of area |
|---|---|---|
| Forest | 525.600 | 55.20% |
| Wetland | 303.913 | 31.92% |
| Urban | 41.578 | 4.37% |
| Agriculture | 35.626 | 3.74% |
| Water | 22.264 | 2.34% |
| Upland nonforested | 15.730 | 1.65% |
| Transportation, Communication, Utilities | 6.240 | 0.66% |
| Barren land | 0.955 | 0.10% |
| <Null> | 0.248 | 0.03% |
| | 952.174 | |

Figure 1. St. Marys River Basin land cover (2000)

Although the basin is not highly developed, urban development continues in the Amelia Island and Macclenny / Glen St. Mary areas. Wastewater from the Fernandina Beach treatment plant, urban runoff, and local pulp mills probably have some effect on the water quality in this area.




**Map 6.** Water quality status and trends in the St. Johns River Water Management District, 2004

Four stations were located on the river and its tributaries: State Road (SR) 2, the Middle Prong at Highway 127, Scotts Landing, and U.S. 17, which is at the Georgia state line (Map 7). The site at SR 2 **(19010006),** the Middle Prong **(MPS)**, and Scotts Landing **(SJA-HS-1018)** all had good water quality, while the site at U.S. 17 **(19010001)**, which is many miles downstream from the headwaters, had fair water quality. The three upstream sites were evaluated as blackwater streams, which means that they had higher color and lower pH than the downstream site, which was evaluated as a stream. There were insufficient data for trend analysis at Scotts Landing and an insignificant trend at all the other sites. Overall, the St. Marys River appears to have good water quality.

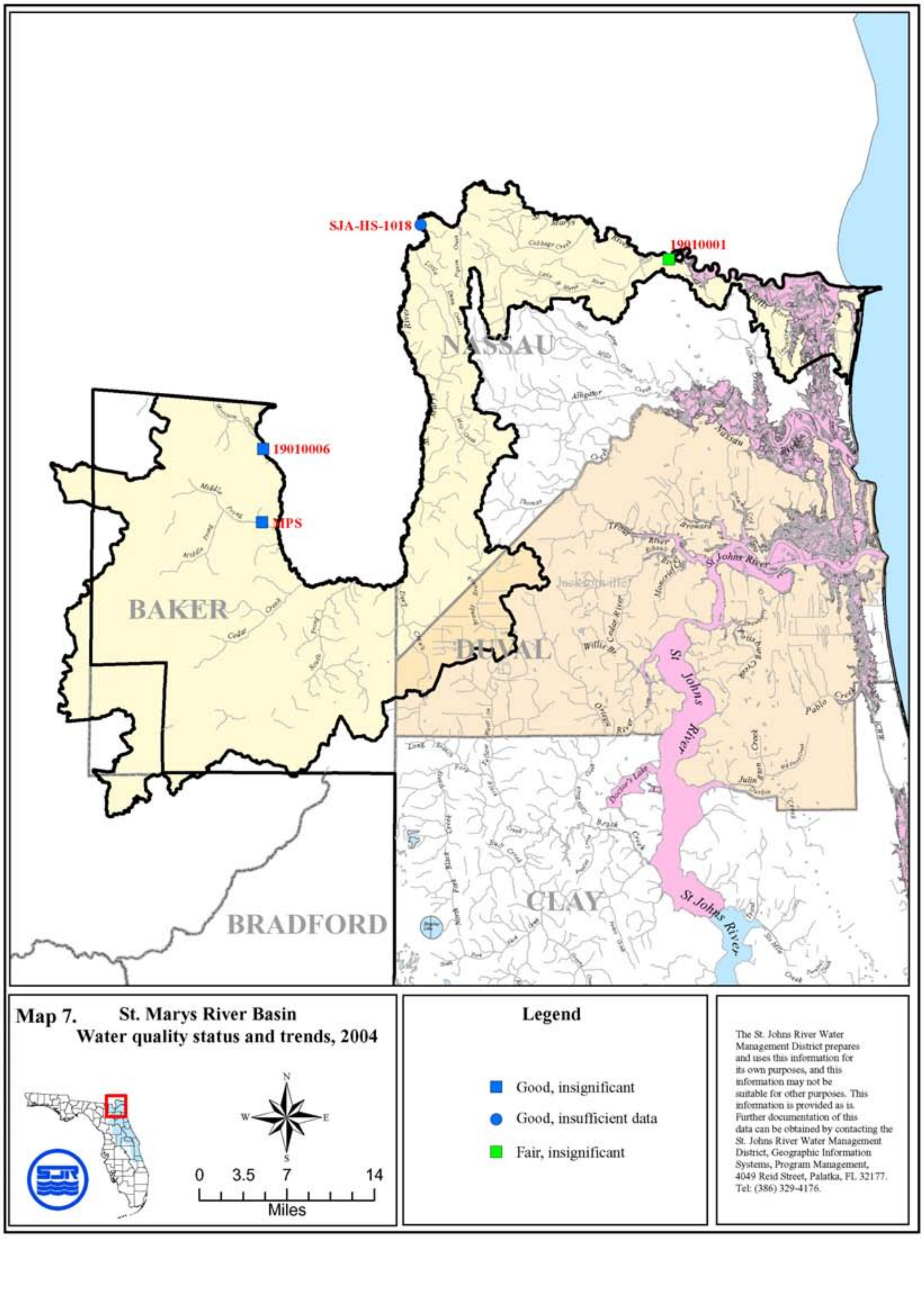
## NASSAU RIVER BASIN

The Nassau River is a tidally influenced river that drains much of the salt marsh west of Amelia Island and empties to the ICW. It also serves as a border between Nassau County and Duval County. This basin of about 424 mi² has a predominant land cover of upland forests used for silviculture (Figure 2).

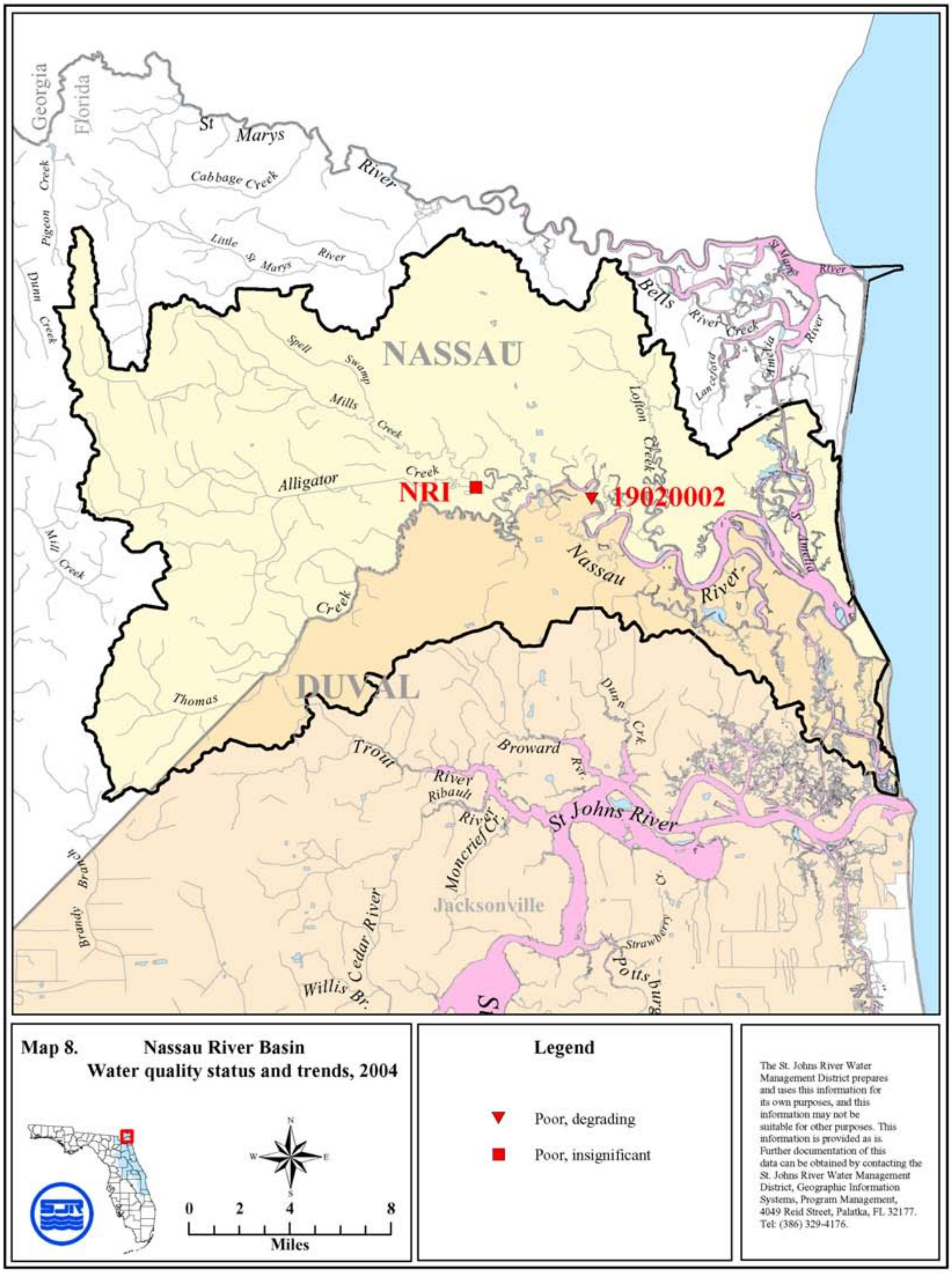
| General Land Use Classes | Area, mi² | % of area |
|---|---|---|
| Forest | 181.970 | 42.90% |
| Wetland | 142.385 | 33.57% |
| Urban | 36.549 | 8.62% |
| Water | 23.783 | 5.61% |
| Agriculture | 20.961 | 4.94% |
| Upland nonforested | 13.137 | 3.10% |
| Transportation, Communication, Utilities | 3.876 | 0.91% |
| Barren land | 1.142 | 0.27% |
| <Null> | 0.341 | 0.08% |
| | 424.151 | |

Figure 2. Nassau River Basin land cover (2000)

There were two stations on the Nassau River (Map 8): the Nassau river near Italia **(NRI)** and at U.S. 17 **(19020002)**. The site near Italia was evaluated as a stream, using the WQI, and it had poor water quality with an insignificant trend. The site at U.S. 17 was evaluated as an estuarine site, using the TSI, and it had poor and degrading water quality.




**Map 7. St. Marys River Basin**
**Water quality status and trends, 2004**



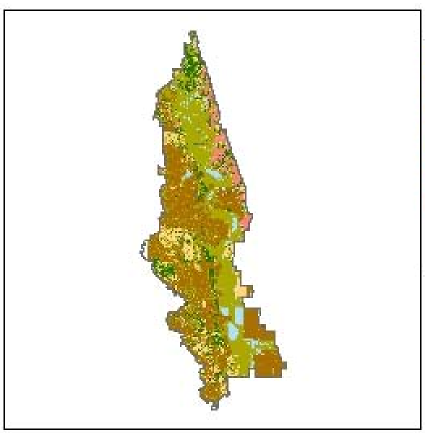

**Map 8.** **Nassau River Basin**
**Water quality status and trends, 2004**

## St. Johns River Basin

The St. Johns River drains most of SJRWMD, and its headwaters are west of Vero Beach. The river flows north and empties to the Atlantic Ocean 20 mi east of Jacksonville. The river has many tributaries, and it regularly reverses flow north of Lake George due to tides and a low gradient. The river has traditionally been subdivided into four main sections: the lower basin, Lake George Basin, middle basin, and upper basin. The Lower St. Johns River Basin comprises the area from Welaka north to the river mouth. The Lake George Basin includes the St. Johns River south of Welaka to the mouth of the Wekiva River. The Middle St. Johns River Basin extends from the mouth of the Wekiva south along the St. Johns River to the mouth of the Econlockhatchee River, while the Upper St. Johns River Basin comprises the area south to the headwaters.

## Upper St. Johns River Basin

The headwaters of the St. Johns River are located in the western part of Indian River and Brevard counties and are comprised of a series of floodplain marshes, river segments, and lakes. The Upper St. Johns River Basin (USRJB) comprises approximately 1,726 mi², and the predominant land cover is wetlands (Figure 3). USRJB contains two surface waters used for potable supplies: Lake Washington and Taylor Creek.



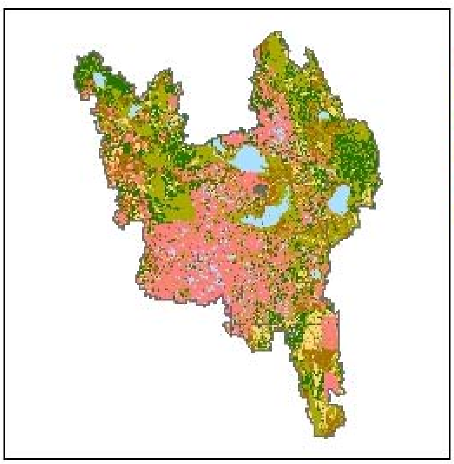
| General Land Use Classes | Area, mi² | % of area |
|---|---|---|
| Wetland | 625.540 | 36.24% |
| Agriculture | 618.787 | 35.85% |
| Upland nonforested | 156.380 | 9.06% |
| Forest | 146.386 | 8.48% |
| Water | 79.339 | 4.60% |
| Urban | 71.104 | 4.12% |
| Transportation, Communication, Utilities | 16.487 | 0.96% |
| Barren land | 6.932 | 0.40% |
| | 1726.284 | |

Figure 3. Upper St. Johns River Basin land cover (2000)

Three lakes, two streams, and a blackwater stream were sampled for this assessment (Map 9). Blue Cypress Lake **(BCL)** had good water quality and an insignificant trend. Lakes Washington **(LWC)** and Poinsett **(LPO)** both had good but degrading water quality due to increasing concentrations of nutrients and chlorophyll *a*. Farther north, the St. Johns River at SR 50 **(SRS)** had fair water quality and an insignificant trend. The two tributaries assessed in this area were Jane Green Creek **(JGS)**, and Crabgrass Creek **(USJ055).** Jane Green Creek had good water quality while Crabgrass Creek had fair water quality. Both tributaries had insignificant trends.

## Middle St. Johns River Basin

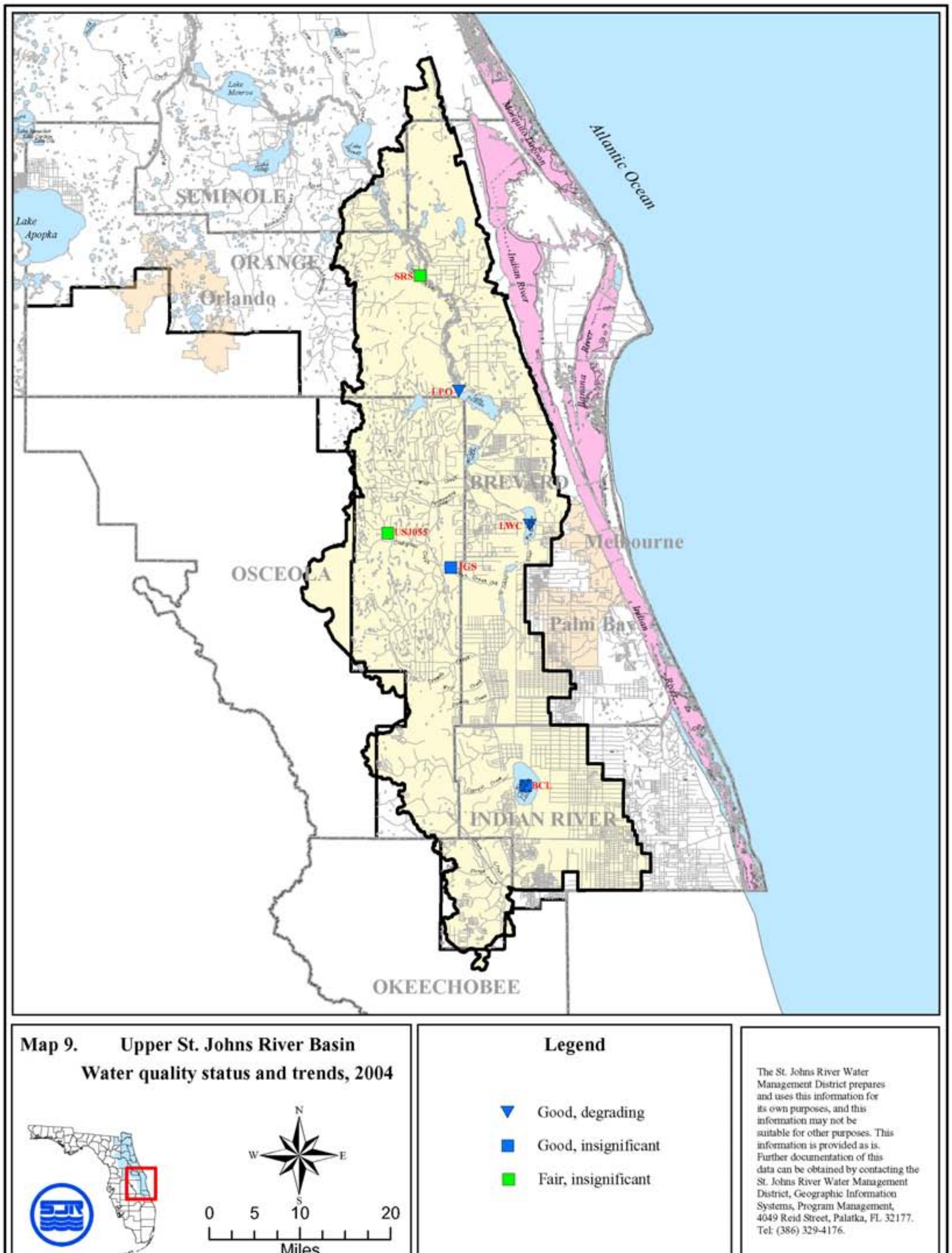
More stations were assessed in the Middle St. Johns River Basin (MSJRB) than in the Upper St. Johns River Basin. With an area of about 1,178 $mi^2$, the predominant land cover is urban and wetlands (Figure 4). The MSJRB contains both the Econlockhatchee and the Wekiva tributaries.

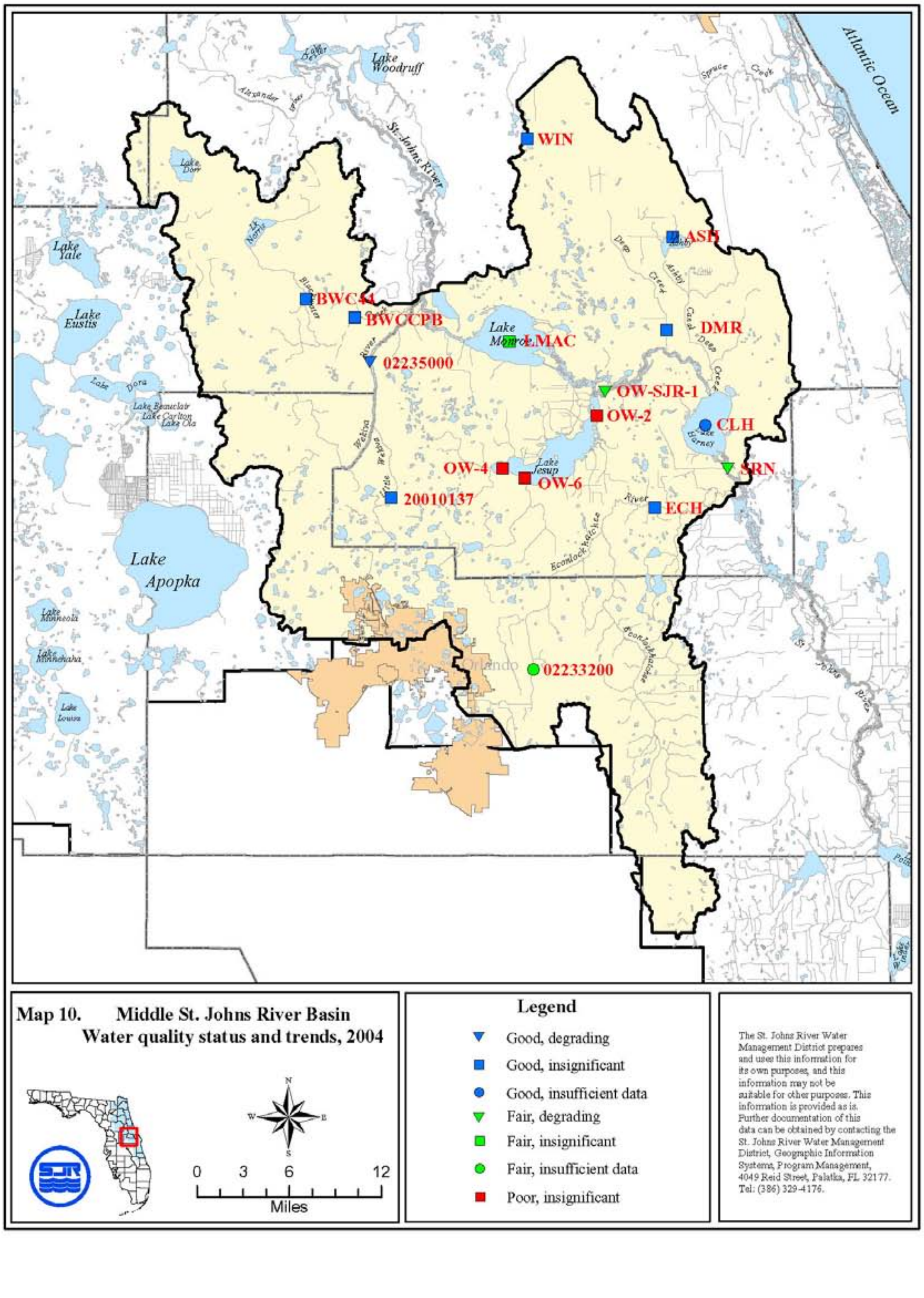


| General Land Use Classes | Area, $mi^2$ | % of area |
|---|---|---|
| Urban | 324.361 | 27.54% |
| Wetland | 285.041 | 24.20% |
| Forest | 221.922 | 18.84% |
| Agriculture | 148.063 | 12.57% |
| Water | 86.398 | 7.33% |
| Upland nonforested | 84.617 | 7.18% |
| Transportation, Communication, Utilities | 22.709 | 1.93% |
| Barren land | 4.821 | 0.41% |
| | 1177.943 | |

Figure 4. Middle St. Johns River Basin land cover (2000)

Three blackwater, seven lake, and six stream sites were sampled in the MSJRB (Map 10). The mainstem site at SR 46 **(SRN)** had fair but degrading water quality due to increasing concentrations of turbidity, phosphorus, and total suspended solids. The Econlockhatchee tributary **(ECH)** had good water quality with no significant trend. Deep Creek **(DMR)** drains Lake Ashby **(ASH)** and both had good water quality and an insignificant trend.


Atlantic Ocean
SEMINOLE
ORANGE
Orlando
Lake Apopka
BREVARD
Melbourne
Palm Bay
OSCEOLA
INDIAN RIVER
OKEECHOBEE
SRS
LPO
LWC
USJ055
IGS
BCL
Map 9. Upper St. Johns River Basin
Water quality status and trends, 2004
Legend
Good, degrading
Good, insignificant
Fair, insignificant
N
S
E
W
0
5
10
20
Miles
The St. Johns River Water Management District prepares and uses this information for its own purposes, and this information may not be suitable for other purposes. This information is provided as is. Further documentation of this data can be obtained by contacting the St. Johns River Water Management District, Geographic Information Systems, Program Management, 4049 Reid Street, Palatka, FL 32177. Tel: (386) 329-4176.


Map 10. Middle St. Johns River Basin
Water quality status and trends, 2004
Legend
Good, degrading
Good, insignificant
Good, insufficient data
Fair, degrading
Fair, insignificant
Fair, insufficient data
Poor, insignificant
0 3 6 12
Miles
The St. Johns River Water Management District prepares and uses this information for its own purposes, and this information may not be suitable for other purposes. This information is provided as is. Further documentation of this data can be obtained by contacting the St. Johns River Water Management District, Geographic Information Systems, Program Management, 4049 Reid Street, Palatka, FL 32177. Tel: (386) 329-4176.
WIN
ASH
BWC44
BWCCPB
LMAC
DMR
02235000
OW-SJR-1
OW-2
CLH
OW-4
OW-6
SRN
20010137
ECH
02233200
Atlantic Ocean
Lake Woodruff
Lake Yale
Lake Eustis
Lake Apopka
Lake Monroe
Lake Jesup
Lake Harney
St. Johns River

Lake Harney (**CLH**) had good water quality but insufficient data for trends. The St. Johns River near the mouth of Lake Jesup **(OW-SJR-1)** had fair but degrading water quality due to increasing concentrations of turbidity, total organic carbon, and phosphorus. All three stations on Lake Jesup **(OW-2, OW-4, OW-6)** had poor quality with insignificant trends. Lake Monroe **(LMAC)** had fair quality with no discernable trends. The Wekiva River joins the St. Johns River farther north, and Blackwater Creek is a tributary to it. The Wekiva River **(02235000)** had good but degrading water quality due to increasing concentrations of total organic carbon and nitrogen, while the Little Wekiva **(20010137)** had good water quality but an insignificant trend. Historically, there were seven wastewater treatment plants and a citrus processing plant discharging to the Little Wekiva (FDEP 1997). These stopped discharging in the mid-1970s, and now there is only an intermittent discharge from the Altamonte Springs Wastewater Treatment Plant. The main concerns in the Little Wekiva are urban stormwater runoff, erosion, and streambed alterations (FDEP 1997). Blackwater Creek **(BWC44, BWCCPB)** had good water quality also, but no significant trends were detected. Lake Winimisset **(WIN)** had good water quality but no significant trend. The Little Econlockhatchee River near Union Park **(02233200)** had fair water quality but insufficient data for trend analysis.

