TECHNICAL PUBLICATION SJ2006-1

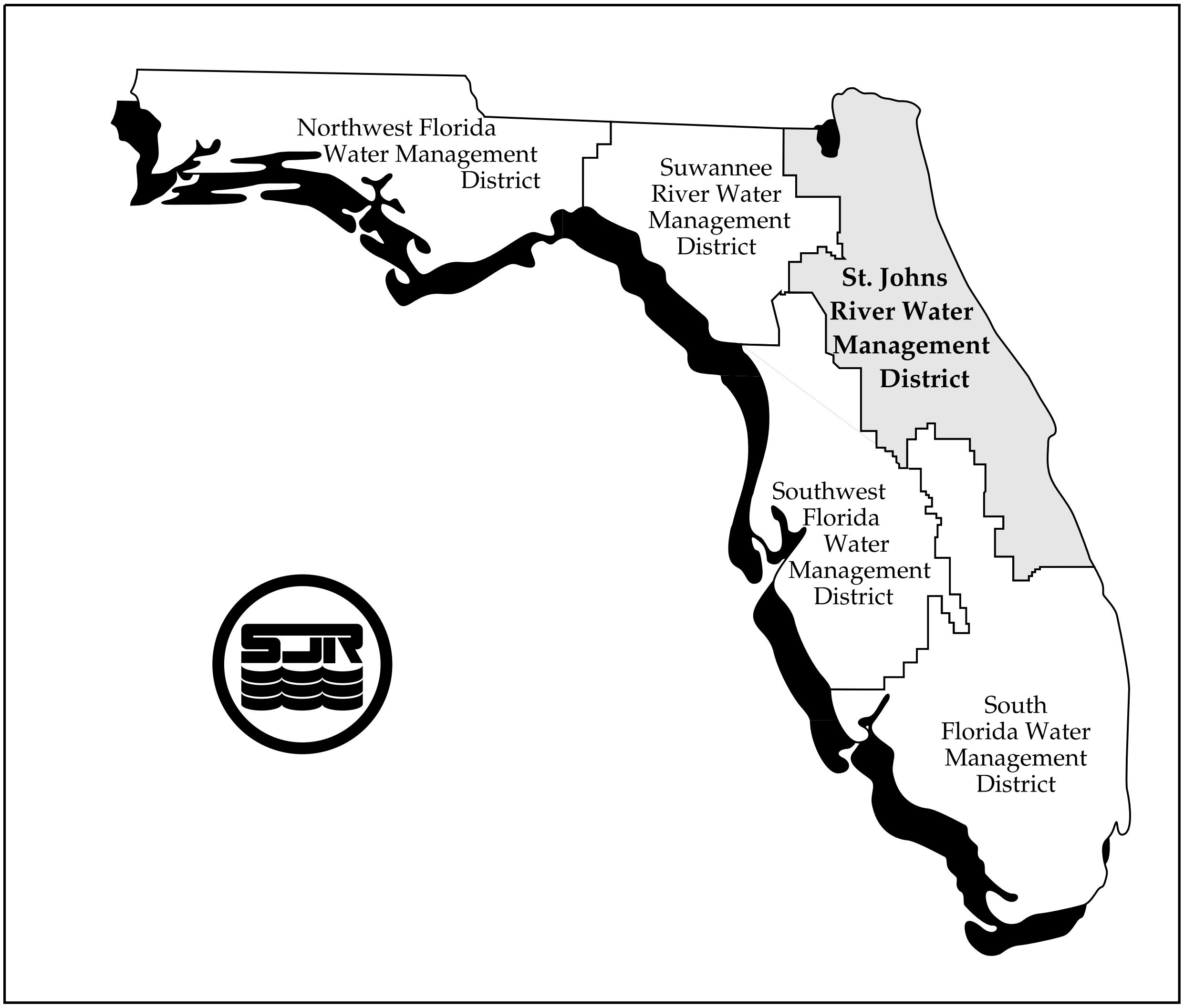
# WATER SUPPLY ASSESSMENT
# 2003
# ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

Technical Publication SJ2006-1

# Water Supply Assessment
# 2003
# St. Johns River Water Management District

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.

This document is published to disseminate information collected by SJRWMD in pursuit of its mission. Copies of this document can be obtained from:

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# EXECUTIVE SUMMARY

The St. Johns River Water Management District (SJRWMD) prepares water supply assessments for the purposes of

- Identifying future water supply needs
- Identifying areas where those needs cannot be met by the water supply plans of major water users without unacceptable impacts to water resources and related natural systems (priority water resource caution areas)

SJRWMD also develops and implements water supply plans to assure that adequate and sustainable water supplies are available to meet projected future water supply needs without unacceptable impacts in priority water resource caution areas (PWRCAs). A major conclusion of this 2003 districtwide water supply assessment (WSA 2003) is that the SJRWMD 2005 water supply plan development process should focus on identifying water supply strategies that will assure that adequate and sustainable water supplies are available to meet projected future water supply needs without unacceptable impacts in the east-central Florida area including all or parts of Brevard, Flagler, Lake, Marion, Orange, Osceola, and Seminole counties.

WSA 2003 has been performed to satisfy SJRWMD's purposes and to meet the requirements of Subparagraph 373.036(2)(b)4, *Florida Statutes* (F.S.), as follows:

> A districtwide water supply assessment, to be completed no later than July 1, 1998, which determines for each water supply planning region
>
> a. Existing legal uses, reasonably anticipated future needs, and existing and reasonably anticipated sources of water and conservation efforts; and
>
> b. Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for all existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems.

WSA 2003 is a required component of the District Water Management Plan (Subsection 373.036(2), F.S.). Because SJRWMD has identified its entire jurisdictional area as one water supply planning region pursuant to the requirements of Subparagraph 373.036(2)(b)2, F.S., WSA 2003 is organized with a districtwide perspective. The assessment is based on a planning period extending through 2025 and is the first 5-year update to the initial *Florida Statutes* mandated assessment in association with updates to the District Water Management Plan.

The SJRWMD approach to addressing these requirements consists of the following:

- Defining the limits of water resource impacts beyond which an unacceptable water resource-related condition could occur (water resource constraints)
- Projecting the water resource impacts that could occur in 2025 as a result of projected changes in water use
- Identifying priority water resource caution areas (PWRCAs)

SJRWMD assessed water resource impacts in two primary categories:

- Impacts to natural systems
- Impacts to groundwater quality (saltwater intrusion)

SJRWMD's assessment of potential water resource impacts is based on the premise that these impacts are affected to the greatest degree by long-term, average water resource conditions rather than by shorter-term conditions, such as extreme droughts or extreme wet periods. Therefore, SJRWMD has used steady-state groundwater flow models calibrated to a year of reasonably average rainfall in combination with projections of average 2025 water use as the basis of projecting impacts. In addition, although SJRWMD has estimated water supply needs for the 1-in-10-year drought condition in 2025, as required by the water supply planning provisions of Chapter 373, F.S., these estimates have not been used as the basis of projecting impacts or identifying PWRCAs.

Projected water level changes between 1995 and 2025 are a key factor in determining the likelihood of impacts to natural systems and groundwater quality. This represents a 30-year projection period rather than the projection period from 2000–2025, which is the focus of WSA 2003. This extended projection period is necessary because natural systems and groundwater quality are impacted by the cumulative long-term change in water levels, not just by portions of this long-term change such as would be represented by the water level change between 2000–2025. SJRWMD plans to continue to use 1995 as the base year for assessments of impacts to natural systems and groundwater quality in future assessments.

The decision to use 1995 as the base year for this analysis was based on the availability of suitable regional groundwater flow models calibrated to 1995 conditions. Although flow models calibrated to 1988 conditions are available for some areas of SJRWMD, those models do not produce simulations as precisely as the 1995 models. This difference in precision is largely related to differences in model grid size and locations of model boundaries.

Changes in the conditions of natural systems and groundwater quality have certainly occurred since predevelopment time through 1995 as a result of historic groundwater withdrawals in SJRWMD. Also, additional natural systems and groundwater quality changes that have not occurred to date are likely to occur in the future as a result of these historic withdrawals. Such changes appear years after the commencement of withdrawals. Inadequate data are available to quantify the relationship of these changes to groundwater level changes and groundwater withdrawals. During this same period, much population growth and associated land development occurred, resulting in significant impacts to natural systems other than those related to groundwater withdrawals. The changes that have resulted or will result from historic groundwater withdrawals and land development are part of the history of Florida’s growth and development prior to the regulation of water-related activities by SJRWMD. They are not the targets of SJRWMD’s water supply management efforts, except to the extent that they may be affected by the establishment of minimum flows and levels.

SJRWMD, based on the requirements of Subparagraph 373.036(2)(b)4a, F.S., inventoried existing legal uses of water, reasonably anticipated future needs, existing and reasonably anticipated sources of water, and conservation efforts. Total water use in SJRWMD in 1995 from ground and surface water sources totaled about 1,364 million gallons per day (mgd) (Table ES1), of which about 453 mgd, approximately 33%, was used for public supply. The public supply category includes utilities that supply at least 0.10 mgd annual average daily flow. Agriculture accounted for about 43% of the total amount used, about 584 mgd.

Table ES1. Total water use (A) for 1995, 2000 and 2025 by category of use, in the St. Johns River Water Management District and (B) as a percent of total change by category of total water use for 1995–2025

A.

| Category | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | 2025 Projected Water Use 1-in-10 Rainfall Year | | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | |
| Public Supply | 441.11 | 12.15 | 453.26 | 549.47 | 14.08 | 563.55 | 809.88 | 25.68 | 835.56 | 84 | 858.46 | 27.22 | 885.68 | 95 |
| Domestic and Other Small Public Supply | 71.09 | 0.00 | 71.09 | 64.50 | 0.00 | 64.50 | 100.67 | 0.00 | 100.67 | 42 | 106.72 | 0.00 | 106.72 | 50 |
| Agricultural Irrigation | 361.16 | 223.15 | 584.31 | 387.85 | 213.74 | 601.59 | 306.93 | 215.18 | 522.11 | -11 | 355.07 | 260.22 | 615.29 | 5 |
| Recreational Irrigation | 68.78 | 30.35 | 99.13 | 72.66 | 31.94 | 104.60 | 107.77 | 48.67 | 156.44 | 58 | 110.51 | 49.89 | 160.40 | 62 |
| Commercial/Industrial/Institutional | 95.55 | 38.13 | 133.68 | 90.56 | 31.80 | 122.36 | 98.63 | 30.67 | 129.30 | -3 | 98.63 | 30.67 | 129.30 | -3 |
| Thermoelectric Power Generation | 7.68 | 14.50 | 22.18 | 10.86 | 18.91 | 29.77 | 13.42 | 28.44 | 41.86 | 89 | 13.42 | 28.44 | 41.86 | 89 |
| Total | 1,045.37 | 318.28 | 1,363.65 | 1,175.90 | 310.47 | 1,486.37 | 1,437.30 | 348.64 | 1,785.94 | 31 | 1,542.81 | 396.44 | 1,939.25 | 42 |

All water use in million gallons per day

2025 public supply water use includes 1.72 mgd from an unspecified source and provider in Volusia County

B.

| Category | Average Rainfall Year | 1-in-10 Rainfall Year |
|---|---|---|
| Public Supply | 90 | 75 |
| Domestic and Other Small Public Supply | 7 | 6 |
| Agricultural Irrigation | -15 | 5 |
| Recreational Irrigation | 14 | 11 |
| Commercial/Industrial/Institutional | -1 | -1 |
| Thermoelectric Power Generation | 5 | 3 |
| Total | 101 | 99 |

Percentages shown may not be exact due to rounding

In a year of average rainfall, total water use in SJRWMD is projected to increase by about 30% to1,786 mgd from 1995 to 2025, and by about 20% from 2000 to 2025. The category with the most significant projected increase during both periods is public supply, where demand is estimated to increase by about 84% to 836 mgd from 1995 to 2025, and by about 48% from 2000 to 2025.

The projected percent increase in water use based on assumed average rainfall conditions between 1995 and 2025, by county, ranges from a high of 135% in Clay County to a low of 6% in Indian River County. (Table ES2). Total water use is expected to remain unchanged in Osceola County, and decrease in Okeechobee and Brevard counties by 5% and 3%, respectively, due to a decrease in agricultural irrigation.

If major water users' current water supply plans for 2025 are implemented, the elevation of the potentiometric surface of the Floridan aquifer system is expected to decline regionally in response to the cumulative withdrawals of water from the Floridan aquifer system (Figure ES1). In response to these declines in the elevation of the potentiometric surface of the Floridan aquifer system and in response to withdrawals from the intermediate and surficial aquifer systems, water levels in the surficial aquifer system would decline (Figure ES2) and contribute to unacceptable impacts to wetlands and lakes in Brevard, Flagler, Lake, Marion, Orange, Osceola, Seminole, and Volusia counties. Also in response to these declines, the discharge of Starbuck Spring in Seminole County and a total of 14 lakes in Lake, Seminole, and Volusia counties would fall below established minimum flows and levels. In addition, chloride concentrations would likely increase to unacceptable levels in public supply wellfields in parts of Brevard, Flagler, Seminole, and Volusia counties, mainly in areas in or near the Atlantic coast and the St. Johns River.

Projections of possible future water resource conditions identified as part of WSA 2003 are not considered by SJRWMD to represent conditions that would certainly exist if projected future withdrawals were implemented. The projections were developed using modeling techniques that used the best information available. However, the lack of data in some areas could affect the accuracy of the projections. Additional data and modeling have been identified as means of improving the accuracy of the projections.

Table ES2. Total water use for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | |
| Alachua | 34.84 | 0.79 | 35.63 | 37.89 | 0.28 | 38.17 | 51.81 | 1.21 | 53.02 | 49 |
| Baker | 3.77 | 0.86 | 4.63 | 5.56 | 1.73 | 7.29 | 6.53 | 0.86 | 7.39 | 60 |
| Bradford | 0.29 | 0.00 | 0.29 | 0.30 | 0.02 | 0.32 | 0.40 | 0.00 | 0.40 | 38 |
| Brevard | 164.35 | 30.12 | 194.47 | 169.27 | 39.20 | 208.47 | 141.45 | 46.70 | 188.15 | -3 |
| Clay | 21.08 | 0.52 | 21.60 | 33.22 | 0.52 | 33.74 | 49.89 | 0.85 | 50.74 | 135 |
| Duval | 140.39 | 1.06 | 141.45 | 153.17 | 1.65 | 154.82 | 191.98 | 1.44 | 193.42 | 37 |
| Flagler | 14.70 | 1.22 | 15.92 | 24.48 | 3.60 | 28.08 | 30.30 | 2.99 | 33.29 | 109 |
| Indian River | 87.06 | 172.43 | 259.49 | 87.46 | 161.08 | 248.54 | 99.81 | 176.30 | 276.11 | 6 |
| Lake | 92.94 | 15.79 | 108.73 | 89.47 | 9.63 | 99.10 | 130.45 | 16.70 | 147.15 | 35 |
| Marion | 33.05 | 1.87 | 34.92 | 43.91 | 1.94 | 45.85 | 52.98 | 2.69 | 55.67 | 59 |
| Nassau | 56.95 | 4.72 | 61.67 | 46.49 | 0.48 | 46.97 | 91.98 | 5.95 | 97.93 | 59 |
| Okeechobee | 14.25 | 0.00 | 14.25 | 15.24 | 0.00 | 15.24 | 13.49 | 0.00 | 13.49 | -5 |
| Orange | 136.15 | 19.20 | 155.35 | 159.11 | 5.32 | 164.43 | 221.70 | 11.43 | 233.13 | 50 |
| Osceola | 6.57 | 9.99 | 16.56 | 29.48 | 19.06 | 48.54 | 6.61 | 9.99 | 16.60 | 0 |
| Putnam | 32.50 | 50.05 | 82.55 | 40.49 | 48.92 | 89.41 | 37.39 | 52.33 | 89.72 | 9 |
| Seminole | 67.03 | 1.57 | 68.60 | 88.25 | 1.78 | 90.03 | 110.24 | 2.37 | 112.61 | 64 |
| St. Johns | 48.63 | 2.26 | 50.89 | 52.49 | 3.16 | 55.65 | 77.90 | 4.06 | 81.96 | 61 |
| Volusia | 90.82 | 5.83 | 96.65 | 99.62 | 12.10 | 111.72 | 122.39 | 12.77 | 135.16 | 40 |
| Total | 1,045.37 | 318.28 | 1,363.65 | 1,175.90 | 310.47 | 1,486.37 | 1,437.30 | 348.64 | 1,785.94 | 31 |

All water use in million gallons per day

Volusia county total includes 1.72 mgd from an unknown source for the I-4 activity center

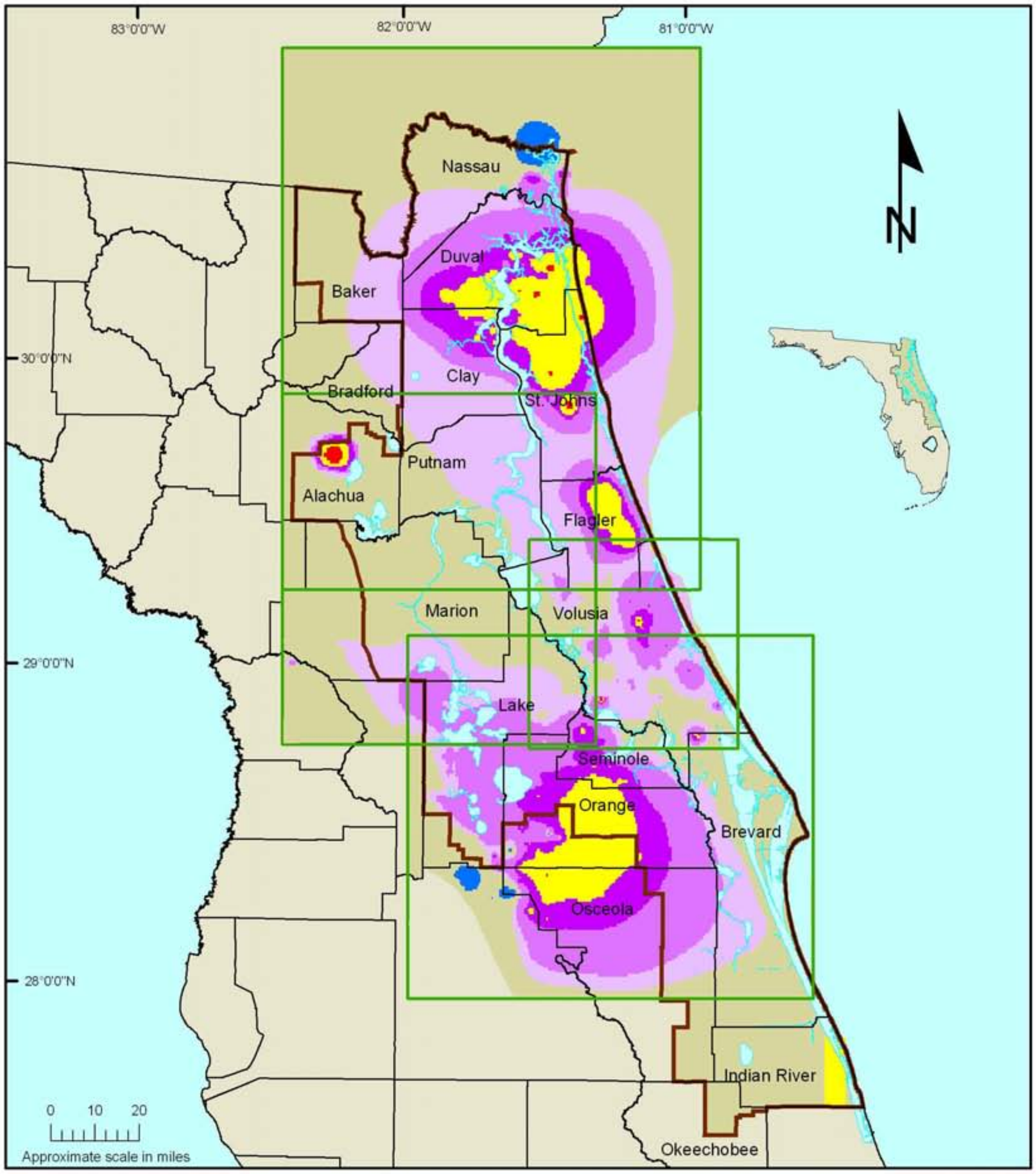


Figure ES1. Projected changes in the elevation of the potentiometric surface of the Floridan aquifer system in response to projected increases in groundwater withdrawals, 1995 - 2025

*Note: This map is a composite of the results of simulations of four regional groundwater flow models. In areas where the boundaries of these models overlap, professional judgment was applied to determine the extent of potentiometric surface changes.*

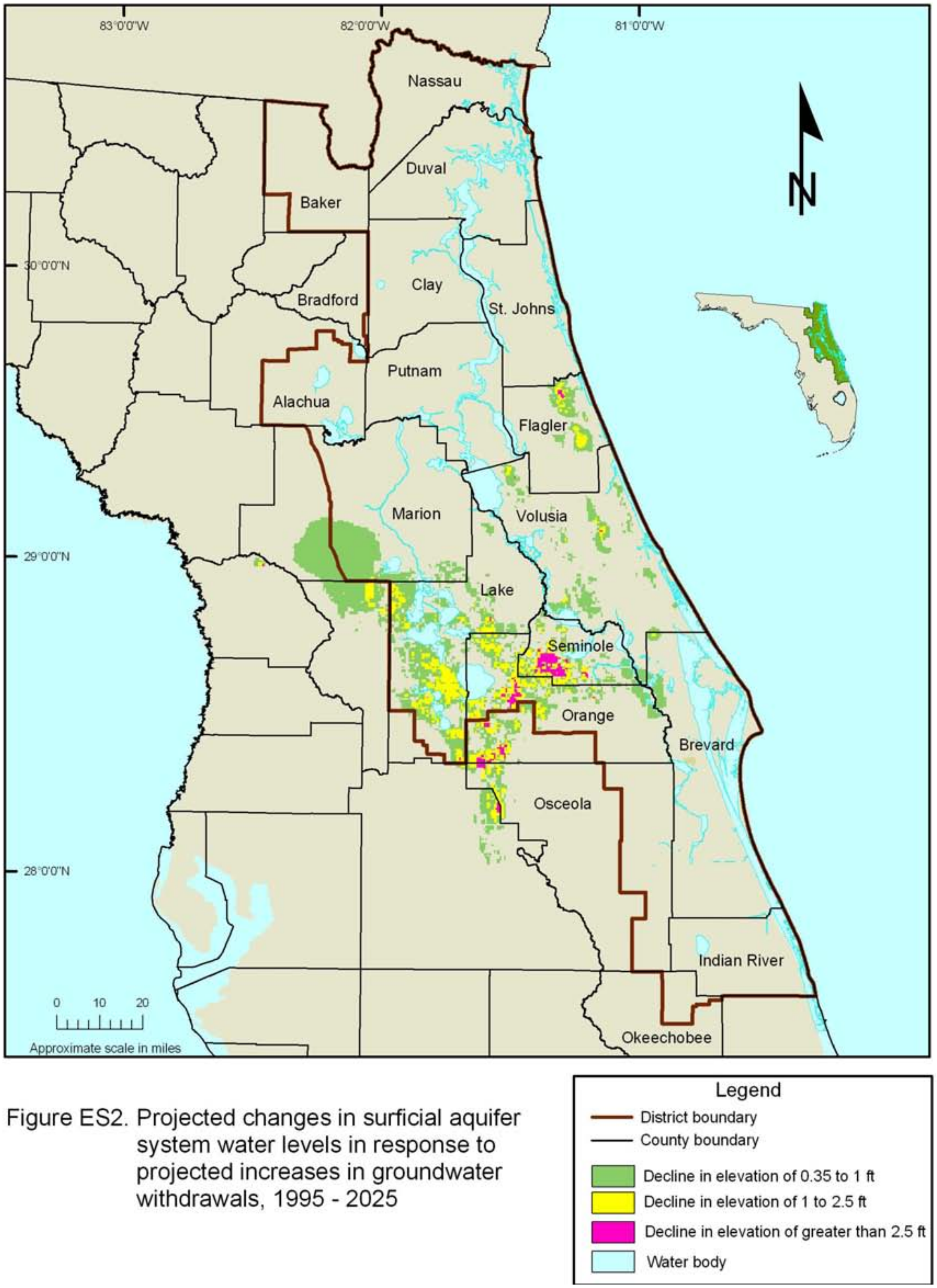


Figure ES2. Projected changes in surficial aquifer system water levels in response to projected increases in groundwater withdrawals, 1995 - 2025

SJRWMD identified priority water resource caution areas (PWRCAs) based on a comparison of water resource constraints to the results of assessments of hydrologic impacts due to 2025 projected water use (Figure ES3). PWRCAs are areas where existing and reasonably anticipated sources of water and conservation efforts may not be adequate (1) to supply water for all existing legal uses and reasonably anticipated future needs and (2) to sustain the water resources and related natural systems. SJRWMD identified PWRCAs based on the water resource constraints and the results of water use, groundwater, and surface water assessments.