Overall, an equal percentage of streams in the MSJRB had good and fair water quality, while none had poor water quality (Figure 5). Half of the streams (50%) had degrading trends while about a third (33%) had insignificant trends (Figure 6). Seventeen percent had insufficient data for trend determination and none of the streams evaluated had an improving trend. All the blackwater stream sites in the MSJRB had good water quality and no significant trends. The three sites on Lake Jesup accounted for the poorly rated lake sites in the basin (Figure 9). None of the lake sites in the MSJRB had improving water quality and most (86%) had insignificant trends (Figure 10).

According to FDEP (Central District Report 2002), Lake Jesup’s pea-green color is due to unicellular algae that feed on nutrients. Since May 1983, sewage outfalls have been diverted from lake tributaries to the Iron Bridge Wastewater Treatment Plant. A long history of intense agriculture in the watershed, recent population growth in the surrounding cities, and a severe restriction of the lake’s outlet to the St. Johns River have contributed to the hypereutrophication of the lake. Both lakes Monroe and Ashby had better water quality than Jesup.

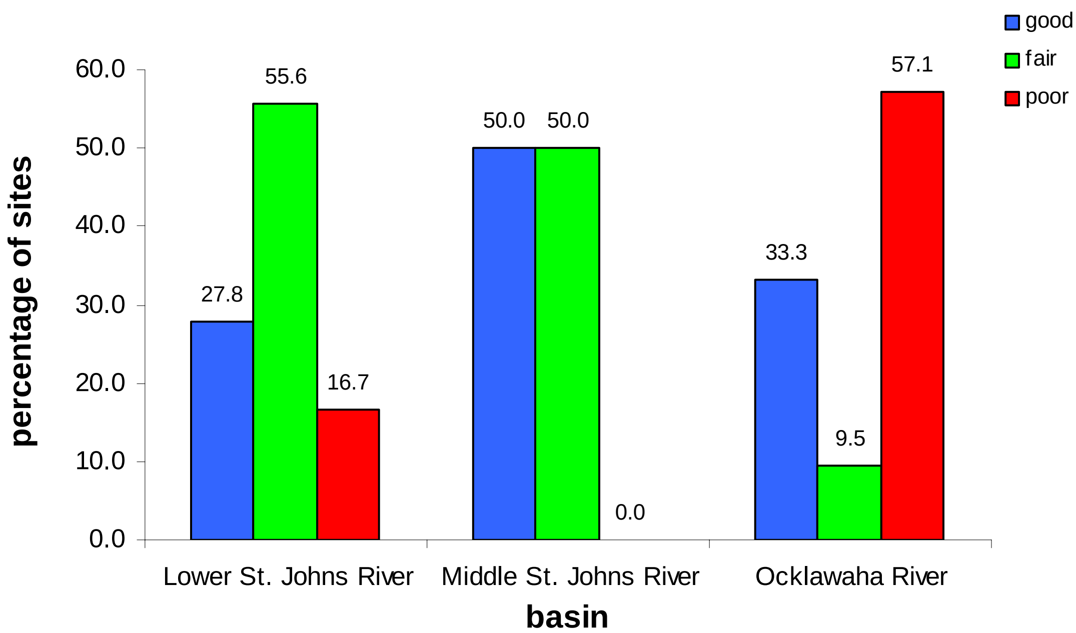



Figure 5. Stream status for selected basins

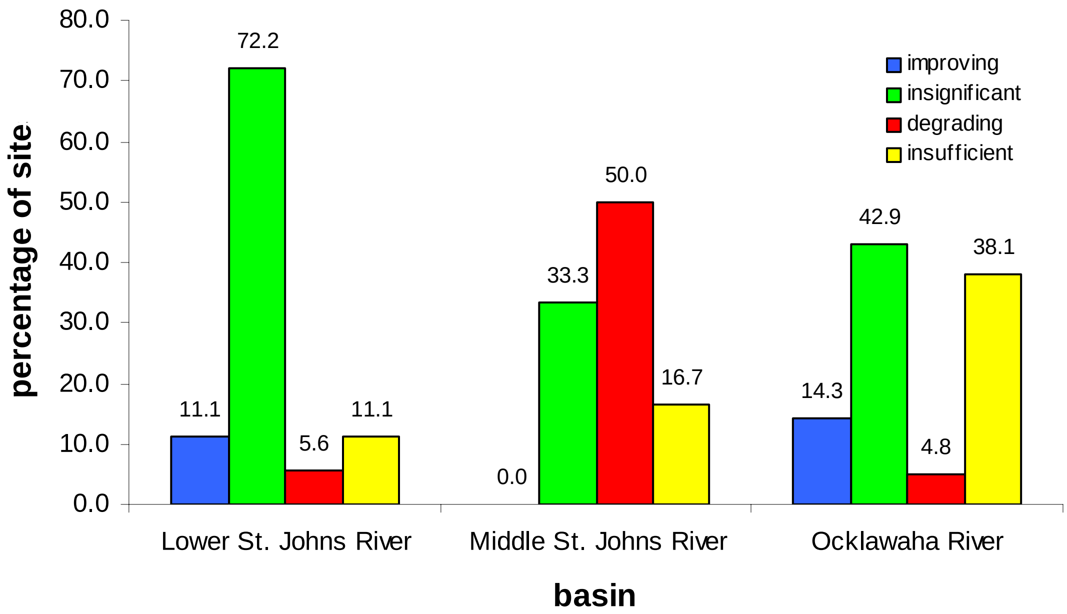
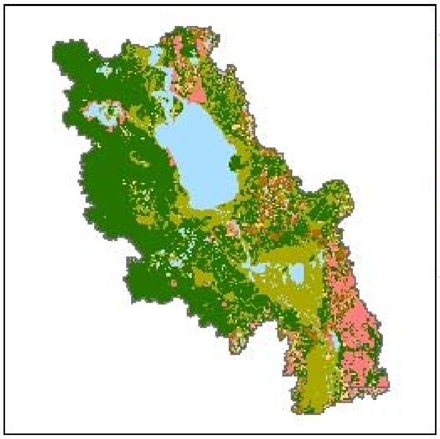
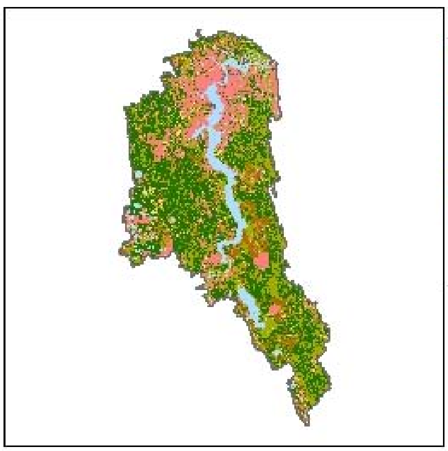



Figure 6. Stream trends for selected basins



| General Land Use Classes | Area, mi² | % of area |
|---|---|---|
| Forest | 390.745 | 47.88% |
| Wetland | 187.782 | 23.01% |
| Water | 110.506 | 13.54% |
| Urban | 68.168 | 8.35% |
| Agriculture | 39.518 | 4.84% |
| Upland nonforested | 16.032 | 1.96% |
| Transportation, Communication, Utilities | 2.354 | 0.29% |
| Barren land | 0.897 | 0.11% |
| | 816.022 | |

Figure 7. Lake George Basin land cover (2000)



| General Land Use Classess | Area, mi² | % of area |
|---|---|---|
| Forest | 1033.555 | 37.51% |
| Wetland | 669.425 | 24.30% |
| Urban | 472.782 | 17.16% |
| Water | 241.933 | 8.78% |
| Agriculture | 191.071 | 6.93% |
| Upland nonforested | 81.499 | 2.96% |
| Transportation, Communication, Utilities | 54.442 | 1.98% |
| Barren land | 10.435 | 0.38% |
| | 2755.171 | |

Figure 8. Lower St. Johns River Basin land cover (2000)

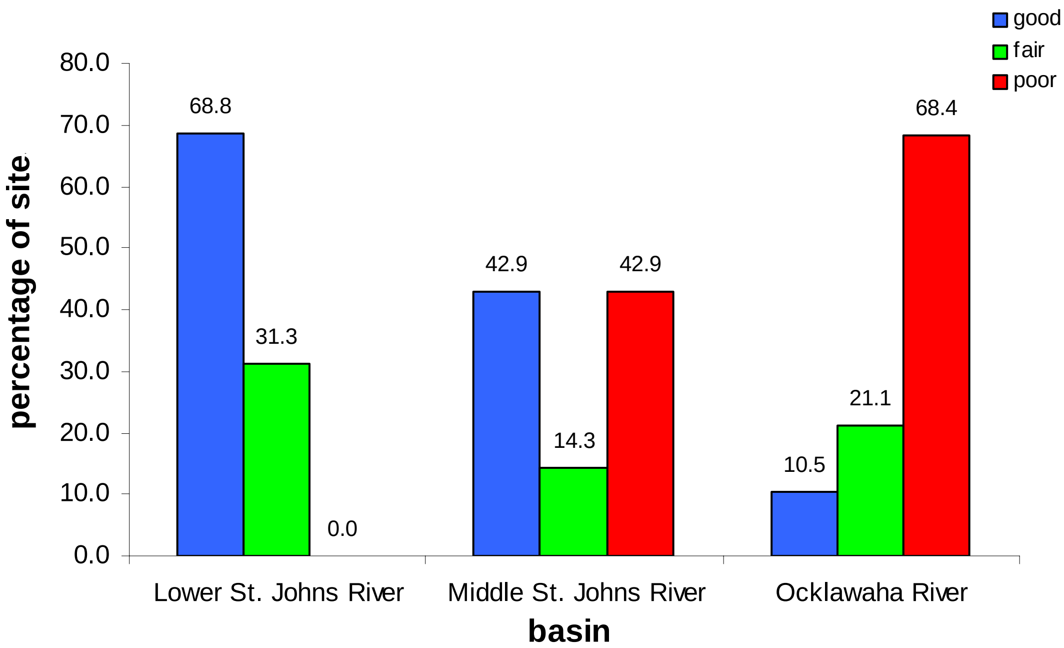



Figure 9. Lake status for selected basins

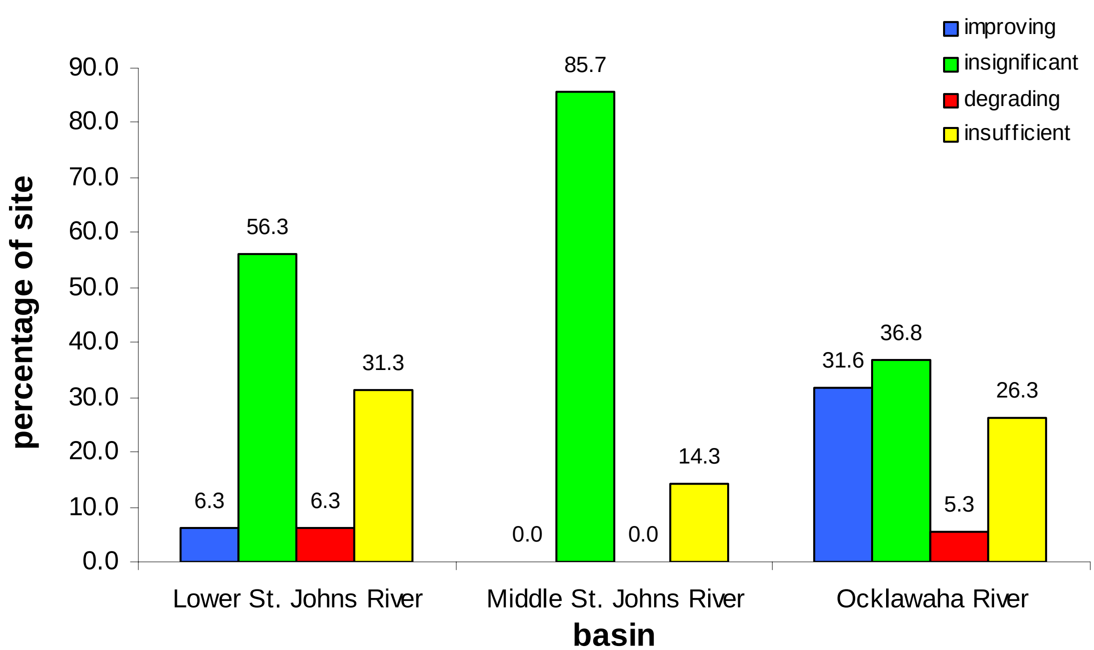



Figure 10. Lake trends for selected basins

## Lake George Basin

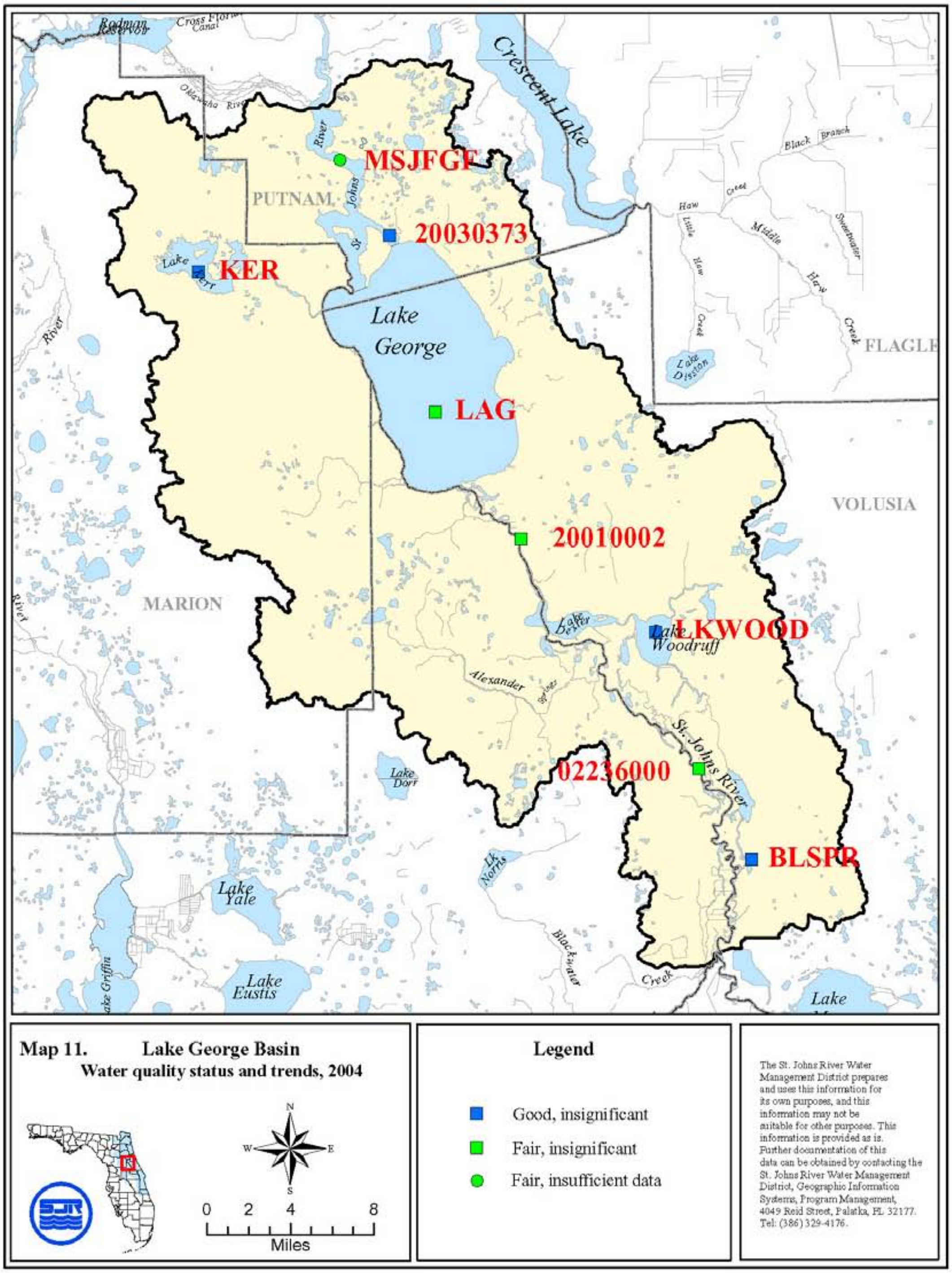
The Lake George Basin (LGB) lies farther north along the St. Johns River. Lake George covers an area of 46,000 acres and provides habitat for the second largest population of bald eagles in the continental United States (excluding Alaska). The basin is 816 $mi^2$ and the predominant land cover is upland forests (Figure 7).

Three lake, one spring, and four stream sites were sampled in the LGB (Map 11). Blue Springs **(BLSPR)** had good water quality and an insignificant trend, and it was the only spring evaluated for this entire assessment. It supplies the St. Johns River below DeLand **(02236000)**, where the water quality was fair, with insufficient data for trend determination. Lake Woodruff **(LKWOOD)** is farther north, and it had good water quality and an insignificant trend. The St. Johns River at SR 40 **(20010002)** and Lake George **(LAG)** both had fair water quality and an insignificant trend. Lake Kerr **(KER)** drains to the north end of Lake George and had good water quality and an insignificant trend. The St. Johns River at channel marker 72 (**20030373**) had good quality and an insignificant trend, while the St. Johns River near the Ft. Gates Ferry **(MSJFGF)** had fair quality, with insufficient data for trend analysis.

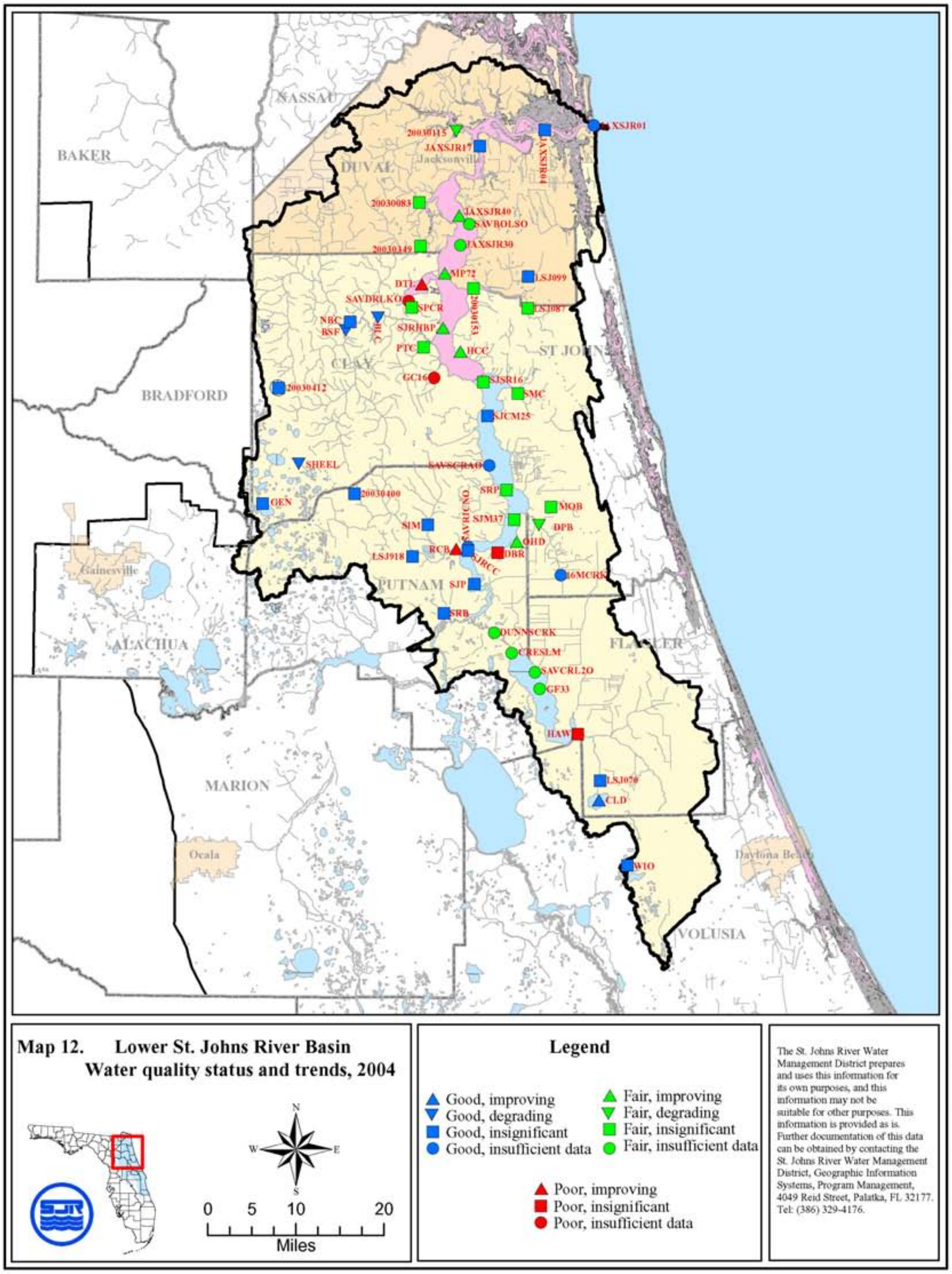
## Lower St. Johns River Basin

The Lower St. Johns River Basin (LSJRB) is the stretch of river below the Ocklawaha River mouth and terminates in the Atlantic Ocean east of Jacksonville. The river is a major route for transportation to Jacksonville, which is one of the largest ports on the East Coast. Commercial and sport fishing are also large industries on the river. LSJRB is 2,755 $mi^2$ with a predominant land cover of upland forests (Figure 8). The LSJRB is tidally influenced by the Atlantic Ocean, and a brackish salt wedge, usually located near Green Cove Springs, characterizes the estuarine interface. According to Hendrickson and Konwinski (1999), the LSJRB is a sixth-order, dark-water river estuary, and it has riverine, lacustrine, and estuarine characteristics.

Many sampling sites were located in the LSJRB. Four blackwater stream, 15 estuarine, 16 lake, and 18 stream sites were evaluated in the LSJRB (Map 12). Moving north from Lake George, the river at Buffalo Bluff **(SRB)** had good water quality but no significant trend. The Oklawaha River joins the St. Johns River south of this area. Dunns Creek **(DUNNSCRK)** joins the St. Johns River north of Buffalo Bluff, and it had fair water quality but insufficient data for




**Map 11. Lake George Basin**
**Water quality status and trends, 2004**


NASSAU
BAKER
DUVAL
Jacksonville
BRADFORD
CLAY
ST JOHNS
PUTNAM
ALACHUA
Gainesville
FLAGLER
MARION
Ocala
Daytona Beach
VOLUSIA
Map 12. Lower St. Johns River Basin
Water quality status and trends, 2004
N
S
W
E
0 5 10 20
Miles
Legend
Good, improving
Good, degrading
Good, insignificant
Good, insufficient data
Fair, improving
Fair, degrading
Fair, insignificant
Fair, insufficient data
Poor, improving
Poor, insignificant
Poor, insufficient data
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trend determination. The St. Johns River from Palatka north to Picolata had variable water quality. In Palatka **(SJP)** and at Rice Creek **(SJRCC)**, the river had good water quality but no significant trends. At Rice Creek (**SAVRICNO**), the river had good quality, but had insufficient data for trend analysis. The St. Johns River at channel marker 37 **(SJM37)** and off Racy Point **(SRP)** had fair water quality and insignificant trends. North of this area (**SAVSCRAO**), the river had good quality but insufficient data for trends.

There are several tributaries to the St. Johns River near Palatka. Rice Creek at SR 100 **(LSJ918)** had good water quality and no significant trend, although at its mouth **(RCB),** the creek had poor but improving water quality, resulting from lower concentrations of turbidity and nitrogen. Simms Creek **(SIM),** which drains to Rice Creek, had good water quality but no significant trend. Dog Branch **(DBR)** had poor water quality and an insignificant trend. The Hasting Drainage District **(OHD)** had fair and improving water quality, due to decreasing concentrations of chlorophyll *a*, total suspended solids, nitrogen, and turbidity. Deep Creek **(DPB)** had fair but degrading water quality. Sixteen Mile Creek (**16MCRK**) had good water quality, but it had insufficient data for trend determination. Moccasin Branch on SR 13 **(MOB)** had fair water quality but no significant trend. Sixmile Creek **(SMC)** joins the St. Johns River north of Picolata, and it had fair water quality and an insignificant trend. The St. Johns River at marker 25 **(SJCM25)** had good water quality with no significant trend.

Estuarine conditions predominate in the St. Johns River north of Green Cove Springs, so sites located in that stretch of the river were analyzed as estuarine sites, using the TSI. The sites in the St. Johns River from Green Cove to Piney Point had fair water quality. The St. Johns River at Green Cove **(SJSR16)** had no significant trend, while Hallowes Cove **(HCC)** and Hibernia Point **(SJRHBP)** both had improving trends due to decreasing nitrogen and chlorophyll *a* concentrations. Julington Creek, at its mouth **(20030153),** had an insignificant trend, while the St. Johns River at Mandarin Point (**MP72**) had improving water quality. Neither Beauclairc Bluff **(JAX SJR30)** nor the Bolles School (**SAVBOLSO**) had sufficient data for trend assessment. Piney Point **(JAX SJR40)** had an improving trend. Farther north, the river near the Jefferson Smurfit plant **(JAX SJR17)** had good water quality and an insignificant trend. Moncrief Creek **(20030115)** had fair but declining water quality due to increasing concentrations of chlorophyll *a* and phosphorus. The St. Johns River, at marker 34 (**JAX SJR04**) and at marker 1 (**JAX SJR01**), had good water quality, but had insignificant and insufficient data for trends, at each respective site.

Many St. Johns River tributaries were sampled for this assessment. Peters Creek **(PTC)** is one such tributary, and it had fair water quality and an insignificant trend. Governors Creek (**GC16**) had poor water quality with insufficient data for trend analysis. Black Creek is a major tributary, and both the south **(BSF)** fork and the creek at Highway 209 **(BLC)** had good but declining water quality, due to increasing concentrations of total suspended solids and chlorophyll *a*. The North Fork **(NBC)** also had good quality but an insignificant trend. Swimming Pen Creek **(SPCR)** drains to Doctors Lake, and it had fair water quality with an insignificant trend. Doctors Lake **(DTL)** had poor but improving water quality, due to decreasing concentrations of total nitrogen. The other site on Doctors Lake (**SAVDRLKO**) had poor water quality and insufficient data for trends. Big Davis Creek and Durbin Creek are tributaries to Julington Creek. Durbin Creek **(LSJ087)** had fair water quality with no significant trend, while Big Davis Creek **(LSJ099)** had good water quality but insufficient data to determine a trend. Both the Ortega River at Collins Road **(20030349)** and Cedar Creek at Blanding Boulevard **(20030083)** had fair water quality, but insignificant trends. Little Haw Creek **(LSJ070)**, located south of Crescent Lake, had good quality with an insignificant trend. The Haw Creek outlet at Dead Lake **(HAW)** had poor water quality and no significant trends.

Some of the lakes in the LSJRB were sampled as well. There were three sites on Crescent Lake: middle of the lake (**GF33**), mid-lake (**SAVCRL20**), and at the outlet (**CRESLM**). All had fair water quality but insufficient data for trends. Georges Lake **(20030400)** had good water quality but an insignificant trend. Lake Sheelar **(SHEEL)** had good but degrading water quality, due to increasing nitrogen concentrations. Lakes Geneva **(GEN)** and Winona **(WIO)** had good water quality and insignificant trends. Lake Disston **(CLD)** had good and improving water quality, due to decreasing chlorophyll *a* concentrations. Kingsley Lake (**20030412**) had good water quality and an insignificant trend.

Overall, 28% of stream sites sampled in the LSJRB basin had good water quality, 17% had poor water quality and 56% had fair water quality (Figure 5). Six percent of the stream sites had a degrading trend, while 11% were improving (Figure 6). The majority of streams (72%) had an insignificant trend, while 11% lacked sufficient data for a trend analysis. All of the blackwater stream sites in LSJRB had good quality, but two had degrading trends and two others had insignificant trends.

Sixty-nine percent of the lake sites sampled in LSJRB had good water quality; 31% had fair water quality, and none of the sites had poor water quality (Figure 9). Nevertheless, 6% of the lake sites had a degrading trend, while 6% had an improving trend (Figure 10). The majority of sites had an insignificant trend (56%) or insufficient data to determine a trend (31%). It is important to point out that most of the mainstem river sites from Palatka to Green Cove Springs were evaluated using the TSI and not the WQI (Map 5).

Finally, several estuarine sites were sampled in the LSJRB. All mainstem river sites from Green Cove Springs northward were analyzed as estuarine sites using the TSI, due to the tidal influence on the river. The majority of estuarine sites in the basin had fair water quality (60%), while 20% had good quality and 20% had poor water quality (Figure 11). Seven percent had degrading trends, while 33% had improving trends (Figure 12). The majority of sites had either an insignificant trend (27%) or did not have sufficient data (33%) for trend analysis.

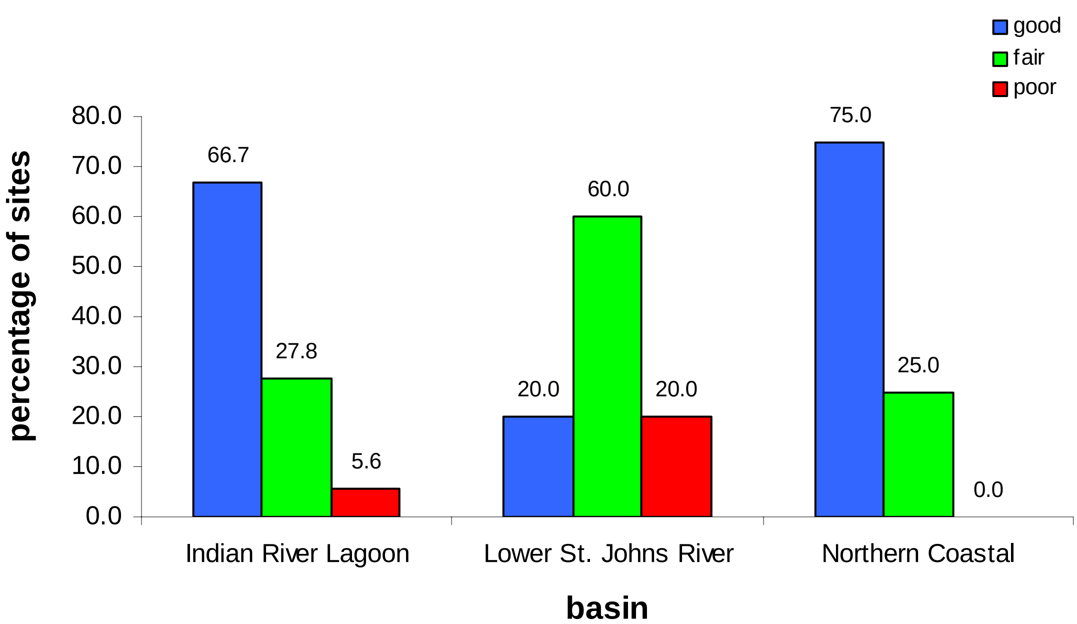



Figure 11. Estuarine status for selected basins

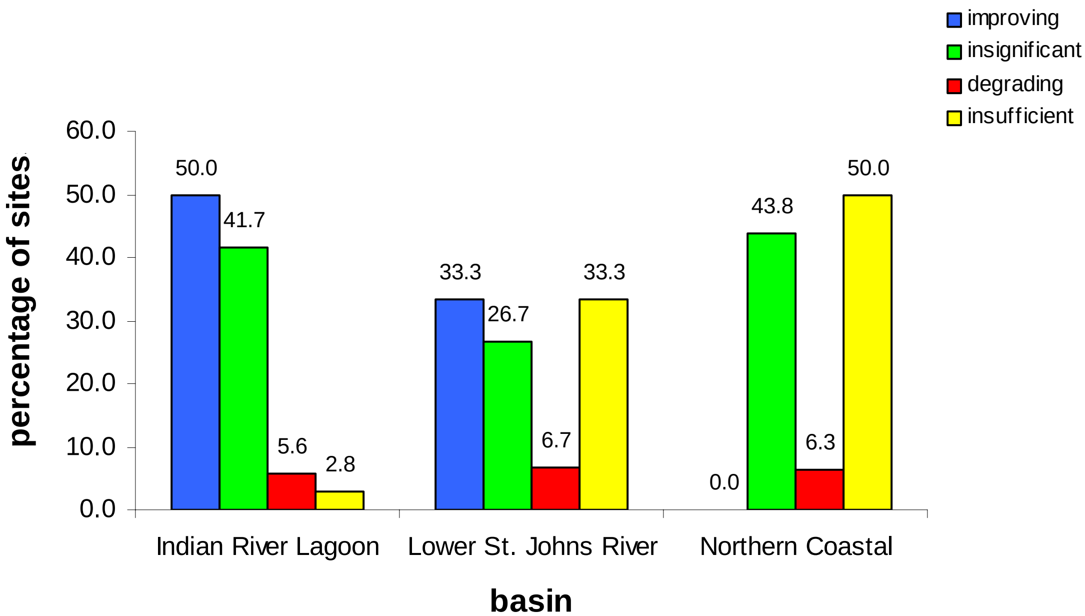


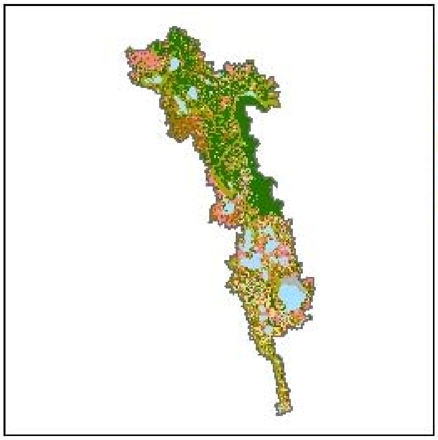

Figure 12. Estuarine trends for selected basins

According to Deuerling and Cooner (1995), the major problem in the LSJRB appears to be stormwater runoff. They claim that storm water can deposit 80 to 95% of the heavy metals that reach the river, as well as a majority of the coliforms, disease organisms, and viruses that reach the river. In addition, excessive freshwater and oxygen-demanding substances are brought into the river by storm water.

## OCKLAWAHA BASIN

The Ocklawaha Basin (OB) comprises approximately 2,115 mi² in the southwestern portion of SJRWMD, and the predominant land cover is upland forests (Figure 13). The headwaters of the Ocklawaha River are the Ocklawaha chain of lakes and the Palatlakaha River in northern Polk County. The Orange Creek Basin is also part of the OB. The Orange Creek Basin is 600 mi², and its main feature is Paynes Prairie.

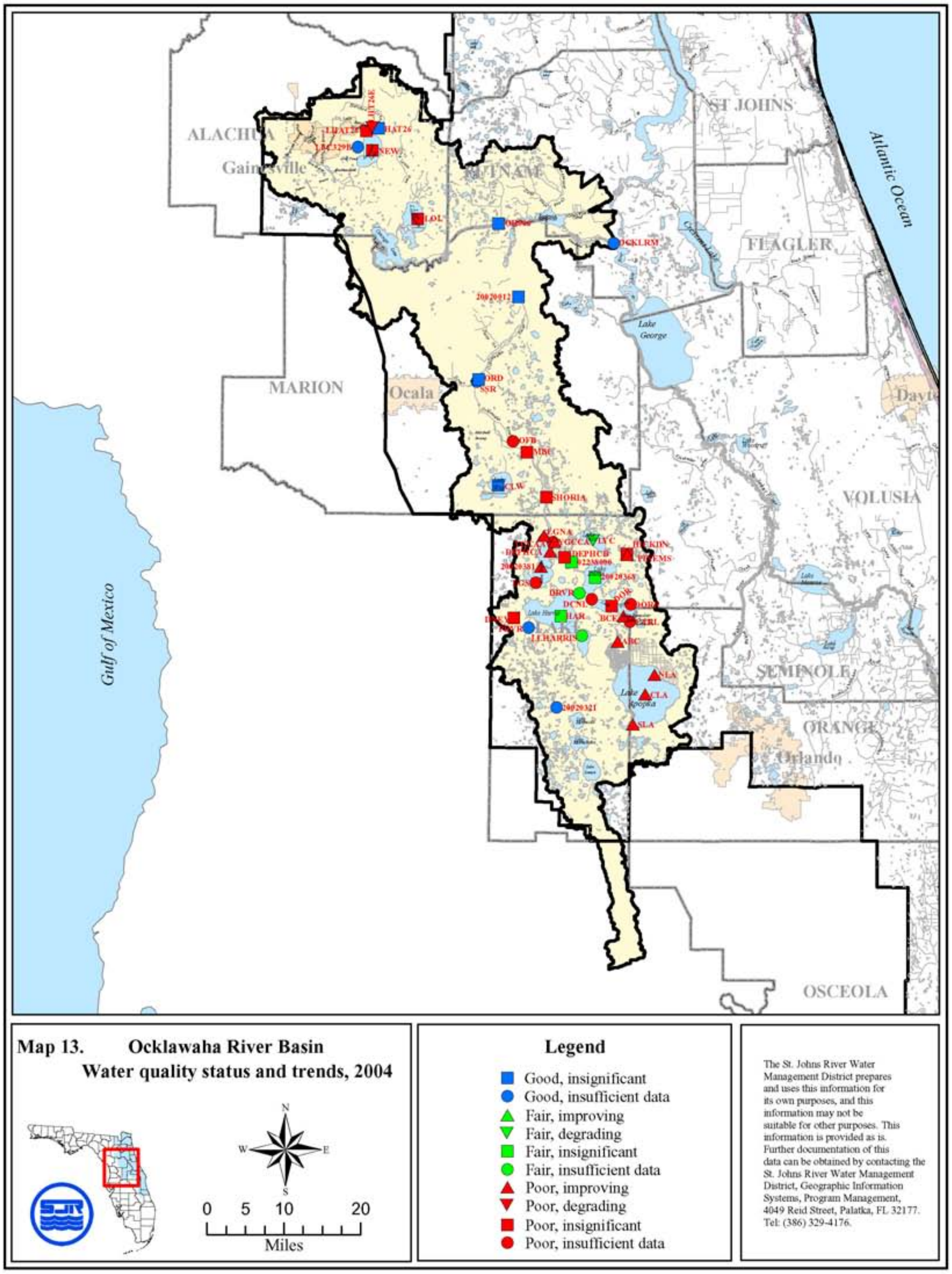
Two blackwater, 19 lake, and 21 stream sites were sampled in this basin (Map 13). Three stations were in Lake Apopka: the southernmost lake station **(SLA)**, the center lake station **(CLA)**, and the northern station **(NLA)**. Although all three had poor water quality, decreasing nutrient concentrations



| General Land Use Classes | Area, mi² | % of area |
|---|---|---|
| Forest | 680.676 | 32.19% |
| Wetland | 418.328 | 19.78% |
| Urban | 310.268 | 14.67% |
| Agriculture | 282.391 | 13.35% |
| Water | 272.554 | 12.89% |
| Upland nonforested | 106.547 | 5.04% |
| Barren land | 23.382 | 1.11% |
| Transportation, Communication, Utilities | 18.623 | 0.88% |
| <Null> | 0.067 | 0.00% |
| | 2114.784 | |

Figure 13. Ocklawaha River Basin land cover (2000)

(especially for phosphorus) and increasing Secchi depth are most likely driving the improving trends. The Apopka Beauclair Canal **(ABC)** and Lake Beauclair East **(BCE)** both had poor but improving water quality. Nearby, Cherry Lake (**20020321**) had good water quality, but it had insufficient data for trends. Lake Dora **(DOR)** had poor water quality with no significant trend. The east pool of Lake Dora (**DORE**), the canal between Dora and Eustis (**DCNL**), and Lake Carlton (**CARL**) all had poor water quality and insufficient data for trend analysis. These lakes are considered eutrophic (Fulton 1995). The Dead River between Eustis and Harris (**DRVR**) and Little Lake Harris (**LLHARRIS**) both had fair water quality, but had insufficient data for trend analysis. Lake Harris **(HAR)** had fair water quality with an insignificant trend. Lake Denham East **(DNEY)** had poor water quality with no significant trend. The Palatlakaha River (**PRVR**) had good quality with insufficient data for trend analysis. Lake Eustis **(20020368)** had fair water quality with no significant trend, as did one of the sites, on Haynes Creek, that connects Lake Eustis to Lake Griffin **(02238000)**. Another site (**DEPHCA**) on Haynes Creek had poor quality with an improving trend, due to decreasing concentrations of turbidity, chlorophyll *a*, nutrients, and total suspended solids. Another site on Haynes Creek, upstream of discharge (**DEPHCB**), had poor water quality with an insignificant trend. Hicks Ditch (**HICKDN**), which drains to Lake Eustis, had poor water quality with an insignificant trend. Pine Meadows (**PINEMS**), which is nearby, also had poor water quality, but it had an improving trend. Lake Griffin **(LGNA, 20020381)** had poor water quality but improving trends, due to lower concentrations of




**Map 13. Ocklawaha River Basin**
**Water quality status and trends, 2004**

nutrients and chlorophyll *a*. A third site on Lake Griffin (**LGS**) had poor water quality with insufficient data for trend analysis. Lake Yale **(LYC)** had fair but degrading water quality, due to increasing concentrations of nutrients and chlorophyll *a*. One of the sites on the canal that connects Lake Yale to Lake Griffin **(YGCCA)** had poor, but improving water quality, due to decreasing nutrient and chlorophyll *a* concentrations, while the other site (**YGCAA**) had poor water quality and insufficient data for trend analysis. Lake Weir **(CLW)** had good water quality with no significant trend.

Farther downstream on the Ocklawaha River, the site at C-231 canal **(SHORIA)** had poor water quality and an insignificant trend. Even farther downstream, at Moss Bluff, the upstream side of the lock **(MBU)** had poor water quality and an insignificant trend. The Ocklawaha below Moss Bluff (**OFB**) had poor water quality with insufficient data for trend determination. The Ocklawaha River at SR 40 **(ORD)** had good water quality but an insignificant trend. The nearby Silver River (**SSR**) had good water quality but had insufficient data for trend analysis. The Ocklawaha River at County Road (CR) 316 **(20020012)** and a tributary to it, Orange Creek at Highway 21 **(OR006)**, both had good water quality but an insignificant trend. The Ocklawaha River near its mouth (**OCKLRM**) had good water quality but had insufficient data for trend analysis.

Several sites were sampled in and around the Gainesville area. Lake Lochloosa **(LOL)** and Newnans Lake **(NEW)** both had poor water quality with no significant trends. The two sites on Little Hatchet Creek **(LHAT26, LHT26E)** had poor water quality and an insignificant and degrading trend, due to increasing concentrations of total organic carbon, nitrate, and nitrogen, respectively. The Hatchet Creek site **(HAT26)** had good water quality but an insignificant trend, while Lake Forest Creek (**LFC329B**) had good water quality but insufficient data for trend analysis.

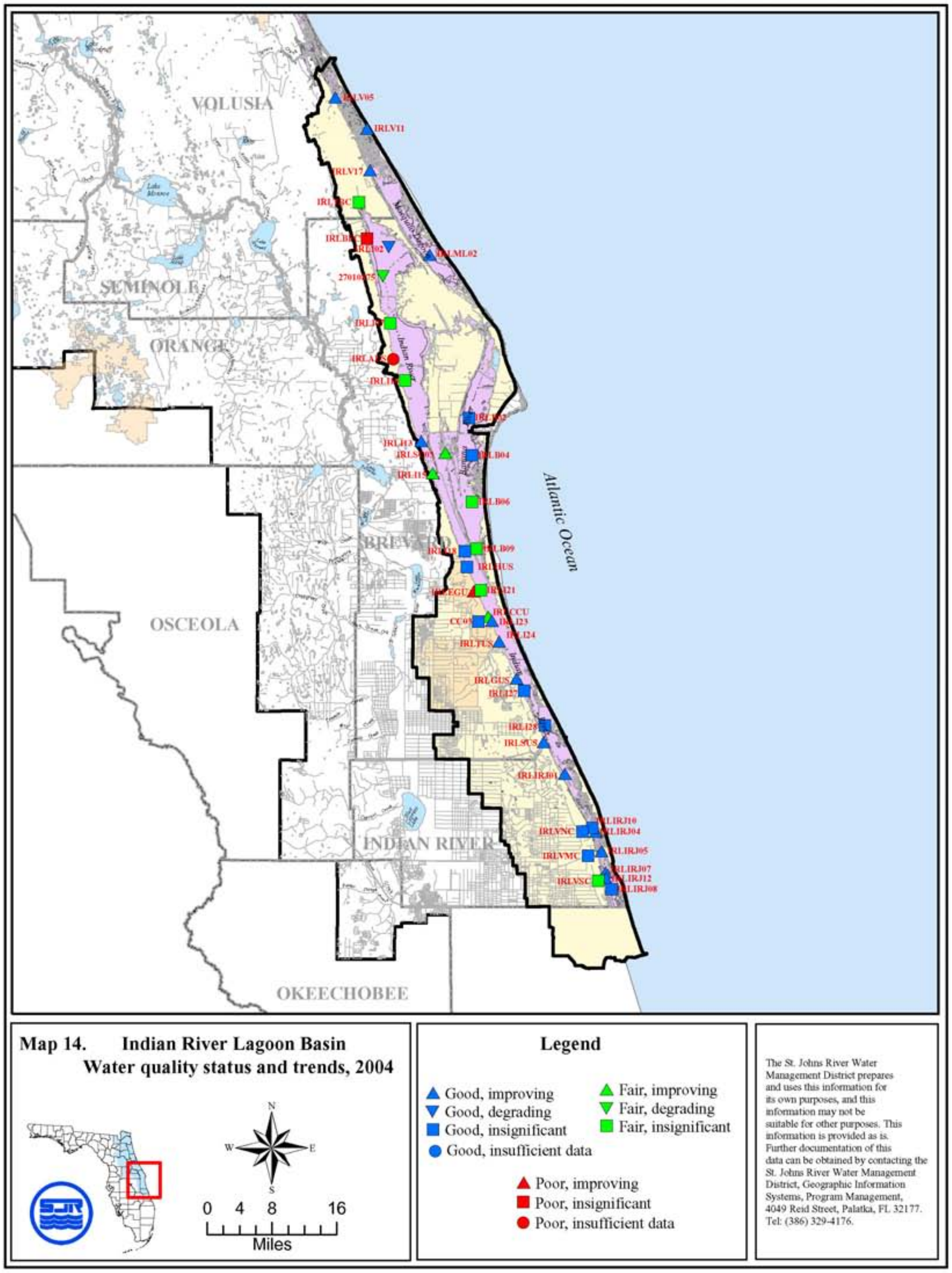
Overall, 33% of stream sites in the OB had good water quality, 10% had fair water quality, and 57% had poor water quality (Figure 5). The majority of stream sites had an insignificant trend (43%) or did not have enough data (38%) to determine a trend (Figure 6). Fourteen percent were improving, while 5% were degrading. FDEP (2001) found that 66% of stream miles were impaired for nutrients and that the most common stressors in this basin, for streams, were dissolved oxygen, nutrients, fecal and total coliforms, and lead.

A majority (68%) of the lake sites had poor water quality (Figure 9). This corroborates FDEP’s (2001) finding that 70% of lakes were impaired for nutrients. FDEP also indicated that the most significant water quality problems were low and supersaturated concentrations of dissolved oxygen and nutrient enrichment. Only 11% of the sites had good water quality, while 21% had fair water quality. Thirty-two percent of the lake sites were improving and 5% were degrading (Figure 10). Thirty-seven percent had an insignificant trend, while 26% of the sites had insufficient data for trend determination.

Surface waters in the Ocklawaha Basin have been affected by farming, flood control, and the construction of navigational canals. In the Orange Creek Basin, converted wetlands for agricultural use have diminished water quality and habitat. According to Fulton (1995), eutrophication of the surface waters was the result of domestic, industrial, and agricultural wastes discharged directly to receiving waters; destruction of aquatic habitats; and channelization. In past decades, waters in the Ocklawaha Basin have had poor quality, due to the hypereutrophic conditions found in the Ocklawaha chain of lakes. Historically, Lake Apopka was clear, densely vegetated, and well known for its sports fishery. SJRWMD is currently restoring thousands of acres of muck farms, adjacent to Lake Apopka and the Ocklawaha chain of lakes, to aquatic and wetland habitat. These activities include removing internal and external nutrient loads, restoring wetland and river habitats, and managing water levels to mimic the natural hydrologic cycle (FDEP 2001). After years of decline, SJRWMD restoration efforts appear to be improving water quality in the lake. Basinwide, these efforts appear to be paying off, as the Ocklawaha Basin has the highest percentage of improving stream and lake sites when compared to the other basins.