PWRCAs identified in WSA 2003 cover about 39% of SJRWMD and include all or parts of Brevard, Flagler, Lake, Marion, Orange, Osceola, Seminole, and Volusia counties. The 2003 boundaries of the PWRCAs include areas that were not within the 1998 boundaries: portions of Brevard, Flagler, Marion, and Volusia counties. These areas are identified based on projected impacts to natural systems. Based on projected 2025 groundwater withdrawals, newly designated PWRCAs in Brevard, Flagler, Marion, and Volusia counties would experience or contribute to unacceptable impacts to native vegetation and lakes. Newly designated PWRCAs in Marion and Volusia counties would contribute to declines in spring discharge and / or lake levels below established minimum flows and levels. In addition, newly designated PWRCAs within Flagler County would experience unacceptable increases in chloride concentrations.

Changes in projected quantities and locations of projected 2025 groundwater and surface water withdrawals can change the boundaries of PWRCAs. Therefore, areas located outside of the identified PWRCAs should not be assumed to be able to support future groundwater and surface water withdrawals without resulting in unacceptable water resource conditions.

Projected 2025 water use in areas to the south and west of the SJRWMD boundary in the South Florida Water Management District (SFWMD) and the Southwest Florida Water Management District (SWFWMD), respectively, will contribute to the projected unacceptable water resource conditions that would occur if major water users' current water supply plans for 2025 are implemented. SJRWMD is coordinating closely with SFWMD and SWFWMD concerning this matter, based on the provisions of a memorandum of understanding entered into by the three water management districts.

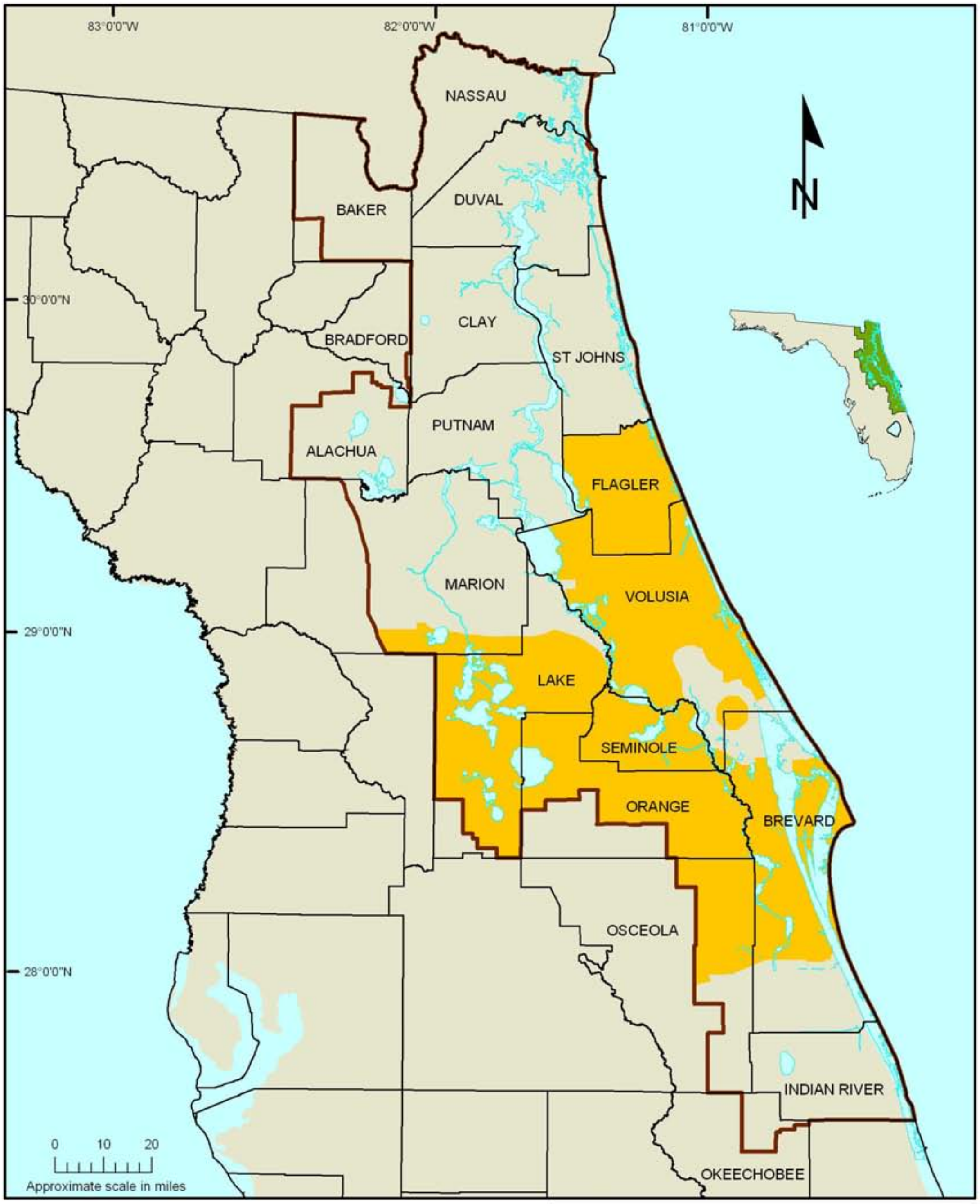


Figure ES3. Priority water resource caution areas in the St. Johns River Water Management District, 2003

Pursuant to Paragraph 373.0361(1), F.S., SJRWMD is required to initiate water supply planning for each water supply planning region where it determines that sources of water are not adequate for the planning period to supply water for all existing and projected reasonable-beneficial uses and to sustain the water resources and related natural systems. PWRCAs identified by SJRWMD represent areas within which existing and anticipated sources of water and conservation efforts are not adequate to supply water for all existing and projected reasonable-beneficial uses and to sustain the water resources and related natural systems through 2025. Therefore, because SJRWMD has identified its entire jurisdictional area as one water supply planning region, one districtwide water supply plan will be developed as an update to the initial plan, the 2000 *District Water Supply Plan* (DWSP 2000) (Vergara 2000) and the 2004 interim update to DWSP 2000 (Vergara 2004).

## WATER SUPPLY PLANNING HISTORY, WITH ACCOMPLISHMENTS

### Water Supply Management Program

SJRWMD's water supply management program consists of the following components:

- Districtwide water supply assessment
- Regional water supply plan development
- Regional water supply plan implementation

Documents presenting the assessments and plans are typically prepared on 5-year recurring schedules, with the districtwide water supply assessment being completed 2 years before completion of the regional water supply plan. Each districtwide water supply assessment identifies PWRCAs, which become the focus of the next regional water supply plan. Regional water supply plans are designed to identify water supply development project options and water resources development projects that are adequate to meet projected water use. These projects, if developed and implemented, are anticipated to be adequate to avoid projected unacceptable impacts in PWRCAs and keep areas from being designated as PWRCAs.

Implementation of the regional water supply plans should result in development of necessary sustainable water supplies. With the development of sustainable supplies, PWRCA designations should eventually be removed. SJRWMD's goal is to prevent the occurrence of the projected unacceptable impacts to the water resources and related natural systems identified in the water supply assessment.

## Water Supply Planning History

SJRWMD's water supply planning program began in 1990, when work began on the 1994 water supply needs and sources assessment, the predecessor to the 1998 districtwide water supply assessment (WSA 1998) (Vergara 1998). The 1994 water supply needs and sources assessment was performed pursuant to the requirements of Section 62-40.520, *F.A.C.*, and Paragraph 373.0391(2)(e), F.S. The planning horizon for this assessment was 2010. The 1994 assessment identified 38% of SJRWMD as a water resource caution area (comparable to PWRCAs in subsequent water supply assessments).

Immediately following completion of the 1994 assessment, SJRWMD commenced an investigation of possible alternative water supply strategies and began the process of developing its first regional water supply plan. This water supply plan development process was termed the Water 2020 process.

WSA 1998 was prepared during the course of the Water 2020 process, based on a planning horizon of 2020. WSA 1998 identified about 40% of SJRWMD as a PWRCA. This PWRCA was the focus of the Water 2020 process and DWSP 2000, which resulted from the process.

DWSP 2000 identified water supply development and water resource development projects designed to make more water available in PWRCAs. In addition, DWSP 2000 identified other strategies, such as use of the consumptive use permitting process and coordination with other governments and major water users, to encourage the implementation of sustainable water supply projects.

WSA 2003 should provide insight into the effectiveness of SJRWMD's water supply planning and implementation efforts in terms of how well SJRWMD is moving toward its goal of assuring the availability of adequate quantities of affordable water for all existing and projected reasonable-beneficial uses.

## Water Supply Planning Accomplishments

WSA 2003 benefited from several accomplishments of SJRWMD's water supply planning and implementation efforts. The benefits are reflected in changes in the area identified as a PWRCA. These accomplishments include

- Completion of the Cooperative Well Retrofit Project

  This accomplishment has resulted in the removal of southwest St. Johns County and a portion of northeast Putnam County from the PWRCA designation. These areas were identified in WSA 1998 as areas within which anticipated water sources are not adequate to supply projected 2020 water use based on interference with existing legal users.

- Decision by the St. Johns County Board of County Commissioners to develop and treat brackish water from the Floridan aquifer system and to reduce withdrawals from the surficial aquifer system

  This accomplishment has resulted in the removal of the St. Johns County Utility service area from the PWRCA designation. This area was identified in WSA 1998 as an area within which anticipated water sources are not adequate to supply projected 2020 water use based on impacts to native vegetation.

- Identification of previously unidentified sources of water for planned development

  This accomplishment has resulted in the removal of north St. Johns County, the portion of Duval County located south of the St. Johns River, and a portion of northeast Lake County from the PWRCA designation as that designation in WSA 1998 was related to a failure to identify a source of water for planned development. WSA 2003 includes identification of planned sources of water for development projected to occur through 2025.

- Improved identification of areas likely to experience harm to native vegetation as a result of projected increases in groundwater withdrawals

  This accomplishment is the result of the development and application of an improved methodology for predicting the likelihood of harm to native vegetation. This improved methodology was developed during the Water 2020 process and is based in part on information derived through that process (Kinser et al. 2003). Use of this improved methodology has resulted in the identification of areas not previously identified as likely to experience harm to native vegetation. Identification of these areas in this 2003 water supply assessment will allow SJRWMD to focus on the development of water supply plans for these areas such that the projected harm can be avoided.

- Identification of areas likely to experience harm to lakes as a result of projected increases in groundwater withdrawals

  WSA 2003 identifies areas that are likely to experience harm to lakes as a result of projected increases in groundwater withdrawals. Identification of these areas is the result of the development and application of a methodology that was not available during previous assessment processes (Kinser et al. 2003). Identification of these areas will bring focus to the development of water supply plans for these areas such that projected harm to lakes can be avoided.

- Improved identification of areas with the greatest likelihood of experiencing unacceptable impacts to groundwater quality as a result of projected increases in groundwater withdrawals

  WSA 2003 identifies areas that are likely to experience unacceptable impacts to groundwater quality as a result of projected increases in groundwater withdrawals. This accomplishment is the result of the development and application of a groundwater quality assessment methodology that can be applied districtwide to public supply wells. This methodology was not available during previous assessment processes. Identification of these areas will bring focus to the development of water supply plans for these areas such that projected groundwater quality problems can be avoided.

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# INTRODUCTION

The St. Johns River Water Management District (SJRWMD) prepares water supply assessments for the purposes of

- Identifying future water supply needs
- Identifying areas where those needs cannot be met by the water supply plans of major water users without unacceptable impacts to water resources and related natural systems (priority water resource caution areas)

SJRWMD also develops and implements water supply plans to assure that adequate and sustainable water supplies are available to meet projected future water supply needs without unacceptable impacts in priority water resource caution areas (PWRCAs).

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WSA 2003 is a required component of the District Water Management Plan (Subsection 373.036(2), F.S.). SJRWMD has identified its entire jurisdictional area as one water supply planning region (Figure 1), pursuant to the requirements of Subparagraph 373.036(2)(b)2, F.S. This 2003 assessment is organized with a districtwide perspective. The assessment is based on a planning period extending through 2025 and is the first 5-year update to the initial *Florida Statutes*-mandated assessment (Vergara 1998) in association with updates to the District Water Management Plan.

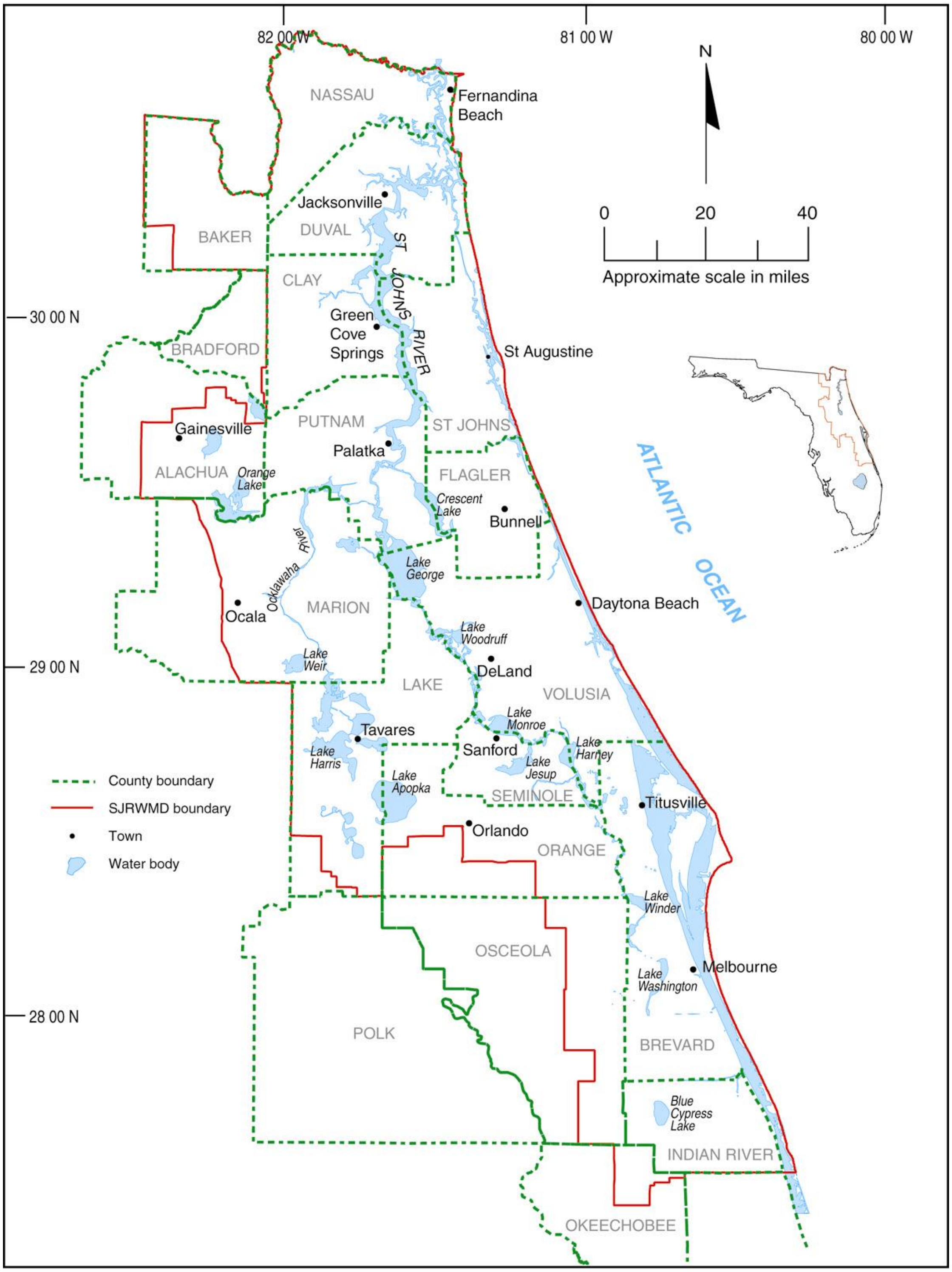


Figure 1. The St. Johns River Water Management District

The SJRWMD approach to addressing these requirements consisted of the following:

- Defining the limits of water resource impacts beyond which an unacceptable water resource-related condition could occur (water resource constraints)
- Projecting the water resource impacts that could occur in 2025 as a result of projected changes in water use
- Identifying priority water resource caution areas

SJRWMD assessed resource problems in the following two primary categories:

- Impacts to natural systems
- Impacts to groundwater quality (saltwater intrusion)

SJRWMD's assessment of potential water resource impacts is based on the premise that these impacts are affected to the greatest degree by long-term average water resource conditions rather than by shorter-term conditions such as extreme droughts or extreme wet periods. Therefore, SJRWMD has used steady-state groundwater flow models calibrated to a year of reasonably average rainfall in combination with projections of average 2025 water use as the basis of projecting impacts. In addition, although SJRWMD has estimated water supply needs for the 1-in-10-year drought condition in 2025, as required by the water supply planning provisions of Chapter 373, F.S., these estimates have not been used as the basis of projecting impacts or identifying PWRCAs.

## WATER SUPPLY PLANNING HISTORY, WITH ACCOMPLISHMENTS

### Water Supply Management Program

SJRWMD's water supply management program consists of the following components:

- Districtwide water supply assessment
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- Regional water supply plan implementation

Documents presenting the assessments and plans are typically prepared on 5-year recurring schedules, with the districtwide water supply assessment being completed 2 years before completion of the regional water supply plan. Each districtwide water supply assessment identifies priority water resource caution areas, which become the focus of the next regional water supply plan. Regional water supply plans are designed to identify water supply development project options and water resources development projects that are adequate to meet projected water use. These projects, if developed and implemented, are anticipated to be adequate to avoid projected unacceptable impacts in PWRCAs.

Implementation of the regional water supply plans should result in development of necessary sustainable water supplies. With the development of sustainable supplies, priority water resource caution area designations should eventually be removed. SJRWMD's goal is to prevent the occurrence of the projected unacceptable impacts to the water resources and related natural systems identified in the water supply assessment.

**Water Supply Planning History**

SJRWMD's water supply planning program began in 1990, when work began on the 1994 water supply needs and sources assessment, the predecessor to the 1998 districtwide water supply assessment (WSA 1998) (Vergara 1998). The 1994 water supply needs and sources assessment was performed pursuant to the requirements of Section 62-40.520, *Florida Administrative Code* (*F.A.C.*), and Paragraph 373.0391(2)(e), F.S. The planning horizon for this assessment was 2010. The 1994 assessment identified 38% of SJRWMD as a water resource caution area (comparable to priority water resource caution areas in subsequent water supply assessments).

Immediately following completion of the 1994 assessment, SJRWMD commenced an investigation of possible alternative water supply strategies and began the process of developing its first regional water supply plan. This water supply plan development process was termed the Water 2020 process.

WSA 1998 was prepared during the course of the Water 2020 process, based on a planning horizon of 2020. WSA 1998 identified about 40% of SJRWMD as a priority water resource caution area. This priority water resource caution area was the focus of the Water 2020 process, which resulted in the 2000 District Water Supply Plan (DWSP 2000).

DWSP 2000 identified water supply development and water resource development projects designed to make more water available to priority water resource caution areas. In addition, DWSP 2000 identified other strategies, such as use of the consumptive use permitting process and coordination with other governments and major water users, to encourage the implementation of sustainable water supply projects.

WSA 2003 should provide insight into the effectiveness of SJRWMD's water supply planning and implementation efforts in terms of how well SJRWMD is moving toward its goal of assuring the availability of adequate quantities of affordable water for all existing and projected reasonable-beneficial uses.

## Water Supply Planning Accomplishments

WSA 2003 benefited from several accomplishments of SJRWMD's water supply planning and implementation efforts. The benefits are reflected in changes in the area identified as a priority water resource caution area. These accomplishments include

- Completion of the Cooperative Well Retrofit Project

This accomplishment has resulted in the removal of southwest St. Johns County and a portion of northeast Putnam County from the priority water resource caution area designation. These areas were identified in WSA 1998 as areas within which anticipated water sources are not adequate to supply projected 2020 water use based on interference with existing legal users.

- Decision by the St. Johns County Board of County Commissioners to develop and treat brackish water from the Floridan aquifer system and to reduce withdrawals from the surficial aquifer system

This accomplishment has resulted in the removal of the St. Johns County Utility service area from the PWRCA designation. This area was identified in WSA 1998 as an area within which anticipated water sources are not adequate to supply projected 2020 water use based on impacts to native vegetation.

- Identification of previously unidentified sources of water for planned development

This accomplishment has resulted in the removal of north St. Johns County, the portion of Duval County located south of the St. Johns River, and a portion of northeast Lake County from the priority water resource caution area designation as that designation in WSA 1998 was related to a failure to identify a source of water for planned development. WSA 2003 includes identification of planned sources of water for development projected to occur through 2025.

- Improved identification of areas likely to experience harm to native vegetation as a result of projected increases in groundwater withdrawals

This accomplishment is the result of the development and application of an improved methodology for predicting the likelihood of harm to native vegetation. This improved methodology was developed during the Water 2020 process and is based in part on information derived through that process (Kinser et al. 2003). Use of this improved methodology has resulted in the identification of areas not previously identified as likely to experience harm to native vegetation. Identification of these areas in WSA 2003 will allow SJRWMD to focus on the development of water supply plans for these areas such that the projected harm can be avoided.

- Identification of areas likely to experience harm to lakes as a result of projected increases in groundwater withdrawals

WSA 2003 identifies areas that are likely to experience harm to lakes as a result of projected increases in groundwater withdrawals. Identification of these areas is the result of the development and application of a methodology that was not available during previous assessment processes (Kinser et al. 2003). Identification of these areas will bring focus to the development of water supply plans for these areas such that projected harm to lakes can be avoided.

- Improved identification of areas with the greatest likelihood of experiencing unacceptable impacts to groundwater quality as a result of projected increases in groundwater withdrawals

WSA 2003 identifies areas that are likely to experience unacceptable impacts to groundwater quality as a result of projected increases in groundwater withdrawals. This accomplishment is the result of the development and application of a groundwater quality assessment methodology that can be applied districtwide to public supply wells (see Groundwater Quality

Impacts in the Planning Region Assessment section). This methodology was not available during previous assessment processes. Identification of these areas will bring focus to the development of water supply plans for these areas such that projected groundwater quality problems can be avoided.