## INDIAN RIVER LAGOON BASIN

The Indian River Lagoon Basin (IRLB) is comprised of three major water bodies: Mosquito Lagoon, Banana River, and the Indian River (Map 14). It is one of the more diverse estuaries in North America, providing 50% of the east Florida fish catch and 90% of Florida's clam harvest. Healthy seagrass beds are vital to maintaining this level of productivity. Farms in the area produce world-famous Indian River Citrus. The economic impact of lagoon activities is estimated to be $730 million annually. The IRLB receives salt water through inlets to the ocean, freshwater from rain, groundwater seepage, and surface water runoff; and discharges from tributaries and drainage canals. Since 1916, the lagoon's watershed drainage area has increased from 572,000 acres to more than 1.4 million acres. The concomitant increase in freshwater inputs has had a major effect on the lagoon. Sedimentation is a concern in the basin,




**Map 14. Indian River Lagoon Basin Water quality status and trends, 2004**

and it negatively impacts seagrass beds and benthos. Although wastewater treatment plants have discharged to the lagoon in the past, the 1990 IRL No Discharge Act has reduced these inputs. In the 1950s and 1960s, over 75% of the salt marsh in the lagoon was diked for mosquito control, eliminating a vital nursery function. One of the goals of the IRL Surface Water Improvement and Management (SWIM) plan is the reconnection and restoration of these wetlands. The lagoon comprises almost 1,162 $mi^2$ in SJRWMD, and the predominant land cover is water (Figure 14).

| General Land Use Classes | Area, $mi^2$ | % of area |
|---|---|---|
| Water | 335.033 | 28.83% |
| Urban | 239.580 | 20.62% |
| Wetland | 182.866 | 15.74% |
| Agriculture | 161.005 | 13.86% |
| Forest | 108.739 | 9.36% |
| Upland nonforested | 102.516 | 8.82% |
| Transportation, Communication, Utilities | 20.750 | 1.79% |
| Barren land | 8.677 | 0.75% |
| <Null> | 0.142 | 0.01% |
| | 1161.949 | |

Figure 14. Indian River Basin land cover (2000)

Five stream sites and 36 estuarine sites were sampled in the IRLB (Map 14). In the Indian River, the Vero South Canal **(IRLVSC)** had fair water quality with no significant trend. The lagoon offshore of the Vero Canal **(IRLIRJ12 IRLIRJ07)** had good and improving water quality. Another lagoon site in the area (**IRLIRJ08**) had good water quality but an insignificant trend. The Vero Main Canal **(IRLVMC**) had good water quality and an insignificant trend, while the lagoon offshore of it **(IRLIRJ05)** had good and improving water quality. The Vero North Canal **(IRLVNC)** had good water quality with an insignificant trend, and the lagoon off that area **(IRLIRJ04, IRLIRJ10)** had good water quality with an improving trend and an insignificant trend, respectively, just off the canal. Farther north, the lagoon off Spratt Point **(IRLIRJ01)** had good and improving water quality. Decreasing concentrations of chlorophyll *a* and total phosphorus appeared to be responsible for the IRLIRJ series of sites that had improving water quality.

The lagoon off the Sebastian River **(IRLSUS)** had good and improving water quality, due to decreasing concentrations of nutrients and chlorophyll *a*. The lagoon near channel marker 55 (**IRLI28**) and near Grant Farm Island **(IRLI27)** both had good water quality and an insignificant trend. The lagoon off Goat Creek **(IRLGUS)** had good and improving water quality, due to decreases in concentrations of chlorophyll *a* and nitrogen. The lagoon at Turkey Creek (**IRLTUS**) had good and improving water quality, due to decreasing chlorophyll *a* concentrations. The lagoon offshore of this area (**IRLI24**) had good water quality but insufficient data for trend analysis. Crane Creek upstream (**CC03)** had good water quality with an insignificant trend, while the mouth of the creek **(IRLCCU)** had fair and improving water quality, due to decreasing concentrations of total nitrogen. The lagoon offshore of Crane Creek **(IRLI23)** had good and improving water quality, due to phosphorus decreases. The Eau Gallie River mouth **(IRLEGU)** had poor but improving water quality, due to decreases in chlorophyll *a* and nitrogen concentrations, whereas the lagoon offshore of the Eau Gallie **(IRLI21)** had fair water quality with an insignificant trend. Horse Creek **(IRLHUS)** had good water quality with an insignificant trend.

The lagoon just south of Pineda Causeway **(IRLI18)** had good water quality with no significant trend. This area is where the Banana River branches off. The Indian River, off Rockledge treatment plant discharge **(IRLI15)**, had fair and improving water quality due to decreases in chlorophyll *a*. The lagoon at the SR 528 bridge **(IRLI13)** had good and improving water quality, due to decreases in the concentrations of phosphorus and chlorophyll *a*. The NASA causeway area **(IRLI10)** had fair water quality with an insignificant trend. Farther north at Addison Creek (**IRLAUS**) the quality was poor with insufficient data for trend analysis. The area around Highway 42 **(IRLI07)** had fair water quality with no significant trends. The lagoon near the Haulover Canal **(27010875)** had fair but degrading water quality, due to increasing concentrations of total phosphorus. Big Flounder Creek **(IRLBFC)** had poor water quality with no significant trend. The Indian River offshore of IRLBFC **(IRLI02)** had good but degrading water quality. The northernmost site on the lagoon **(IRLTBC)** had fair water quality with an insignificant trend.

In the Banana River, the southernmost site **(IRLB09)** at the confluence with the Indian River and the Banana River **(IRLB06)** both had fair water quality with no significant trend. The Sykes Creek area (**IRLSCO3**) had fair and improving water quality, due to decreasing concentrations of chlorophyll *a*.

The Banana River near the SR 520 causeway **(IRLB04)** and at **(IRLB02)** had good water quality with no significant trends.

The southernmost site **(IRLML02)** on the Mosquito Lagoon had good water quality and an improving trend, mainly due to decreasing phosphorus concentrations. The Mosquito Lagoon at Oak Hill Dock **(IRLV17)**, farther north **(IRLV11)**, and at channel marker 47 **(IRLV05)** all had good and improving water quality, due to decreasing concentrations of phosphorus and chlorophyll *a*. These results seem to corroborate those of Sigua et al. (1999) and indicate that the Mosquito Lagoon exhibits good water quality, mainly due to the pristine habitat in the area, reduced urbanization, and a negligible amount of agricultural discharges.

Overall, estuarine water quality in IRLB was mostly good (67%), and only 28% of the stations sampled had fair water quality, while 6% had poor quality (Figure 11). Fifty percent of the sampled estuarine sites were improving, while 6% were degrading, so more sites were improving than were degrading (Figure 12). Forty-two percent of estuarine sites had an insignificant trend while 3% had insufficient data to determine a trend.

## NORTHERN COASTAL BASIN

The Northern Coastal Basin (NCB) is the coastal area that includes the Intracoastal Waterway (ICW) from Ponte Vedra south to the Spruce Creek in Volusia County. The basin is about 733 $mi^2$, and the predominant land cover is upland forests (Figure 15). The Tomoka River, Spruce Creek, and Pellicer Creek, with parts of the Guana-Tolomato-Matanzas system, are classified as Outstanding Florida Waters.

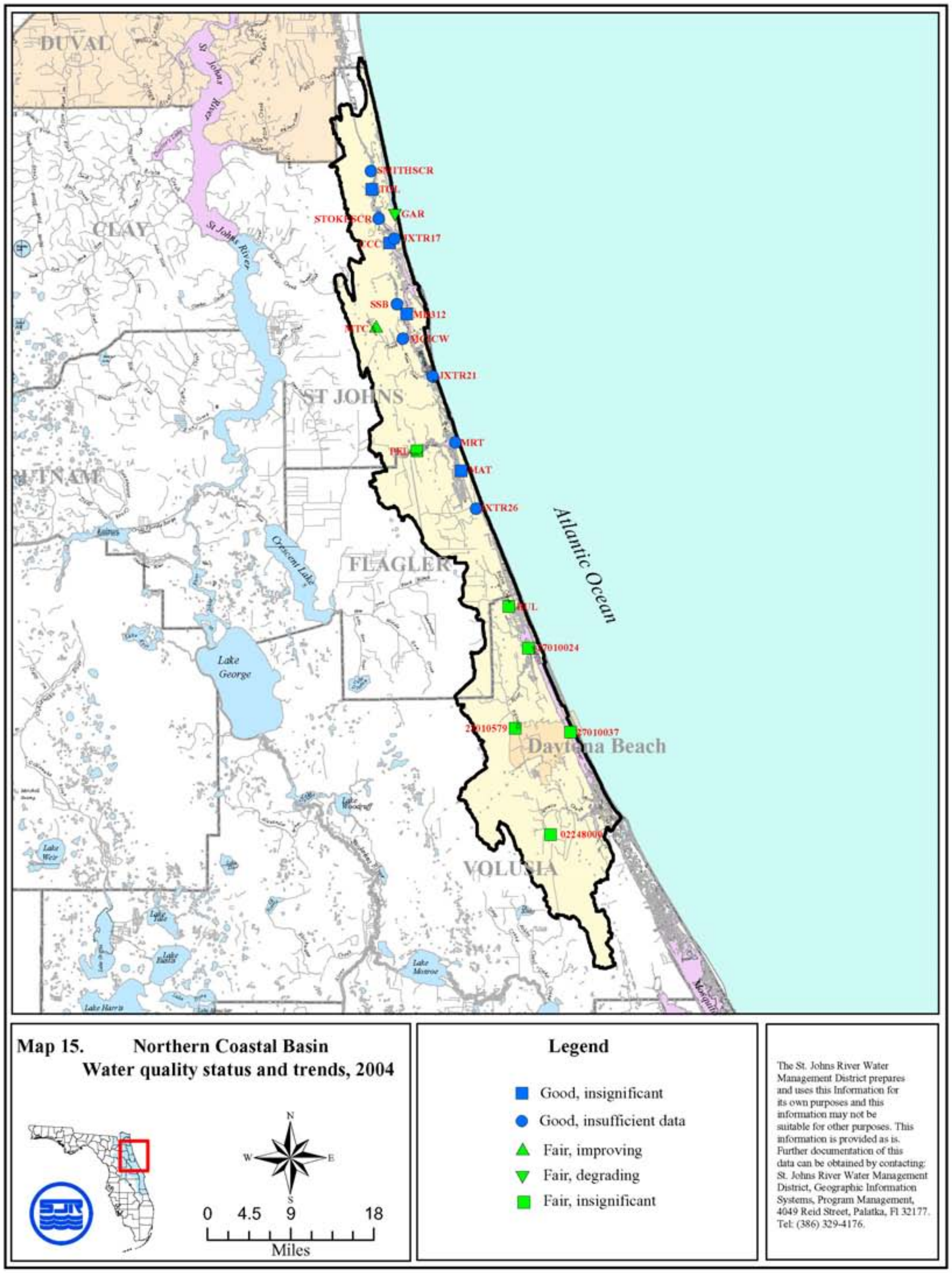
Sixteen estuarine sites and four stream sites were assessed (Map 15). The southernmost sites all had fair water quality and an insignificant trend. These sites were: Spruce Creek **(02248000)**, the Halifax River (**27010037**), the Tomoka River **(27010579)**, the Tomoka River at the Old Dixie Highway Bridge (**27010024**), and Bulow Creek **(BUL)**. The ICW at Fox Cut **(JXTR26)** had good water quality but insufficient data for trend analysis, while the ICW at the Matanzas Inlet area **(MAT)** had good water quality and an insignificant trend. The ICW at the confluence with Pellicer Creek **(MRT)** had good water quality with insufficient data for trends. Pellicer Creek **(PEL)** had fair water

| General Land Use Classes | Area, mi² | % of area |
|---|---|---|
| Forest | 235.101 | 32.09% |
| Wetland | 226.652 | 30.94% |
| Urban | 146.001 | 19.93% |
| Water | 50.661 | 6.92% |
| Upland nonforested | 39.302 | 5.36% |
| Transportation, Communication, Utilities | 16.792 | 2.29% |
| Agriculture | 14.193 | 1.94% |
| Barren land | 3.817 | 0.52% |
| <Null> | 0.080 | 0.01% |
| | 732.615 | |

Figure 15. Northern Coastal Basin land cover (2000)

quality but an insignificant trend. Farther north, the ICW, both at Crescent Beach **(JXTR21)** and at Moultrie Creek **(MCICW)**, had good water quality but did not have enough data for trend analysis. Farther upstream, Moultrie creek **(MTC)** had fair and improving water quality, due to decreasing phosphorus concentrations. The ICW at the CR 312 bridge **(MR312)** had good water quality but no significant trend, while the San Sebastian River **(SSB)** had good water quality but insufficient data for trend detection. Moving farther north, the site at the confluence of the ICW and the Guana River **(JXTR17)** had good water quality but insufficient data for trends. However, the Guana River proper (**GAR)** had fair but degrading water quality, due to increasing concentrations of nutrients and chlorophyll *a*. Farther north, tributaries to the ICW, including Casa Cola Creek **(CCC)**, had good water quality but an insignificant trend, while Stokes **(STOKESCR)** and Smiths creeks **(SMITHSCR)** both had good water quality, but insufficient data for trends. The ICW in this area **(TOL)** had good water quality, although no significant trends were apparent.

Overall, NCB sites appear to have the best water quality of all the basins. Seventy-five percent of the estuarine sites sampled had good water quality, 25% had fair quality, and there were not any poorly rated sites (Figure 11). The basin has only recently been sampled, as 50% of those estuarine sites did not have at least 10 years of data for a trend analysis, while 44% had an insignificant trend (Figure 12). None were improving and 6% were degrading.




**Map 15. Northern Coastal Basin Water quality status and trends, 2004**

## DISTRICTWIDE RESULTS FOR ALL WATER BODY TYPES

Results were combined for water body types over all basins (Figure 16 and 17, see also Appendix B, Map 6).

Results were also combined over all basins and water body types (Figure 18 and 19). These figures include the 2004 results for reference.

### Springs

Only one spring site, Blue Springs in Volusia County, was evaluated, and it had good, but degrading water quality.

### Blackwater streams

Thirteen blackwater stream sites were evaluated, and with one exception, all had good water quality. One was improving, nine had an insignificant trend, two were degrading, and one had insufficient data. Blackwater stream sites were located in the lower and middle St. Johns and St. Marys river basins.

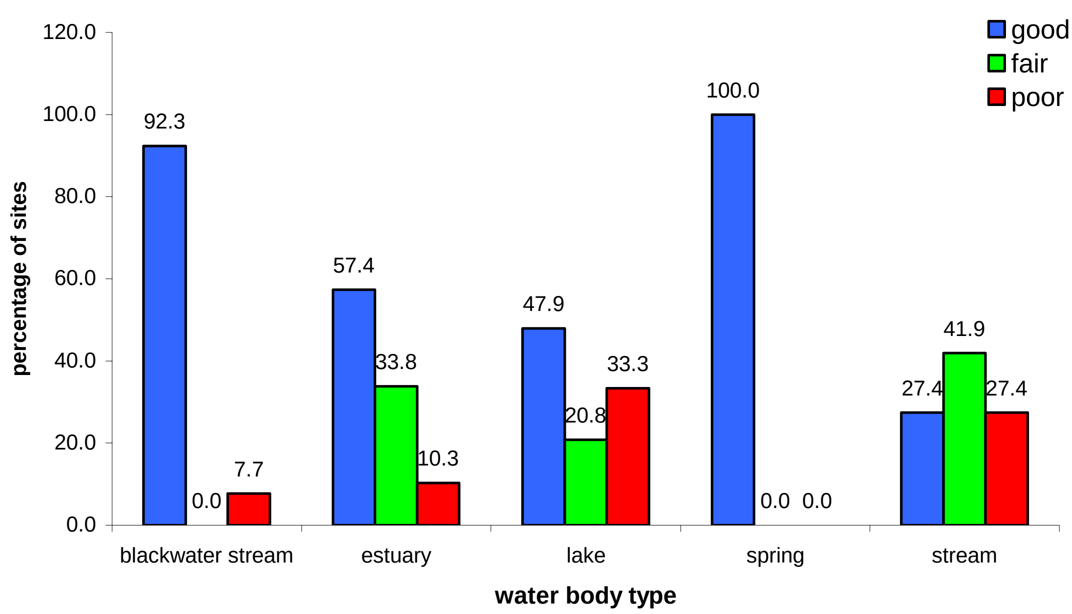



Figure 16. Status results by water body type over all basins

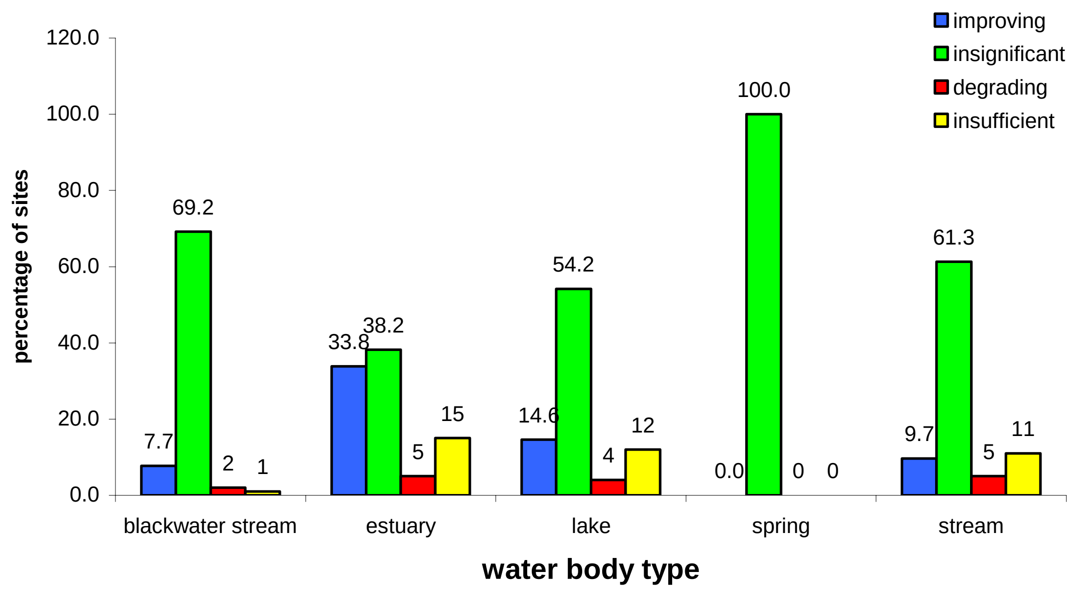



Figure 17. Trend results by water body type over all basins

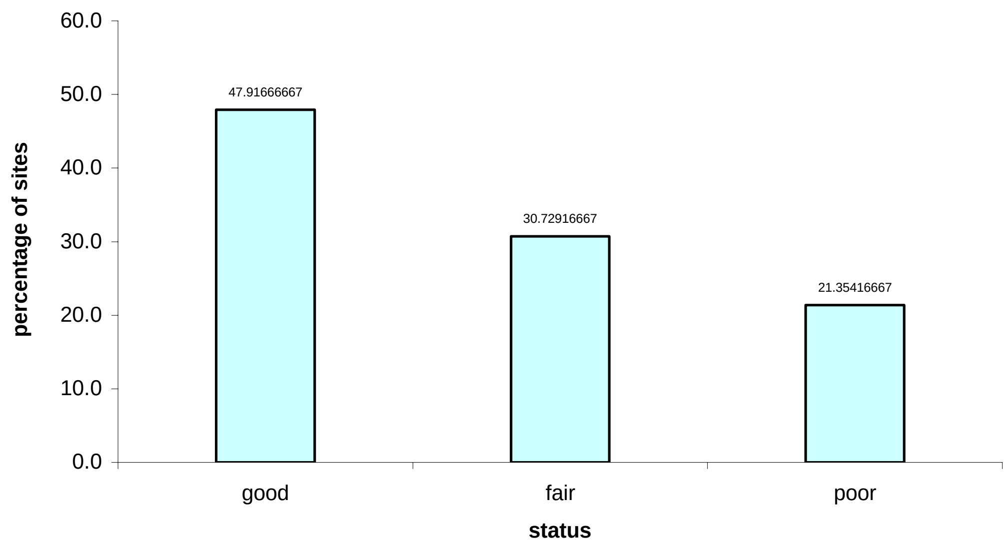



Figure 18. Status results over all basins

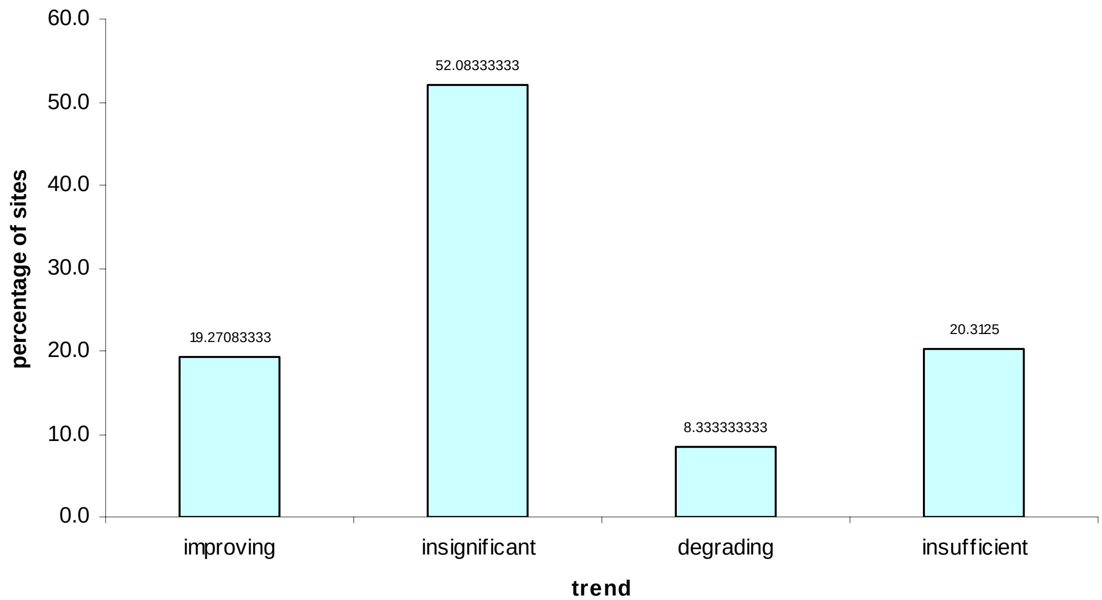



Figure 19. Trend results over all basins

**Lakes**

Forty-eight lake sites were evaluated; 21 had good, 11 had fair, and 16 had poor water quality. Eleven lake sites had insufficient data to determine a trend, while 26 had insignificant trends, seven were improving, and four were degrading. Most of the lake sites were located in the lower St. Johns and Ocklawaha river basins.

**Streams**

Sixty-two stream sites were evaluated, and 26 had fair, 19 had good, and 17 had poor water quality. Thirteen had insufficient data for trends; 38 had insignificant trends; five were degrading; and six were improving. Most of the stream sites were located in the Ocklawaha and lower St. Johns river basins.

## Estuaries

Sixty-eight estuarine sites were evaluated; 39 had good, 23 had fair, and six had poor water quality. Fourteen had insufficient data for trend evaluation, while 26 were insignificant, 23 were improving, and five were degrading. The majority of estuarine sites were in the Indian River and Northern Coastal basins.

# SUMMARY

Springs and blackwater streams had the highest percentage of sites with good water quality (Figure 16). However, relatively few of these water types were sampled. Of the other water body types, estuaries had the highest percentage of sites with good water quality (57%), while streams had the lowest (27%). Streams had the most sites with fair quality (42%), while lakes had the fewest (21%). Lakes had the highest percentage of poor sites (33%), while estuaries had the lowest (10%).

Districtwide, 48% of the sites assessed had good water quality, 31% had fair quality and 21% had poor quality (Figure 18). However, the majority of the poor sites were located in lakes, many of which were in the Ocklawaha basin.

Estuarine sites had the highest percentage of improving sites (34%) followed by lake sites (15%), stream sites (10%), and blackwater stream sites (8%, Figure 17). Not counting the single spring site, streams and estuaries had the highest percentage of sites that were degrading (5%), followed by lakes (4%). A large number of sites had no significant trend or insufficient data to determine a trend.

Of all basins and water body types, approximately 19% of sampled sites showed an improving trend, while almost 8% showed a degrading trend (Figure 19). The majority either had no significant trend (52%) or did not have enough data to calculate a trend (20%).

Interpreting results from this assessment is complicated by the fact that the sites were not randomly chosen and, therefore, may not adequately represent the basins they are in. Although a station can be considered to represent and adequately characterize the water body that it is located in, it is statistically unsupportable to state that the results from a series of stations within a particular basin actually represent all the water quality in that basin. Fortunately, most of the stations are located in major water bodies, which comprise the majority of the surface water within the areas of interest.

In summary, the St. Johns River appeared to have good water quality upstream, but as it flowed north, the quality degraded somewhat. For the most part, the river had fair water quality from Lake Jesup to the mouth. Rice Creek and Dog Branch were the only improving tributaries, while other tributaries were degrading or had no trend. Lake Jesup had poor water quality, as did Rice Creek at its mouth. The upper reaches of the Ocklawaha River had poor quality, but there were significant improving trends in lakes and streams affected by SJRWMD restoration programs. As the Ocklawaha flowed north, it had improved water quality. The Indian River lagoon had mostly good or fair water quality, with a few poor tributaries. While the Banana River had similar water quality, all of the Mosquito Lagoon sites had good water quality. The IRLB had many significant trends, most of which appeared to be improving. The NCB sites appeared to have mostly good water quality, as did sites in the Nassau River and St. Marys River basins. Many sites had insufficient data to determine trends, and for many other sites, there were no significant trends.

This assessment was designed to provide a general overview of water quality throughout SJRWMD. Water quality was determined through a constituent concentration analysis. The most recent 5 years of data were used to determine status, and the most recent 15 years of data were used to determine trends. The assessment was not designed to determine the causes of poor water quality, nor was it to determine the causes of degrading or improving trends. Nevertheless, there are some general factors that may have affected water quality during the study period. SJRWMD received substantial rainfall during the 2004 hurricane season, which may have affected water quality as the result of increased stormwater runoff from the surrounding lands. Continued land development can reduce water retention times in wetland areas, and thus lead to a decrease in the water quality from nonpoint sources. A variety of factors, such as these, would merit a separate assessment to determine impacts on water quality throughout SJRWMD.

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# APPENDIX A—STATION LOCATIONS AND RESULTS TABLES

Table A1. Station locations sorted by major basin

| Station | Latitude | Longitude | Station Location | Basin | Water body Type |
|---|---|---|---|---|---|
| 27010875 | 284113.05 | 804844.73 | INDIAN RIVER AT INTRACOASTAL WATERWAY (ICW) CM 12 NEAR HALOV | INDIAN RIVER LAGOON | estuary |
| CC03 | 280407.72 | 803716.31 | INDIAN RIVER LAGOON (IRL) CRANE CREEK | INDIAN RIVER LAGOON | stream |
| IRLAUS | 283221.70 | 804733.50 | IRL AT ADDISON CREEK AT U.S. 1 | INDIAN RIVER LAGOON | stream |
| IRLB02 | 282601.00 | 803822.00 | IRL IN BRL CM23 MIDWAY BETWEEN NASA AND 528 CAUSEWAYS | INDIAN RIVER LAGOON | estuary |
| IRLB04 | 282200.00 | 803800.00 | IRL IN BRL EAST SIDE 1.0 KM NORTH OF SR 520 CAUSEWAY | INDIAN RIVER LAGOON | estuary |
| IRLB06 | 281700.00 | 803800.00 | IRL IN BRL CM4 8 KM NORTH OF PINEDA CAUSEWAY | INDIAN RIVER LAGOON | estuary |
| IRLB09 | 281156.00 | 803732.00 | IRL IN BRL 2KM SOUTH OF PINEDA CSWY WEST OF TORTOISE ISLAND | INDIAN RIVER LAGOON | estuary |
| IRLBFC | 284518.00 | 805042.00 | IRL AT BIG FLOUNDER CREEK AT END OF FLOUNDER CREEK ROAD | INDIAN RIVER LAGOON | estuary |
| IRLCCU | 280439.00 | 803608.00 | IRL AT CRANE CREEK AT U.S. 1 | INDIAN RIVER LAGOON | estuary |
| IRLEGU | 280725.00 | 803750.00 | IRL AT EAU GALLIE RIVER AT U.S. 1 | INDIAN RIVER LAGOON | estuary |
| IRLGUS | 275805.00 | 803241.00 | IRL AT GOAT CREEK AT U.S. 1 | INDIAN RIVER LAGOON | estuary |
| IRLHUS | 280959.72 | 803839.80 | IRL AT HORSE CREEK AT U.S. 1 | INDIAN RIVER LAGOON | estuary |
| IRLI02 | 284420.00 | 804802.00 | IRL NORTHWEST OF HAULOVER CANAL APPROXIMATELY 3.5 KM | INDIAN RIVER LAGOON | estuary |
| IRLI07 | 283612.00 | 804754.00 | IRL 1.8 KM SOUTH OF SR 406 NEAR WEST SHORE | INDIAN RIVER LAGOON | estuary |
| IRLI10 | 283004.00 | 804608.00 | IRL 2.8 KM SOUTH OF NASA CSWY WEST SIDE | INDIAN RIVER LAGOON | estuary |
| IRLI13 | 282334.00 | 804410.00 | IRL WEST SIDE 1.0 KM SOUTH OF SR 528 BRIDGE | INDIAN RIVER LAGOON | estuary |
| IRLI15 | 282006.00 | 804248.00 | IRL CENTER 2.3 KM SOUTH OF SR 520 WITHIN 0.5 KM OF ROCKLEDGE | INDIAN RIVER LAGOON | estuary |
| IRLI18 | 281140.00 | 803856.00 | IRL NEAR WEST SHORE 1.2 KM SOUTH OF PINEDA CAUSEWAY | INDIAN RIVER LAGOON | estuary |
| IRLI21 | 280730.00 | 803700.00 | IRL EAST OF MOUTH OF EAU GALLIE RIVER | INDIAN RIVER LAGOON | estuary |
| IRLI23 | 280412.00 | 803540.00 | IRL CENTER JUST SOUTH OF MELBOURNE CAUSEWAY | INDIAN RIVER LAGOON | estuary |
| IRLI24 | 280237.00 | 803431.00 | IRL CENTER JUST SOUTH OF POWERLINES 30 M EAST OF U.S. 1 | INDIAN RIVER LAGOON | estuary |
| IRLI27 | 275644.00 | 803146.00 | IRL AT CENTER OF ICW NEAR GRANT FARM ISLAND | INDIAN RIVER LAGOON | estuary |
| IRLI28 | 275301.00 | 802919.00 | IRL CENTER NEAR CHANNEL MARKER (CM) 55 NORTH OF SEBASTIAN INLET | INDIAN RIVER LAGOON | estuary |
| IRLIRJ01 | 274748.00 | 802656.00 | IRL AT CM70 OFF SPRATT PT SOUTH OF SEBASTIAN INLET WEST OF ICW | INDIAN RIVER LAGOON | estuary |
| IRLIRJ04 | 274133.00 | 802314.00 | IRL AT CM123 EAST OF ICW | INDIAN RIVER LAGOON | estuary |
| IRLIRJ05 | 273928.00 | 802232.00 | IRL AT CM135 EAST OF ICW | INDIAN RIVER LAGOON | estuary |
| IRLIRJ07 | 273711.00 | 802204.00 | IRL AT CM150 WEST OF ICW | INDIAN RIVER LAGOON | estuary |
| IRLIRJ08 | 273523.00 | 802120.00 | IRL AT CM158 WEST OF ICW | INDIAN RIVER LAGOON | estuary |

BRL = Banana River Lagoon

Table A1—*continued*

| Station | Latitude | Longitude | Station Location | Basin | Water body Type |
|---|---|---|---|---|---|
| IRLIRJ10 | 274157.00 | 802339.00 | IRL AT CONFLUENCE OF VERO NORTH CANAL WEST OF CM120 | INDIAN RIVER LAGOON | estuary |
| IRLIRJ12 | 273634.00 | 802201.00 | IRL AT CONFLUENCE OF VERO SOUTH CANAL | INDIAN RIVER LAGOON | estuary |
| IRLML02 | 284335.00 | 804305.00 | IRL IN MOSQUITO LAGOON (ML) SOUTH OF HAULOVER CANAL | INDIAN RIVER LAGOON | estuary |
| IRLSC03 | 282218.00 | 804113.00 | IRL IN SYKES CREEK AT WILDLIFE OBSERVATION TOWER 0.5 KM | INDIAN RIVER LAGOON | estuary |
| IRLSUS | 275115.00 | 802929.00 | IRL AT SEBASTIAN RIVER AT U.S. 1 | INDIAN RIVER LAGOON | estuary |
| IRLTBC | 284914.00 | 805141.00 | IRL AT TURNBULL CREEK AT U.S. 1 | INDIAN RIVER LAGOON | estuary |
| IRLTUS | 280158.00 | 803448.00 | IRL AT TURKEY CREEK AT U.S. 1 | INDIAN RIVER LAGOON | estuary |
| IRLV05 | 290029.00 | 805434.00 | IRL IN ML SOUTH OF CM47 AT SOUTH CANAL DISCHARGE | INDIAN RIVER LAGOON | estuary |
| IRLV11 | 285709.00 | 805041.00 | IRL IN ML EAST OF CEDAR ISLAND AND WEST OF BETHUNE BEACH | INDIAN RIVER LAGOON | estuary |
| IRLV17 | 285241.00 | 805022.00 | IRL IN ML SOUTH OF CM7 NEAR BARLOW'S CRAB BLDG AND OAK HILL DOCK | INDIAN RIVER LAGOON | estuary |
| IRLVMC | 273857.00 | 802408.00 | IRL AT VERO MAIN CANAL AT U. S. 1 | INDIAN RIVER LAGOON | stream |
| IRLVNC | 274134.00 | 802449.00 | IRL AT VERO NORTH CANAL AT U.S. 1 | INDIAN RIVER LAGOON | stream |
| IRLVSC | 273617.00 | 802258.00 | IRL AT VERO SOUTH CANAL AT U.S. 1 | INDIAN RIVER LAGOON | stream |
| 02236000 | 290028.29 | 812252.12 | ST. JOHNS RIVER NEAR DELAND | LAKE GEORGE | stream |
| 20010002 | 291000.16 | 813120.56 | ST. JOHNS RIVER AT HWY 40 NEAR ASTOR | LAKE GEORGE | stream |
| 20030373 | 292239.53 | 813739.65 | ST JOHNS RIVER AT CM 72 | LAKE GEORGE | stream |
| BLSPR | 285641.91 | 812021.12 | BLUE SPRING NEAR ORANGE CITY | LAKE GEORGE | spring |
| KER | 292105.90 | 814646.04 | LAKE KERR B/T KAUFFMANS ISL AND PT PLEASANT | LAKE GEORGE | lake |
| LAG | 291517.82 | 813528.20 | LAKE GEORGE AT MARKER 9 | LAKE GEORGE | lake |
| LKWOOD | 290609.01 | 812456.13 | LAKE WOODRUFF AT CENTER | LAKE GEORGE | lake |
| MSJFGF | 292547.69 | 814004.37 | MIDDLE ST. JOHNS R NEAR FT GATES FERRY | LAKE GEORGE | stream |
| 16MCRK | 293932.30 | 812741.76 | 16 MILE CREEK AT DEEP CRK RD W | LOWER ST. JOHNS RIVER | stream |
| 20030083 | 301623.20 | 814359.79 | CEDAR RIVER AT BLANDING BLVD BRIDGE RT 21 | LOWER ST. JOHNS RIVER | stream |
| 20030115 | 302325.36 | 813946.89 | MONCRIEF CREEK NEAR MOUTH | LOWER ST. JOHNS RIVER | estuary |
| 20030153 | 300754.14 | 813744.73 | JULINGTON CREEK AT HWY 13 BRIDGE | LOWER ST. JOHNS RIVER | estuary |
| 20030349 | 301205.24 | 814350.85 | ORTEGA RIVER AT COLLINS ROAD | LOWER ST. JOHNS RIVER | stream |
| 20030400 | 294729.67 | 815110.93 | GEORGES LAKE 200 YDS FROM WEST BANK | LOWER ST. JOHNS RIVER | lake |
| 20030412 | 295754.99 | 815954.10 | KINGSLEY LAKE AT CENTER | LOWER ST. JOHNS RIVER | lake |

Table A1—*continued*

| Station | Latitude | Longitude | Station Location | Basin | Water body Type |
|---|---|---|---|---|---|
| BLC | 300455.00 | 814835.00 | BLACK CREEK AT HWY 209 | LOWER ST. JOHNS RIVER | bwstream |
| BSF | 300339.00 | 815217.00 | SOUTH FORK OF BLACK CREEK AT HWY 218 | LOWER ST. JOHNS RIVER | bwstream |
| CLD | 291718.59 | 812315.79 | CENTER OF LAKE DISSTON | LOWER ST. JOHNS RIVER | lake |
| CRESLM | 293146.40 | 813313.40 | CRESCENT LAKE AT OUTLET TO DUNNS CREEK | LOWER ST. JOHNS RIVER | lake |
| DBR | 294143.00 | 813450.00 | DOG BRANCH 50 METERS DOWNSTR C R 207 A | LOWER ST. JOHNS RIVER | stream |
| DPB | 294426.00 | 813010.00 | DEEP CREEK AT RAILROAD BRIDGE | LOWER ST. JOHNS RIVER | stream |
| DTL | 300817.00 | 814338.00 | DOCTORS LAKE AT CENTER | LOWER ST. JOHNS RIVER | estuary |
| DUNNSCRK | 293348.48 | 813512.37 | DUNNS CR MIDWAY BETW CRESCENT LAKE AND ST. JOHNS RIVER | LOWER ST. JOHNS RIVER | stream |
| GC16 | 295902.00 | 814211.00 | GOVERNORS CK AT HWY 16 NR GREEN COVE | LOWER ST. JOHNS RIVER | estuary |
| GEN | 294626.11 | 820135.00 | LAKE GENEVA NEAR KEYSTONE HTS | LOWER ST. JOHNS RIVER | lake |
| GF33 | 292819.28 | 813000.89 | MIDDLE OF LAKE CRESCENT BTW SALT BRANCH CANAL AND UNION AVE | LOWER ST. JOHNS RIVER | lake |
| HAW | 292349.05 | 812542.43 | OUTLET OF HAW CREEK AT DEAD LAKE | LOWER ST. JOHNS RIVER | stream |
| HCC | 300140.00 | 813913.00 | HALLOWES COVE AT CENTER | LOWER ST. JOHNS RIVER | estuary |
| JAXST. JOHNS RIVER01 | 302407.00 | 812408.00 | ST. JOHNS RIVER AT RED MARKER 1 | LOWER ST. JOHNS RIVER | estuary |
| JAXST. JOHNS RIVER04 | 302338.00 | 812945.00 | ST. JOHNS RIVER AT RED MARKER 34 | LOWER ST. JOHNS RIVER | estuary |
| JAXST. JOHNS RIVER17 | 302201.00 | 813708.00 | ST. JOHNS RIVER NEAR JEFFERSON SMURFITT | LOWER ST. JOHNS RIVER | estuary |
| JAXST. JOHNS RIVER30 | 301211.00 | 813918.00 | ST. JOHNS RIVER AT BEAUCLERC BLUFF | LOWER ST. JOHNS RIVER | estuary |
| JAXST. JOHNS RIVER40 | 301508.00 | 813928.00 | ST. JOHNS RIVER NEAR PINEY POINT 100 M SW OF GREEN CM 5 | LOWER ST. JOHNS RIVER | estuary |
| LSJ070 | 291912.50 | 812308.67 | LITTLE HAW CREEK AT U.S. 305 | LOWER ST. JOHNS RIVER | bwstream |
| LSJ087 | 300557.68 | 813134.06 | DURBIN CREEK AT RACETRACK ROAD | LOWER ST. JOHNS RIVER | stream |
| LSJ099 | 300907.01 | 813133.06 | BIG DAVIS CREEK AT U.S. 1 | LOWER ST. JOHNS RIVER | stream |
| LSJ918 | 294117.77 | 814431.48 | RICE CREEK AT SR 100 | LOWER ST. JOHNS RIVER | stream |
| MOB | 294617.00 | 812850.00 | MOCCASIN BRANCH ON SR 13 | LOWER ST. JOHNS RIVER | stream |

Table A1—*continued*

| Station | Latitude | Longitude | Station Location | Basin | Water body Type |
|---|---|---|---|---|---|
| MP72 | 300924.00 | 814102.00 | ST. JOHNS RIVER AT MANDARIN PT BTW CM 10 AND 11 CENTER | LOWER ST. JOHNS RIVER | estuary |
| NBC | 300432.00 | 815147.00 | NORTH FORK OF BLACK CREEK AT SR 21 | LOWER ST. JOHNS RIVER | bwstream |
| OHD | 294249.00 | 813243.00 | OUTLET OF HASTINGS DRAINAGE DISTRICT | LOWER ST. JOHNS RIVER | stream |
| PTC | 300204.00 | 814324.00 | PETERS CREEK AT HWY 209 | LOWER ST. JOHNS RIVER | stream |
| RCB | 294205.00 | 813934.00 | RICE CREEK AT U.S. 17 BRIDGE | LOWER ST. JOHNS RIVER | stream |
| SAVBOLSO | 301417.00 | 813816.00 | BOLLS SCHOOLS OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | estuary |
| SAVCRL2O | 292957.00 | 813034.00 | CRESCENT LAKE SITE 2 OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | lake |
| SAVDRLKO | 300636.00 | 814509.00 | DOCTORS LAKE OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | estuary |
| SAVRICNO | 294217.00 | 813813.00 | RICE CREEK OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | lake |
| SAVSCRAO | 295023.00 | 813552.00 | SCRATCH ANKLE OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | lake |
| SHEEL | 295021.47 | 815728.20 | LAKE SHEELAR CENTER (GOLD HEAD BRDG – CLAY CO) | LOWER ST. JOHNS RIVER | lake |
| SIM | 294427.09 | 814249.00 | SIMMS CREEK 2 MILES NNE OF BARDIN | LOWER ST. JOHNS RIVER | stream |
| SJCM25 | 295516.00 | 813606.00 | ST. JOHNS RIVER AT CM 25 NEAR PICOLATA | LOWER ST. JOHNS RIVER | lake |
| SJM37 | 294501.00 | 813300.00 | ST. JOHNS RIVER AT CM 37 FEDERAL POINT | LOWER ST. JOHNS RIVER | lake |
| SJP | 293837.00 | 813730.00 | ST. JOHNS RIVER AT PALATKA (U.S. 17) | LOWER ST. JOHNS RIVER | lake |
| ST. JOHNS RIVERCC | 294156.00 | 813812.00 | ST. JOHNS RIVER BELOW RICE CREEK CENTER CHANNEL | LOWER ST. JOHNS RIVER | lake |
| ST. JOHNS RIVERHBP | 300400.00 | 814113.00 | ST. JOHNS RIVER AT HIBERNIA POINT | LOWER ST. JOHNS RIVER | estuary |
| SJSR16 | 295838.00 | 813636.00 | ST. JOHNS RIVER AT SR 16 SOUTH OF SHANDS BRIDGE | LOWER ST. JOHNS RIVER | estuary |
| SMC | 295732.00 | 813237.00 | SIXMILE CREEK AT SR 13 | LOWER ST. JOHNS RIVER | stream |
| SPCR | 300559.00 | 814448.00 | SWIMMING PEN CREEK AT HWY 220 | LOWER ST. JOHNS RIVER | stream |
| SRB | 293542.00 | 814056.00 | ST. JOHNS RIVER AT BUFFALO BLUFF RR BRIDGE | LOWER ST. JOHNS RIVER | stream |
| SRP | 294756.00 | 813352.00 | ST JOHNS RIVER AT RACY POINT | LOWER ST. JOHNS RIVER | lake |
| WIO | 291048.76 | 812002.13 | LAKE WINONA | LOWER ST. JOHNS RIVER | lake |
| 02233200 | 283128.78 | 811438.05 | LITTLE ECONLOCKHATCHEE R NR UNION PARK | MIDDLE ST. JOHNS RIVER | stream |
| 02235000 | 284854.36 | 812510.86 | WEKIVA RIVER NEAR SANFORD | MIDDLE ST. JOHNS RIVER | stream |
| 20010137 | 284112.13 | 812348.74 | LITTLE WEKIVA RIVER AT HWY 434 | MIDDLE ST. JOHNS RIVER | stream |
| ASH | 285605.04 | 810543.39 | CENTER OF LAKE ASHBY | MIDDLE ST. JOHNS RIVER | lake |
| BWC44 | 285228.72 | 812921.93 | BLACKWATER CREEK AT HWY 44 | MIDDLE ST. JOHNS RIVER | bwstream |
| BWCCPB | 285126.95 | 812612.81 | BLACKWATER CREEK AT CARTER PROP BRIDGE | MIDDLE ST. JOHNS RIVER | bwstream |

Table A1—*continued*

| Station | Latitude | Longitude | Station Location | Basin | Water body Type |
|---|---|---|---|---|---|
| CLH | 284521.40 | 810336.02 | CENTER OF LAKE HARNEY | MIDDLE ST. JOHNS RIVER | lake |
| DMR | 285046.30 | 810606.36 | DEEP CREEK AT MAYTOWN ROAD | MIDDLE ST. JOHNS RIVER | bwstream |
| ECH | 284039.78 | 810650.28 | ECON RIVER AT SNOWHILL ROAD (SR 426) | MIDDLE ST. JOHNS RIVER | stream |
| LMAC | 285005.84 | 811615.28 | LAKE MONROE AT CENTER | MIDDLE ST. JOHNS RIVER | lake |
| OW-2 | 284553.16 | 811034.68 | LK JESUP OFF GRASSY POINT | MIDDLE ST. JOHNS RIVER | lake |
| OW-4 | 284219.02 | 811514.46 | LK JESUP W OF BRIDGE BTWN WHITES LNDG AND BIRD ISLAND | MIDDLE ST. JOHNS RIVER | lake |
| OW-6 | 284253.62 | 811638.82 | LK JESUP OFF CENTER OF FAR W ARM | MIDDLE ST. JOHNS RIVER | lake |
| OW-ST. JOHNS RIVER-1 | 284714.10 | 811002.28 | MID-ST. JOHNS RIVER EAST OF BARGE CANAL &ANDEAST OF JJ FISH CAMP | MIDDLE ST. JOHNS RIVER | stream |
| SRN | 284253.00 | 810208.00 | LAKE HARNEY INFLOW – ST. JOHNS RIVER AT SR 46 BRIDGE | MIDDLE ST. JOHNS RIVER | stream |
| WIN | 290137.05 | 811507.18 | LAKE WINNEMISSETT | MIDDLE ST. JOHNS RIVER | lake |
| 19020002 | 303429.72 | 813631.09 | NASSAU RIVER AT U.S. 17 | NASSAU RIVER | estuary |
| NRI | 303453.26 | 814108.79 | NASSAU RIVER NEAR ITALIA | NASSAU RIVER | stream |
| 02238000 | 285218.97 | 814702.26 | HAYNES CREEK AT LISBON | OCKLAWAHA RIVER | stream |
| 20020012 | 292218.56 | 815406.06 | OKLAWAHA RIVER AT SR 316 | OCKLAWAHA RIVER | stream |
| 20020321 | 283555.43 | 814850.55 | CHERRY LAKE AT CENTER | OCKLAWAHA RIVER | lake |
| 20020368 | 285035.04 | 814359.34 | LAKE EUSTIS AT CENTER | OCKLAWAHA RIVER | lake |
| 20020381 | 285148.09 | 815059.21 | LAKE GRIFFIN MIDDLE OFFSHORE OF TREASURE IS | OCKLAWAHA RIVER | lake |
| ABC | 284320.04 | 814104.08 | APOPKA BEAUCLAIR CANAL AT APOPKA LOCK AND DAM | OCKLAWAHA RIVER | stream |
| BCE | 284614.50 | 814018.60 | CANAL ENTRANCE TO LAKE BEAUCLAIR | OCKLAWAHA RIVER | lake |
| CARL | 284536.28 | 813928.01 | CENTER OF LAKE CARLTON | OCKLAWAHA RIVER | lake |
| CLA | 283729.90 | 813729.70 | LAKE APOPKA CENTER STATION | OCKLAWAHA RIVER | lake |
| CLW | 290055.76 | 815631.63 | CENTER OF LAKE WIER | OCKLAWAHA RIVER | lake |
| DCNL | 284807.48 | 814425.76 | DORA CANAL; 100M N OF HWY 19 BRIDGE | OCKLAWAHA RIVER | stream |
| DEPHCA | 285331.20 | 814945.42 | "HAYNES CREEK DOWNSTREAM OF DISCHARGE ""T""" | OCKLAWAHA RIVER | stream |
| DEPHCB | 285251.96 | 814756.99 | "HAYNES CREEK UPSTREAM OF DISCHARGE ""V""" | OCKLAWAHA RIVER | stream |
| DNEY | 284557.32 | 815422.90 | LAKE DENHAM EAST | OCKLAWAHA RIVER | lake |
| DOR | 284721.73 | 814151.64 | CENTER OF LAKE DORA | OCKLAWAHA RIVER | lake |
| DORE | 284734.27 | 813924.67 | LAKE DORA; CENTER OF EAST POOL | OCKLAWAHA RIVER | lake |
| DRVR | 284847.04 | 814558.84 | DEAD RIVER; UNDER THE POWER WIRES | OCKLAWAHA RIVER | stream |