## WATER SUPPLY ASSESSMENT HISTORY

SJRWMD completed assessments similar to this assessment in 1994 and 1998 (Vergara 1994, 1998). The projection period used in WSA 1998 extends through the year 2020. Priority water resource caution areas (PWRCAs) identified as a result of WSA 1998 include about 40% of the SJRWMD jurisdictional area (Figure 2). The identification of the PWRCAs was based almost exclusively on water resource conditions that were anticipated to become critical based on projected 2020 water use rather than on existing conditions. The areas of anticipated critical water resource problems identified in WSA 1998—located in Brevard, Flagler, Lake, Orange, Osceola, Seminole, Volusia, and St. Johns counties—were related largely to projected increases in public supply water use to serve an increasing population. The only area with an identified existing critical water resource problem was the area of eastern Putnam County-western St. Johns County impacted by seasonal groundwater withdrawals.

Subsequent to the 1996 Florida legislative session, during which water supply development and funding received considerable attention but no substantive final action, Governor Lawton Chiles signed Executive Order 96-297, on September 30, 1996. The executive order brought heightened focus to Florida's water supply planning process through the inclusion of requirements for the development of water supply assessments and water supply plans. The executive order resulted in the creation of the Water Supply Development and Funding Work Group. This work group issued a final report in February 1997. The report contained numerous recommendations concerning water supply development and funding. The work group's recommendations were incorporated in water supply legislation adopted by the 1997 Florida Legislature. This legislation, enacted as Chapter 97-160, *Laws of Florida*, included amendments to Chapter 373, F.S., including Subparagraph 373.036(2)(b)4.

The Florida Department of Environmental Protection (FDEP) and Florida's five water management districts joined together to form the Water Planning Coordination Group (WPCG) for the purpose of developing strategies for implementation of Executive Order 96-297 and the new water supply

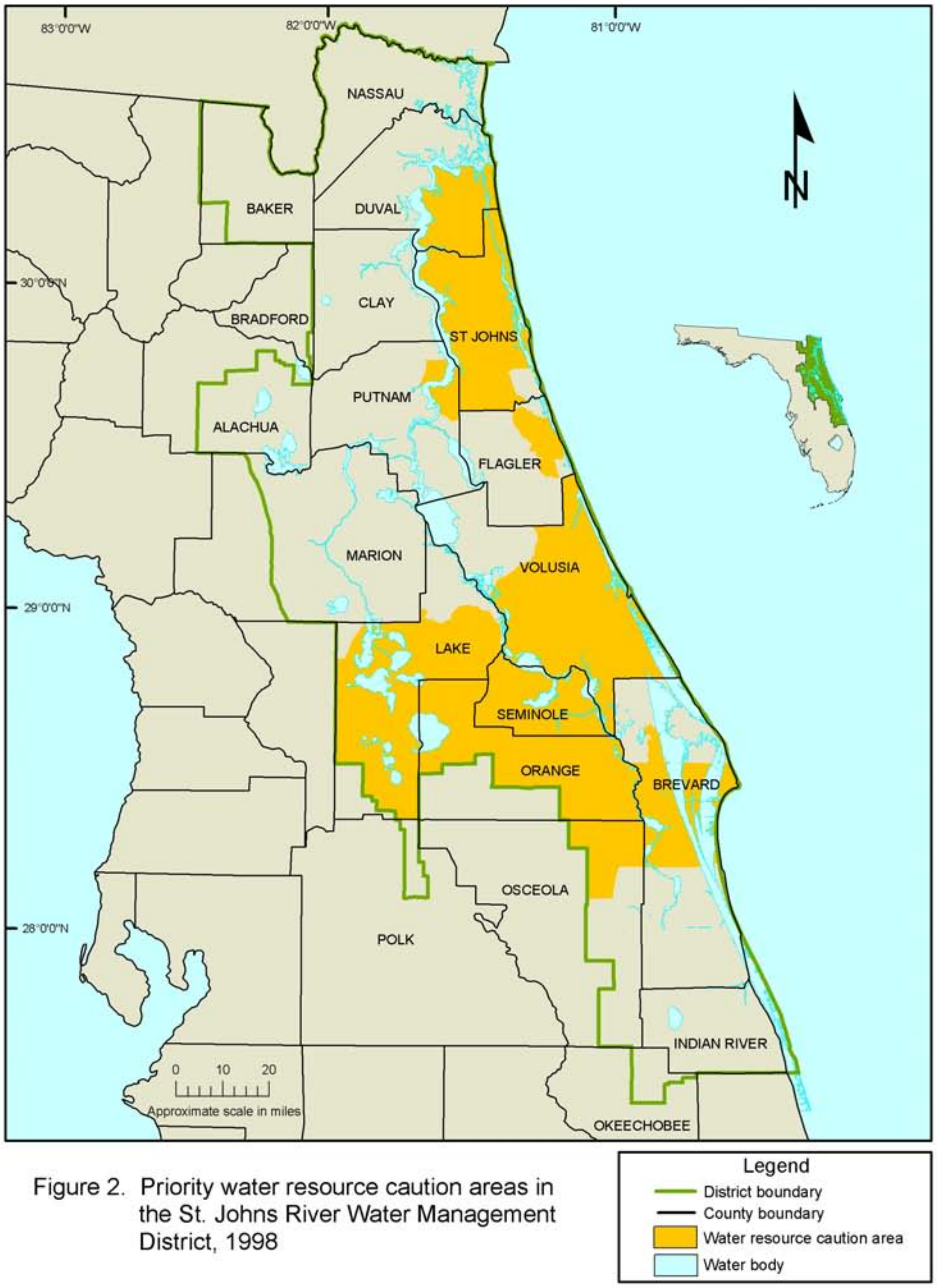



Figure 2. Priority water resource caution areas in the St. Johns River Water Management District, 1998

provisions of Chapter 373, F.S. WPCG identified the need to develop consistency standards to be followed by the water management districts in association with the water supply assessment and water supply planning processes.

SJRWMD, based on the requirements of Subparagraph 373.036(2)(b)4a, F.S., and on the guidance provided by the WPCG, inventoried existing legal uses of water, reasonably anticipated future needs, existing and reasonably anticipated sources of water, and conservation efforts.

SJRWMD identified PWRCAs based on a comparison of water resource constraints to the results of assessments of hydrologic impacts due to projected 2025 demands (Figure 3). PWRCAs are areas where existing and reasonably anticipated sources of water and conservation efforts may not be adequate (1) to supply water for all existing legal uses and reasonably anticipated future needs and (2) to sustain the water resources and related natural systems.

Changes in projected quantities and locations of 2025 groundwater and surface water withdrawals can change the boundaries of PWRCAs. Therefore, areas located outside of the identified PWRCAs should not be assumed to be able to support future groundwater and surface water withdrawals without resulting in unacceptable water resource conditions.

Projected 2025 water use in areas to the south and west of the SJRWMD boundary in the South Florida Water Management District (SFWMD) and the Southwest Florida Water Management District (SWFWMD), respectively, would contribute to the projected unacceptable water resource conditions if major water users' current water supply plans for 2025 are implemented. SJRWMD is coordinating closely with SFWMD and SWFWMD concerning this matter, based on the provisions of a memorandum of understanding entered into by the three water management districts.

Pursuant to Paragraph 373.0361(1), F.S., SJRWMD is required to initiate water supply planning for each water supply planning region where it determines that sources of water are not adequate for the planning period to supply water for all existing and projected reasonable-beneficial uses and to sustain the water resources and related natural systems. PWRCAs identified by SJRWMD represent areas within which existing and anticipated sources of water and conservation efforts are not adequate to supply water for all existing and projected reasonable-beneficial uses and to sustain the water

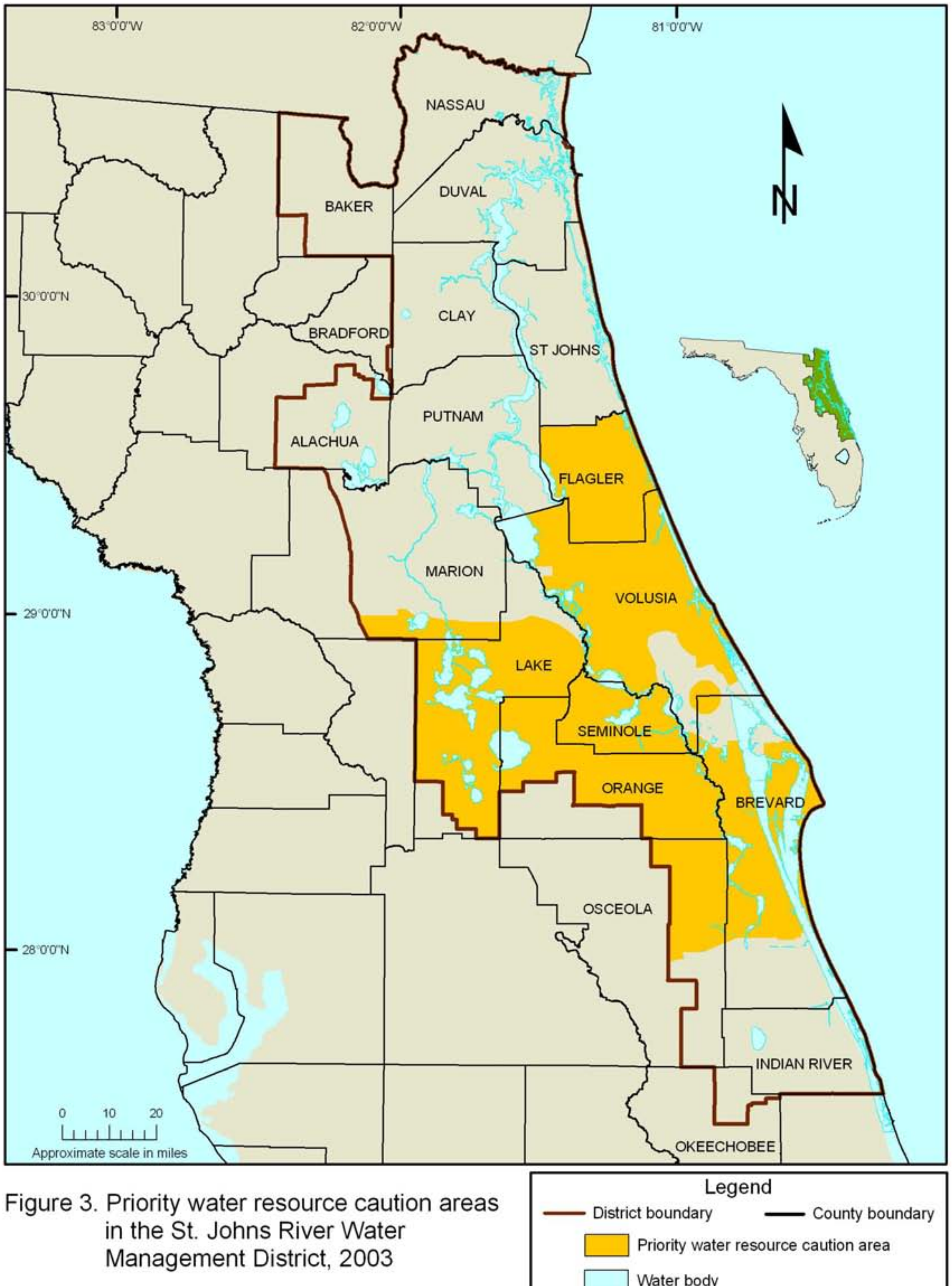



Figure 3. Priority water resource caution areas in the St. Johns River Water Management District, 2003

resources and related natural systems through 2025. Therefore, because SJRWMD has identified its entire jurisdictional area as one water supply planning region, one districtwide water supply plan will be developed as a 5-year update to DWSP 2000.

# ASSESSMENT APPROACH

WSA 2003 has been prepared to address the water supply assessment requirements of Subparagraph 373.036(2)(b)4, F.S. WSA 2003 is the first planned 5-year update of WSA 1998.

SJRWMD does not consider projections of possible future water resource conditions, as identified in this assessment, to represent conditions that would certainly exist if projected future withdrawals were implemented. The projections were developed using modeling techniques that used the best information available. However, the lack of data in some areas could affect the accuracy of the projections. Additional projects are under way to improve the accuracy of the projections.

The SJRWMD approach to addressing the statutory requirements consisted of the following:

- Defining water resource impact limits beyond which unacceptable water resource-related conditions could occur (water resource constraints)
- Projecting water level changes between 1995 and 2025
- Projecting water resource impacts that could occur in 2025 as a result of projected changes in water use
- Comparing projected water resource impacts with water resource constraints to identify priority water resource caution areas

The application of this approach consisted of the following components:

- Water resource constraint development
- Water use assessment
- Groundwater assessment
- Surface water assessment
- Priority water resource caution areas identification
- Intergovernmental, water supplier, and public coordination
- Additional data collection and water resource identification recommendations

## WATER RESOURCE CONSTRAINT DEVELOPMENT

SJRWMD assessed water resource problems in the following two primary categories:

- Impacts to natural systems
- Impacts to groundwater quality

For each category considered, SJRWMD developed a water resource constraint to identify areas where existing and reasonably anticipated sources of water and conservation efforts are not adequate (1) to supply water for all existing legal uses and reasonably anticipated future needs and (2) to sustain the water resources and related natural systems. These constraints are considered to be limits beyond which unacceptable water resource conditions could occur.

WSA 1998 included an additional constraint, impacts to existing legal users of water. This constraint concerned an existing legal user's ability to withdraw water from a well because of water level declines caused by other users of water.

At the time of the WSA 1998 investigations, this type of interference was common seasonally in portions of northeastern Putnam County and southwestern St. Johns County during periods of potato crop irrigation. Therefore, these areas were included in the PWRCAs.

During the DWSP 2000 development process, this interference issue was addressed cooperatively with major water users in the area through a cooperative well retrofit project. This project consisted of a two-pronged solution developed by the Area IV work group: (1) elimination of the seasonal drawdowns on existing legal domestic self-supply users through a cost-share repair process and (2) avoidance of construction of inadequate new domestic well systems through development of county well construction ordinances. The problem has since been adequately addressed.

DWSP 2000 identified "investigation of areas where domestic self-supply wells are sensitive to water level fluctuations" as a necessary water resource development project because of the lack of basic information and data associated with this issue. This project resulted in a document titled *Investigation of areas where domestic self-supply wells are sensitive to water level* *fluctuations* (D.L. Smith and Associates 2003), which has been published as SJRWMD special publication SP2004-SP38. This document presents a comprehensive assessment of self-supply wells and their sensitivity to water level declines. Based on this investigation, SJRWMD has concluded that almost all self-supply wells are potentially sensitive to water level declines. Most sensitive are the self-supply wells that are not equipped with submersible pumps.

In addition, SJRWMD has concluded that, although the potential for interference is widespread, it is largely a facilities issue and not a resource availability issue. That is, water is available to the self-supply user given adequate well construction and pumping equipment. Therefore, unlike other constraints (e.g., wetlands impacts or spring flow declines) considered in the delineation of PWRCAs, the occurrence of interference with self-supply wells is not likely to require a water supplier to develop an alternative water supply source. Mitigation of the interference will likely be necessary, which will add to the cost of water supply development, but development of new alternative supplies (e.g., surface water or demineralized seawater) will likely be unnecessary.

Because interference with self-supply wells can potentially occur anywhere in SJRWMD and is not fundamentally a resource availability issue, and because solutions are available on a case-by-case basis, the interference with existing legal users' criteria did not contribute to the delineation of PWRCAs in WSA 2003.

The potential for future interference with self-supply wells is an important concern that will continue to be considered in the consumptive use permitting process and can be minimized with proper self-supply well design standards specified and enforced by county ordinance.

## PROJECTED WATER LEVEL CHANGES 1995–2025

Projected water level changes between 1995 and 2025 are a key factor in determining the likelihood of impacts to natural systems and groundwater quality. This represents a 30-year projection period rather than the 25-year projection period (2000–2025), which is the focus of WSA 2003. This extended projection period is necessary because natural systems and groundwater quality are impacted by the cumulative long-term change in water levels, not just by portions of this long-term change such as would be represented by the water level change between 2000–2025. SJRWMD plans to continue to use

1995 as the base year for assessments of impacts to natural systems and groundwater quality in future assessments.

The decision to use 1995 as the base year for this analysis was based on the availability of suitable regional groundwater flow models calibrated to 1995 conditions. Although flow models calibrated to 1988 conditions are available for some areas of SJRWMD, those models do not produce simulations as precisely as the 1995 models. This difference in precision is largely related to differences in model grid size and locations of model boundaries.

Changes in the conditions of natural systems and groundwater quality have certainly occurred since predevelopment time through 1995 as a result of historic groundwater withdrawals in SJRWMD. Also, additional natural systems and groundwater quality changes that have not occurred to date are likely to occur in the future as a result of these historic withdrawals. Such changes appear years after the commencement of withdrawals. Inadequate historical data are available to quantify the relationship of these changes to groundwater level changes and groundwater withdrawals. During this same period, much population growth and associated land development occurred, resulting in significant impacts to natural systems other than those related to groundwater withdrawals. The changes that have resulted or will result from historic groundwater withdrawals and land development are part of the history of Florida's growth and development prior to the regulation of water-related activities by SJRWMD. They are not the targets of SJRWMD's water supply management efforts, except to the extent that the establishment of minimum flows and levels may affect them.

## WATER USE ASSESSMENT

As part of WSA 1998, year 1995 water use served as the base year for the 2020 projections. Although 1995 remains the base year in the groundwater modeling portion of WSA 2003, for the purpose of making year-2025 water use projections, one or more years of water use data were used, as follows:

- Public supply (1995–1999)
- Domestic self-supply and small public supply systems (1995–1999)
- Commercial / industrial / institutional self-supply (2000)
- Thermoelectric power generation self-supply (2000)
- Agricultural self-supply (1995)

- Recreational self-supply (1995)

Water use data for 2000 was not used as a basis for development of the projections for public supply and domestic self-supply and small public supply systems water use categories. The drought conditions that existed in 2000 (the driest year for the period 1991–2000) resulted in higher than average water use rates. Therefore, SJRWMD determined 2000 water use data would not serve well as the base year for estimating future water use for an average rainfall year as per the direction of the Water Demand Projection Subcommittee (WDPS).

SJRWMD has made a concerted effort to develop water use projections that are consistent with the specific plans of major water users. SJRWMD shared its projections with major water users and, if appropriate, revised these projections in response to comments received from these users.

A detailed description of the water use needs assessment is included in this plan, in the chapter titled “Planning Region Assessments.”

## GROUNDWATER ASSESSMENT

SJRWMD has developed four regional groundwater flow models (Figure 4) to assess the potential for hydrologic impacts associated with projected 2025 water use (Birdie 2004; McGurk and Presley 2002; Motz 2004; Williams 2004). The models utilize the U.S. Geological Survey (USGS) MODFLOW code. The models were constructed and calibrated to average 1995 hydrologic conditions for the purpose of simulating the response of the hydrologic system to projected water use. Results of the models are used to assess changes in Floridan and surficial aquifer water levels. In addition to these regional groundwater flow models, several more-localized groundwater flow models were used to more closely examine potential water level changes in the Gainesville Regional Utilities Murphree Wellfield area, the St. Johns County Tillman Ridge Wellfield area, the City of St. Augustine Wellfield area, and the Vero Beach and Indian River County wellfields area. (CH2M HILL 2005, Toth 2001a, Toth 2001b, and Toth 2001c, respectively). In cases where these more-localized models overlapped areas included in the regional flow models, the results of the more-localized models were used.

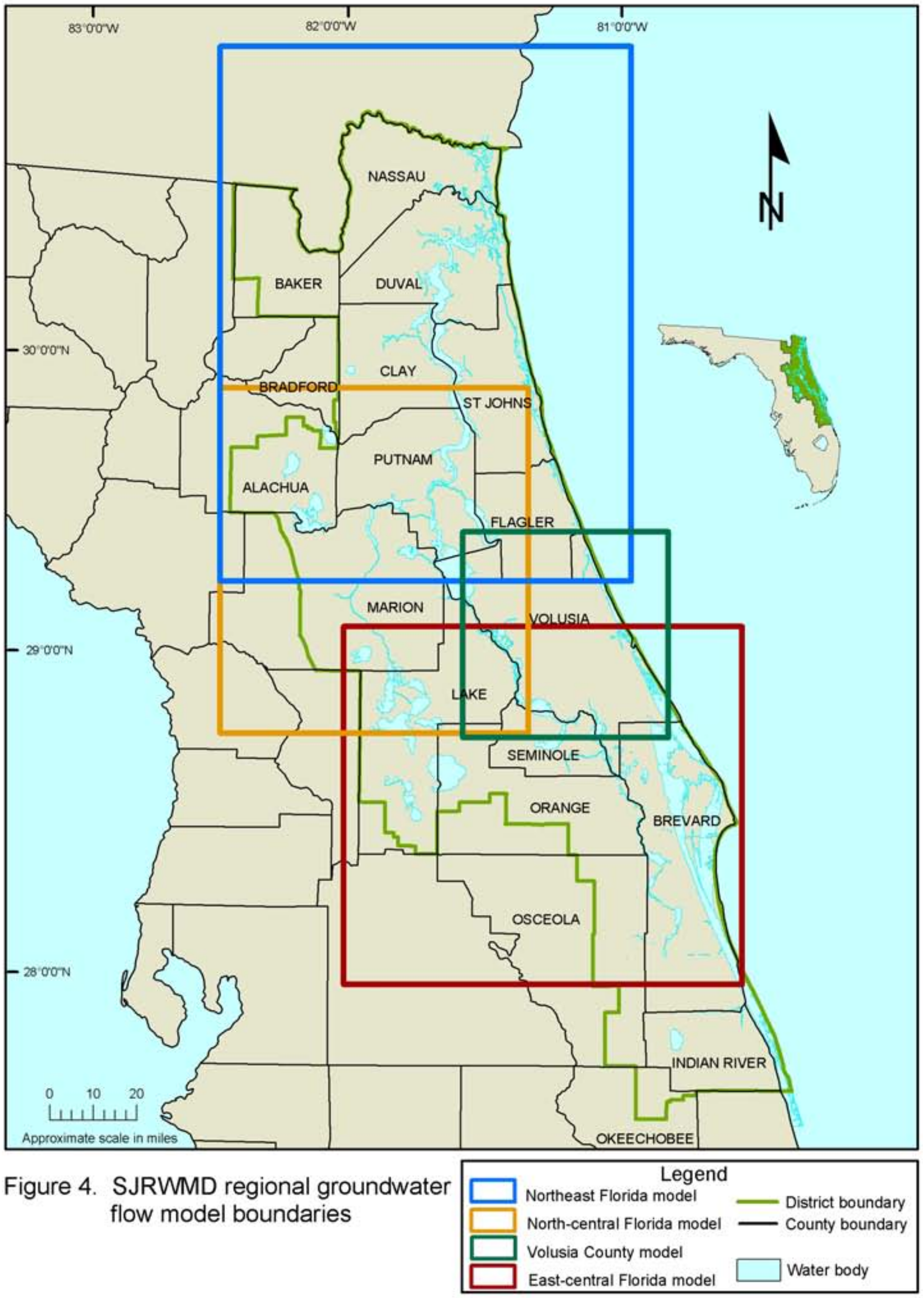



Figure 4. SJRWMD regional groundwater flow model boundaries

## SURFACE WATER ASSESSMENT

SJRWMD performed detailed hydrologic impact assessments in association with WSA 2003 to determine the impacts of projected 2025 water use on surface water resources. Regional groundwater flow models were used to predict potential reductions in surficial aquifer water levels and spring discharges. These predicted reductions in water levels and spring discharges were used to assess potential hydrologic impacts to native vegetation (wetlands), lakes, springs, and established minimum flows and levels. GIS landscape models were used to support the assessment of likelihood of harm to wetlands and lakes. SJRWMD identified areas where projected 2025 flows and / or levels are less than adopted minimum flows and / or levels for springs and lakes.