Table A1—*continued*

| Station | Latitude | Longitude | Station Location | Basin | Water body Type |
|---|---|---|---|---|---|
| HAR | 284612.47 | 814821.41 | CENTER OF LAKE HARRIS | OCKLAWAHA RIVER | lake |
| HAT26 | 294114.00 | 821224.00 | HATCHET CREEK AT SR 26 NR NEWNANS LAKE | OCKLAWAHA RIVER | bwstream |
| HICKDN | 285316.45 | 813954.39 | HICKS DITCH DOWNSTRM – EAST RD CULVERT PINE MEADOW | OCKLAWAHA RIVER | stream |
| LFC329B | 293906.00 | 821504.00 | LAKE FOREST CREEK AT SR 329B | OCKLAWAHA RIVER | stream |
| LGNA | 285517.63 | 815036.12 | LAKE GRIFFIN; NORTH | OCKLAWAHA RIVER | lake |
| LGS | 284956.29 | 815137.67 | LAKE GRIFFIN; SOUTH | OCKLAWAHA RIVER | lake |
| LHAT26 | 294057.00 | 821359.00 | LITTLE HATCHET CREEK ON SR 26; W INTRSCTN. CR 222 | OCKLAWAHA RIVER | stream |
| LHT26E | 294117.00 | 821315.00 | LITTLE HATCHET CREEK AT CR 26; EAST OF CR 222 | OCKLAWAHA RIVER | stream |
| LLHARRIS | 284401.45 | 814536.94 | CENTER LITTLE LAKE HARRIS AT HOWEY IN THE HILLS | OCKLAWAHA RIVER | lake |
| LOL | 293100.30 | 820714.19 | CENTER LAKE LOCHLOOSA | OCKLAWAHA RIVER | lake |
| LYC | 285444.85 | 814413.65 | CENTER OF LAKE YALE | OCKLAWAHA RIVER | lake |
| MBU | 290443.91 | 815253.14 | AT MOSS BLUFF; UPSTREAM OF THE LOCK | OCKLAWAHA RIVER | stream |
| NEW | 293843.00 | 821312.00 | NEWNANS LAKE; CENTER | OCKLAWAHA RIVER | lake |
| NLA | 283942.20 | 813616.90 | LAKE APOPKA NORTH | OCKLAWAHA RIVER | lake |
| OCKLRM | 292829.00 | 814152.00 | OCKLAWAHA R 1 MILE UPSTR OF MOUTH | OCKLAWAHA RIVER | stream |
| OFB | 290557.00 | 815442.00 | OKLAWAHA RIVER CANAL AT THE OKLAWAHA FARMS BRIDGE | OCKLAWAHA RIVER | stream |
| OR006 | 293034.44 | 815646.21 | ORANGE CREEK AT SR 21 | OCKLAWAHA RIVER | stream |
| ORD | 291255.66 | 815909.78 | OCKLAWAHA RIVER DOWNSTREAM SR 40 | OCKLAWAHA RIVER | stream |
| PINEMS | 285311.94 | 813950.32 | PINE MEADOWS SOUTH BYPASS CANAL UPSTREAM OF DISCHARGE SITE | OCKLAWAHA RIVER | bwstream |
| PRVR | 284452.92 | 815229.47 | PALATLAKAHA RIVER AT SR 48 | OCKLAWAHA RIVER | stream |
| SHORIA | 285938.00 | 815019.00 | C231 CANAL NEAR INTAKE TO SUNNYHILL MARSH | OCKLAWAHA RIVER | stream |
| SLA | 283402.80 | 813902.20 | LK APOPKA EAST OF APOPKA SPG MOUTH OF GOURD | OCKLAWAHA RIVER | lake |
| SSR | 291240.86 | 815922.07 | SILVER RIVER; 200M UPSTREAM OF OCKLAWAHA R. | OCKLAWAHA RIVER | stream |
| YGCAA | 285435.36 | 814926.64 | YALE-GRIFFIN CANAL EAST OF CONFLUENCE WITH LAKE GRIFFIN | OCKLAWAHA RIVER | stream |
| YGCCA | 285437.14 | 814914.87 | YALE-GRIFFIN CANAL WEST OF EMERALDA ISLAND RD | OCKLAWAHA RIVER | stream |
| 19010001 | 304429.09 | 814116.65 | ST. MARYS RIVER AT U.S. 17 GEORGIA LINE | ST. MARYS RIVER | stream |
| 19010006 | 303102.83 | 821348.75 | ST. MARYS RIVER AT SR 2 | ST. MARYS RIVER | bwstream |
| MPS | 302556.00 | 821352.00 | MIDDLE PRONG ST MARYS AT HWY 127 | ST. MARYS RIVER | bwstream |
| SJA-HS-1018 | 304645.28 | 820118.70 | ST. MARYS RIVER W OF TRADER'S HILL | ST. MARYS RIVER | bwstream |

Table A1—*continued*

| Station | Latitude | Longitude | Station Location | Basin | Water body Type |
|---|---|---|---|---|---|
| 02248000 | 290301.89 | 810247.84 | SPRUCE CREEK NEAR SAMSULA | UPPER COASTAL | stream |
| 27010024 | 292031.70 | 810510.85 | TOMOKA RIVER AT OLD DIXIE HWY BRIDGE | UPPER COASTAL | estuary |
| 27010037 | 291239.37 | 810040.64 | HALIFAX RIVER 100 FT N SI BEACH MEMORIAL BRIDGE | UPPER COASTAL | estuary |
| 27010579 | 291301.49 | 810634.70 | TOMOKA RIVER AT 11TH STREET BRIDGE | UPPER COASTAL | stream |
| BUL | 292427.32 | 810718.57 | BULOW CREEK AT LOW BRIDGE | UPPER COASTAL | estuary |
| CCC | 295841.00 | 812013.00 | CASA COLA CREEK | UPPER COASTAL | estuary |
| GAR | 300115.17 | 811938.19 | GUANA RIVER 100 METERS SOUTH OF THE DAM | UPPER COASTAL | estuary |
| JXTR17 | 295905.00 | 811942.00 | CONFLUENCE OF TOLOMATO AND GUANA RIVERS – ICWW | UPPER COASTAL | estuary |
| JXTR21 | 294606.00 | 811532.00 | MATANZAS RIVER NORTH OF CRESCENT BEACH AT SR 206 BRIDGE | UPPER COASTAL | estuary |
| JXTR26 | 293340.00 | 811050.00 | ICWW MARKER AT FOX CUT | UPPER COASTAL | estuary |
| MAT | 293712.04 | 811227.70 | MATANZAS R S OF WASHINGTON OAKS MKR 109 | UPPER COASTAL | estuary |
| MCICW | 294940.00 | 811846.00 | MOULTRIE CREEK OFF ICW | UPPER COASTAL | estuary |
| MR312 | 295158.28 | 811821.27 | MATANZAS RIVER AT CR 312 | UPPER COASTAL | estuary |
| MRT | 293953.00 | 811305.00 | CONFLUENCE OF PELLICER CREEK AND ICW | UPPER COASTAL | estuary |
| MTC | 295049.94 | 812138.91 | MOULTRIE CREEK AT SR 207 | UPPER COASTAL | stream |
| PEL | 293904.66 | 811712.81 | PELLICER CREEK AT U.S. 1 | UPPER COASTAL | stream |
| SMITHSCR | 300525.00 | 812215.00 | SMITH'S CREEK | UPPER COASTAL | estuary |
| SSB | 295255.00 | 811926.00 | SAN SEBASTIAN RIVER AT U.S. 1 | UPPER COASTAL | estuary |
| STOKESCR | 300057.00 | 812124.00 | STOKES CREEK | UPPER COASTAL | estuary |
| TOL | 300343.86 | 812209.03 | TOLOMATO R 1 MI N DEEP CR AT SPANISH LNDG | UPPER COASTAL | estuary |
| BCL | 274335.66 | 804512.80 | BLUE CYPRESS LAKE AT CENTER | UPPER ST. JOHNS RIVER | lake |
| JGS | 280429.63 | 805316.37 | JANE GREEN CREEK AT USGS GAGE (TEN MILE ROAD) | UPPER ST. JOHNS RIVER | bwstream |
| LPO | 282126.16 | 805219.22 | ST. JOHNS RIVER AT LAKE POINSETT OUTLET SOUTH OF SR 520 | UPPER ST. JOHNS RIVER | lake |
| LWC | 280832.79 | 804440.59 | LAKE WASHINGTON CENTER | UPPER ST. JOHNS RIVER | lake |
| SRS | 283234.07 | 805635.09 | SEMINOLE RANCH SOUTH BOUNDARY AT SR 50 IN ST. JOHNS RIVER | UPPER ST. JOHNS RIVER | stream |
| USJ055 | 280749.14 | 810006.17 | CRABGRASS CREEK AT SR 192 | UPPER ST. JOHNS RIVER | stream |

Table A2. Status results for each site sorted by basin

| Station | Station Location | Basin | Water Body Type | Method Used | Seasonal Median N | Median Index | Quality |
|---|---|---|---|---|---|---|---|
| 27010875 | INDIAN RIVER AT ICW CM 12 NEAR HALOV | INDIAN RIVER LAGOON | estuary | tsi | 11 | 54.8 | fair |
| CC03 | INDIAN RIVER LAGOON CRANE CREEK | INDIAN RIVER LAGOON | stream | wqi | 11 | 44.5 | good |
| IRLAUS | IRL AT ADDISON CREEK AT U.S.1 | INDIAN RIVER LAGOON | stream | wqi | 8 | 76.5 | poor |
| IRLB02 | IRL IN BRL CM23 MIDWAY BETWEEN NASA AND 528 CAUSEWAYS | INDIAN RIVER LAGOON | estuary | tsi | 11 | 45.9 | good |
| IRLB04 | IRL IN BRL EAST SIDE 1.0 KM NORTH OF SR 520 CSWY | INDIAN RIVER LAGOON | estuary | tsi | 11 | 49.8 | good |
| IRLB06 | IRL IN BRL CM4 8 KM NORTH OF PINEDA CAUSEWAY | INDIAN RIVER LAGOON | estuary | tsi | 11 | 51.6 | fair |
| IRLB09 | IRL IN BRL 2KM SOUTH OF PINEDA CSWY WEST OF TORTOISE | INDIAN RIVER LAGOON | estuary | tsi | 11 | 53.2 | fair |
| IRLBFC | IRL AT BIG FLOUNDER CREEK AT END OF FLOUNDER CREEK | INDIAN RIVER LAGOON | estuary | tsi | 11 | 62.5 | poor |
| IRLCCU | IRL AT CRANE CREEK AT U.S.1 | INDIAN RIVER LAGOON | estuary | tsi | 11 | 56.3 | fair |
| IRLEGU | IRL AT EAU GALLIE RIVER AT U.S.1 | INDIAN RIVER LAGOON | estuary | tsi | 11 | 61.5 | poor |
| IRLGUS | IRL AT GOAT CREEK AT U.S.1 | INDIAN RIVER LAGOON | estuary | tsi | 11 | 46.4 | good |
| IRLHUS | IRL AT HORSE CREEK AT U.S.1 | INDIAN RIVER LAGOON | estuary | tsi | 11 | 46.1 | good |
| IRLI02 | IRL NORTHWEST OF HAULOVER CANAL APPROXIMATELY 3.5 KM | INDIAN RIVER LAGOON | estuary | tsi | 11 | 49.5 | good |
| IRLI07 | IRL 1.8 KM SOUTH OF SR 406 NEAR WEST SHORE | INDIAN RIVER LAGOON | estuary | tsi | 11 | 54.7 | fair |
| IRLI10 | IRL 2.8 KM SOUTH OF NASA CSWY WEST SIDE | INDIAN RIVER LAGOON | estuary | tsi | 11 | 54.4 | fair |
| IRLI13 | IRL WEST SIDE 1.0 KM SOUTH OF SR 528 BRIDGE | INDIAN RIVER LAGOON | estuary | tsi | 11 | 48.3 | good |
| IRLI15 | IRL CENTER 2.3 KM SOUTH OF SR 520 WITHIN 0.5 KM OF | INDIAN RIVER LAGOON | estuary | tsi | 11 | 50.5 | fair |
| IRLI18 | IRL NEAR WEST SHORE 1.2 KM SOUTH OF PINEDA CSWY | INDIAN RIVER LAGOON | estuary | tsi | 11 | 49.1 | good |
| IRLI21 | IRL EAST OF MOUTH OF EAU GALLIE RIVER | INDIAN RIVER LAGOON | estuary | tsi | 11 | 52.9 | fair |
| IRLI23 | IRL CENTER JUST SOUTH OF MELBOURNE CSWY | INDIAN RIVER LAGOON | estuary | tsi | 11 | 49.2 | good |
| IRLI24 | IRL CENTER JUST SOUTH OF POWERLINES 30 M EAST OF | INDIAN RIVER LAGOON | estuary | tsi | 7 | 49.1 | good |
| IRLI27 | IRL AT CENTER OF ICW NEAR GRANT FARM ISLAND | INDIAN RIVER LAGOON | estuary | tsi | 11 | 48.5 | good |
| IRLI28 | IRL CENTER NEAR CM55 NORTH OF SEBASTIAN INLET | INDIAN RIVER LAGOON | estuary | tsi | 8 | 43 | good |
| IRLIRJ01 | IRL AT CM70 OFF SPRATT PT SOUTH OF SEBASTIAN INLET WEST | INDIAN RIVER LAGOON | estuary | tsi | 11 | 46.8 | good |

Table A2—*continued*

| Station | Station Location | Basin | Water Body Type | Method Used | Seasonal Median N | Median Index | Quality |
|---|---|---|---|---|---|---|---|
| IRLIRJ04 | IRL AT CM123 EAST OF ICW | INDIAN RIVER LAGOON | estuary | tsi | 11 | 47.6 | good |
| IRLIRJ05 | IRL AT CM135 EAST OF ICW | INDIAN RIVER LAGOON | estuary | tsi | 11 | 48 | good |
| IRLIRJ07 | IRL AT CM150 WEST OF ICW | INDIAN RIVER LAGOON | estuary | tsi | 11 | 47.6 | good |
| IRLIRJ08 | IRL AT CM158 WEST OF ICW | INDIAN RIVER LAGOON | estuary | tsi | 8 | 48.4 | good |
| IRLIRJ10 | IRL AT CONFLUENCE OF VERO NORTH CANAL WEST OF CM120 | INDIAN RIVER LAGOON | estuary | tsi | 11 | 45.1 | good |
| IRLIRJ12 | IRL AT CONFLUENCE OF VERO SOUTH CANAL | INDIAN RIVER LAGOON | estuary | tsi | 11 | 49.4 | good |
| IRLML02 | IRL IN ML SOUTH OF HAULOVER CANAL | INDIAN RIVER LAGOON | estuary | tsi | 11 | 42.4 | good |
| IRLSC03 | IRL IN SYKES CREEK AT WILDLIFE OBSERVATION TOWER 0.5 KM | INDIAN RIVER LAGOON | estuary | tsi | 11 | 54.6 | fair |
| IRLSUS | IRL AT SEBASTIAN RIVER AT U.S. 1 | INDIAN RIVER LAGOON | estuary | tsi | 11 | 48.2 | good |
| IRLTBC | IRL AT TURNBULL CREEK AT U.S. 1 | INDIAN RIVER LAGOON | estuary | tsi | 11 | 52.9 | fair |
| IRLTUS | IRL AT TURKEY CREEK AT U.S. 1 | INDIAN RIVER LAGOON | estuary | tsi | 11 | 45.9 | good |
| IRLV05 | IRL IN ML SOUTH OF CM47 AT SOUTH CANAL DISCHARGE | INDIAN RIVER LAGOON | estuary | tsi | 11 | 45.1 | good |
| IRLV11 | IRL IN ML EAST OF CEDAR ISLAND AND WEST OF BETHUNE | INDIAN RIVER LAGOON | estuary | tsi | 11 | 44 | good |
| IRLV17 | IRL IN ML SOUTH OF CM7 NEAR BARLOW'S CRAB BLDG AND OAK | INDIAN RIVER LAGOON | estuary | tsi | 11 | 44.3 | good |
| IRLVMC | IRL AT VERO MAIN CANAL AT U.S. 1 | INDIAN RIVER LAGOON | stream | wqi | 11 | 39.3 | good |
| IRLVNC | IRL AT VERO NORTH CANAL AT U.S. 1 | INDIAN RIVER LAGOON | stream | wqi | 11 | 43.6 | good |
| IRLVSC | IRL AT VERO SOUTH CANAL AT U.S. 1 | INDIAN RIVER LAGOON | stream | wqi | 11 | 48.3 | fair |
| 02236000 | ST. JOHNS RIVER NEAR DELAND | LAKE GEORGE | stream | wqi | 11 | 47.1 | fair |
| 20010002 | ST. JOHNS RIVER AT HWY 40 NEAR ASTOR | LAKE GEORGE | stream | wqi | 11 | 45.2 | fair |
| 20030373 | ST JOHNS RIVER AT CM 72 | LAKE GEORGE | stream | wqi | 11 | 42.3 | good |
| BLSPR | BLUE SPRING NEAR ORANGE CITY | LAKE GEORGE | spring | wqi | 11 | 26.1 | good |
| KER | LAKE KERR B/T KAUFFMANS ISL AND PT PLEASANT | LAKE GEORGE | lake | tsi | 11 | 23.3 | good |
| LAG | LAKE GEORGE AT M 9 | LAKE GEORGE | lake | tsi | 11 | 61.4 | fair |
| LKWOOD | LAKE WOODRUFF AT CENTER | LAKE GEORGE | lake | tsi | 11 | 55.6 | good |

Table A2—*continued*

| Station | Station Location | Basin | Water Body Type | Method Used | Seasonal Median N | Median Index | Quality |
|---|---|---|---|---|---|---|---|
| MSJFGF | MIDDLE ST. JOHNS R NEAR FT GATES FERRY | LAKE GEORGE | stream | wqi | 9 | 47.6 | fair |
| 16MCRK | 16 MILE CREEK AT DEEP CRK RD W | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 43 | good |
| 20030083 | CEDAR RIVER AT BLANDING BLVD BRIDGE RT 21 | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 47 | fair |
| 20030115 | MONCRIEF CREEK NEAR MOUTH | LOWER ST. JOHNS RIVER | estuary | tsi | 11 | 57.4 | fair |
| 20030153 | JULINGTON CREEK AT HWY 13 BRIDGE | LOWER ST. JOHNS RIVER | estuary | tsi | 11 | 50.4 | fair |
| 20030349 | ORTEGA RIVER AT COLLINS ROAD | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 51.8 | fair |
| 20030400 | GEORGES LAKE 200 YDS FROM WEST BANK | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 29.6 | good |
| 20030412 | KINGSLEY LAKE AT CENTER | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 22.1 | good |
| BLC | BLACK CREEK AT HWY 209 | LOWER ST. JOHNS RIVER | bwstream | wqi | 11 | 39.9 | good |
| BSF | SOUTH FORK OF BLACK CREEK AT HWY 218 | LOWER ST. JOHNS RIVER | bwstream | wqi | 11 | 40.6 | good |
| CLD | CENTER OF LAKE DISSTON | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 44.2 | good |
| CRESLM | CRESCENT LAKE AT OUTLET TO DUNNS CREEK | LOWER ST. JOHNS RIVER | lake | tsi | 9 | 65.4 | fair |
| DBR | DOG BRANCH 50 METERS DOWNSTR CR 207 A | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 62.1 | poor |
| DPB | DEEP CREEK AT RAILROAD BRIDGE | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 54.2 | fair |
| DTL | DOCTORS LAKE AT CENTER | LOWER ST. JOHNS RIVER | estuary | tsi | 11 | 64.5 | poor |
| DUNNSCRK | DUNNS CR MIDWAY BETW CRESCENT L AT ST. JOHNS RIVER | LOWER ST. JOHNS RIVER | stream | wqi | 10 | 51.5 | fair |
| GC16 | GOVERNORS CK AT HWY 16 NR GREEN COVE | LOWER ST. JOHNS RIVER | estuary | tsi | 11 | 75.5 | poor |
| GEN | LAKE GENEVA NEAR KEYSTONE HTS | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 25.3 | good |
| GF33 | LAKE CRESCENT BTW SALT BRANCH CANAL AND UNION AVE | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 62.9 | fair |
| HAW | OUTLET OF HAW CREEK AT DEAD LAKE | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 62.8 | poor |
| HCC | HALLOWES COVE AT CENTER | LOWER ST. JOHNS RIVER | estuary | tsi | 10 | 55.7 | fair |
| JAXST. JOHNS RIVER01 | ST. JOHNS RIVER AT RED MARKER 1 | LOWER ST. JOHNS RIVER | estuary | tsi | 10 | 43.6 | good |

Table A2—*continued*

| Station | Station Location | Basin | Water Body Type | Method Used | Seasonal Median N | Median Index | Quality |
|---|---|---|---|---|---|---|---|
| JAXST. JOHNS RIVER04 | ST. JOHNS RIVER AT RED MARKER 34 | LOWER ST. JOHNS RIVER | estuary | tsi | 10 | 46 | good |
| JAXST. JOHNS RIVER17 | ST. JOHNS RIVER NEAR JEFFERSON SMURFITT | LOWER ST. JOHNS RIVER | estuary | tsi | 10 | 48.4 | good |
| JAXST. JOHNS RIVER30 | ST. JOHNS RIVER AT BEAUCLERC BLUFF | LOWER ST. JOHNS RIVER | estuary | tsi | 8 | 56.3 | fair |
| JAXST. JOHNS RIVER40 | ST. JOHNS RIVER NEAR PINEY POINT 100 M SW OF GREEN CHANNEL MARKER (CM)5 | LOWER ST. JOHNS RIVER | estuary | tsi | 11 | 54.7 | fair |
| LSJ070 | LITTLE HAW CREEK AT US 305 | LOWER ST. JOHNS RIVER | bwstream | wqi | 11 | 22.6 | good |
| LSJ087 | DURBIN CREEK AT RACETRACK ROAD | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 55.1 | fair |
| LSJ099 | BIG DAVIS CREEK AT US1 | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 41.3 | good |
| LSJ918 | RICE CREEK AT SR 100 | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 34.7 | good |
| MOB | MOCCASIN BRANCH ON SR 13 | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 58.3 | fair |
| MP72 | ST. JOHNS RIVER AT MANDARIN PT BTW CM 10 & 11 CENTER | LOWER ST. JOHNS RIVER | estuary | tsi | 9 | 53.6 | fair |
| NBC | NORTH FORK OF BLACK CREEK AT SR 21 | LOWER ST. JOHNS RIVER | bwstream | wqi | 11 | 31.5 | good |
| OHD | OUTLET OF HASTINGS DRAINAGE DISTRICT | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 52.8 | fair |
| PTC | PETERS CREEK AT HWY 209 | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 48.2 | fair |
| RCB | RICE CREEK AT U.S. 17 BRIDGE | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 65.6 | poor |
| SAVBOLSO | BOLLS SCHOOLS OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | estuary | tsi | 9 | 53.7 | fair |
| SAVCRL2O | CRESCENT LAKE SITE 2 OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 60.4 | fair |
| SAVDRLKO | DOCTORS LAKE OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | estuary | tsi | 10 | 65.3 | poor |
| SAVRICNO | RICE CREEK OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | lake | tsi | 10 | 59.9 | good |
| SAVSCRAO | SCRATCH ANKLE OUTSIDE GRASSBED | LOWER ST. JOHNS RIVER | lake | tsi | 9 | 60.0 | good |
| SHEEL | LAKE SHEELAR AT CENTER (GOLD HEAD BRDG – CLAY CO) | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 21.8 | good |
| SIM | SIMMS CREEK 2 MILES NNE OF BARDIN | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 22.6 | good |