## IDENTIFICATION OF PRIORITY WATER RESOURCE CAUTION AREAS

Priority water resource caution areas (PWRCAs) are areas where existing and reasonably anticipated sources of water and conservation efforts may not be adequate (1) to supply water for all existing legal uses and reasonably anticipated future needs and (2) to sustain the water resources and related natural systems. SJRWMD identified PWRCAs based on the water resource constraints and the results of water use, groundwater, and surface water assessments as detailed in the section of this document titled Assessment Criteria Used.

## UNCERTAINTY IN RESOURCE ANALYSES

Uncertainty is inherent in the resource analyses associated with WSA 2003 (Appendix E). Major sources of uncertainty include water supply projections, groundwater and surface water models, and water resource constraints. Water supply projections and groundwater models, as they are prepared and used by SJRWMD, are based on the assumption that average rainfall conditions will exist in 2025, the planning horizon for WSA 2003. Therefore, if 2025 experiences below average rainfall, then the impacts are likely to be greater than projected. Likewise, if 2025 experiences above average rainfall, then the impacts are likely less than projected.

Water supply projections for a 1-in-10-year drought condition are presented in WSA 2003. These projections are provided so that adequate information is available for use in designing facilities that are at least capable of providing enough water to meet demands during 1-in-10-year drought conditions. Most water supply facilities in SJRWMD are capable of producing quantities of water adequate to meet demands in drier conditions than those experienced during a 1-in-10-year drought.

Climatic variations, which can be affected by short-term phenomenon such as El Nino and La Nina, and by longer-term phenomenon such as the Atlantic Multidecadal Oscillation (AMO), contribute to climatic uncertainty. Recently, speculation of a direct link between the AMO and extended periods of above and below normal rainfall has raised questions about the value of making water supply projections and using groundwater flow models that are based on average rainfall conditions. AMO is an ongoing series of periodic changes in the sea surface temperature of the North Atlantic Ocean, with cool and warm phases that may last for decades at a time. It has been associated with changes in the frequency of North American droughts and Atlantic hurricanes. It has also been associated with rainfall increases in peninsular Florida during a warm phase. A warm phase has been in effect since the mid-1990s (NOAA 2005). SJRWMD recognizes the potential impact of AMO on the water resources within its jurisdiction. At this time, SJRWMD considers the level of uncertainty associated with predicting AMO events and associated changes in rainfall to be too great to warrant a change in its WSA water use predictions and groundwater modeling approaches. During extended periods of higher rainfall that have been associated with AMO events, periods of drought occur. Reductions in water use projections and changes in SJRWMD's groundwater models to account for possible extended periods of above average rainfall could result in the underdevelopment of water supply sources and facilities if the anticipated above normal rainfall should not occur or should shorter-term drought periods occur during these extended periods of higher rainfall. In addition, the inevitable AMO shift and associated extended periods of lower rainfall would necessitate more water supply source and facilities development than would be available if extended periods above average rainfall were used as the basis of water supply planning. Basing water supply infrastructure development on AMO wet periods is clearly a high-risk approach, considering that 1) the AMO has not been established as the long-term overriding influence on SJRWMD rainfall, 2) the change from an AMO wet period to a dry period cannot be accurately predicted, and 3) the lead time to bring new sources and facilities online would be an estimated 5 to 10 years.

Therefore, SJRWMD has based its water supply projections and groundwater models on average rainfall conditions. SJRWMD will continue to explore the link between AMO and rainfall conditions within its jurisdiction.

## INTERGOVERNMENTAL, WATER SUPPLIER, AND PUBLIC COORDINATION

SJRWMD coordinated its assessment activities with FDEP, SFWMD, SWFWMD, Suwannee River Water Management District (SRWMD), local governments, the state of Georgia, water suppliers, and the public. This coordination was planned to achieve the following objectives:

- To disseminate and explain project-related information
- To understand and address FDEP assessment expectations
- To ensure a smooth and accurate exchange of data and results between neighboring water management districts
- To assure, to the extent possible, that data being used to perform the assessment are the best data available
- To address project-related concerns
- To develop a consensus concerning the identification of PWRCAs

SJRWMD coordinated assessment approach, work activities, and results with FDEP, SFWMD, SWFWMD, and SRWMD.

SJRWMD coordinated assessment activities with the Georgia Environmental Protection Division. This coordination included information sharing. The draft assessment document was made available for review and comment.

SJRWMD worked closely with water suppliers to project water use. Consensus between actively participating water suppliers and SJRWMD was reached before projections were finalized and incorporated into the assessment process. The draft assessment document was made available to water suppliers for review and comment.

Because the majority of public water suppliers are local governments, most local governments had staff involvement in assessment development. The draft assessment document was made available to staff and elected officials of local governments for review and comment.

Public workshops were held to present the draft assessment document. All aspects of the assessment process, including water use projections, water resource constraint development, groundwater modeling, and identification of PWRCAs were addressed in the workshops. The draft assessment document was made available to the public for review and comment. Comments were considered in this final document.

## RECOMMENDED ADDITIONAL DATA COLLECTION AND WATER RESOURCE INVESTIGATIONS

Based on the results of the water use, groundwater, and surface water assessments, and as a result of the coordination process, SJRWMD identified areas where data collection and water resource investigations needed to be performed to better evaluate the potential for future water resource problems and to prevent water resource problems from occurring. Areas identified include

- Reuse data and areas of applied reuse
- Actual golf course water use data
- Agriculture trend data for specific crops and counties
- Development and implementation of Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) crop model
- Transient groundwater model development
- Water quality monitoring investigations
- Improved groundwater quality data
- Residential irrigation investigations

# METHODOLOGY OF PROJECTIONS FOR ALL WATER USE CATEGORIES

SJRWMD, based on the requirements of Subparagraph 373.036(2)(b)4a, F.S., and on guidance from WPCG, determined "existing legal uses, reasonably anticipated future needs, and existing and reasonably anticipated sources of water and conservation efforts."

SJRWMD used one or more years as the basis for projections in each of the following water use categories:

- Public supply (1995–1999)
- Domestic self-supply and small public supply systems (1995–1999)
- Commercial/industrial/institutional self-supply (2000)
- Thermoelectric power generation self-supply (2000)
- Agricultural self-supply (1995)
- Recreational self-supply (1995)

WDPS, a subcommittee of the WPCG, developed the definitions of the water use categories. The WDPS was composed of representatives of Florida's five water management districts and FDEP. The water use projection methodologies used by SJRWMD are consistent with the recommendations of WDPS.

The SJRWMD goal in projecting water use is to develop estimates of projected need that appear to be reasonable based on the best information available and that are mutually acceptable to the water users and SJRWMD. Projections are not necessarily consistent with permit allocations. SJRWMD recognizes that these are planning level projections and that the projections may be subject to change in subsequent evaluations, including SJRWMD consumptive use permit (CUP) evaluations.

Public supply water use projections presented in WSA 2003 are based on the assumption that current levels of water conservation will be continued through 2025 for all categories unless planned changes were indicated by the public supply utility during the assessment process, in which case, these changes are reflected in the projections.

Projections for a 1-in-10-year drought have been made for the public supply, domestic self-supply and small public supply systems, and agricultural self-supply, and recreational self-supply categories. Drought events do not have significant impacts on water use in the thermoelectric power generation or the commercial/industrial/institutional self-supply categories. Water use for these categories are primarily related to processing and production needs.

## PUBLIC SUPPLY

Public supply water use refers to demand from publicly and privately owned public supply utilities that have a 1995–1999 annual average daily flow of at least 0.10 million gallons per day (mgd). This differs from WSA 1998 in which only public suppliers with a projected annual average daily flow of 0.25 mgd or greater were included. Public supply water use includes any uses of water from a public supply system. SJRWMD inventoried 1995–1999 water use and then calculated projections for 2025. The initial list of suppliers in the 2003 inventory was based on the suppliers identified in WSA 1998 and on additional information provided by FDEP.

Reported use for years 1995–1999 is based on reports to FDEP of use by public supply utilities. Projections for public supply utilities identified as providing an average of 0.10 mgd from 1995–1999 or a projected use of at least 0.10 mgd in year 2000 were made by SJRWMD and provided to the suppliers for review along with a request for additional information if the projections did not appear to be reasonable. Although SJRWMD did not formally solicit estimates, if a supplier provided them, SJRWMD compared them to its own and then attempted to reconcile any significant discrepancies. Supplier projections were not relied upon exclusively because of the different methodologies used to develop these estimates. In many cases, the supplier provided additional information that led to a new, mutually acceptable estimate.

SJRWMD calculated projections in 5-year increments from year 2000 to 2025 based on estimates of population growth within the service area boundaries of public supply utilities. SJRWMD 2020 projections developed as part of WSA 2003 were then compared with the utility-based 2020 projections published in WSA 1998. If SJRWMD had not yet received a response from a supplier, SJRWMD contacted the supplier if the utility-based 2020 projections were greater or less than 20% of the SJRWMD 2003 population-based 2020 projections. If requested, SJRWMD provided the suppliers with all information used to make its projections. In the majority of cases, the suppliers agreed that the SJRWMD projections were reasonable. If not, SJRWMD staff worked with the suppliers to reach a consensus regarding the projections.

Demand for water to meet the general needs of the public is reported in two categories—in the public supply category for users withdrawing at least 0.10 mgd and in the domestic self-supply and small public supply category (domestic self-supply category). This combined water use is referred to as public use water. Consistent with WSA 1998, an analysis of projected change in public use water was performed based on demand in both categories, because changes in one category may be partially offset by changes in another.

SJRWMD projections were made based on available population growth data such as countywide estimates made by the Bureau of Economic and Business Research at the University of Florida and transportation analysis zone data prepared for the Florida Department of Transportation in the metropolitan planning organization districts. SJRWMD developed its own population growth and distribution model for all 18 counties within the SJRWMD boundaries (Doty 2005). This model is documented in SJRWMD Special Publication SJ 2005-SP9.

Population-based water use projections for average annual daily flow were made by multiplying the average gross per capita use, in gallons per day, for each public supply utility by its projected population in 2025. The average gross per capita use was based on total water use for each public supply utility for the period 1995–1999 (Appendix A). Total average annual daily flow for each year (1995–1999) for each public supply utility was divided by the population estimate for that utility service area for each respective year, resulting in a gross per capita use for each year. Averaging these gross per capita values resulted in a gross per capita value that was used to calculate projected public supply water use through 2025.

Consistent with the 1998 assessment methodology, projections for a 1-in-10-year drought event were calculated using an average-to-drought year factor of +6%. This factor was agreed to by the 1-in-10-Year Drought Subcommittee of the WPCG. The rationale for use of the +6% factor is addressed in the subcommittee's report (WPCG 1998).

## DOMESTIC SELF-SUPPLY AND SMALL PUBLIC SUPPLY SYSTEMS

Domestic self-supply refers primarily to water use by individual users not serviced by a public supply system (i.e., a residence with a private well). However, the domestic self-supply category also may contain estimates of demand associated with lawn irrigation and other residential uses from self-supply wells in areas serviced by a public supplier. It also may include projected water use for which the source of withdrawal has not yet been identified. In WSA 1998, a small public supply system was defined as a system with an average annual daily flow between 0.01 mgd and 0.25 mgd. In WSA 2003, small public supply systems refer to systems with an average annual daily flow between 0.01 mgd and 0.10 mgd.

The assessment of water use in this category relies heavily on projections of population growth from the SJRWMD population growth model for 2000 through 2025 (Doty 2005). SJRWMD estimated the portion of each county located within SJRWMD boundaries by overlaying SJRWMD boundaries atop Census 2000 block-level data and 2025 utility-level projections. This information was subdivided into either the public supply or the domestic self-supply and small public-supply systems categories. Domestic self-supply and small public supply populations are estimated by subtracting the public supply population for each county from the total SJRWMD population for each county.

In WSA 1998, 100 gallons per day per capita was used in most cases to calculate water use for this category. SJRWMD deviated from this in WSA 2003 based on comments received during the WSA 2003 water use projections review process. Many public supply utilities expressed a belief that domestic self-supply use is similar to public supply use.

In WSA 2003, total water use for the domestic self-supply category was calculated for each county by multiplying the 2025 domestic self-supply population by the public supply population's average household per capita water use value. Household water use was calculated by multiplying each public supply utility's reported water use for each year 1995–1999 by the utility's estimated household use percentage as provided in the utility's consumptive use permit. Public supply population and public supply residential water use were then summed for each year, 1995–1999, for each county. A per capita water use value was calculated for each year and averaged, resulting in a residential per capita average (gallons per day) value for the domestic self-supply category of water use. This residential per capita value was then multiplied by the 2025, domestic self-supply population, resulting in the 2025 projected water use for this category.

As in WSA 1998, water use by domestic self-supply and small public supply utilities in a 1-in-10-year drought event was calculated by increasing the total projection for an average rainfall year by +6%, based on the guidance of the 1-in-10-Year Drought Subcommittee of the WPCG.

## AGRICULTURAL SELF-SUPPLY

SJRWMD determines crop supplemental irrigation needs by multiplying irrigated acreage by a supplemental irrigation requirement calculated using the Blaney-Criddle agricultural water use simulation model (SJRWMD 1987). In WSA 1998, SJRWMD used published data for a normal and a 2-in-10-year rainfall probability and assumed that all growers operated at the medium efficiency rate to compensate for the slight increase in water use that would occur during a 1-in-10-year rainfall probability event. In order to maintain consistency among water management districts across shared borders, SJRWMD adopted the average year and the 1-in-10-year supplemental irrigation requirements for citrus used by SFWMD in its water use permitting program. Data from the SJRWMD Benchmark Farms Monitoring Project was used to calculate irrigation needs of potatoes and fern (Singleton 1996 and pers. com. 1998; Florence, pers. com. 1998). These data have been determined to be highly reliable indicators of irrigation needs for these two crops grown under Florida conditions. This projection methodology is consistent with the recommendation of WDPS.

Due to lack of new trend data and broad acknowledgment that agriculture is generally static, if not declining, in SJRWMD, in WSA 2003, projected 2025 acreages and associated supplemental irrigation levels are the same as the projected 2020 acreages and supplemental irrigation levels reported in WSA 1998, except for ridge citrus grown in Lake County. A more intensive review of ridge citrus acreages was performed by SJRWMD in response to concerns raised by elected officials in Lake County. Projected acreages and supplemental irrigation requirements for 2020, which were reported in WSA 1998, were based on an extension to 2020 of the trend analysis performed by the Institute of Food and Agricultural Sciences, University of Florida, for SJRWMD's 1994 needs and sources assessment. This extension included some slight modifications to integrate observed changes in trends. Information from published reports such as the annual reports by the Division of Plant Inspection of the Florida Department of Agriculture and Consumer Services and the citrus industry was used to verify 1995 crop acreage and ascertain trends in acreage. SJRWMD projections were reviewed and approved by staff of the county cooperative extension services, various grower associations, and county planning offices.

## RECREATIONAL SELF-SUPPLY

The recreational self-supply water use category includes only golf course irrigation because SJRWMD does not have reliable estimates of either acreage or water use for other recreational uses. For purposes of WSA 2003, SJRWMD assumes these other recreational water uses are generally not significant in comparison to golf course irrigation and water uses in other categories. Irrigated golf course acreage in 1995 was determined using information obtained from the SJRWMD CUP database. Acreage projections for each county were calculated by multiplying the irrigated acreage in each county in 1995 by the respective county population growth rates. Irrigational water use for an average and a 1-in-10-year rainfall probability were estimated using the Blaney-Criddle agricultural water use simulation model (SJRWMD 1987).

The 2025 acreages and irrigational water use reported in WSA 2003 are the same as those reported in WSA 1998. SJRWMD recognizes that the projection methodology for this category generally overestimates water use and needs to be improved. Comments received from golf course superintendents on improvements in irrigation management, course design, and increased reliance on water from stormwater runoff and reclaimed sources convinced SJRWMD of the need to investigate methods to improve its estimates. A document titled *Evaluation of Golf Course Water Use* (Miller et al 2005) was prepared for SJRWMD to address this concern. The document has been published by SJRWMD as special publication SJ2005-SP13.

## COMMERCIAL/INDUSTRIAL/INSTITUTIONAL SELF-SUPPLY

All permitted commercial/industrial/institutional self-suppliers listed in the SJRWMD CUP database with an average daily use of at least 0.10 mgd were asked to provide projections of estimated average use in 2025 and use in 2000. This differed from WSA 1998 in which users with an average daily use of at least 0.25 mgd were surveyed. Projections were estimated by SJRWMD for users that did not respond to the request for information and for users with an average daily use less than 0.10 mgd. SJRWMD projections are made by multiplying the 2000 use by the projected countywide rate of population growth between 2000 and 2025. Information on use in 1995 was obtained from Florence (1997) or from the SJRWMD CUP database.

For WSA 2003, the individual facilities within each commercial/industrial/institutional subcategory were reclassified according to USGS methodology (Marella 1995). The reclassification resulted in differences in totals for the subcategories. The reclassification is as follows:

1. Commercial water use (self-supply)
   - Motels
   - Hotels
   - Restaurants
   - Office buildings
   - Commercial facilities

2. Industrial water use (self-supply)
   - Fabricating
   - Processing
   - Washing
   - Cooling—includes such industries as
     - Steel
     - Chemical and allied products
     - Paper and allied products
     - Mining
     - Petroleum refining

3. Institutional water use (self-supply)
   - Prisons and correctional facilities
   - Hospitals
   - Schools and universities

## THERMOELECTRIC POWER GENERATION SELF-SUPPLY

Consistent with WSA 1998, all permitted thermoelectric power generation self-suppliers listed in the SJRWMD CUP database were inventoried and queried about their projected 2025 water use. SJRWMD calculated projections for suppliers who did not respond to requests for information by multiplying the 2000 average daily use by the countywide rate of population growth. Because of the uncertainties associated with the potential deregulation of the industry, projections in this water use category may be subject to significant change in subsequent water supply assessments. SJRWMD distinguished between water used for once-through cooling and recirculation and for all other uses associated with thermoelectric power generation. This distinction was made because the use of water for once-through cooling and recirculation is generally considered to be nonconsumptive. Because it is typically returned to the same source from which it was withdrawn without a noticeable water resource impact. As in WSA 1998, only uses other than those for once-through cooling and recirculation are considered in the total water use reported in WSA 2003.

Governor Jeb Bush, through Executive Order 2000-127, has created an Energy 2020 Commission to determine Florida's energy needs and the best way to structure the industry with a 2020 planning horizon. Although information from the Commission was not available for use in WSA 2003, SJRWMD is planning to use information available from the 2020 Commission or the Public Service Commission to assist in projecting the future water needs of this industry in subsequent assessments.

# PLANNING REGION ASSESSMENTS

SJRWMD identified its entire jurisdictional area as one water supply planning region pursuant to the requirements of Subparagraph 373.036(2)(b)2, F.S. WSA 2003 includes an evaluation of the groundwater and surface water resources of the 18-county area of SJRWMD. This evaluation was performed to assess the availability of these resources to supply existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems through 2025.

Water use projections through 2025 are presented in WSA 2003 along with an assessment of their potential impacts on groundwater and surface water resources should they occur.

## EXISTING USE FOR EACH WATER USE CATEGORY—1995

This section presents the same information presented in the 1998 assessment. It is included in WSA 2003 because it was used to establish base-year conditions in the regional groundwater flow models that were used in the groundwater source evaluation.

SJRWMD, based on the requirements of Subparagraph 373.036(2)(b)4a, F.S., and on the guidance provided by the WPCG, has inventoried existing legal uses of water for the year 1995.

The total 1995 population in SJRWMD was 3,516,494 (Table 1). The total water use in SJRWMD in 1995 from groundwater and surface water sources totaled 1,363.65 mgd (Table 2), of which 453.26 mgd, about 33%, was used by public supply systems that use at least 0.10 mgd average annual daily flow. Agriculture accounted for about 43% of the total amount used (excluding saline water), 584.31 mgd. The greatest use of freshwater from groundwater sources by category was for public supply, followed closely by agriculture.

The three counties with the largest water use from groundwater sources in 1995 were Brevard, Duval, and Orange (Table 3). These counties all used greater than 100 mgd. Five counties—Indian River, Lake, Nassau, Seminole, and Volusia—used between 50 and 100 mgd.

Table 1. Population for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District

| County | County Population | SJRWMD Population | SJRWMD Public Supply Population* | SJRWMD Domestic & Small Utility Population† | County Population | SJRWMD Population | SJRWMD Public Supply Population* | SJRWMD Domestic & Small Utility Population† | County Population | SJRWMD Population | SJRWMD Public Supply Population* | SJRWMD Domestic & Small Utility Population† | SJRWMD Population Change Percent 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1995 | | | | 2000 | | | | 2025 | | | | |
| Alachua | 199,776 | 153,696 | 137,441 | 16,255 | 217,955 | 167,607 | 151,136 | 16,471 | 292,500 | 223,587 | 188,645 | 34,942 | 45 |
| Baker | 20,275 | 19,020 | 3,786 | 15,234 | 22,259 | 20,701 | 3,976 | 16,725 | 30,700 | 28,501 | 5,074 | 23,427 | 50 |
| Bradford | 24,302 | 1,031 | 0 | 1,031 | 26,088 | 1,226 | 294 | 932 | 32,800 | 1,584 | 0 | 1,584 | 54 |
| Brevard | 437,604 | 437,604 | 415,224 | 22,380 | 476,230 | 476,230 | 454,153 | 22,077 | 681,913 | 681,913 | 654,061 | 27,852 | 56 |
| Clay | 123,400 | 123,400 | 89,434 | 33,966 | 140,814 | 140,814 | 101,193 | 39,621 | 227,135 | 227,135 | 182,608 | 44,527 | 84 |
| Duval | 725,925 | 725,925 | 681,707 | 44,218 | 778,879 | 778,879 | 732,201 | 46,678 | 1,026,792 | 1,026,792 | 978,266 | 48,526 | 41 |
| Flagler | 39,267 | 39,267 | 33,423 | 5,844 | 49,832 | 49,832 | 42,020 | 7,812 | 140,200 | 140,200 | 131,862 | 8,338 | 257 |
| Indian River | 93,441 | 93,441 | 64,867 | 28,574 | 112,947 | 112,947 | 93,191 | 19,756 | 167,200 | 167,200 | 149,158 | 18,042 | 79 |
| Lake | 187,269 | 186,201 | 124,706 | 61,495 | 210,528 | 209,475 | 142,900 | 66,575 | 395,656 | 393,877 | 287,057 | 106,820 | 112 |
| Marion | 226,876 | 178,907 | 80,133 | 98,774 | 258,916 | 187,973 | 80,896 | 107,077 | 410,300 | 293,443 | 127,307 | 166,136 | 64 |
| Nassau | 50,802 | 50,802 | 16,878 | 33,924 | 57,663 | 57,663 | 20,662 | 37,001 | 91,800 | 91,800 | 47,511 | 44,289 | 81 |
| Okeechobee | 32,855 | 616 | 0 | 616 | 35,910 | 718 | 0 | 718 | 47,200 | 963 | 0 | 963 | 56 |
| Orange | 786,918 | 605,248 | 546,588 | 58,660 | 896,344 | 699,148 | 615,621 | 83,527 | 1,452,526 | 1,041,056 | 946,513 | 94,543 | 72 |
| Osceola | 136,627 | 395 | 0 | 395 | 172,493 | 1,725 | 0 | 1,725 | 325,900 | 3,259 | 0 | 3,259 | 725 |
| Putnam | 67,747 | 67,747 | 11,503 | 56,244 | 70,423 | 70,423 | 17,654 | 52,769 | 83,200 | 83,200 | 11,322 | 71,878 | 23 |
| St. Johns | 103,482 | 103,482 | 84,644 | 18,838 | 123,135 | 123,135 | 100,889 | 22,246 | 292,228 | 292,228 | 260,757 | 31,471 | 182 |
| Seminole | 326,359 | 326,359 | 300,760 | 25,599 | 365,196 | 365,196 | 336,689 | 28,507 | 529,087 | 529,087 | 495,534 | 33,553 | 62 |
| Volusia | 403,353 | 403,353 | 367,076 | 36,277 | 443,343 | 443,343 | 405,029 | 38,314 | 654,509 | 654,509 | 614,291 | 40,218 | 62 |
| Total | 3,986,276 | 3,516,494 | 2,958,169 | 558,323 | 4,458,955 | 3,907,035 | 3,298,504 | 608,531 | 6,881,646 | 5,880,334 | 5,079,965 | 800,369 | 67 |

Source: 1995 estimates = University of Florida 1996; Smith and Nogle, BEBR, 1998
2025 projections = Doty 2003; Smith and Nogle, BEBR, 2001

*Suppliers with an average daily flow of greater than or equal to 0.10 million gallons per day (mgd)
†Private domestic wells and suppliers with an average daily flow of less than 0.10 mgd

Table 2. Total water use (A) for 1995, 2000 and 2025 by category of use, in the St. Johns River Water Management District and (B) as a percent of total change by category of water use for 1995–2025

A.

| Category | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | 2025 Projected Water Use 1-in-10 Rainfall Year | | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | |
| Public Supply | 441.11 | 12.15 | 453.26 | 549.47 | 14.08 | 563.55 | 809.88 | 25.68 | 835.56 | 84 | 858.46 | 27.22 | 885.68 | 95 |
| Domestic and Other Small Public Supply | 71.09 | 0.00 | 71.09 | 64.50 | 0.00 | 64.50 | 100.67 | 0.00 | 100.67 | 42 | 106.72 | 0.00 | 106.72 | 50 |
| Agricultural Irrigation | 361.16 | 223.15 | 584.31 | 387.85 | 213.74 | 601.59 | 306.93 | 215.18 | 522.11 | -11 | 355.07 | 260.22 | 615.29 | 5 |
| Recreational Irrigation | 68.78 | 30.35 | 99.13 | 72.66 | 31.94 | 104.60 | 107.77 | 48.67 | 156.44 | 58 | 110.51 | 49.89 | 160.40 | 62 |
| Commercial/Industrial/Institutional | 95.55 | 38.13 | 133.68 | 90.56 | 31.80 | 122.36 | 98.63 | 30.67 | 129.30 | -3 | 98.63 | 30.67 | 129.30 | -3 |
| Thermoelectric Power Generation | 7.68 | 14.50 | 22.18 | 10.86 | 18.91 | 29.77 | 13.42 | 28.44 | 41.86 | 89 | 13.42 | 28.44 | 41.86 | 89 |
| Total | 1,045.37 | 318.28 | 1,363.65 | 1,175.90 | 310.47 | 1,486.37 | 1,437.30 | 348.64 | 1,785.94 | 31 | 1,542.81 | 396.44 | 1,939.25 | 42 |

All water use in million gallons per day

2025 public supply water use includes 1.72 mgd from an unspecified source and provider in Volusia County

B.

| Category | Average Rainfall Year | 1-in-10 Rainfall Year |
|---|---|---|
| Public Supply | 90 | 75 |
| Domestic and Other Small Public Supply | 7 | 6 |
| Agricultural Irrigation | -15 | 5 |
| Recreational Irrigation | 14 | 11 |
| Commercial/Industrial/Institutional | -1 | -1 |
| Thermoelectric Power Generation | 5 | 3 |
| Total | 101 | 99 |

Percentages shown may not be exact due to rounding

Table 3. Total water use for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District, average rainfall year and 1-in-10-rainfall year

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Average Rainfall Year | | | Percent change | 1-in-10 Rainfall Year | | | Percent change |
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | |
| Alachua | 34.84 | 0.79 | 35.63 | 37.89 | 0.28 | 38.17 | 51.81 | 1.21 | 53.02 | 49 | 55.00 | 1.27 | 56.27 | 58 |
| Baker | 3.77 | 0.86 | 4.63 | 5.56 | 1.73 | 7.29 | 6.53 | 0.86 | 7.39 | 60 | 6.93 | 0.93 | 7.86 | 70 |
| Bradford | 0.29 | 0.00 | 0.29 | 0.30 | 0.02 | 0.32 | 0.40 | 0.00 | 0.40 | 38 | 0.43 | 0.00 | 0.43 | 48 |
| Brevard | 164.35 | 30.12 | 194.47 | 169.27 | 39.20 | 208.47 | 141.45 | 46.70 | 188.15 | -3 | 150.74 | 49.52 | 200.26 | 3 |
| Clay | 21.08 | 0.52 | 21.60 | 33.22 | 0.52 | 33.74 | 49.89 | 0.85 | 50.74 | 135 | 52.60 | 0.87 | 53.47 | 148 |
| Duval | 140.39 | 1.06 | 141.45 | 153.17 | 1.65 | 154.82 | 191.98 | 1.44 | 193.42 | 37 | 201.63 | 1.48 | 203.11 | 44 |
| Flagler | 14.70 | 1.22 | 15.92 | 24.48 | 3.60 | 28.08 | 30.30 | 2.99 | 33.29 | 109 | 32.76 | 3.07 | 35.83 | 125 |
| Indian River | 87.06 | 172.43 | 259.49 | 87.46 | 161.08 | 248.54 | 99.81 | 176.30 | 276.11 | 6 | 115.42 | 216.27 | 331.69 | 28 |
| Lake | 92.94 | 15.79 | 108.73 | 89.47 | 9.63 | 99.10 | 130.45 | 16.70 | 147.15 | 35 | 138.79 | 17.53 | 156.32 | 44 |
| Marion | 33.05 | 1.87 | 34.92 | 43.91 | 1.94 | 45.85 | 52.98 | 2.69 | 55.67 | 59 | 56.53 | 2.83 | 59.36 | 70 |
| Nassau | 56.95 | 4.72 | 61.67 | 46.49 | 0.48 | 46.97 | 91.98 | 5.95 | 97.93 | 59 | 94.12 | 6.05 | 100.17 | 62 |
| Okeechobee | 14.25 | 0.00 | 14.25 | 15.24 | 0.00 | 15.24 | 13.49 | 0.00 | 13.49 | -5 | 16.24 | 0.00 | 16.24 | 14 |
| Orange | 136.15 | 19.20 | 155.35 | 159.11 | 5.32 | 164.43 | 221.70 | 11.43 | 233.13 | 50 | 236.55 | 13.19 | 249.74 | 61 |
| Osceola | 6.57 | 9.99 | 16.56 | 29.48 | 19.06 | 48.54 | 6.61 | 9.99 | 16.60 | 0 | 7.57 | 10.59 | 18.16 | 10 |
| Putnam | 32.50 | 50.05 | 82.55 | 40.49 | 48.92 | 89.41 | 37.39 | 52.33 | 89.72 | 9 | 41.14 | 52.67 | 93.81 | 14 |
| St. Johns | 48.63 | 2.26 | 50.89 | 52.49 | 3.16 | 55.65 | 77.90 | 4.06 | 81.96 | 61 | 87.19 | 4.16 | 91.35 | 80 |
| Seminole | 67.03 | 1.57 | 68.60 | 88.25 | 1.78 | 90.03 | 110.24 | 2.37 | 112.61 | 64 | 117.13 | 2.45 | 119.58 | 74 |
| Volusia* | 90.82 | 5.83 | 96.65 | 99.62 | 12.10 | 111.72 | 122.39 | 12.77 | 135.16 | 40 | 132.04 | 13.56 | 145.60 | 51 |
| Total | 1,045.37 | 318.28 | 1,363.65 | 1,175.90 | 310.47 | 1,486.37 | 1,437.30 | 348.64 | 1,785.94 | 31 | 1,542.81 | 396.44 | 1,939.25 | 42 |

All water use in million gallons per day

Percent change from 1995 water use

*2025 water use include 1.72 mgd of demand with an unspecified source and provider

## Public Supply

The 1995 water use by public supply utilities is listed by source and county (Table 4) and by individual utility (Table 5). The total water use by public supply utilities was 453.26 mgd, of which 441.11 mgd was groundwater. Only in Brevard County was water used from a surface water source (12.15 mgd, 3% of the category total). The county with the largest consumption of water for public supply use was Orange County (104.60 mgd, 23% of the category total), followed by Duval County (96.72 mgd, 21% of the category total).

## Domestic Self-Supply and Small Public Supply Systems

The 1995 water use for domestic self-supply and small public supply systems was approximately 16% of public use water (71.09 mgd vs. 453.26 mgd) (Tables 7 and 5).

## Agricultural Self-Supply

Agricultural self-supply was the second largest use category for groundwater (361.16 mgd, Table 2) and the largest use category for ground and surface water sources combined (584.31 mgd). Approximately 62% of the water used for supplemental irrigation in 1995 came from groundwater sources (Tables 7 and 8). The counties with the largest use of ground and surface water sources were Indian River (237.35 mgd) and Brevard (124.81 mgd). Over 70% of the irrigation water used in Indian River County came from surface water sources. Both Brevard and Indian River counties have significant acreage in citrus and improved pasture. Citrus and pasture were the largest use categories of agricultural irrigation water in 1995 (291.17 mgd and 148.76 mgd, respectively, Table 9).

A portion of the water used for agricultural irrigation in 1995 came from reclaimed water sources. An SJRWMD survey of reclaimed water providers indicates that 15.95 mgd of reclaimed water was supplied for agricultural irrigation throughout SJRWMD in 1995 (Brandes 1995).

The methodologies for estimating 1995 agricultural irrigation requirements and for estimating reclaimed water use are different. The quantities of reclaimed water use reported to SJRWMD were the quantities that were supplied regardless of whether they were used to achieve a water resource benefit. Therefore, subtracting the quantity of reclaimed water supplied for agricultural irrigation from the total water use for agricultural irrigation was

Table 4. Public supply water use for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Average Rainfall Year | | | | | 1-in-10 Rainfall Year | | | | |
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | Percent Change | Unspecified Water Source† | Ground | Surfac e | Total | Percent Change | Unspecified Water Source† |
| Alachua | 20.73 | 0.00 | 20.73 | 25.71 | 0.00 | 25.71 | 32.68 | 0.00 | 32.68 | 58 | 0.00 | 34.64 | 0.00 | 34.64 | 67 | 0.00 |
| Baker | 0.65 | 0.00 | 0.65 | 0.81 | 0.00 | 0.81 | 0.94 | 0.00 | 0.94 | 45 | 0.00 | 1.00 | 0.00 | 1.00 | 54 | 0.00 |
| Bradford | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| Brevard | 38.94 | 12.15 | 51.09 | 38.96 | 14.08 | 53.04 | 53.19 | 25.68 | 78.87 | 54 | 0.00 | 56.38 | 27.22 | 83.60 | 64 | 0.00 |
| Clay | 11.78 | 0.00 | 11.78 | 14.46 | 0.00 | 14.46 | 37.54 | 0.00 | 37.54 | 219 | 0.00 | 39.79 | 0.00 | 39.79 | 238 | 0.00 |
| Duval | 96.72 | 0.00 | 96.72 | 117.47 | 0.00 | 117.47 | 150.02 | 0.00 | 150.02 | 55 | 0.00 | 159.02 | 0.00 | 159.02 | 64 | 0.00 |
| Flagler | 4.40 | 0.00 | 4.40 | 5.94 | 0.00 | 5.94 | 21.44 | 0.00 | 21.44 | 387 | 0.00 | 22.73 | 0.00 | 22.73 | 417 | 0.00 |
| Indian River | 10.70 | 0.00 | 10.70 | 13.81 | 0.00 | 13.81 | 22.54 | 0.00 | 22.54 | 111 | 0.00 | 23.89 | 0.00 | 23.89 | 123 | 0.00 |
| Lake | 23.51 | 0.00 | 23.51 | 37.76 | 0.00 | 37.76 | 63.18 | 0.00 | 63.18 | 169 | 0.00 | 66.97 | 0.00 | 66.97 | 185 | 0.00 |
| Marion | 13.41 | 0.00 | 13.41 | 17.28 | 0.00 | 17.28 | 24.05 | 0.00 | 24.05 | 79 | 0.00 | 25.49 | 0.00 | 25.49 | 90 | 0.00 |
| Nassau | 4.43 | 0.00 | 4.43 | 6.33 | 0.00 | 6.33 | 13.14 | 0.00 | 13.14 | 197 | 0.00 | 13.93 | 0.00 | 13.93 | 214 | 0.00 |
| Okeecho bee | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| Orange | 104.60 | 0.00 | 104.60 | 129.37 | 0.00 | 129.37 | 173.19 | 0.00 | 173.19 | 66 | 24.23 | 183.58 | 0.00 | 183.58 | 76 | 25.68 |
| Osceola | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| Putnam | 3.14 | 0.00 | 3.14 | 2.74 | 0.00 | 2.74 | 4.73 | 0.00 | 4.73 | 51 | 0.00 | 5.01 | 0.00 | 5.01 | 60 | 0.00 |
| St. Johns | 10.42 | 0.00 | 10.42 | 15.91 | 0.00 | 15.91 | 34.83 | 0.00 | 34.83 | 234 | 0.00 | 36.92 | 0.00 | 36.92 | 254 | 0.00 |
| Seminole | 49.95 | 0.00 | 49.95 | 66.46 | 0.00 | 66.46 | 90.39 | 0.00 | 90.39 | 81 | 0.00 | 95.81 | 0.00 | 95.81 | 92 | 0.00 |
| Volusia | 47.73 | 0.00 | 47.73 | 56.46 | 0.00 | 56.46 | 88.02 | 0.00 | 88.02 | 84 | 1.72 | 93.30 | 0.00 | 93.30 | 95 | 1.82 |
| Total | 441.11 | 12.15 | 453.26 | 549.47 | 14.08 | 563.55 | 809.88 | 25.68 | 835.56 | 84 | 25.95 | 858.46 | 27.22 | 885.68 | 95 | 27.50 |

All water use in million gallons per day

Percent change from 1995 water use

†Orange County plans to save this water through conservation efforts. Currently there is no plan for any utility to provide 1.72 mgd that is from an unknown source in Volusia County.

Table 5. Public supply water use for 1995, 2000 and 2025, by county and utility, in the St. Johns River Water Management District

A. Specified Water Source

| Utility/Facility | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | |
| Alachua County | | | | | | | | | | |
| Gainesville Regional Utilities | 20.44 | 0.00 | 20.44 | 25.41 | 0.00 | 25.41 | 32.34 | 0.00 | 32.34 | 58 |
| Hawthorne, City of | 0.19 | 0.00 | 0.19 | 0.20 | 0.00 | 0.20 | 0.24 | 0.00 | 0.24 | 26 |
| Kincaid Hills | 0.10 | 0.00 | 0.10 | 0.10 | 0.00 | 0.10 | 0.10 | 0.00 | 0.10 | 0 |
| Total | 20.73 | 0.00 | 20.73 | 25.71 | 0.00 | 25.71 | 32.68 | 0.00 | 32.68 | 58 |
| Baker County | | | | | | | | | | |
| Macclenny, City of | 0.65 | 0.00 | 0.65 | 0.81 | 0.00 | 0.81 | 0.94 | 0.00 | 0.94 | 45 |
| Total | 0.65 | 0.00 | 0.65 | 0.81 | 0.00 | 0.81 | 0.94 | 0.00 | 0.94 | 45 |
| Brevard County | | | | | | | | | | |
| Brevard County Utilities—Barefoot Bay | 0.45 | 0.00 | 0.45 | 0.48 | 0.00 | 0.48 | 0.63 | 0.00 | 0.63 | 40 |
| Brevard County Utilities—North Brevard System | 0.70 | 0.00 | 0.70 | 0.69 | 0.00 | 0.69 | 0.91 | 0.00 | 0.91 | 30 |
| Cocoa, City of | 24.21 | 0.00 | 24.21 | 25.61 | 0.00 | 25.61 | 31.23 | 9.47 | 40.70 | 68 |
| Melbourne, City of | 3.74 | 12.15 | 15.89 | 3.29 | 14.08 | 17.37 | 6.03 | 16.21 | 22.24 | 40 |
| Palm Bay Utilities | 4.94 | 0.00 | 4.94 | 5.74 | 0.00 | 5.74 | 8.84 | 0.00 | 8.84 | 79 |
| Titusville, City of | 4.90 | 0.00 | 4.90 | 3.15 | 0.00 | 3.15 | 5.55 | 0.00 | 5.55 | 13 |
| Total | 38.94 | 12.15 | 51.09 | 38.96 | 14.08 | 53.04 | 53.19 | 25.68 | 78.87 | 54 |
| Clay County | | | | | | | | | | |
| Clay County Utilities Authority | 8.87 | 0.00 | 8.87 | 11.27 | 0.00 | 11.27 | 33.04 | 0.00 | 33.04 | 272 |
| Clay County Utilities Authority—Keystone Heights[1] | 0.38 | 0.00 | 0.38 | 0.44 | 0.00 | 0.44 | 0.73 | 0.00 | 0.73 | 92 |
| Green Cove Springs, Town of | 0.91 | 0.00 | 0.91 | 1.26 | 0.00 | 1.26 | 2.22 | 0.00 | 2.22 | 144 |
| Orange Park, City of | 1.62 | 0.00 | 1.62 | 1.49 | 0.00 | 1.49 | 1.55 | 0.00 | 1.55 | -4 |
| Total | 11.78 | 0.00 | 11.78 | 14.46 | 0.00 | 14.46 | 37.54 | 0.00 | 37.54 | 219 |
| Duval County | | | | | | | | | | |
| Atlantic Beach, City of | 3.15 | 0.00 | 3.15 | 2.17 | 0.00 | 2.17 | 4.25 | 0.00 | 4.25 | 35 |
| Baldwin | 0.21 | 0.00 | 0.21 | 0.28 | 0.00 | 0.28 | 0.30 | 0.00 | 0.30 | 43 |
| Jacksonville Beach, City of | 2.90 | 0.00 | 2.90 | 3.53 | 0.00 | 3.53 | 3.97 | 0.00 | 3.97 | 37 |
| JEA | 75.28 | 0.00 | 75.28 | 94.41 | 0.00 | 94.41 | 119.88 | 0.00 | 119.88 | 59 |
| JEA[2] | 12.30 | 0.00 | 12.30 | 12.95 | 0.00 | 12.95 | 15.78 | 0.00 | 15.78 | 28 |
| JEA—Beacon Hills, Cobblestone, Woodmere | 1.28 | 0.00 | 1.28 | 2.51 | 0.00 | 2.51 | 3.84 | 0.00 | 3.84 | 200 |
| Neptune Beach, City of | 1.21 | 0.00 | 1.21 | 1.22 | 0.00 | 1.22 | 1.57 | 0.00 | 1.57 | 30 |
| Normandy Village Utilities | 0.39 | 0.00 | 0.39 | 0.40 | 0.00 | 0.40 | 0.43 | 0.00 | 0.43 | 10 |
| Total | 96.72 | 0.00 | 96.72 | 117.47 | 0.00 | 117.47 | 150.02 | 0.00 | 150.02 | 55 |
| Flagler County | | | | | | | | | | |
| Bunnell, City of | 0.25 | 0.00 | 0.25 | 0.18 | 0.00 | 0.18 | 0.59 | 0.00 | 0.59 | 136 |
| Dunes Community Development District | 0.00 | 0.00 | 0.00 | 0.14 | 0.00 | 0.14 | 0.68 | 0.00 | 0.68 | 100 |
| Flagler Beach, City of | 0.49 | 0.00 | 0.49 | 0.62 | 0.00 | 0.62 | 1.08 | 0.00 | 1.08 | 120 |
| Ormond Beach—Hunter's Ridge | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 | 0.00 | 0.45 | 100 |
| Palm Coast, City of | 3.66 | 0.00 | 3.66 | 5.00 | 0.00 | 5.00 | 18.64 | 0.00 | 18.64 | 409 |
| Total | 4.40 | 0.00 | 4.40 | 5.94 | 0.00 | 5.94 | 21.44 | 0.00 | 21.44 | 387 |