Table A2—*continued*

| Station | Station Location | Basin | Water Body Type | Method Used | Seasonal Median N | Median Index | Quality |
|---|---|---|---|---|---|---|---|
| SJCM25 | ST. JOHNS RIVER AT CM 25 NEAR PICOLATA | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 58.1 | good |
| SJM37 | ST. JOHNS RIVER AT CM 37 FEDERAL POINT | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 61.2 | fair |
| SJP | ST. JOHNS RIVER AT PALATKA (U.S. 17) | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 58.5 | good |
| ST. JOHNS RIVERCC | ST. JOHNS RIVER BELOW RICE CREEK CENTER CHANNEL | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 59.3 | good |
| ST. JOHNS RIVERHBP | ST. JOHNS RIVER AT HIBERNIA POINT | LOWER ST. JOHNS RIVER | estuary | tsi | 11 | 54.3 | fair |
| SJSR16 | ST. JOHNS RIVER AT SR 16 SOUTH OF SHANDS BRIDGE | LOWER ST. JOHNS RIVER | estuary | tsi | 10 | 58 | fair |
| SMC | SIXMILE CREEK AT SR 13 | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 55.4 | fair |
| SPCR | SWIMMING PEN CREEK AT HWY 220 | LOWER ST. JOHNS RIVER | stream | wqi | 11 | 49.4 | fair |
| SRB | ST. JOHNS RIVER AT BUFFALO BLUFF RR BRIDGE | LOWER ST. JOHNS RIVER | stream | wqi | 8 | 43.6 | good |
| SRP | ST JOHNS RIVER AT RACY POINT | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 61.1 | fair |
| WIO | LAKE WINONA | LOWER ST. JOHNS RIVER | lake | tsi | 11 | 24.4 | good |
| 02233200 | LITTLE ECONLOCKHATCHEE R NR UNION PARK | MIDDLE ST. JOHNS RIVER | stream | wqi | 11 | 48.8 | fair |
| 02235000 | WEKIVA RIVER NEAR SANFORD | MIDDLE ST. JOHNS RIVER | stream | wqi | 11 | 30.3 | good |
| 20010137 | LITTLE WEKIVA RIVER AT HWY 434 | MIDDLE ST. JOHNS RIVER | stream | wqi | 11 | 41.6 | good |
| ASH | CENTER OF LAKE ASHBY | MIDDLE ST. JOHNS RIVER | lake | tsi | 11 | 58.7 | good |
| BWC44 | BLACKWATER CREEK AT HWY 44 | MIDDLE ST. JOHNS RIVER | bwstream | wqi | 11 | 32.7 | good |
| BWCCPB | BLACKWATER CREEK AT CARTER PROP BRIDGE | MIDDLE ST. JOHNS RIVER | bwstream | wqi | 11 | 41.5 | good |
| CLH | CENTER OF LAKE HARNEY | MIDDLE ST. JOHNS RIVER | lake | tsi | 8 | 55.8 | good |
| DMR | DEEP CREEK AT MAYTOWN ROAD | MIDDLE ST. JOHNS RIVER | bwstream | wqi | 11 | 36.5 | good |
| ECH | ECON RIVER AT SNOWHILL ROAD (SR 426) | MIDDLE ST. JOHNS RIVER | stream | wqi | 11 | 40.5 | good |
| LMAC | LAKE MONROE AT CENTER | MIDDLE ST. JOHNS RIVER | lake | tsi | 11 | 61.8 | fair |
| OW-2 | LK JESUP OFF GRASSY POINT | MIDDLE ST. JOHNS RIVER | lake | tsi | 11 | 74.6 | poor |
| OW-4 | LK JESUP W OF BRIDGE BTWN WHITES LNDG AND BIRD ISLAND | MIDDLE ST. JOHNS RIVER | lake | tsi | 11 | 74.5 | poor |
| OW-6 | LK JESUP OFF CENTER OF FAR W ARM | MIDDLE ST. JOHNS RIVER | lake | tsi | 11 | 73.8 | poor |

Table A2—*continued*

| Station | Station Location | Basin | Water Body Type | Method Used | Seasonal Median N | Median Index | Quality |
|---|---|---|---|---|---|---|---|
| OW-ST. JOHNS RIVER-1 | MID ST. JOHNS RIVER EAST OF BARGE CANAL AND EAST OF JJ FISH CAMP | MIDDLE ST. JOHNS RIVER | stream | wqi | 11 | 52.5 | fair |
| SRN | LAKE HARNEY INFLOW – ST. JOHNS RIVER AT SR 46 BRIDGE | MIDDLE ST. JOHNS RIVER | stream | wqi | 11 | 57.6 | fair |
| WIN | LAKE WINNEMISSETT | MIDDLE ST. JOHNS RIVER | lake | tsi | 11 | 21.5 | good |
| 19020002 | NASSAU RIVER AT U.S. 17 | NASSAU RIVER | estuary | tsi | 11 | 62.9 | poor |
| NRI | NASSAU RIVER NEAR ITALIA | NASSAU RIVER | stream | wqi | 11 | 65 | poor |
| 02238000 | HAYNES CREEK AT LISBON | OCKLAWAHA RIVER | stream | wqi | 11 | 56.5 | fair |
| 20020012 | OKLAWAHA RIVER AT SR 316 | OCKLAWAHA RIVER | stream | wqi | 11 | 28.8 | good |
| 20020321 | CHERRY LAKE AT CENTER | OCKLAWAHA RIVER | lake | tsi | 11 | 45.7 | good |
| 20020368 | LAKE EUSTIS AT CENTER | OCKLAWAHA RIVER | lake | tsi | 11 | 66.8 | fair |
| 20020381 | LAKE GRIFFIN MIDDLE OFFSHORE OF TREASURE IS | OCKLAWAHA RIVER | lake | tsi | 11 | 73.5 | poor |
| ABC | APOPKA BEAUCLAIR CANAL AT APOPKA LOCK AND DAM | OCKLAWAHA RIVER | stream | wqi | 11 | 71.4 | poor |
| BCE | CANAL ENTRANCE TO LAKE BEAUCLAIR | OCKLAWAHA RIVER | lake | tsi | 11 | 80 | poor |
| CARL | CENTER OF LAKE CARLTON | OCKLAWAHA RIVER | lake | tsi | 11 | 79.1 | poor |
| CLA | LAKE APOPKA CENTER STATION | OCKLAWAHA RIVER | lake | tsi | 11 | 78 | poor |
| CLW | CENTER OF LAKE WIER | OCKLAWAHA RIVER | lake | tsi | 11 | 36.7 | good |
| DCNL | DORA CANAL; 100M N OF HWY 19 BRIDGE | OCKLAWAHA RIVER | stream | wqi | 11 | 64.5 | poor |
| DEPHCA | "HAYNES CREEK DOWNSTREAM OF DISCHARGE ""T""" | OCKLAWAHA RIVER | stream | wqi | 11 | 64.7 | poor |
| DEPHCB | "HAYNES CREEK UPSTREAM OF DISCHARGE ""V""" | OCKLAWAHA RIVER | stream | wqi | 11 | 62.2 | poor |
| DNEY | LAKE DENHAM EAST | OCKLAWAHA RIVER | lake | tsi | 11 | 73.7 | poor |
| DOR | CENTER OF LAKE DORA | OCKLAWAHA RIVER | lake | tsi | 11 | 78.4 | poor |
| DORE | LAKE DORA; CENTER OF EAST POOL | OCKLAWAHA RIVER | lake | tsi | 11 | 80.2 | poor |
| DRVR | DEAD RIVER; UNDER THE POWER WIRES | OCKLAWAHA RIVER | stream | wqi | 11 | 48.8 | fair |
| HAR | CENTER OF LAKE HARRIS | OCKLAWAHA RIVER | lake | tsi | 11 | 69.4 | fair |
| HAT26 | HATCHET CREEK AT SR 26 NR NEWNANS LAKE | OCKLAWAHA RIVER | bwstream | wqi | 11 | 30.1 | good |
| HICKDN | HICKS DITCH DOWNSTREAM EAST RD CULVERT PINE MEADOW | OCKLAWAHA RIVER | stream | wqi | 11 | 66.4 | poor |

Table A2—*continued*

| Station | Station Location | Basin | Water Body Type | Method Used | Seasonal Median N | Median Index | Quality |
|---|---|---|---|---|---|---|---|
| LFC329B | LAKE FOREST CREEK AT SR 329B | OCKLAWAHA RIVER | stream | wqi | 11 | 41.1 | good |
| LGNA | LAKE GRIFFIN; NORTH | OCKLAWAHA RIVER | lake | tsi | 11 | 76.6 | poor |
| LGS | LAKE GRIFFIN; SOUTH | OCKLAWAHA RIVER | lake | tsi | 11 | 79.8 | poor |
| LHAT26 | LITTLE HATCHET CREEK ON SR 26; W INTRSCTN. CR 222 | OCKLAWAHA RIVER | stream | wqi | 8 | 71.7 | poor |
| LHT26E | LITTLE HATCHET CREEK AT CR 26; EAST OF CR 222 | OCKLAWAHA RIVER | stream | wqi | 11 | 68.1 | poor |
| LLHARRIS | CENTER LITTLE LAKE HARRIS AT HOWEY IN THE HILLS | OCKLAWAHA RIVER | lake | tsi | 11 | 69.1 | fair |
| LOL | CENTER LAKE LOCHLOOSA | OCKLAWAHA RIVER | lake | tsi | 10 | 75.9 | poor |
| LYC | CENTER OF LAKE YALE | OCKLAWAHA RIVER | lake | tsi | 11 | 63.5 | fair |
| MBU | AT MOSS BLUFF; UPSTREAM OF THE LOCK | OCKLAWAHA RIVER | stream | wqi | 11 | 63.2 | poor |
| NEW | NEWNANS LAKE; CENTER | OCKLAWAHA RIVER | lake | tsi | 10 | 86.8 | poor |
| NLA | LAKE APOPKA NORTH | OCKLAWAHA RIVER | lake | tsi | 11 | 78.4 | poor |
| OCKLRM | OCKLAWAHA R 1 MILE UPSTR OF MOUTH | OCKLAWAHA RIVER | stream | wqi | 11 | 41.4 | good |
| OFB | OKLAWAHA RIVER CANAL AT THE OKLAWAHA FARMS BRIDGE | OCKLAWAHA RIVER | stream | wqi | 9 | 64.3 | poor |
| OR006 | ORANGE CREEK AT SR 21 | OCKLAWAHA RIVER | stream | wqi | 11 | 37.7 | good |
| ORD | OCKLAWAHA RIVER DOWNSTREAM SR 40 | OCKLAWAHA RIVER | stream | wqi | 11 | 35.6 | good |
| PINEMS | PINE MEADOWS S BYPASS CNL UPSTREAM OF DISCHARGE SITE | OCKLAWAHA RIVER | bwstream | wqi | 11 | 64.6 | poor |
| PRVR | PALATLAKAHA RIVER AT SR 48 | OCKLAWAHA RIVER | stream | wqi | 8 | 41.5 | good |
| SHORIA | C231 CANAL NEAR INTAKE TO SUNNYHILL MARSH | OCKLAWAHA RIVER | stream | wqi | 11 | 66.9 | poor |
| SLA | LK APOPKA EAST OF APOPKA SPG MOUTH OF GOURD | OCKLAWAHA RIVER | lake | tsi | 11 | 86.9 | poor |
| SSR | SILVER RIVER; 200M UPSTREAM OF OCKLAWAHA R. | OCKLAWAHA RIVER | stream | wqi | 10 | 29 | good |
| YGCAA | YALE-GRIFFIN CANAL EAST OF CONFLUENCE WITH LAKE GRIFFIN | OCKLAWAHA RIVER | stream | wqi | 11 | 64 | poor |
| YGCCA | YALE-GRIFFIN CANAL WEST OF EMERALDA ISLAND RD | OCKLAWAHA RIVER | stream | wqi | 11 | 65 | poor |
| 19010001 | ST. MARYS RIVER AT U.S. 17 GEORGIA LINE | ST. MARYS RIVER | stream | wqi | 11 | 53.6 | fair |
| 19010006 | ST. MARYS RIVER AT SR 2 | ST. MARYS RIVER | bwstream | wqi | 11 | 14.5 | good |
| MPS | MIDDLE PRONG ST MARYS AT HWY 127 | ST. MARYS RIVER | bwstream | wqi | 11 | 22 | good |
| SJA-HS-1018 | ST. MARYS RIVER W OF TRADER'S HILL | ST. MARYS RIVER | bwstream | wqi | 9 | 30.9 | good |

Table A2—*continued*

| Station | Station Location | Basin | Water Body Type | Method Used | Seasonal Median N | Median Index | Quality |
|---|---|---|---|---|---|---|---|
| 02248000 | SPRUCE CREEK NEAR SAMSULA | UPPER COASTAL | stream | wqi | 11 | 56.7 | fair |
| 27010024 | TOMOKA RIVER AT OLD DIXIE HWY BRIDGE | UPPER COASTAL | estuary | tsi | 11 | 56.9 | fair |
| 27010037 | HALIFAX RIVER 100 FT N SI BEACH MEMORIAL BRIDGE | UPPER COASTAL | estuary | tsi | 11 | 51.6 | fair |
| 27010579 | TOMOKA RIVER AT 11TH STREET BRIDGE | UPPER COASTAL | stream | wqi | 11 | 50 | fair |
| BUL | BULOW CREEK AT LOW BRIDGE | UPPER COASTAL | estuary | tsi | 11 | 58.7 | fair |
| CCC | CASA COLA CREEK | UPPER COASTAL | estuary | tsi | 11 | 45.5 | good |
| GAR | GUANA RIVER 100 METERS SOUTH OF THE DAM | UPPER COASTAL | estuary | tsi | 11 | 53.4 | fair |
| JXTR17 | CONFLUENCE OF TOLOMATO AND GUANA RIVERS – ICWW | UPPER COASTAL | estuary | tsi | 11 | 44.3 | good |
| JXTR21 | MATANZAS RIVER NORTH OF CRESCENT BEACH AT SR 206 BRIDGE | UPPER COASTAL | estuary | tsi | 11 | 37.5 | good |
| JXTR26 | ICWW MARKER AT FOX CUT | UPPER COASTAL | estuary | tsi | 11 | 44.3 | good |
| MAT | MATANZAS R S OF WASHINGTON OAKS MKR 109 | UPPER COASTAL | estuary | tsi | 11 | 42.7 | good |
| MCICW | MOULTRIE CREEK OFF ICW | UPPER COASTAL | estuary | tsi | 11 | 43.1 | good |
| MR312 | MATANZAS RIVER AT CR 312 | UPPER COASTAL | estuary | tsi | 11 | 39.9 | good |
| MRT | CONFLUENCE OF PELLICER CREEK AND ICW | UPPER COASTAL | estuary | tsi | 11 | 38.7 | good |
| MTC | MOULTRIE CREEK AT SR 207 | UPPER COASTAL | stream | wqi | 11 | 51.3 | fair |
| PEL | PELLICER CREEK AT U.S. 1 | UPPER COASTAL | stream | wqi | 11 | 47.8 | fair |
| SMITHSCR | SMITH'S CREEK | UPPER COASTAL | estuary | tsi | 11 | 46.7 | good |
| SSB | SAN SEBASTIAN RIVER AT U.S. 1 | UPPER COASTAL | estuary | tsi | 11 | 41.5 | good |
| STOKESCR | STOKES CREEK | UPPER COASTAL | estuary | tsi | 11 | 45.7 | good |
| TOL | TOLOMATO R 1 MI N DEEP CR AT SPANISH LNDG | UPPER COASTAL | estuary | tsi | 11 | 45.6 | good |
| BCL | BLUE CYPRESS LAKE AT CENTER | UPPER ST. JOHNS RIVER | lake | tsi | 11 | 49.3 | good |
| JGS | JANE GREEN CREEK AT USGS GAUGE (TEN MILE ROAD) | UPPER ST. JOHNS RIVER | bwstream | wqi | 11 | 24.1 | good |
| LPO | ST. JOHNS RIVER AT LAKE POINSETT OUTLET SOUTH OF SR 520 | UPPER ST. JOHNS RIVER | lake | tsi | 11 | 59.5 | good |
| LWC | LAKE WASHINGTON CENTER | UPPER ST. JOHNS RIVER | lake | tsi | 11 | 55 | good |
| SRS | SEMINOLE RANCH SOUTH BOUNDARY AT SR 50 IN ST. JOHNS RIVER | UPPER ST. JOHNS RIVER | stream | wqi | 11 | 56.6 | fair |
| USJ055 | CRABGRASS CREEK AT SR 192 | UPPER ST. JOHNS RIVER | stream | wqi | 11 | 54 | fair |

Table A3. Trend results for each site sorted by basin

| Station | Method | Seasonal Medians Available | Period of Record (yrs) | Kendall K | Variance K | Z-score | Z-prob | Trend | Seasonality Condition | Sen Slope | Lower 95% CI for Sen Slope | Upper 95% CI for Sen Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27010875 | tsi | 21 | 1995–2004 (11) | 84 | | | | degrading | nonseasonal | 1.296 | | |
| CC03 | wqi | 21 | 1995–2004 (11) | -18 | 290.00 | -0.998 | 0.318 | insignificant | seasonal | -0.709 | -1.517 | 0.432 |
| IRLAUS | wqi | 15 | 1990–2004 (9) | 21 | 109.67 | 1.91 | 0.056 | insufficient | seasonal | 0.750 | 0.200 | 1.735 |
| IRLB02 | tsi | 28 | 1990–2004 (16) | 22 | | | | insignificant | nonseasonal | 0.138 | | |
| IRLB04 | tsi | 30 | 1990–2004 (16) | -33 | | | | insignificant | nonseasonal | -0.150 | | |
| IRLB06 | tsi | 19 | 1990–2004 (10) | -33 | | | | insignificant | nonseasonal | -0.804 | | |
| IRLB09 | tsi | 29 | 1990–2004 (16) | -24 | | | | insignificant | nonseasonal | -0.098 | | |
| IRLBFC | tsi | 29 | 1990–2004 (15) | -26 | | | | insignificant | nonseasonal | -0.202 | | |
| IRLCCU | tsi | 26 | 1990–2004 (14) | -133 | | | | improving | nonseasonal | -0.581 | | |
| IRLEGU | tsi | 26 | 1990–2004 (14) | -135 | | | | improving | nonseasonal | -0.730 | | |
| IRLGUS | tsi | 29 | 1990–2004 (15) | -120 | | | | improving | nonseasonal | -0.629 | | |
| IRLHUS | tsi | 29 | 1990–2004 (15) | 8 | | | | insignificant | nonseasonal | 0.029 | | |
| IRLI02 | tsi | 28 | 1990–2004 (16) | 92 | | | | degrading | nonseasonal | 0.682 | | |
| IRLI07 | tsi | 23 | 1990–2004 (14) | 15 | | | | insignificant | nonseasonal | 0.251 | | |
| IRLI10 | tsi | 20 | 1990–2004 (11) | 15 | 257.00 | 0.873 | 0.383 | insignificant | seasonal | 0.516 | -0.654 | 1.570 |
| IRLI13 | tsi | 21 | 1991–2004 (12) | -60 | | | | improving | nonseasonal | -0.994 | | |
| IRLI15 | tsi | 19 | 1990–2004 (10) | -53 | | | | improving | nonseasonal | -1.054 | | |
| IRLI18 | tsi | 25 | 1990–2004 (15) | -34 | 533.33 | -1.429 | 0.153 | insignificant | seasonal | -0.443 | -0.968 | 0.072 |
| IRLI21 | tsi | 20 | 1990–2004 (11) | 3 | 257.00 | 0.125 | 0.901 | insignificant | seasonal | 0.059 | -0.747 | 0.649 |
| IRLI23 | tsi | 20 | 1990–2004 (11) | -62 | | | | improving | nonseasonal | -0.522 | | |
| IRLI24 | tsi | 7 | 1990–2004 (5) | -5 | | | | insufficient | nonseasonal | -1.953 | | |
| IRLI27 | tsi | 31 | 1990–2004 (16) | 3 | 901.67 | 0.067 | 0.947 | insignificant | seasonal | 0.006 | -0.415 | 0.418 |
| IRLI28 | tsi | 17 | 1990–2004 (10) | -34 | | | | insignificant | nonseasonal | -0.634 | | |
| IRLIRJ01 | tsi | 29 | 199–02004 (16) | -76 | 742.00 | -2.753 | 0.006 | improving | seasonal | -0.650 | -1.005 | -0.291 |
| IRLIRJ04 | tsi | 29 | 1990–2004 (16) | -58 | 742.00 | -2.093 | 0.036 | improving | seasonal | -0.409 | -0.789 | -0.085 |
| IRLIRJ05 | tsi | 28 | 1990–2004 (16) | -67 | 677.00 | -2.537 | 0.011 | improving | seasonal | -0.566 | -0.887 | -0.229 |
| IRLIRJ07 | tsi | 29 | 1990–2004 (16) | -56 | 742.00 | -2.019 | 0.043 | improving | seasonal | -0.396 | -0.765 | -0.100 |
| IRLIRJ08 | tsi | 18 | 1990–2004 (11) | -29 | | | | insignificant | nonseasonal | -0.359 | | |
| IRLIRJ10 | tsi | 27 | 1991–2004 (15) | -29 | 602.33 | -1.141 | 0.254 | insignificant | seasonal | -0.308 | -0.833 | 0.078 |
| IRLIRJ12 | tsi | 27 | 1991–2004 (15) | -49 | 602.33 | -1.956 | 0.05 | improving | seasonal | -0.367 | -0.771 | -0.080 |

Table A3—*continued*

| Station | Method | Seasonal Medians Available | Period of Record (yrs) | Kendall K | Variance K | Z-score | Z-prob | Trend | Seasonality Condition | Sen Slope | Lower 95% CI for Sen Slope | Upper 95% CI for Sen Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRLML02 | tsi | 27 | 1990–2004 (16) | -85 | | | | improving | nonseasonal | -0.757 | | |
| IRLSC03 | tsi | 23 | 1990–2004 (12) | -79 | | | | improving | nonseasonal | -0.664 | | |
| IRLSUS | tsi | 28 | 1990–2004 (15) | -106 | 667.33 | -4.065 | 0 | improving | seasonal | -1.148 | -1.533 | -0.777 |
| IRLTBC | tsi | 29 | 1990–2004 (15) | -50 | | | | insignificant | nonseasonal | -0.468 | | |
| IRLTUS | tsi | 23 | 1990–2004 (13) | -107 | | | | improving | nonseasonal | -0.835 | | |
| IRLV05 | tsi | 28 | 1990–2004 (15) | -81 | 677.00 | -3.075 | 0.002 | improving | seasonal | -0.961 | -1.449 | -0.427 |
| IRLV11 | tsi | 30 | 1990–2004 (16) | -71 | 827.00 | -2.434 | 0.015 | improving | seasonal | -0.654 | -0.967 | -0.205 |
| IRLV17 | tsi | 30 | 1990–2004 (16) | -105 | 827.00 | -3.616 | 0 | improving | seasonal | -0.669 | -0.922 | -0.313 |
| IRLVMC | wqi | 29 | 1990–2004 (15) | -14 | 742.00 | -0.477 | 0.633 | insignificant | seasonal | -0.127 | -0.593 | 0.404 |
| IRLVNC | wqi | 29 | 1990–2004 (15) | -30 | 742.00 | -1.065 | 0.287 | insignificant | seasonal | -0.210 | -0.563 | 0.132 |
| IRLVSC | wqi | 29 | 1990–2004 (15) | 24 | 742.00 | 0.844 | 0.398 | insignificant | seasonal | 0.120 | -0.191 | 0.413 |
| 02236000 | wqi | 20 | 1995–2004 (11) | 24 | 250.00 | 1.455 | 0.146 | insignificant | seasonal | 0.514 | -0.066 | 1.415 |
| 20010002 | wqi | 19 | 1996–2004 (10) | -5 | 217.00 | -0.272 | 0.786 | insignificant | seasonal | -0.177 | -0.844 | 0.785 |
| 20030373 | wqi | 20 | 1995–2004 (11) | 22 | 250.00 | 1.328 | 0.184 | insignificant | seasonal | 0.696 | -0.411 | 0.944 |
| BLSPR | wqi | 23 | 1994–2004 (12) | -3 | | | | insignificant | nonseasonal | -0.002 | | |
| KER | tsi | 29 | 1990–2004 (15) | -82 | | | | insignificant | nonseasonal | -0.315 | | |
| LAG | tsi | 31 | 1990–2004 (16) | -29 | 901.67 | -0.932 | 0.351 | insignificant | seasonal | -0.168 | -0.530 | 0.150 |
| LKWOOD | tsi | 21 | 1991–2004 (12) | -20 | 290.00 | -1.116 | 0.265 | insignificant | seasonal | -0.345 | -1.073 | 0.239 |
| MSJFGF | wqi | 11 | 1998–2004 (7) | 15 | | | | insufficient | nonseasonal | 1.648 | | |
| 16MCRK | wqi | 12 | 1999–2004 (7) | 14 | 56.67 | 1.727 | 0.084 | insufficient | seasonal | 1.591 | 0.089 | 5.303 |
| 20030083 | wqi | 20 | 1995–2004 (11) | 8 | 250.00 | 0.443 | 0.658 | insignificant | seasonal | 0.312 | -0.434 | 1.090 |
| 20030115 | tsi | 20 | 1995–2004 (11) | 66 | | | | degrading | nonseasonal | 1.253 | | |
| 20030153 | tsi | 20 | 1995–2004 (11) | -18 | 250.00 | -1.075 | 0.282 | insignificant | seasonal | -0.574 | -1.246 | 0.187 |
| 20030349 | wqi | 20 | 1995–2004 (11) | -10 | 250.00 | -0.569 | 0.569 | insignificant | seasonal | -0.269 | -1.329 | 0.691 |
| 20030400 | tsi | 20 | 1995–2004 (11) | -40 | | | | insignificant | nonseasonal | -0.681 | | |
| 20030412 | tsi | 20 | 1995–2004 (11) | -46 | | | | insignificant | nonseasonal | -1.060 | | |
| BLC | wqi | 29 | 1990–2004 (15) | 166 | | | | degrading | nonseasonal | 0.931 | | |
| BSF | wqi | 31 | 1990–2004 (16) | 111 | | | | degrading | nonseasonal | 0.600 | | |
| CLD | tsi | 31 | 1990–2004 (16) | -53 | 901.67 | -1.732 | 0.083 | improving | seasonal | -0.429 | -0.946 | -0.051 |
| CRESLM | tsi | 11 | 19982–004 (6) | -25 | | | | insufficient | nonseasonal | -2.037 | | |

Table A3—*continued*

| Station | Method | Seasonal Medians Available | Period of Record (yrs) | Kendall K | Variance K | Z-score | Z-prob | Trend | Seasonality Condition | Sen Slope | Lower 95% CI for Sen Slope | Upper 95% CI for Sen Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DBR | wqi | 29 | 1991–2004 (15) | -30 | 742.00 | -1.065 | 0.287 | insignificant | seasonal | -0.279 | -0.677 | 0.123 |
| DPB | wqi | 31 | 1990–2004 (16) | 65 | 901.67 | 2.131 | 0.033 | degrading | seasonal | 0.538 | 0.169 | 0.854 |
| DTL | tsi | 30 | 1990–2004 (16) | -68 | 816.67 | -2.345 | 0.019 | improving | seasonal | -0.265 | -0.418 | -0.115 |
| DUNNSCRK | wqi | 13 | 1998–2004 (7) | 8 | | | | insufficient | nonseasonal | 0.673 | | |
| GC16 | tsi | 16 | 1993–2004 (9) | -90 | | | | insufficient | nonseasonal | -1.872 | | |
| GEN | tsi | 23 | 1994–2004 (12) | 35 | | | | insignificant | nonseasonal | 0.555 | | |
| GF33 | tsi | 12 | 1999–2004 (7) | 10 | | | | insufficient | nonseasonal | 0.410 | | |
| HAW | wqi | 31 | 1990–2004 (16) | 41 | 901.67 | 1.332 | 0.183 | insignificant | seasonal | 0.310 | -0.137 | 0.669 |
| HCC | tsi | 30 | 1990–2004 (15) | -64 | 816.67 | -2.205 | 0.027 | improving | seasonal | -0.397 | -0.714 | -0.094 |
| JAXST. JOHNS RIVER01 | tsi | 10 | 1999–2004 (5) | -1 | | | | insufficient | nonseasonal | -0.937 | | |
| JAXST. JOHNS RIVER04 | tsi | 19 | 1994–2004 (11) | 1 | | | | insignificant | nonseasonal | 0.002 | | |
| JAXST. JOHNS RIVER17 | tsi | 19 | 1994–2004 (11) | -5 | | | | insignificant | nonseasonal | -0.123 | | |
| JAXST. JOHNS RIVER30 | tsi | 9 | 1999–2003 (6) | -26 | | | | insufficient | nonseasonal | -1.938 | | |
| JAXST. JOHNS RIVER40 | tsi | 20 | 1994–2004 (11) | -54 | | | | improving | nonseasonal | -0.444 | | |
| LSJ070 | wqi | 24 | 1992–2004 (13) | -14 | 425.33 | -0.63 | 0.528 | insignificant | seasonal | -0.349 | -1.268 | 0.450 |
| LSJ087 | wqi | 26 | 1992–2004 (14) | -33 | 546.33 | -1.369 | 0.171 | insignificant | seasonal | -0.811 | -1.614 | 0.091 |
| LSJ099 | wqi | 25 | 1992–2004 (13) | -30 | 481.33 | -1.322 | 0.186 | insignificant | seasonal | -0.793 | -1.256 | 0.165 |
| LSJ918 | wqi | 26 | 1992–2004 (14) | 1 | 546.33 | 0 | 1 | insignificant | seasonal | 0.000 | -0.985 | 0.956 |
| MOB | wqi | 30 | 1991–2004 (16) | 2 | 816.67 | 0.035 | 0.972 | insignificant | seasonal | 0.048 | -0.761 | 0.758 |
| MP72 | tsi | 17 | 1993–2004 (11) | -26 | 157.33 | -1.993 | 0.046 | improving | seasonal | -0.314 | -0.817 | -0.027 |
| NBC | wqi | 29 | 1991–2004 (15) | 40 | 742.00 | 1.432 | 0.152 | insignificant | seasonal | 0.354 | -0.066 | 0.693 |
| OHD | wqi | 29 | 1991–2004 (15) | -84 | 742.00 | -3.047 | 0.002 | improving | seasonal | -1.050 | -1.436 | -0.548 |
| PTC | wqi | 25 | 1992–2004 (14) | -24 | 481.33 | -1.048 | 0.294 | insignificant | seasonal | -0.452 | -0.804 | 0.094 |

Table A3—*continued*

| Station | Method | Seasonal Medians Available | Period of Record (yrs) | Kendall_K | Variance K | Z-score | Z-prob | Trend | Seasonality Condition | Sen Slope | Lower 95% CI for Sen Slope | Upper 95% CI for Sen Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RCB | wqi | 31 | 1990–2004 (16) | -121 | | | | improving | nonseasonal | -0.474 | | |
| SAVBOLSO | tsi | 14 | 1997–2004 (8) | -45 | | | | insufficient | nonseasonal | -0.962 | | |
| SAVCRL2O | tsi | 16 | 1997–2004 (9) | -8 | 130.67 | -0.612 | 0.54 | insufficient | seasonal | -0.616 | -1.625 | 0.728 |
| SAVDRLKO | tsi | 15 | 1997–2004 (8) | -7 | 109.67 | -0.573 | 0.567 | insufficient | seasonal | -0.179 | -0.475 | 0.247 |
| SAVRICNO | tsi | 15 | 1997–2004 (8) | -25 | 109.67 | -2.292 | 0.022 | insufficient | seasonal | -0.566 | -0.897 | -0.150 |
| SAVSCRAO | tsi | 14 | 1997–2004 (8) | -24 | 88.67 | -2.443 | 0.015 | insufficient | seasonal | -0.940 | -1.473 | -0.386 |
| SHEEL | tsi | 23 | 1991–2004 (13) | 39 | 377.67 | 1.955 | 0.051 | degrading | seasonal | 0.641 | 0.177 | 1.248 |
| SIM | wqi | 23 | 1994–2004 (12) | -3 | 377.67 | -0.103 | 0.918 | insignificant | seasonal | -0.139 | -1.220 | 0.798 |
| SJCM25 | tsi | 28 | 1991–2004 (15) | -22 | 667.33 | -0.813 | 0.416 | insignificant | seasonal | -0.260 | -0.543 | 0.228 |
| SJM37 | tsi | 25 | 1993–2004 (13) | 6 | 481.33 | 0.228 | 0.82 | insignificant | seasonal | 0.135 | -0.298 | 0.533 |
| SJP | tsi | 29 | 1990–2004 (15) | -10 | 742.00 | -0.33 | 0.741 | insignificant | seasonal | -0.108 | -0.350 | 0.183 |
| ST. JOHNS RIVERCC | tsi | 25 | 1993–2004 (13) | -6 | 481.33 | -0.228 | 0.82 | insignificant | seasonal | -0.063 | -0.364 | 0.363 |
| ST. JOHNS RIVERHBP | tsi | 28 | 1991–2004 (15) | -46 | 667.33 | -1.742 | 0.082 | improving | seasonal | -0.149 | -0.512 | -0.031 |
| SJSR16 | tsi | 27 | 1991–2004 (14) | -29 | 602.33 | -1.141 | 0.254 | insignificant | seasonal | -0.245 | -0.531 | 0.140 |
| SMC | wqi | 31 | 1990–2004 (16) | 27 | 901.67 | 0.866 | 0.387 | insignificant | seasonal | 0.179 | -0.146 | 0.454 |
| SPCR | wqi | 25 | 1993–2004 (13) | 36 | 481.33 | 1.595 | 0.111 | insignificant | seasonal | 0.253 | -0.018 | 0.616 |
| SIM | wqi | 23 | 1994–2004 (12) | -3 | 377.67 | -0.103 | 0.918 | insignificant | seasonal | -0.139 | -1.220 | 0.798 |
| SJCM25 | tsi | 28 | 1991–2004 (15) | -22 | 667.33 | -0.813 | 0.416 | insignificant | seasonal | -0.260 | -0.543 | 0.228 |
| SJM37 | tsi | 25 | 1993–2004 (13) | 6 | 481.33 | 0.228 | 0.82 | insignificant | seasonal | 0.135 | -0.298 | 0.533 |
| SJP | tsi | 29 | 1990–2004 (15) | -10 | 742.00 | -0.33 | 0.741 | insignificant | seasonal | -0.108 | -0.350 | 0.183 |
| ST. JOHNS RIVERCC | tsi | 25 | 1993–2004 (13) | -6 | 481.33 | -0.228 | 0.82 | insignificant | seasonal | -0.063 | -0.364 | 0.363 |
| ST. JOHNS RIVERHBP | tsi | 28 | 1991–2004 (15) | -46 | 667.33 | -1.742 | 0.082 | improving | seasonal | -0.149 | -0.512 | -0.031 |
| SJSR16 | tsi | 27 | 1991–2004 (14) | -29 | 602.33 | -1.141 | 0.254 | insignificant | seasonal | -0.245 | -0.531 | 0.140 |
| SMC | wqi | 31 | 1990–2004 (16) | 27 | 901.67 | 0.866 | 0.387 | insignificant | seasonal | 0.179 | -0.146 | 0.454 |
| SPCR | wqi | 25 | 1993–2004 (13) | 36 | 481.33 | 1.595 | 0.111 | insignificant | seasonal | 0.253 | -0.018 | 0.616 |
| SRB | wqi | 28 | 1990–2004 (15) | 37 | 677.00 | 1.384 | 0.166 | insignificant | seasonal | 0.330 | -0.043 | 0.747 |
| SRP | tsi | 31 | 1990–2004 (16) | 1 | 901.67 | 0 | 1 | insignificant | seasonal | 0.005 | -0.322 | 0.265 |
| WIO | tsi | 23 | 1993–2004 (12) | 59 | | | | insignificant | nonseasonal | 0.930 | | |

Table A3—*continued*

| Station | Method | Seasonal Medians Available | Period of Record (yrs) | Kendall K | Variance K | Z-score | Z-prob | Trend | Seasonality Condition | Sen Slope | Lower 95% CI for Sen Slope | Upper 95% CI for Sen Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02233200 | wqi | 14 | 1998–2004 (8) | 26 | 88.67 | 2.655 | 0.008 | insufficient | seasonal | 1.120 | 0.530 | 2.129 |
| 02235000 | wqi | 21 | 1995–2004 (11) | 40 | 290.00 | 2.29 | 0.022 | degrading | seasonal | 1.692 | 0.275 | 3.632 |
| 20010137 | wqi | 21 | 1995–2004 (11) | 18 | 290.00 | 0.998 | 0.318 | insignificant | seasonal | 0.598 | -0.480 | 1.553 |
| ASH | tsi | 21 | 1995–2004 (11) | 40 | | | | insignificant | nonseasonal | 0.784 | | |
| BWC44 | wqi | 28 | 1991–2004 (15) | -12 | 667.33 | -0.426 | 0.67 | insignificant | seasonal | -0.118 | -0.475 | 0.353 |
| BWCCPB | wqi | 27 | 1991–2004 (14) | -23 | | | | insignificant | nonseasonal | -0.190 | | |
| CLH | tsi | 8 | 2001–2004 (5) | -6 | | | | insufficient | nonseasonal | -0.610 | | |
| DMR | wqi | 23 | 1994–2004 (12) | 1 | 377.67 | 0 | 1 | insignificant | seasonal | 0.083 | -1.040 | 1.082 |
| ECH | wqi | 29 | 1991–2004 (15) | 10 | 742.00 | 0.33 | 0.741 | insignificant | seasonal | 0.140 | -0.405 | 0.561 |
| LMAC | tsi | 27 | 1991–2004 (14) | -9 | | | | insignificant | nonseasonal | -0.052 | | |
| OW-2 | tsi | 21 | 1995–2004 (11) | 0 | 290.00 | 0 | 1 | insignificant | seasonal | 0.008 | -0.687 | 0.534 |
| OW-4 | tsi | 21 | 1995–2004 (11) | -28 | | | | insignificant | nonseasonal | -0.403 | | |
| OW-6 | tsi | 21 | 1995–2004 (11) | -32 | | | | insignificant | nonseasonal | -0.420 | | |
| OW-ST. JOHNS RIVER-1 | wqi | 19 | 1996–2004 (10) | 35 | 217.00 | 2.308 | 0.021 | degrading | seasonal | 1.212 | 0.367 | 2.365 |
| SRN | wqi | 29 | 1991–2004 (15) | 82 | 742.00 | 2.974 | 0.003 | degrading | seasonal | 0.797 | 0.337 | 1.252 |
| WIN | tsi | 24 | 1990–2004 (13) | 20 | | | | insignificant | nonseasonal | 0.443 | | |
| 19020002 | tsi | 20 | 1995–2004 (11) | 116 | | | | degrading | nonseasonal | 2.135 | | |
| NRI | wqi | 20 | 1995–2004 (11) | -8 | 250.00 | -0.443 | 0.658 | insignificant | seasonal | -0.272 | -1.271 | 0.372 |
| 02238000 | wqi | 20 | 1995–2004 (11) | -16 | | | | insignificant | nonseasonal | -0.227 | | |
| 20020012 | wqi | 20 | 1996–2004 (11) | 4 | | | | insignificant | nonseasonal | 0.153 | | |
| 20020321 | tsi | 14 | 1998–2004 (8) | 53 | | | | insufficient | nonseasonal | 2.622 | | |
| 20020368 | tsi | 21 | 1995–2004 (11) | -12 | | | | insignificant | nonseasonal | -0.313 | | |
| 20020381 | tsi | 20 | 1995–2004 (11) | -60 | | | | improving | nonseasonal | -2.056 | | |
| ABC | wqi | 31 | 1990–2004 (16) | -51 | 901.67 | -1.665 | 0.096 | improving | seasonal | -0.416 | -0.744 | -0.029 |
| BCE | tsi | 30 | 1990–2004 (16) | -153 | | | | improving | nonseasonal | -0.680 | | |
| CARL | tsi | 12 | 1999–2004 (7) | -32 | | | | insufficient | nonseasonal | -2.468 | | |
| CLA | tsi | 31 | 1990–2004 (16) | -173 | | | | improving | nonseasonal | -0.554 | | |
| CLW | tsi | 31 | 1990–2004 (16) | -13 | | | | insignificant | nonseasonal | -0.004 | | |
| DCNL | wqi | 12 | 1999–2004 (7) | 22 | | | | insufficient | nonseasonal | 1.350 | | |

Table A3—*continued*

| Station | Method | Seasonal Medians Available | Period of Record (yrs) | Kendall K | Variance K | Z-score | Z-prob | Trend | Seasonality Condition | Sen Slope | Lower 95% CI for Sen Slope | Upper 95% CI for Sen Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPHCA | wqi | 21 | 1994–2004 (11) | -42 | 290.00 | -2.408 | 0.016 | improving | seasonal | -1.244 | -1.873 | -0.511 |
| DEPHCB | wqi | 21 | 1994–2004 (11) | 16 | 290.00 | 0.881 | 0.378 | insignificant | seasonal | 0.403 | -0.544 | 0.808 |
| DNEY | tsi | 31 | 1990–2004 (16) | -61 | | | | insignificant | nonseasonal | -0.282 | | |
| DOR | tsi | 30 | 1990–2004 (16) | -44 | 816.67 | -1.505 | 0.132 | insignificant | seasonal | -0.382 | -0.664 | 0.049 |
| DORE | tsi | 12 | 1999–2004 (7) | -42 | | | | insufficient | nonseasonal | -2.831 | | |
| DRVR | wqi | 12 | 1999–2004 (7) | 10 | | | | insufficient | nonseasonal | 0.530 | | |
| HAR | tsi | 30 | 1990–2004 (16) | 11 | | | | insignificant | nonseasonal | 0.036 | | |
| HAT26 | wqi | 25 | 1993–2004 (13) | -52 | | | | insignificant | nonseasonal | -0.539 | | |
| HICKDN | wqi | 19 | 1996–2004 (10) | -37 | | | | insignificant | nonseasonal | -1.699 | | |
| LFC329B | wqi | 15 | 1998–2004 (8) | 15 | 109.67 | 1.337 | 0.181 | insufficient | seasonal | 1.178 | -0.101 | 2.899 |
| LGNA | tsi | 20 | 1995–2004 (11) | -86 | | | | improving | nonseasonal | -2.480 | | |
| LGS | tsi | 12 | 1999–2004 (7) | -28 | | | | insufficient | nonseasonal | -3.130 | | |
| LHAT26 | wqi | 19 | 1994–2004 (12) | 19 | 217.00 | 1.222 | 0.222 | insignificant | seasonal | 0.742 | -0.315 | 1.323 |
| LHT26E | wqi | 23 | 1994–2004 (12) | 35 | 377.67 | 1.75 | 0.08 | degrading | seasonal | 1.756 | 0.337 | 3.125 |
| LLHARRIS | tsi | 11 | 1999–2004 (6) | -15 | | | | insufficient | nonseasonal | -1.198 | | |
| LOL | tsi | 29 | 1990–2004 (15) | 68 | | | | insignificant | nonseasonal | 0.669 | | |
| LYC | tsi | 31 | 1990–2004 (16) | 273 | | | | degrading | nonseasonal | 2.247 | | |
| MBU | wqi | 31 | 1990–2004 (16) | -1 | 901.67 | 0 | 1 | insignificant | seasonal | -0.010 | -0.384 | 0.467 |
| NEW | tsi | 22 | 1994–2004 (11) | 3 | | | | insignificant | nonseasonal | 0.086 | | |
| NLA | tsi | 31 | 1990–2004 (16) | -115 | | | | improving | nonseasonal | -0.415 | | |
| OCKLRM | wqi | 15 | 1998–2004 (8) | 37 | | | | insufficient | nonseasonal | 3.098 | | |
| OFB | wqi | 9 | 2000–2004 (5) | -14 | | | | insufficient | nonseasonal | -2.468 | | |
| OR006 | wqi | 27 | 1992–2004 (14) | 67 | | | | insignificant | nonseasonal | 0.660 | | |
| ORD | wqi | 23 | 1994–2004 (12) | -11 | 377.67 | -0.515 | 0.607 | insignificant | seasonal | -0.262 | -0.807 | 0.536 |
| PINEMS | wqi | 19 | 1996–2004 (10) | -49 | | | | improving | nonseasonal | -2.533 | | |
| PRVR | wqi | 8 | 2000–2004 (5) | 12 | | | | insufficient | nonseasonal | 4.416 | | |
| SHORIA | wqi | 31 | 1990–2004 (16) | -27 | 901.67 | -0.866 | 0.387 | insignificant | seasonal | -0.221 | -0.762 | 0.228 |
| SLA | tsi | 29 | 1991–2004 (15) | -106 | | | | improving | nonseasonal | -0.678 | | |
| SSR | wqi | 11 | 1994–2004 (7) | -3 | | | | insufficient | nonseasonal | -0.177 | | |
| YGCAA | wqi | 16 | 1994–2004 (9) | -11 | 136.33 | -0.856 | 0.392 | insufficient | seasonal | -0.588 | -1.624 | 0.861 |
| YGCCA | wqi | 21 | 1994–2004 (11) | -100 | | | | improving | nonseasonal | -1.274 | | |

Table A3—*continued*

| Station | Method | Seasonal Medians Available | Period of Record (yrs) | Kendall K | Variance K | Z-score | Z-prob | Trend | Seasonality Condition | Sen Slope | Lower 95% CI for Sen Slope | Upper 95% CI for Sen Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19010001 | wqi | 20 | 1995–2004 (11) | -10 | 250.00 | -0.569 | 0.569 | insignificant | seasonal | -0.235 | -0.840 | 0.713 |
| 19010006 | wqi | 20 | 1995–2004 (11) | -20 | 250.00 | -1.202 | 0.229 | insignificant | seasonal | -0.335 | -1.233 | 0.197 |
| MPS | wqi | 27 | 1990–2004 (14) | -15 | 602.33 | -0.57 | 0.568 | insignificant | seasonal | -0.196 | -0.674 | 0.411 |
| SJA-HS-1018 | wqi | 9 | 2001–2004 (5) | 8 | 25.33 | 1.391 | 0.164 | insufficient | seasonal | 1.043 | -0.723 | 4.782 |
| 02248000 | wqi | 20 | 1995–2004 (11) | 12 | 250.00 | 0.696 | 0.487 | insignificant | seasonal | 0.284 | -0.362 | 1.219 |
| 27010024 | tsi | 20 | 1995–2004 (11) | 32 | | | | insignificant | nonseasonal | 0.485 | | |
| 27010037 | tsi | 20 | 1995–2004 (11) | -18 | 250.00 | -1.075 | 0.282 | insignificant | seasonal | -0.462 | -1.037 | 0.545 |
| 27010579 | wqi | 20 | 1995–2004 (11) | 0 | 250.00 | 0 | 1 | insignificant | seasonal | 0.029 | -0.791 | 1.187 |
| BUL | tsi | 31 | 1990–2004 (16) | 39 | 901.67 | 1.265 | 0.206 | insignificant | seasonal | 0.312 | -0.107 | 0.732 |
| CCC | tsi | 19 | 1990–2004 (11) | 1 | 217.00 | 0 | 1 | insignificant | seasonal | 0.021 | -0.404 | 0.392 |
| GAR | tsi | 19 | 1990–2004 (11) | 55 | | | | degrading | nonseasonal | 1.059 | | |
| JXTR17 | tsi | 17 | 1997–2004 (9) | -14 | 157.33 | -1.036 | 0.3 | insufficient | seasonal | -0.257 | -0.801 | 0.378 |
| JXTR21 | tsi | 17 | 1997–2004 (9) | -4 | 157.33 | -0.239 | 0.811 | insufficient | seasonal | -0.211 | -1.074 | 1.205 |
| JXTR26 | tsi | 17 | 1997–2004 (9) | 8 | 157.33 | 0.558 | 0.577 | insufficient | seasonal | 0.520 | -0.350 | 1.533 |
| MAT | tsi | 31 | 1990–2004 (16) | 43 | 901.67 | 1.399 | 0.162 | insignificant | seasonal | 0.284 | -0.024 | 0.664 |
| MCICW | tsi | 17 | 1997–2004 (9) | 8 | 157.33 | 0.558 | 0.577 | insufficient | seasonal | 0.205 | -0.474 | 1.572 |
| MR312 | tsi | 29 | 1991–2004 (15) | -14 | | | | insignificant | nonseasonal | -0.106 | | |
| MRT | tsi | 17 | 1997–2004 (9) | 6 | 157.33 | 0.399 | 0.69 | insufficient | seasonal | 0.214 | -0.567 | 0.644 |
| MTC | wqi | 30 | 1990–2004 (16) | -88 | 816.67 | -3.044 | 0.002 | improving | seasonal | -0.572 | -0.918 | -0.270 |
| PEL | wqi | 31 | 1990–2004 (16) | 17 | 901.67 | 0.533 | 0.594 | insignificant | seasonal | 0.310 | -0.364 | 0.880 |
| SMITHSCR | tsi | 17 | 1997–2004 (9) | 42 | 157.33 | 3.269 | 0.001 | insufficient | seasonal | 0.885 | 0.456 | 1.927 |
| SSB | tsi | 17 | 1997–2004 (9) | 8 | | | | insufficient | nonseasonal | 0.194 | | |
| STOKESCR | tsi | 17 | 1997–2004 (9) | 24 | 157.33 | 1.834 | 0.067 | insufficient | seasonal | 0.839 | 0.105 | 1.965 |
| TOL | tsi | 31 | 1990–2004 (16) | 35 | 901.67 | 1.132 | 0.258 | insignificant | seasonal | 0.223 | -0.241 | 0.615 |
| BCL | tsi | 27 | 1991–2004 (14) | 15 | | | | insignificant | nonseasonal | 0.124 | | |
| JGS | wqi | 29 | 1991–2004 (15) | 12 | 742.00 | 0.404 | 0.686 | insignificant | seasonal | 0.077 | -0.394 | 0.504 |
| LPO | tsi | 29 | 1991–2004 (15) | 60 | 742.00 | 2.166 | 0.03 | degrading | seasonal | 0.848 | 0.154 | 1.672 |
| LWC | tsi | 29 | 1991–2004 (15) | 82 | 742.00 | 2.974 | 0.003 | degrading | seasonal | 0.665 | 0.299 | 1.015 |
| SRS | wqi | 29 | 1991–2004 (15) | 30 | 742.00 | 1.065 | 0.287 | insignificant | seasonal | 0.235 | -0.084 | 0.661 |
| USJ055 | wqi | 25 | 1992–2004 (14) | 0 | 481.33 | 0 | 1 | insignificant | seasonal | -0.042 | -0.693 | 0.587 |