Table 5—*Continued*

| Utility/Facility | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | |
| Indian River County | | | | | | | | | | |
| Fellsmere, City of | 0.19 | 0.00 | 0.19 | 0.30 | 0.00 | 0.30 | 0.46 | 0.00 | 0.46 | 142 |
| Indian River County Utilities | 3.75 | 0.00 | 3.75 | 5.93 | 0.00 | 5.93 | 13.46 | 0.00 | 13.46 | 259 |
| Vero Beach, City of | 6.76 | 0.00 | 6.76 | 7.58 | 0.00 | 7.58 | 8.62 | 0.00 | 8.62 | 28 |
| Total | 10.70 | 0.00 | 10.70 | 13.81 | 0.00 | 13.81 | 22.54 | 0.00 | 22.54 | 111 |
| Lake County | | | | | | | | | | |
| Aquasource Utility Inc.—Kings Cove Subdivision | 0.06 | 0.00 | 0.06 | 0.13 | 0.00 | 0.13 | 0.17 | 0.00 | 0.17 | 183 |
| Aqua Utilities Florida—Silver Lakes/Western Shores[1] | 0.92 | 0.00 | 0.92 | 1.06 | 0.00 | 1.06 | 1.26 | 0.00 | 1.26 | 37 |
| Aqua Utilities Florida—Valencia Terrace[1] | 0.13 | 0.00 | 0.13 | 0.11 | 0.00 | 0.11 | 0.11 | 0.00 | 0.11 | -15 |
| Astor - Astor Park Water Association | 0.27 | 0.00 | 0.27 | 0.31 | 0.00 | 0.31 | 0.44 | 0.00 | 0.44 | 63 |
| Chateau Land Dev.—Orange Lake MHP | 0.13 | 0.00 | 0.13 | 0.17 | 0.00 | 0.17 | 0.15 | 0.00 | 0.15 | 15 |
| Clerbrook Golf and RV Resort | 0.14 | 0.00 | 0.14 | 0.14 | 0.00 | 0.14 | 0.48 | 0.00 | 0.48 | 243 |
| Clermont, City of | 1.63 | 0.00 | 1.63 | 2.00 | 0.00 | 2.00 | 9.62 | 0.00 | 9.62 | 490 |
| Eustis, City of | 2.33 | 0.00 | 2.33 | 2.95 | 0.00 | 2.95 | 5.01 | 0.00 | 5.01 | 115 |
| Fruitland Park, City of | 0.59 | 0.00 | 0.59 | 0.77 | 0.00 | 0.77 | 0.98 | 0.00 | 0.98 | 66 |
| Groveland, City of | 0.36 | 0.00 | 0.36 | 0.48 | 0.00 | 0.48 | 2.15 | 0.00 | 2.15 | 497 |
| Groveland, City of—Palisades Country Club | 0.08 | 0.00 | 0.08 | 0.32 | 0.00 | 0.32 | 0.80 | 0.00 | 0.80 | 900 |
| Harbor Hills Utilities LP | 0.19 | 0.00 | 0.19 | 0.51 | 0.00 | 0.51 | 1.07 | 0.00 | 1.07 | 463 |
| Hawthorne at Leesburg | 0.42 | 0.00 | 0.42 | 0.51 | 0.00 | 0.51 | 0.51 | 0.00 | 0.51 | 21 |
| Howey In The Hills, Town of | 0.21 | 0.00 | 0.21 | 0.33 | 0.00 | 0.33 | 0.35 | 0.00 | 0.35 | 67 |
| Lady Lake Central | 0.26 | 0.00 | 0.26 | 0.38 | 0.00 | 0.38 | 0.49 | 0.00 | 0.49 | 88 |
| Leesburg, City of | 4.87 | 0.00 | 4.87 | 6.82 | 0.00 | 6.82 | 7.74 | 0.00 | 7.74 | 59 |
| Mascotte, Town of | 0.25 | 0.00 | 0.25 | 0.32 | 0.00 | 0.32 | 1.32 | 0.00 | 1.32 | 428 |
| Mid Florida Lakes MHP | 0.31 | 0.00 | 0.31 | 0.61 | 0.00 | 0.61 | 0.38 | 0.00 | 0.38 | 23 |
| Minneola, City of | 0.39 | 0.00 | 0.39 | 0.60 | 0.00 | 0.60 | 3.63 | 0.00 | 3.63 | 831 |
| Monteverde, Town of | 0.15 | 0.00 | 0.15 | 0.26 | 0.00 | 0.26 | 0.33 | 0.00 | 0.33 | 120 |
| Mount Dora, City of | 2.72 | 0.00 | 2.72 | 3.94 | 0.00 | 3.94 | 5.05 | 0.00 | 5.05 | 86 |
| Oak Springs MHP | 0.17 | 0.00 | 0.17 | 0.12 | 0.00 | 0.12 | 0.15 | 0.00 | 0.15 | -12 |
| Pennbrooke Utilities Inc. | 0.11 | 0.00 | 0.11 | 0.32 | 0.00 | 0.32 | 0.27 | 0.00 | 0.27 | 145 |
| Southlake Utilities | 0.07 | 0.00 | 0.07 | 0.71 | 0.00 | 0.71 | 3.22 | 0.00 | 3.22 | 4500 |
| Sunlake Estates | 0.28 | 0.00 | 0.28 | 0.43 | 0.00 | 0.43 | 0.20 | 0.00 | 0.20 | -29 |
| Tavares, City of | 1.49 | 0.00 | 1.49 | 2.74 | 0.00 | 2.74 | 5.21 | 0.00 | 5.21 | 250 |
| UIF-Lake Groves | 0.12 | 0.00 | 0.12 | 1.14 | 0.00 | 1.14 | 1.07 | 0.00 | 1.07 | 792 |
| UIF-Lake Utility Services Inc. | 0.53 | 0.00 | 0.53 | 2.69 | 0.00 | 2.69 | 5.10 | 0.00 | 5.10 | 862 |
| Umatilla, City of | 0.44 | 0.00 | 0.44 | 0.47 | 0.00 | 0.47 | 0.59 | 0.00 | 0.59 | 34 |
| Villages of Lake-Sumter | 3.39 | 0.00 | 3.39 | 5.89 | 0.00 | 5.89 | 4.46 | 0.00 | 4.46 | 32 |
| Water Oak Estates | 0.34 | 0.00 | 0.34 | 0.30 | 0.00 | 0.30 | 0.64 | 0.00 | 0.64 | 88 |
| Wedgewood Homeowner's Assoc Inc. | 0.16 | 0.00 | 0.16 | 0.23 | 0.00 | 0.23 | 0.23 | 0.00 | 0.23 | 44 |
| Total | 23.51 | 0.00 | 23.51 | 37.76 | 0.00 | 37.76 | 63.18 | 0.00 | 63.18 | 169 |

Table 5—*Continued*

| Utility/Facility | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | |
| Marion County | | | | | | | | | | |
| Aquasource Utilities Inc. | 0.16 | 0.00 | 0.16 | 0.21 | 0.00 | 0.21 | 0.24 | 0.00 | 0.24 | 50 |
| Belleview, City of | 0.63 | 0.00 | 0.63 | 0.86 | 0.00 | 0.86 | 1.03 | 0.00 | 1.03 | 63 |
| Marion County Utilities—Silver Springs Shores | 1.90 | 0.00 | 1.90 | 1.32 | 0.00 | 1.32 | 1.27 | 0.00 | 1.27 | -33 |
| Marion County Utilities—Spruce Creek Golf and Country Club[1] | 0.00 | 0.00 | 0.00 | 1.08 | 0.00 | 1.08 | 3.57 | 0.00 | 3.57 | 100 |
| Marion County Utilities—Spruce Creek South[1] | 0.87 | 0.00 | 0.87 | 1.01 | 0.00 | 1.01 | 1.68 | 0.00 | 1.68 | 93 |
| Marion County Utilities—Stonecrest[1] | 0.12 | 0.00 | 0.12 | 0.60 | 0.00 | 0.60 | 2.10 | 0.00 | 2.10 | 1650 |
| Marion Utilities | 0.43 | 0.00 | 0.43 | 0.57 | 0.00 | 0.57 | 0.41 | 0.00 | 0.41 | -5 |
| Ocala, City of | 8.70 | 0.00 | 8.70 | 10.84 | 0.00 | 10.84 | 12.47 | 0.00 | 12.47 | 43 |
| Ocala East Villas | 0.11 | 0.00 | 0.11 | 0.13 | 0.00 | 0.13 | 0.15 | 0.00 | 0.15 | 36 |
| Sunshine Utilities | 0.49 | 0.00 | 0.49 | 0.66 | 0.00 | 0.66 | 1.13 | 0.00 | 1.13 | 131 |
| Total | 13.41 | 0.00 | 13.41 | 17.28 | 0.00 | 17.28 | 24.05 | 0.00 | 24.05 | 79 |
| Nassau County | | | | | | | | | | |
| Fernandina Beach, City of | 3.22 | 0.00 | 3.22 | 4.33 | 0.00 | 4.33 | 5.42 | 0.00 | 5.42 | 68 |
| JEA[2] | 0.09 | 0.00 | 0.09 | 0.43 | 0.00 | 0.43 | 4.71 | 0.00 | 4.71 | 5133 |
| Nassau County—Amelia Island | 1.12 | 0.00 | 1.12 | 1.57 | 0.00 | 1.57 | 3.01 | 0.00 | 3.01 | 169 |
| Total | 4.43 | 0.00 | 4.43 | 6.33 | 0.00 | 6.33 | 13.14 | 0.00 | 13.14 | 197 |
| Orange County | | | | | | | | | | |
| Apopka, City of | 5.90 | 0.00 | 5.90 | 7.31 | 0.00 | 7.31 | 13.75 | 0.00 | 13.75 | 133 |
| Chateau Land Development Co | 0.18 | 0.00 | 0.18 | 0.22 | 0.00 | 0.22 | 0.25 | 0.00 | 0.25 | 39 |
| Eatonville, Town of | 0.65 | 0.00 | 0.65 | 0.52 | 0.00 | 0.52 | 0.95 | 0.00 | 0.95 | 46 |
| Maitland, City of | 2.82 | 0.00 | 2.82 | 3.68 | 0.00 | 3.68 | 4.19 | 0.00 | 4.19 | 49 |
| Oakland, Town of | 0.11 | 0.00 | 0.11 | 0.18 | 0.00 | 0.18 | 0.94 | 0.00 | 0.94 | 755 |
| Ocoee, City of | 3.68 | 0.00 | 3.68 | 6.30 | 0.00 | 6.30 | 9.97 | 0.00 | 9.97 | 171 |
| Orange County Utilities | 24.65 | 0.00 | 24.65 | 33.72 | 0.00 | 33.72 | 59.78 | 0.00 | 59.78 | 143 |
| Orlando Utilities Commission | 51.97 | 0.00 | 51.97 | 60.14 | 0.00 | 60.14 | 60.20 | 0.00 | 60.20 | 16 |
| Rock Springs MHP | 0.23 | 0.00 | 0.23 | 0.25 | 0.00 | 0.25 | 0.24 | 0.00 | 0.24 | 4 |
| Shadow Hills MHP | 0.18 | 0.00 | 0.18 | 0.13 | 0.00 | 0.13 | 0.13 | 0.00 | 0.13 | -28 |
| UIF- Wedgefield | 0.18 | 0.00 | 0.18 | 0.29 | 0.00 | 0.29 | 0.98 | 0.00 | 0.98 | 444 |
| Winter Garden, City of | 1.86 | 0.00 | 1.86 | 2.92 | 0.00 | 2.92 | 4.19 | 0.00 | 4.19 | 125 |
| Winter Park, City of | 11.35 | 0.00 | 11.35 | 13.11 | 0.00 | 13.11 | 16.99 | 0.00 | 16.99 | 50 |
| Zellwood Station Utilities | 0.57 | 0.00 | 0.57 | 0.47 | 0.00 | 0.47 | 0.52 | 0.00 | 0.52 | -9 |
| Zellwood Water Association | 0.27 | 0.00 | 0.27 | 0.13 | 0.00 | 0.13 | 0.11 | 0.00 | 0.11 | -59 |
| Total | 104.60 | 0.00 | 104.60 | 129.37 | 0.00 | 129.37 | 173.19 | 0.00 | 173.19 | 66 |
| Putnam County | | | | | | | | | | |
| Crescent City | 0.32 | 0.00 | 0.32 | 0.39 | 0.00 | 0.39 | 0.32 | 0.00 | 0.32 | 0 |
| East Putnam County Water System | 0.00 | 0.00 | 0.00 | 0.24 | 0.00 | 0.24 | 2.00 | 0.00 | 2.00 | 100 |
| Palatka, City of | 2.82 | 0.00 | 2.82 | 2.11 | 0.00 | 2.11 | 2.41 | 0.00 | 2.41 | -15 |
| Total | 3.14 | 0.00 | 3.14 | 2.74 | 0.00 | 2.74 | 4.73 | 0.00 | 4.73 | 51 |

Table 5—*Continued*

| Utility/Facility | 1995Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | |
| St. Johns County | | | | | | | | | | |
| Intercoastal Utilities | 1.08 | 0.00 | 1.08 | 2.47 | 0.00 | 2.47 | 4.75 | 0.00 | 4.75 | 340 |
| JEA[2] | 1.40 | 0.00 | 1.40 | 2.80 | 0.00 | 2.80 | 8.30 | 0.00 | 8.30 | 493 |
| JEA—Julington Creek | 0.32 | 0.00 | 0.32 | 1.68 | 0.00 | 1.68 | 2.60 | 0.00 | 2.60 | 713 |
| North Beach Water System | 0.22 | 0.00 | 0.22 | 0.32 | 0.00 | 0.32 | 0.48 | 0.00 | 0.48 | 118 |
| St. Augustine, City of | 2.24 | 0.00 | 2.24 | 2.18 | 0.00 | 2.18 | 2.87 | 0.00 | 2.87 | 28 |
| St. Johns County Utilities | 3.20 | 0.00 | 3.20 | 3.49 | 0.00 | 3.49 | 11.98 | 0.00 | 11.98 | 274 |
| St. Johns Service Company | 1.96 | 0.00 | 1.96 | 2.97 | 0.00 | 2.97 | 3.85 | 0.00 | 3.85 | 96 |
| Total | 10.42 | 0.00 | 10.42 | 15.91 | 0.00 | 15.91 | 34.83 | 0.00 | 34.83 | 234 |
| Seminole County | | | | | | | | | | |
| Altamonte Springs, City of | 6.48 | 0.00 | 6.48 | 6.71 | 0.00 | 6.71 | 9.50 | 0.00 | 9.50 | 47 |
| Casselberry, City of | 5.92 | 0.00 | 5.92 | 6.24 | 0.00 | 6.24 | 8.57 | 0.00 | 8.57 | 45 |
| Seminole Co. Utilities—Apple Valley[1] | 0.46 | 0.00 | 0.46 | 0.56 | 0.00 | 0.56 | 0.81 | 0.00 | 0.81 | 76 |
| Aqua Utilities Florida—Chuluota[1] | 0.21 | 0.00 | 0.21 | 0.21 | 0.00 | 0.21 | 1.22 | 0.00 | 1.22 | 481 |
| Seminole Co. Utilities—Druid Hills/Bretton Woods[1] | 0.13 | 0.00 | 0.13 | 0.11 | 0.00 | 0.11 | 0.11 | 0.00 | 0.11 | -15 |
| Seminole Co. Utilities—Meredith Manor[1] | 0.27 | 0.00 | 0.27 | 0.33 | 0.00 | 0.33 | 0.34 | 0.00 | 0.34 | 26 |
| Lake Mary, City of | 1.75 | 0.00 | 1.75 | 4.27 | 0.00 | 4.27 | 4.43 | 0.00 | 4.43 | 153 |
| Longwood, City of | 2.00 | 0.00 | 2.00 | 2.17 | 0.00 | 2.17 | 2.89 | 0.00 | 2.89 | 45 |
| Oviedo, City of | 2.82 | 0.00 | 2.82 | 4.39 | 0.00 | 4.39 | 5.69 | 0.00 | 5.69 | 102 |
| Palm Valley MHP | 0.23 | 0.00 | 0.23 | 0.22 | 0.00 | 0.22 | 0.44 | 0.00 | 0.44 | 91 |
| Sanford, City of | 5.74 | 0.00 | 5.74 | 6.89 | 0.00 | 6.89 | 10.94 | 0.00 | 10.94 | 91 |
| Seminole County Utilities | 11.03 | 0.00 | 11.03 | 18.05 | 0.00 | 18.05 | 28.09 | 0.00 | 28.09 | 155 |
| UIF—Sanlando Utilities Corp. | 8.81 | 0.00 | 8.81 | 11.08 | 0.00 | 11.08 | 10.76 | 0.00 | 10.76 | 22 |
| UIF—Oakland Shores | 0.10 | 0.00 | 0.10 | 0.10 | 0.00 | 0.10 | 0.10 | 0.00 | 0.10 | 0 |
| UIF—Ravenna Park | 0.10 | 0.00 | 0.10 | 0.11 | 0.00 | 0.11 | 0.10 | 0.00 | 0.10 | 0 |
| UIF—Weathersfield | 0.35 | 0.00 | 0.35 | 0.36 | 0.00 | 0.36 | 0.37 | 0.00 | 0.37 | 6 |
| Winter Springs, City of | 3.55 | 0.00 | 3.55 | 4.66 | 0.00 | 4.66 | 6.03 | 0.00 | 6.03 | 70 |
| Total | 49.95 | 0.00 | 49.95 | 66.46 | 0.00 | 66.46 | 90.39 | 0.00 | 90.39 | 81 |
| Volusia County | | | | | | | | | | |
| Daytona Beach, City of | 12.42 | 0.00 | 12.42 | 13.57 | 0.00 | 13.57 | 18.51 | 0.00 | 18.51 | 49 |
| De Land, City of | 5.08 | 0.00 | 5.08 | 5.96 | 0.00 | 5.96 | 7.24 | 0.00 | 7.24 | 43 |
| Deltona, City of—Deltona Lakes | 9.12 | 0.00 | 9.12 | 12.04 | 0.00 | 12.04 | 17.12 | 0.00 | 17.12 | 88 |
| Edgewater, City of | 1.49 | 0.00 | 1.49 | 1.80 | 0.00 | 1.80 | 3.21 | 0.00 | 3.21 | 115 |
| Holly Hill, City of | 1.16 | 0.00 | 1.16 | 1.29 | 0.00 | 1.29 | 1.71 | 0.00 | 1.71 | 47 |
| Lake Beresford Water Association | 0.17 | 0.00 | 0.17 | 0.19 | 0.00 | 0.19 | 0.25 | 0.00 | 0.25 | 47 |
| Lake Helen, City of | 0.24 | 0.00 | 0.24 | 0.23 | 0.00 | 0.23 | 0.56 | 0.00 | 0.56 | 133 |
| New Smyrna Beach, City of | 4.27 | 0.00 | 4.27 | 4.99 | 0.00 | 4.99 | 7.12 | 0.00 | 7.12 | 67 |
| Orange City, Town of | 1.33 | 0.00 | 1.33 | 1.37 | 0.00 | 1.37 | 2.92 | 0.00 | 2.92 | 120 |
| Ormond Beach, City of | 4.90 | 0.00 | 4.90 | 5.72 | 0.00 | 5.72 | 9.39 | 0.00 | 9.39 | 92 |
| Pierson, Town of | 0.12 | 0.00 | 0.12 | 0.15 | 0.00 | 0.15 | 0.16 | 0.00 | 0.16 | 33 |
| Port Orange, City of | 5.28 | 0.00 | 5.28 | 5.56 | 0.00 | 5.56 | 8.20 | 0.00 | 8.20 | 55 |

Table 5—*Continued*

| Utility/Facility | 1995Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | |
| Volusia County Utilities | 2.15 | 0.00 | 2.15 | 3.59 | 0.00 | 3.59 | 9.91 | 0.00 | 9.91 | 361 |
| I-4 / SR 472 Activity Center Use | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.72 | 0.00 | 1.72 | 0 |
| Total | 47.73 | 0.00 | 47.73 | 56.46 | 0.00 | 56.46 | 88.02 | 0.00 | 88.02 | 84 |
| St. Johns River Water Management District | 441.11 | 12.15 | 453.26 | 549.47 | 14.08 | 563.55 | 809.88 | 25.68 | 835.56 | 84 |

mgd = million gallons per day
[1]Formerly Florida Water Services
[2]Formerly United Water Florida

## B. Unspecified Water Source

| Utility/Facility | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total |
| Orange County | | | | | | | | | |
| Orange County Utilities[†] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 17.05 |
| Orlando Utilities Commission (OUC)[†] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.18 |
| Total | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24.23 |
| Volusia County | | | | | | | | | |
| I-4 / SR 472 Activity Center Use[§] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.72 | 0.00 | 1.72 |
| Total | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.72 | 0.00 | 1.72 |
| St. Johns River Water Management District | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.72 | 0.00 | 25.95 |

All water use in million gallons per day
[†]SJRWMD projected additional water use that will be eliminated through implementation of OUC's water use conservation plan
[§]Currently there is no plan for any utility to provide water to meet this demand

Table 6. Domestic self-supply and other small public supply water use for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | | 2025 Projected Water Use 1-in-10 Rainfall Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | Percent Change | Ground | Surface | Total | Percent Change |
| Alachua | 2.28 | 0.00 | 2.28 | 1.75 | 0.00 | 1.75 | 3.42 | 0.00 | 3.42 | 50 | 3.63 | 0.00 | 3.63 | 59 |
| Baker | 1.51 | 0.00 | 1.51 | 1.77 | 0.00 | 1.77 | 3.89 | 0.00 | 3.89 | 158 | 4.12 | 0.00 | 4.12 | 173 |
| Bradford | 0.12 | 0.00 | 0.12 | 0.10 | 0.00 | 0.10 | 0.19 | 0.00 | 0.19 | 58 | 0.20 | 0.00 | 0.20 | 67 |
| Brevard | 6.22 | 0.00 | 6.22 | 2.34 | 0.00 | 2.34 | 1.96 | 0.00 | 1.96 | -68 | 2.08 | 0.00 | 2.08 | -67 |
| Clay | 3.03 | 0.00 | 3.03 | 4.20 | 0.00 | 4.20 | 5.35 | 0.00 | 5.35 | 77 | 5.67 | 0.00 | 5.67 | 87 |
| Duval | 7.96 | 0.00 | 7.96 | 4.95 | 0.00 | 4.95 | 6.46 | 0.00 | 6.46 | -19 | 6.85 | 0.00 | 6.85 | -14 |
| Flagler | 1.19 | 0.00 | 1.19 | 0.83 | 0.00 | 0.83 | 0.78 | 0.00 | 0.78 | -34 | 0.83 | 0.00 | 0.83 | -30 |
| Indian River | 3.99 | 0.00 | 3.99 | 2.09 | 0.00 | 2.09 | 1.67 | 0.00 | 1.67 | -58 | 1.77 | 0.00 | 1.77 | -56 |
| Lake | 6.02 | 0.00 | 6.02 | 7.06 | 0.00 | 7.06 | 14.50 | 0.00 | 14.50 | 141 | 15.37 | 0.00 | 15.37 | 155 |
| Marion | 10.40 | 0.00 | 10.40 | 11.35 | 0.00 | 11.35 | 16.55 | 0.00 | 16.55 | 59 | 17.54 | 0.00 | 17.54 | 69 |
| Nassau | 2.63 | 0.00 | 2.63 | 3.92 | 0.00 | 3.92 | 10.90 | 0.00 | 10.90 | 314 | 11.55 | 0.00 | 11.55 | 339 |
| Okeechobee | 0.06 | 0.00 | 0.06 | 0.08 | 0.00 | 0.08 | 0.17 | 0.00 | 0.17 | 183 | 0.18 | 0.00 | 0.18 | 200 |
| Orange | 3.79 | 0.00 | 3.79 | 8.85 | 0.00 | 8.85 | 12.32 | 0.00 | 12.32 | 225 | 13.06 | 0.00 | 13.06 | 245 |
| Osceola | 0.04 | 0.00 | 0.04 | 0.18 | 0.00 | 0.18 | 0.63 | 0.00 | 0.63 | 1,475 | 0.67 | 0.00 | 0.67 | 1,575 |
| Putnam | 5.10 | 0.00 | 5.10 | 5.59 | 0.00 | 5.59 | 9.62 | 0.00 | 9.62 | 89 | 10.20 | 0.00 | 10.20 | 100 |
| St. Johns | 4.24 | 0.00 | 4.24 | 2.36 | 0.00 | 2.36 | 3.65 | 0.00 | 3.65 | -14 | 3.87 | 0.00 | 3.87 | -9 |
| Seminole | 2.56 | 0.00 | 2.56 | 3.02 | 0.00 | 3.02 | 4.28 | 0.00 | 4.28 | 67 | 4.54 | 0.00 | 4.54 | 77 |
| Volusia | 9.95 | 0.00 | 9.95 | 4.06 | 0.00 | 4.06 | 4.33 | 0.00 | 4.33 | -56 | 4.59 | 0.00 | 4.59 | -54 |
| Total | 71.09 | 0.00 | 71.09 | 64.50 | 0.00 | 64.50 | 100.67 | 0.00 | 100.67 | 42 | 106.72 | 0.00 | 106.72 | 50 |

All water use in million gallons per day
Percent change from 1995 water use

Table 7. Agricultural irrigation water use and acreage for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | | 2025 Projected Water Use 1-in-10 Rainfall Year | | | | Acreage | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | Percent Change | Ground | Surface | Total | Percent Change | 1995 | 2025 | Percent Change |
| Alachua | 4.82 | 0.21 | 5.03 | 4.13 | 0.04 | 4.17 | 6.97 | 0.39 | 7.36 | 46 | 7.82 | 0.43 | 8.25 | 64 | 5,485 | 7,456 | 36 |
| Baker | 1.28 | 0.86 | 2.14 | 2.67 | 1.64 | 4.31 | 1.27 | 0.86 | 2.13 | 0 | 1.38 | 0.93 | 2.31 | 8 | 567 | 560 | -1 |
| Bradford | 0.09 | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.09 | 0.00 | 0.09 | 0 | 0.11 | 0.00 | 0.11 | 22 | 110 | 113 | 3 |
| Brevard | 113.19 | 11.62 | 124.81 | 118.79 | 18.03 | 136.82 | 78.73 | 11.68 | 90.41 | -28 | 84.58 | 12.75 | 97.33 | -22 | 88,630 | 61,556 | -31 |
| Clay | 0.80 | 0.00 | 0.80 | 5.92 | 0.04 | 5.96 | 1.39 | 0.00 | 1.39 | 74 | 1.49 | 0.00 | 1.49 | 86 | 419 | 611 | 46 |
| Duval | 2.19 | 0.18 | 2.37 | 3.74 | 0.33 | 4.07 | 2.84 | 0.28 | 3.12 | 32 | 2.97 | 0.29 | 3.26 | 38 | 1,342 | 1,716 | 28 |
| Flagler | 8.77 | 0.16 | 8.93 | 15.67 | 0.03 | 15.70 | 7.19 | 0.37 | 7.56 | -15 | 8.30 | 0.39 | 8.69 | -3 | 7,235 | 6,261 | -13 |
| Indian River | 67.33 | 170.02 | 237.35 | 64.63 | 157.86 | 222.49 | 67.91 | 172.60 | 240.51 | 1 | 81.88 | 212.47 | 294.35 | 24 | 95,032 | 96,127 | 1 |
| Lake | 43.91 | 7.06 | 50.97 | 28.85 | 5.16 | 34.01 | 21.05 | 3.04 | 24.09 | -53 | 24.33 | 3.54 | 27.87 | -45 | 24,570 | 17,452 | -29 |
| Marion | 5.80 | 0.72 | 6.52 | 11.10 | 0.78 | 11.88 | 6.91 | 0.79 | 7.70 | 18 | 7.96 | 0.88 | 8.84 | 36 | 5,173 | 6,130 | 18 |
| Nassau | 0.25 | 0.00 | 0.25 | 0.68 | 0.02 | 0.70 | 0.28 | 0.00 | 0.28 | 12 | 0.32 | 0.00 | 0.32 | 28 | 205 | 231 | 13 |
| Okeechobee | 14.19 | 0.00 | 14.19 | 15.16 | 0.00 | 15.16 | 13.32 | 0.00 | 13.32 | -6 | 16.06 | 0.00 | 16.06 | 13 | 7,785 | 7,181 | -8 |
| Orange | 16.18 | 17.76 | 33.94 | 6.84 | 3.35 | 10.19 | 18.20 | 9.10 | 27.30 | -20 | 21.64 | 10.80 | 32.44 | -4 | 29,935 | 18,214 | -39 |
| Osceola | 6.53 | 9.99 | 16.52 | 29.30 | 19.06 | 48.36 | 5.98 | 9.99 | 15.97 | -3 | 6.90 | 10.59 | 17.49 | 6 | 12,354 | 12,354 | 0 |
| Putnam | 11.85 | 0.81 | 12.66 | 11.69 | 3.50 | 15.19 | 16.87 | 2.88 | 19.75 | 56 | 19.75 | 3.22 | 22.97 | 81 | 9,315 | 12,980 | 39 |
| St. Johns | 30.07 | 0.00 | 30.07 | 28.59 | 0.00 | 28.59 | 32.40 | 0.00 | 32.40 | 8 | 39.22 | 0.00 | 39.22 | 30 | 26,180 | 28,196 | 8 |
| Seminole | 9.46 | 0.34 | 9.80 | 11.06 | 0.02 | 11.08 | 7.75 | 0.42 | 8.17 | -17 | 8.78 | 0.45 | 9.23 | -6 | 4,797 | 3,704 | -23 |
| Volusia | 24.45 | 3.42 | 27.87 | 29.03 | 3.88 | 32.91 | 17.78 | 2.78 | 20.56 | -26 | 21.58 | 3.48 | 25.06 | -10 | 11,692 | 8,015 | -31 |
| Total | 361.16 | 223.15 | 584.31 | 387.85 | 213.74 | 601.59 | 306.93 | 215.18 | 522.11 | -11 | 355.07 | 260.22 | 615.29 | 5 | 330,826 | 288,857 | -13 |

All water use in million gallons per day
Percent change from 1995 water use

Table 8. Agricultural irrigation water use and acreage for 1995 and 2025, by county and crop, in the St. Johns River Water Management District

| Crop | 1995 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | 2025 Projected Water Use 1-in10 Rainfall Year | | | Acreage | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | 1995 | 2025 | |
| Alachua County | | | | | | | | | | | | | |
| Citrus | 0.09 | 0.00 | 0.09 | 0.09 | 0.00 | 0.09 | 0 | 0.11 | 0.00 | 0.11 | 40 | 40 | 0 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.13 | 0.00 | 0.13 | 0.13 | 0.00 | 0.13 | 0 | 0.16 | 0.00 | 0.16 | 175 | 175 | 0 |
| Other Fruit and Nuts | 1.20 | 0.14 | 1.34 | 1.69 | 0.19 | 1.88 | 40 | 1.91 | 0.22 | 2.13 | 1,980 | 2,780 | 40 |
| Pasture | 0.78 | 0.00 | 0.78 | 0.78 | 0.00 | 0.78 | 0 | 0.83 | 0.00 | 0.83 | 680 | 680 | 0 |
| Greenhouse/Nursery | 0.43 | 0.07 | 0.50 | 1.27 | 0.20 | 1.47 | 194 | 1.37 | 0.21 | 1.58 | 104 | 304 | 192 |
| Sod | 0.11 | 0.00 | 0.11 | 0.11 | 0.00 | 0.11 | 0 | 0.11 | 0.00 | 0.11 | 50 | 50 | 0 |
| Turf Grass | 0.47 | 0.00 | 0.47 | 0.66 | 0.00 | 0.66 | 40 | 0.70 | 0.00 | 0.70 | 406 | 577 | 42 |
| Vegetables, Melons, and Berries | 1.61 | 0.00 | 1.61 | 2.24 | 0.00 | 2.24 | 39 | 2.63 | 0.00 | 2.63 | 2,050 | 2,850 | 39 |
| Total | 4.82 | 0.21 | 5.03 | 6.97 | 0.39 | 7.36 | 46 | 7.82 | 0.43 | 8.25 | 5,485 | 7,456 | 36 |
| Baker County | | | | | | | | | | | | | |
| Citrus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.00 | 0.06 | 0.06 | 0.00 | 0.06 | 0.06 | 0 | 0.00 | 0.07 | 0.07 | 80 | 80 | 0 |
| Other Fruit and Nuts | 0.05 | 0.00 | 0.05 | 0.04 | 0.00 | 0.04 | -20 | 0.05 | 0.00 | 0.05 | 67 | 60 | -10 |
| Pasture | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Greenhouse/Nursery | 1.23 | 0.80 | 2.03 | 1.23 | 0.80 | 2.03 | 0 | 1.33 | 0.86 | 2.19 | 420 | 420 | 0 |
| Sod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Turf Grass | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Vegetables, Melons, and Berries | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Total | 1.28 | 0.86 | 2.14 | 1.27 | 0.86 | 2.13 | 0 | 1.38 | 0.93 | 2.31 | 567 | 560 | -1 |
| Bradford County | | | | | | | | | | | | | |
| Citrus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Other Fruit and Nuts | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Pasture | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Greenhouse/Nursery | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Sod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Turf Grass | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0 | 0.02 | 0.00 | 0.02 | 10 | 13 | 30 |
| Vegetables, Melons, and Berries | 0.08 | 0.00 | 0.08 | 0.08 | 0.00 | 0.08 | 0 | 0.09 | 0.00 | 0.09 | 100 | 100 | 0 |
| Total | 0.09 | 0.00 | 0.09 | 0.09 | 0.00 | 0.09 | 0 | 0.11 | 0.00 | 0.11 | 110 | 113 | 3 |
| Brevard County | | | | | | | | | | | | | |
| Citrus | 12.62 | 4.91 | 17.53 | 7.83 | 3.04 | 10.87 | -38 | 9.78 | 3.80 | 13.58 | 6,450 | 4,000 | -38 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 2.27 | 0.00 | 2.27 | 0.99 | 0.00 | 0.99 | -56 | 1.14 | 0.00 | 1.14 | 2,300 | 1,000 | -57 |

Table 8—*Continued*

| Crop | 1995 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | 2025 Projected Water Use 1-in10 Rainfall Year | | | Acreage | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | 1995 | 2025 | |
| Other Fruit and Nuts | 0.29 | 0.03 | 0.32 | 0.19 | 0.02 | 0.21 | -34 | 0.21 | 0.02 | 0.23 | 460 | 300 | -35 |
| Pasture | 93.71 | 4.93 | 98.64 | 61.77 | 3.25 | 65.02 | -34 | 65.02 | 3.42 | 68.44 | 75,860 | 50,000 | -34 |
| Greenhouse/Nursery | 1.02 | 0.00 | 1.02 | 2.42 | 0.00 | 2.42 | 137 | 2.60 | 0.00 | 2.60 | 210 | 500 | 138 |
| Sod | 1.16 | 1.74 | 2.90 | 3.57 | 5.35 | 8.92 | 208 | 3.66 | 5.49 | 9.15 | 1,300 | 4,000 | 208 |
| Turf Grass | 0.83 | 0.01 | 0.84 | 1.22 | 0.02 | 1.24 | 48 | 1.29 | 0.02 | 1.31 | 650 | 956 | 47 |
| Vegetables, Melons, and Berries | 1.29 | 0.00 | 1.29 | 0.74 | 0.00 | 0.74 | -43 | 0.88 | 0.00 | 0.88 | 1,400 | 800 | -43 |
| Total | 113.19 | 11.62 | 124.81 | 78.73 | 11.68 | 90.41 | -28 | 84.58 | 12.75 | 97.33 | 88,630 | 61,556 | -31 |
| Clay County | | | | | | | | | | | | | |
| Citrus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Other Fruit and Nuts | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0 | 0.01 | 0.00 | 0.01 | 13 | 13 | 0 |
| Pasture | 0.11 | 0.00 | 0.11 | 0.11 | 0.00 | 0.11 | 0 | 0.12 | 0.00 | 0.12 | 100 | 100 | 0 |
| Greenhouse/Nursery | 0.48 | 0.00 | 0.48 | 0.97 | 0.00 | 0.97 | 102 | 1.04 | 0.00 | 1.04 | 100 | 200 | 100 |
| Sod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Turf Grass | 0.17 | 0.00 | 0.17 | 0.27 | 0.00 | 0.27 | 59 | 0.29 | 0.00 | 0.29 | 146 | 238 | 63 |
| Vegetables, Melons, and Berries | 0.03 | 0.00 | 0.03 | 0.03 | 0.00 | 0.03 | 0 | 0.03 | 0.00 | 0.03 | 60 | 60 | 0 |
| Total | 0.80 | 0.00 | 0.80 | 1.39 | 0.00 | 1.39 | 74 | 1.49 | 0.00 | 1.49 | 419 | 611 | 46 |
| Duval County | | | | | | | | | | | | | |
| Citrus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Other Fruit and Nuts | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0 | 0.02 | 0.00 | 0.02 | 20 | 20 | 0 |
| Pasture | 0.57 | 0.00 | 0.57 | 0.57 | 0.00 | 0.57 | 0 | 0.61 | 0.00 | 0.61 | 500 | 500 | 0 |
| Greenhouse/Nursery | 0.35 | 0.00 | 0.35 | 0.35 | 0.00 | 0.35 | 0 | 0.37 | 0.00 | 0.37 | 72 | 72 | 0 |
| Sod | 1.09 | 0.18 | 1.27 | 1.68 | 0.28 | 1.96 | 54 | 1.73 | 0.29 | 2.02 | 600 | 927 | 55 |
| Turf Grass | 0.17 | 0.00 | 0.17 | 0.23 | 0.00 | 0.23 | 35 | 0.24 | 0.00 | 0.24 | 150 | 197 | 31 |
| Vegetables, Melons, and Berries | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Total | 2.19 | 0.18 | 2.37 | 2.84 | 0.28 | 3.12 | 32 | 2.97 | 0.29 | 3.26 | 1,342 | 1,716 | 28 |
| Flagler County | | | | | | | | | | | | | |
| Citrus | 0.18 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | -100 | 0.00 | 0.00 | 0.00 | 50 | 0 | -100 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Other Fruit and Nuts | 0.07 | 0.00 | 0.07 | 0.05 | 0.00 | 0.05 | -29 | 0.07 | 0.00 | 0.07 | 120 | 87 | -28 |
| Pasture | 0.80 | 0.00 | 0.80 | 0.89 | 0.00 | 0.89 | 11 | 0.94 | 0.00 | 0.94 | 695 | 776 | 12 |
| Greenhouse/Nursery | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Sod | 0.46 | 0.00 | 0.46 | 0.26 | 0.00 | 0.26 | -43 | 0.27 | 0.00 | 0.27 | 220 | 126 | -43 |

Table 8—*Continued*

| Crop | 1995 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | 2025 Projected Water Use 1-in10 Rainfall Year | | | Acreage | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | 1995 | 2025 | |
| Turf Grass | 0.01 | 0.16 | 0.17 | 0.03 | 0.37 | 0.40 | 135 | 0.03 | 0.39 | 0.42 | 150 | 344 | 129 |
| Vegetables, Melons, and Berries | 7.25 | 0.00 | 7.25 | 5.96 | 0.00 | 5.96 | -18 | 6.99 | 0.00 | 6.99 | 6,000 | 4,928 | -18 |
| Total | 8.77 | 0.16 | 8.93 | 7.19 | 0.37 | 7.56 | -15 | 8.30 | 0.39 | 8.69 | 7,235 | 6,261 | -13 |
| Indian River County | | | | | | | | | | | | | |
| Citrus | 50.65 | 151.93 | 202.58 | 51.42 | 154.23 | 205.65 | 2 | 64.24 | 192.72 | 256.96 | 65,446 | 66,436 | 2 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.19 | 2.12 | 2.31 | 0.24 | 2.58 | 2.82 | 22 | 0.27 | 2.99 | 3.26 | 2,350 | 2,850 | 21 |
| Other Fruit and Nuts | 0.12 | 0.00 | 0.12 | 0.12 | 0.00 | 0.12 | 0 | 0.14 | 0.00 | 0.14 | 170 | 178 | 5 |
| Pasture | 13.33 | 13.33 | 26.66 | 12.94 | 12.94 | 25.88 | -3 | 13.63 | 13.63 | 27.26 | 22,747 | 22,094 | -3 |
| Greenhouse/Nursery | 0.41 | 0.00 | 0.41 | 0.41 | 0.00 | 0.41 | 0 | 0.44 | 0.00 | 0.44 | 85 | 85 | 0 |
| Sod | 0.91 | 1.38 | 2.29 | 0.99 | 1.50 | 2.49 | 9 | 1.02 | 1.54 | 2.56 | 1,000 | 1,088 | 9 |
| Turf Grass | 0.00 | 0.06 | 0.06 | 0.00 | 0.10 | 0.10 | 67 | 0.00 | 0.10 | 0.10 | 54 | 83 | 54 |
| Vegetables, Melons, and Berries | 1.72 | 1.20 | 2.92 | 1.79 | 1.25 | 3.04 | 4 | 2.14 | 1.49 | 3.63 | 3,180 | 3,313 | 4 |
| Total | 67.33 | 170.02 | 237.35 | 67.91 | 172.60 | 240.51 | 1 | 81.88 | 212.47 | 294.35 | 95,032 | 96,127 | 1 |
| Lake County | | | | | | | | | | | | | |
| Citrus | 33.91 | 5.07 | 38.98 | 6.89 | 1.21 | 8.10 | -79 | 8.61 | 1.51 | 10.12 | 16,842 | 10,000 | -41 |
| Fern | 1.31 | 0.15 | 1.46 | 1.67 | 0.19 | 1.86 | 27 | 2.15 | 0.24 | 2.39 | 550 | 700 | 27 |
| Field Crops | 0.25 | 0.25 | 0.50 | 0.23 | 0.23 | 0.46 | -8 | 0.28 | 0.28 | 0.56 | 650 | 585 | -10 |
| Other Fruit and Nuts | 0.33 | 0.01 | 0.34 | 0.69 | 0.02 | 0.71 | 109 | 0.81 | 0.02 | 0.83 | 552 | 1,156 | 109 |
| Pasture | 2.06 | 0.10 | 2.16 | 1.68 | 0.08 | 1.76 | -19 | 1.78 | 0.08 | 1.86 | 1,886 | 1,535 | -19 |
| Greenhouse/Nursery | 4.85 | 0.23 | 5.08 | 9.23 | 0.44 | 9.67 | 90 | 9.94 | 0.47 | 10.41 | 1,050 | 2,000 | 90 |
| Sod | 0.08 | 0.49 | 0.57 | 0.09 | 0.55 | 0.64 | 12 | 0.09 | 0.56 | 0.65 | 250 | 279 | 12 |
| Turf Grass | 0.11 | 0.02 | 0.13 | 0.19 | 0.04 | 0.23 | 77 | 0.20 | 0.04 | 0.24 | 120 | 202 | 68 |
| Vegetables, Melons, and Berries | 1.01 | 0.74 | 1.75 | 0.38 | 0.28 | 0.66 | -62 | 0.47 | 0.34 | 0.81 | 2,670 | 995 | -63 |
| Total | 43.91 | 7.06 | 50.97 | 21.05 | 3.04 | 24.09 | -53 | 24.33 | 3.54 | 27.87 | 24,570 | 17,452 | -29 |
| Marion County | | | | | | | | | | | | | |
| Citrus | 1.50 | 0.10 | 1.60 | 1.98 | 0.13 | 2.11 | 32 | 2.47 | 0.17 | 2.64 | 700 | 925 | 32 |
| Fern | 0.05 | 0.00 | 0.05 | 0.13 | 0.00 | 0.13 | 160 | 0.17 | 0.00 | 0.17 | 20 | 50 | 150 |
| Field Crops | 0.33 | 0.15 | 0.48 | 0.30 | 0.13 | 0.43 | -10 | 0.35 | 0.15 | 0.50 | 484 | 440 | -9 |
| Other Fruit and Nuts | 0.75 | 0.00 | 0.75 | 1.06 | 0.00 | 1.06 | 41 | 1.24 | 0.00 | 1.24 | 1,230 | 1,726 | 40 |
| Pasture | 0.66 | 0.42 | 1.08 | 0.72 | 0.46 | 1.18 | 9 | 0.76 | 0.49 | 1.25 | 940 | 1,030 | 10 |
| Greenhouse/Nursery | 0.27 | 0.05 | 0.32 | 0.35 | 0.07 | 0.42 | 31 | 0.37 | 0.07 | 0.44 | 66 | 86 | 30 |
| Sod | 1.49 | 0.00 | 1.49 | 1.51 | 0.00 | 1.51 | 1 | 1.55 | 0.00 | 1.55 | 660 | 668 | 1 |
| Turf Grass | 0.10 | 0.00 | 0.10 | 0.16 | 0.00 | 0.16 | 60 | 0.17 | 0.00 | 0.17 | 83 | 137 | 65 |
| Vegetables, Melons, and Berries | 0.65 | 0.00 | 0.65 | 0.70 | 0.00 | 0.70 | 8 | 0.88 | 0.00 | 0.88 | 990 | 1,068 | 8 |
| Total | 5.80 | 0.72 | 6.52 | 6.91 | 0.79 | 7.70 | 18 | 7.96 | 0.88 | 8.84 | 5,173 | 6,130 | 18 |

Table 8—*Continued*

| Crop | 1995 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | 2025 Projected Water Use 1-in10 Rainfall Year | | | Acreage | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | 1995 | 2025 | |
| Nassau County | | | | | | | | | | | | | |
| Citrus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.07 | 0.00 | 0.07 | 0.07 | 0.00 | 0.07 | 0 | 0.09 | 0.00 | 0.09 | 90 | 93 | 3 |
| Other Fruit and Nuts | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0 | 0.01 | 0.00 | 0.01 | 15 | 15 | 0 |
| Pasture | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Greenhouse/Nursery | 0.10 | 0.00 | 0.10 | 0.10 | 0.00 | 0.10 | 0 | 0.10 | 0.00 | 0.10 | 20 | 20 | 0 |
| Sod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Turf Grass | 0.03 | 0.00 | 0.03 | 0.05 | 0.00 | 0.05 | 67 | 0.06 | 0.00 | 0.06 | 30 | 48 | 60 |
| Vegetables, Melons, and Berries | 0.04 | 0.00 | 0.04 | 0.05 | 0.00 | 0.05 | 25 | 0.06 | 0.00 | 0.06 | 50 | 55 | 10 |
| Total | 0.25 | 0.00 | 0.25 | 0.28 | 0.00 | 0.28 | 12 | 0.32 | 0.00 | 0.32 | 205 | 231 | 13 |
| Okeechobee County | | | | | | | | | | | | | |
| Citrus | 10.67 | 0.00 | 10.67 | 10.22 | 0.00 | 10.22 | -4 | 12.77 | 0.00 | 12.77 | 4,668 | 4,471 | -4 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Other Fruit and Nuts | 0.08 | 0.00 | 0.08 | 0.00 | 0.00 | 0.00 | -100 | 0.00 | 0.00 | 0.00 | 117 | 0 | -100 |
| Pasture | 3.44 | 0.00 | 3.44 | 3.10 | 0.00 | 3.10 | -10 | 3.29 | 0.00 | 3.29 | 3,000 | 2,710 | -10 |
| Greenhouse/Nursery | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Sod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Turf Grass | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Vegetables, Melons, and Berries | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Total | 14.19 | 0.00 | 14.19 | 13.32 | 0.00 | 13.32 | -6 | 16.06 | 0.00 | 16.06 | 7,785 | 7,181 | -8 |
| Orange County | | | | | | | | | | | | | |
| Citrus | 7.64 | 0.85 | 8.49 | 10.62 | 1.18 | 11.80 | 39 | 13.28 | 1.47 | 14.75 | 3,596 | 5,000 | 39 |
| Fern | 0.11 | 0.00 | 0.11 | 0.11 | 0.00 | 0.11 | 0 | 0.14 | 0.00 | 0.14 | 40 | 40 | 0 |
| Field Crops | 0.44 | 0.15 | 0.59 | 0.44 | 0.15 | 0.59 | 0 | 0.51 | 0.18 | 0.69 | 600 | 600 | 0 |
| Other Fruit and Nuts | 0.09 | 0.00 | 0.09 | 0.37 | 0.00 | 0.37 | 311 | 0.43 | 0.00 | 0.43 | 150 | 600 | 300 |
| Pasture | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Greenhouse/Nursery | 4.77 | 0.83 | 5.60 | 4.77 | 0.83 | 5.60 | 0 | 5.13 | 0.89 | 6.02 | 1,157 | 1,157 | 0 |
| Sod | 0.24 | 0.28 | 0.52 | 0.24 | 0.28 | 0.52 | 0 | 0.25 | 0.29 | 0.54 | 200 | 200 | 0 |
| Turf Grass | 0.37 | 0.07 | 0.44 | 0.59 | 0.11 | 0.70 | 59 | 0.63 | 0.12 | 0.75 | 381 | 617 | 62 |
| Vegetables, Melons, and Berries | 2.52 | 15.58 | 18.10 | 1.06 | 6.55 | 7.61 | -58 | 1.27 | 7.85 | 9.12 | 23,811 | 10,000 | -58 |
| Total | 16.18 | 17.76 | 33.94 | 18.20 | 9.10 | 27.30 | -20 | 21.64 | 10.80 | 32.44 | 29,935 | 18,214 | -39 |

Table 8—*Continued*

| Crop | 1995 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | 2025 Projected Water Use 1-in10 Rainfall Year | | | Acreage | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | 1995 | 2025 | |
| Osceola County | | | | | | | | | | | | | |
| Citrus | 3.71 | 0.00 | 3.71 | 3.16 | 0.00 | 3.16 | -15 | 3.92 | 0.00 | 3.92 | 1,174 | 1,174 | 0 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Other Fruit and Nuts | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Pasture | 2.82 | 9.99 | 12.81 | 2.82 | 9.99 | 12.81 | 0 | 2.98 | 10.59 | 13.57 | 11,180 | 11,180 | 0 |
| Greenhouse/Nursery | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Sod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Turf Grass | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Vegetables, Melons, and Berries | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Total | 6.53 | 9.99 | 16.52 | 5.98 | 9.99 | 15.97 | -3 | 6.90 | 10.59 | 17.49 | 12,354 | 12,354 | 0 |
| Putnam County | | | | | | | | | | | | | |
| Citrus | 0.47 | 0.00 | 0.47 | 1.18 | 0.00 | 1.18 | 151 | 1.45 | 0.00 | 1.45 | 200 | 500 | 150 |
| Fern | 3.19 | 0.79 | 3.98 | 2.18 | 0.54 | 2.72 | -32 | 2.81 | 0.69 | 3.50 | 1,500 | 1,022 | -32 |
| Field Crops | 0.39 | 0.02 | 0.41 | 1.17 | 0.06 | 1.23 | 200 | 1.41 | 0.07 | 1.48 | 500 | 1,500 | 200 |
| Other Fruit and Nuts | 0.19 | 0.00 | 0.19 | 0.22 | 0.00 | 0.22 | 16 | 0.28 | 0.00 | 0.28 | 320 | 360 | 13 |
| Pasture | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Greenhouse/Nursery | 1.69 | 0.00 | 1.69 | 3.71 | 2.28 | 5.99 | 254 | 4.00 | 2.46 | 6.46 | 350 | 1,566 | 347 |
| Sod | 0.51 | 0.00 | 0.51 | 2.30 | 0.00 | 2.30 | 351 | 2.36 | 0.00 | 2.36 | 220 | 1,000 | 355 |
| Turf Grass | 0.03 | 0.00 | 0.03 | 0.04 | 0.00 | 0.04 | 33 | 0.04 | 0.00 | 0.04 | 25 | 32 | 28 |
| Vegetables, Melons, and Berries | 5.38 | 0.00 | 5.38 | 6.07 | 0.00 | 6.07 | 13 | 7.40 | 0.00 | 7.40 | 6,200 | 7,000 | 13 |
| Total | 11.85 | 0.81 | 12.66 | 16.87 | 2.88 | 19.75 | 56 | 19.75 | 3.22 | 22.97 | 9,315 | 12,980 | 39 |
| Seminole County | | | | | | | | | | | | | |
| Citrus | 4.36 | 0.00 | 4.36 | 2.19 | 0.00 | 2.19 | -50 | 2.75 | 0.00 | 2.75 | 1,816 | 914 | -50 |
| Fern | 0.05 | 0.00 | 0.05 | 0.13 | 0.00 | 0.13 | 160 | 0.17 | 0.00 | 0.17 | 20 | 50 | 150 |
| Field Crops | 0.05 | 0.00 | 0.05 | 0.08 | 0.00 | 0.08 | 60 | 0.10 | 0.00 | 0.10 | 50 | 85 | 70 |
| Other Fruit and Nuts | 0.05 | 0.00 | 0.05 | 0.01 | 0.00 | 0.01 | -80 | 0.01 | 0.00 | 0.01 | 75 | 16 | -79 |
| Pasture | 0.56 | 0.00 | 0.56 | 0.42 | 0.00 | 0.42 | -25 | 0.44 | 0.00 | 0.44 | 490 | 366 | -25 |
| Greenhouse/Nursery | 2.57 | 0.33 | 2.90 | 3.17 | 0.40 | 3.57 | 23 | 3.42 | 0.43 | 3.85 | 600 | 740 | 23 |
| Sod | 0.81 | 0.00 | 0.81 | 0.85 | 0.00 | 0.85 | 5 | 0.86 | 0.00 | 0.86 | 320 | 332 | 4 |
| Turf Grass | 0.14 | 0.01 | 0.15 | 0.23 | 0.02 | 0.25 | 67 | 0.24 | 0.02 | 0.26 | 136 | 216 | 59 |
| Vegetables, Melons, and Berries | 0.87 | 0.00 | 0.87 | 0.67 | 0.00 | 0.67 | -23 | 0.79 | 0.00 | 0.79 | 1,290 | 985 | -24 |
| Total | 9.46 | 0.34 | 9.80 | 7.75 | 0.42 | 8.17 | -17 | 8.78 | 0.45 | 9.23 | 4,797 | 3,704 | -23 |
| St. Johns County | | | | | | | | | | | | | |
| Citrus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Fern | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Field Crops | 1.64 | 0.00 | 1.64 | 1.64 | 0.00 | 1.64 | 0 | 1.98 | 0.00 | 1.98 | 2,000 | 2,000 | 0 |

Table 8—*Continued*

| Crop | 1995 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | 2025 Projected Water Use 1-in10 Rainfall Year | | | Acreage | | Percent Change 1995–2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | | Ground | Surface | Total | 1995 | 2025 | |
| Other Fruit and Nuts | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Pasture | 1.15 | 0.00 | 1.15 | 1.15 | 0.00 | 1.15 | 0 | 1.21 | 0.00 | 1.21 | 1,000 | 1,000 | 0 |
| Greenhouse/Nursery | 0.48 | 0.00 | 0.48 | 0.48 | 0.00 | 0.48 | 0 | 0.52 | 0.00 | 0.52 | 100 | 100 | 0 |
| Sod | 0.12 | 0.00 | 0.12 | 0.12 | 0.00 | 0.12 | 0 | 0.13 | 0.00 | 0.13 | 60 | 60 | 0 |
| Turf Grass | 0.02 | 0.00 | 0.02 | 0.04 | 0.00 | 0.04 | 100 | 0.04 | 0.00 | 0.04 | 20 | 36 | 80 |
| Vegetables, Melons, and Berries | 26.66 | 0.00 | 26.66 | 28.97 | 0.00 | 28.97 | 9 | 35.34 | 0.00 | 35.34 | 23,000 | 25,000 | 9 |
| Total | 30.07 | 0.00 | 30.07 | 32.40 | 0.00 | 32.40 | 8 | 39.22 | 0.00 | 39.22 | 26,180 | 28,196 | 8 |
| Volusia County | | | | | | | | | | | | | |
| Citrus | 2.33 | 0.18 | 2.51 | 1.36 | 0.10 | 1.46 | -42 | 1.70 | 0.13 | 1.83 | 1,100 | 640 | -42 |
| Fern | 14.82 | 3.04 | 17.86 | 10.94 | 2.24 | 13.18 | -26 | 14.07 | 2.88 | 16.95 | 6,726 | 4,977 | -26 |
| Field Crops | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Other Fruit and Nuts | 0.04 | 0.00 | 0.04 | 0.03 | 0.00 | 0.03 | -25 | 0.03 | 0.00 | 0.03 | 67 | 44 | -34 |
| Pasture | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Greenhouse/Nursery | 1.92 | 0.08 | 2.00 | 2.54 | 0.27 | 2.81 | 41 | 2.73 | 0.29 | 3.02 | 412 | 538 | 31 |
| Sod | 3.98 | 0.00 | 3.98 | 2.31 | 0.00 | 2.31 | -42 | 2.38 | 0.00 | 2.38 | 1,837 | 1,066 | -42 |
| Turf Grass | 0.16 | 0.12 | 0.28 | 0.23 | 0.17 | 0.40 | 43 | 0.25 | 0.18 | 0.43 | 245 | 350 | 43 |
| Vegetables, Melons, and Berries | 1.20 | 0.00 | 1.20 | 0.37 | 0.00 | 0.37 | -69 | 0.42 | 0.00 | 0.42 | 1,305 | 400 | -69 |
| Total | 24.45 | 3.42 | 27.87 | 17.78 | 2.78 | 20.56 | -26 | 21.58 | 3.48 | 25.06 | 11,692 | 8,015 | -31 |
| SJRWMD | | | | | | | | | | | | | |
| Citrus | 128.13 | 163.04 | 291.17 | 96.94 | 159.89 | 256.83 | -12 | 121.08 | 199.80 | 320.88 | 102,082.00 | 94,100 | -8 |
| Fern | 19.53 | 3.98 | 23.51 | 15.16 | 2.97 | 18.13 | -23 | 19.51 | 3.81 | 23.32 | 8,856.00 | 6,839 | -23 |
| Field Crops | 5.76 | 2.75 | 8.51 | 5.29 | 3.21 | 8.50 | 100 | 6.29 | 3.74 | 10.03 | 9,279.00 | 9,408 | 100 |
| Other Fruit and Nuts | 3.29 | 0.18 | 3.47 | 4.50 | 0.23 | 4.73 | 36 | 5.22 | 0.26 | 5.48 | 5,356.00 | 7,355 | 37 |
| Pasture | 119.99 | 28.77 | 148.76 | 86.95 | 26.72 | 113.67 | 100 | 91.61 | 28.21 | 119.82 | 119,078.00 | 91,971 | 100 |
| Greenhouse/Nursery | 20.57 | 2.39 | 22.96 | 31.00 | 5.29 | 36.29 | 58 | 33.36 | 5.68 | 39.04 | 4,746.00 | 7,788 | 64 |
| Sod | 10.96 | 4.07 | 15.03 | 14.03 | 7.96 | 21.99 | 46 | 14.41 | 8.17 | 22.58 | 6,717.00 | 9,796 | 46 |
| Turf Grass | 2.62 | 0.45 | 3.07 | 3.95 | 0.83 | 4.78 | 56 | 4.20 | 0.87 | 5.07 | 2,606.00 | 4,046 | 55 |
| Vegetables, Melons, and Berries | 50.31 | 17.52 | 67.83 | 49.11 | 8.08 | 57.19 | -16 | 59.39 | 9.68 | 69.07 | 72,106.00 | 57,554 | -20 |
| Total | 361.16 | 223.15 | 584.31 | 306.93 | 215.18 | 522.11 | -11 | 355.07 | 260.22 | 615.29 | 330,826 | 288,857 | -13 |

All water use in million gallons per day

Table 8—*Continued*

Equivalent Terminology

| Water Supply Assessment | Annual Water Use Survey |
|---|---|
| Citrus | Citrus |
| Fern | Ferns |
| Field Crops | Cotton, field corn, peanuts, rice, sorghum, soybeans, sugar cane, tobacco, wheat |
| Other Fruit and Nuts | Blueberries, grapes, peaches, pecans, strawberries, watermelons |
| Pasture | Improved pasture |
| Greenhouse/Nursery | Ornamentals (field-grown), ornamentals (container-grown) |
| Sod | Sod |
| Turf Grass | Turf grass (lawn) |
| Vegetables, Melons, and Berries | Cabbage, carrots, cucumbers, peppers, potatoes, tomatoes, sweet corn |

Table 9. Agricultural irrigation water use and acreage for 1995, 2000 and 2025, by crop category, in the St. Johns River Water Management District

| Crop | 1995 Water Use | | | 2025 Projected Water Use (mgd) Average Rainfall Year | | | | 2025 Projected Water Use (mgd) 1-in-10 Rainfall Year | | | | Acreage | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Percent Change | Ground | Surface | Total | Percent Change | 1995 | 2025 | Percent Change |
| Citrus | 128.13 | 163.04 | 291.17 | 96.94 | 159.89 | 256.83 | -12 | 121.08 | 199.80 | 320.88 | 10 | 102,082 | 94,100 | -8 |
| Fern | 19.53 | 3.98 | 23.51 | 15.16 | 2.97 | 18.13 | -23 | 19.51 | 3.81 | 23.32 | -1 | 8,856 | 6,839 | -23 |
| Field Crops | 5.76 | 2.75 | 8.51 | 5.29 | 3.21 | 8.50 | 0.1 | 6.29 | 3.74 | 10.03 | 18 | 9,279 | 9,408 | 1 |
| Other Fruit and Nuts | 3.29 | 0.18 | 3.47 | 4.50 | 0.23 | 4.73 | 36 | 5.22 | 0.26 | 5.48 | 58 | 5,356 | 7,355 | 37 |
| Pasture | 119.99 | 28.77 | 148.76 | 86.95 | 26.72 | 113.67 | 24 | 91.61 | 28.21 | 119.82 | -19 | 119,078 | 91,971 | 23 |
| Greenhouse/Nursery | 20.57 | 2.39 | 22.96 | 31.00 | 5.29 | 36.29 | 58 | 33.36 | 5.68 | 39.04 | 70 | 4,746 | 7,788 | 64 |
| Sod | 10.96 | 4.07 | 15.03 | 14.03 | 7.96 | 21.99 | 46 | 14.41 | 8.17 | 22.58 | 50 | 6,717 | 9,796 | 46 |
| Turf Grass | 2.62 | 0.45 | 3.07 | 3.95 | 0.83 | 4.78 | 56 | 4.20 | 0.87 | 5.07 | 65 | 2,606 | 4,046 | 55 |
| Vegetables, Melons, and Berries | 50.31 | 17.52 | 67.83 | 49.11 | 8.08 | 57.19 | -16 | 59.39 | 9.68 | 69.07 | 2 | 72,106 | 57,554 | -20 |
| Total | 361.16 | 223.15 | 584.31 | 306.93 | 215.18 | 522.11 | -11 | 355.07 | 260.22 | 615.29 | 5 | 330,826 | 288,857 | -13 |

All water use in million gallons per day
Percent change from 1995 water use

not considered an acceptable means of determining the amount of groundwater and surface water used for agricultural irrigation. SJRWMD recognizes the need to more accurately assess the impact of using reclaimed water on the demands for groundwater and surface water. SJRWMD will work toward addressing this need in its ongoing survey of wastewater treatment and reuse (year 2000 reuse amounts are provided in Appendix B). This information will be included in the next scheduled update of the water supply assessment.

### Recreational Self-Supply

Total recreational self-supply water use in 1995 was 99.13 mgd, of which 68.78 mgd, 69%, was groundwater (Table 10). A portion of the water used for recreational self-supply in 1995 came from reclaimed water sources. An SJRWMD survey of reclaimed water providers indicates that 20.73 mgd of reclaimed water was supplied for recreational self-supply purposes throughout SJRWMD in 1995 (Brandes 1995).

The methodologies for estimating 1995 recreational self-supply requirements and for estimating reclaimed water use are different. The quantities of reclaimed water use reported to SJRWMD were the quantities that were supplied regardless of whether they were used to achieve a water resource benefit. Therefore, subtracting the quantity of reclaimed water supplied for recreational self-supply purposes from the total water used for recreational self-supply was not considered an acceptable means of determining the amount of groundwater and surface water used for recreational self-supply purposes. SJRWMD recognizes the need to assess more accurately the impact of using reclaimed water on the demands for groundwater and surface water. SJRWMD will continue to work toward addressing this need in its ongoing survey of wastewater treatment and reuse (year 2000 reuse amounts are provided in Appendix B). This information is not available for WSA 2003.

### Commercial/Industrial/Institutional Self-Supply

Total commercial/industrial/institutional self-supply water use in 1995 was 133.68 mgd, of which 95.55 mgd was from groundwater sources (Tables 11 and 12). An insignificant amount of the water use in this category comes from saline surface water sources and is used for nonconsumptive purposes. Saline surface water for this category was not addressed in WSA 1998, nor is it addressed in WSA 2003. The only counties with significant use in this

Table 10. Recreational water use (golf course irrigation) and acreage for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | | 2025 Projected Water Use 1-in-10 Rainfall Year | | | | Acreage | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | Percent Change | Ground | Surface | Total | Percent Change | 1995 | 2025 | Percent Change |
| Alachua | 4.70 | 0.58 | 5.28 | 4.11 | 0.24 | 4.35 | 6.67 | 0.82 | 7.49 | 42 | 6.84 | 0.84 | 7.68 | 45 | 2,394 | 3,400 | 42 |
| Baker | 0.14 | 0.00 | 0.14 | 0.14 | 0.09 | 0.23 | 0.21 | 0.00 | 0.21 | 50 | 0.21 | 0.00 | 0.21 | 50 | 70 | 100 | 43 |
| Bradford | 0.08 | 0.00 | 0.08 | 0.20 | 0.02 | 0.22 | 0.11 | 0.00 | 0.11 | 38 | 0.11 | 0.00 | 0.11 | 38 | 38 | 48 | 26 |
| Brevard | 3.89 | 6.35 | 10.24 | 7.75 | 7.08 | 14.83 | 5.72 | 9.33 | 15.05 | 47 | 5.85 | 9.54 | 15.39 | 50 | 3,987 | 5,860 | 47 |
| Clay | 1.01 | 0.52 | 1.53 | 1.77 | 0.48 | 2.25 | 1.65 | 0.85 | 2.50 | 63 | 1.69 | 0.87 | 2.56 | 67 | 667 | 1,087 | 63 |
| Duval | 3.76 | 0.88 | 4.64 | 6.17 | 1.32 | 7.49 | 4.93 | 1.16 | 6.09 | 31 | 5.06 | 1.19 | 6.25 | 35 | 2,193 | 2,872 | 31 |
| Flagler | 0.16 | 1.06 | 1.22 | 1.84 | 3.50 | 5.34 | 0.36 | 2.43 | 2.79 | 129 | 0.37 | 2.49 | 2.86 | 134 | 588 | 1,346 | 129 |
| Indian River | 4.88 | 2.41 | 7.29 | 6.81 | 3.22 | 10.03 | 7.52 | 3.70 | 11.22 | 54 | 7.71 | 3.80 | 11.51 | 58 | 3,175 | 4,889 | 54 |
| Lake | 9.27 | 7.59 | 16.86 | 5.36 | 3.87 | 9.23 | 15.58 | 12.74 | 28.32 | 68 | 15.98 | 13.07 | 29.05 | 72 | 7,360 | 12,364 | 68 |
| Marion | 1.59 | 1.15 | 2.74 | 2.23 | 1.16 | 3.39 | 2.63 | 1.90 | 4.53 | 65 | 2.70 | 1.95 | 4.65 | 70 | 1,200 | 1,979 | 65 |
| Nassau | 15.15 | 2.47 | 17.62 | 3.10 | 0.46 | 3.56 | 24.24 | 3.95 | 28.19 | 60 | 24.90 | 4.05 | 28.95 | 64 | 8,095 | 12,952 | 60 |
| Okeechobee | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 |
| Orange | 7.56 | 1.44 | 9.00 | 10.25 | 1.97 | 12.22 | 12.25 | 2.33 | 14.58 | 62 | 12.53 | 2.39 | 14.92 | 66 | 3,405 | 5,516 | 62 |
| Osceola | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0 | 733 | 1,407 | 92 |
| Putnam | 0.20 | 0.00 | 0.20 | 0.64 | 0.40 | 1.04 | 0.25 | 0.00 | 0.25 | 25 | 0.26 | 0.00 | 0.26 | 30 | 87 | 110 | 26 |
| St. Johns | 3.84 | 2.26 | 6.10 | 5.55 | 3.16 | 8.71 | 6.92 | 4.06 | 10.98 | 80 | 7.08 | 4.16 | 11.24 | 84 | 2,940 | 5,291 | 80 |
| Seminole | 4.92 | 1.23 | 6.15 | 7.70 | 1.76 | 9.46 | 7.82 | 1.95 | 9.77 | 59 | 8.00 | 2.00 | 10.00 | 63 | 2,415 | 3,839 | 59 |
| Volusia | 7.63 | 2.41 | 10.04 | 9.04 | 3.21 | 12.25 | 10.91 | 3.45 | 14.36 | 43 | 11.22 | 3.54 | 14.76 | 47 | 4,490 | 6,422 | 43 |
| Total | 68.78 | 30.35 | 99.13 | 72.66 | 31.94 | 104.60 | 107.77 | 48.67 | 156.44 | 58 | 110.51 | 49.89 | 160.40 | 62 | 43,837 | 69,482 | 59 |

All water use in million gallons per day
Percent change from 1995 to 2025

Table 11. Commercial/industrial/institutional water use for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change from 1995 to 2025 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total |
| Alachua | 1.91 | 0.00 | 1.91 | 2.04 | 0.00 | 2.04 | 1.51 | 0.00 | 1.51 | -21 | 0 | -21 |
| Baker | 0.19 | 0.00 | 0.19 | 0.17 | 0.00 | 0.17 | 0.22 | 0.00 | 0.22 | 16 | 0 | 16 |
| Bradford | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 100 | 0 | 100 |
| Brevard | 1.80 | 0.00 | 1.80 | 1.04 | 0.01 | 1.05 | 1.35 | 0.01 | 1.36 | -25 | 100 | -24 |
| Clay | 4.46 | 0.00 | 4.46 | 6.87 | 0.00 | 6.87 | 3.96 | 0.00 | 3.96 | -11 | 0 | -11 |
| Duval | 24.27 | 0.00 | 24.27 | 12.51 | 0.00 | 12.51 | 18.10 | 0.00 | 18.10 | -25 | 0 | -25 |
| Flagler | 0.18 | 0.00 | 0.18 | 0.20 | 0.07 | 0.27 | 0.53 | 0.19 | 0.72 | 194 | 100 | 300 |
| Indian River | 0.16 | 0.00 | 0.16 | 0.12 | 0.00 | 0.12 | 0.17 | 0.00 | 0.17 | 6 | 0 | 6 |
| Lake | 10.23 | 1.14 | 11.37 | 10.44 | 0.60 | 11.04 | 16.14 | 0.92 | 17.06 | 58 | -24 | 50 |
| Marion | 1.85 | 0.00 | 1.85 | 1.95 | 0.00 | 1.95 | 2.84 | 0.00 | 2.84 | 54 | 0 | 54 |
| Nassau | 34.49 | 2.25 | 36.74 | 32.46 | 0.00 | 32.46 | 43.42 | 2.00 | 45.42 | 26 | -13 | 24 |
| Okeechobee | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Orange | 3.61 | 0.00 | 3.61 | 3.04 | 0.00 | 3.04 | 4.54 | 0.00 | 4.54 | 26 | 0 | 26 |
| Osceola | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Putnam | 11.51 | 34.74 | 46.25 | 19.14 | 31.12 | 50.26 | 5.08 | 27.55 | 32.63 | -56 | -26 | -29 |
| St. Johns | 0.06 | 0.00 | 0.06 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 |
| Seminole | 0.14 | 0.00 | 0.14 | 0.08 | 0.00 | 0.08 | 0.10 | 0.00 | 0.10 | 0 | 0 | -29 |
| Volusia | 0.69 | 0.00 | 0.69 | 0.49 | 0.00 | 0.49 | 0.66 | 0.00 | 0.66 | -4 | 0 | -4 |
| Total | 95.55 | 38.13 | 133.68 | 90.56 | 31.80 | 122.36 | 98.63 | 30.67 | 129.30 | 3 | -20 | -3 |

All water use in million gallons per day

Table 12. Commercial/industrial/institutional total water use for 1995, 2000 and 2025, by county and user, in the St. Johns River Water Management District

| Facility | Category | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total |
| Alachua County | | | | | | | | | | |
| University of Florida | Institutional | 1.71 | 0.00 | 1.71 | 2.04 | 0.00 | 2.04 | 1.51 | 0.00 | 1.51 |
| Other small users | | 0.20 | 0.00 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | | 1.91 | 0.00 | 1.91 | 2.04 | 0.00 | 2.04 | 1.51 | 0.00 | 1.51 |
| Baker County | | | | | | | | | | |
| Northeast Florida State Hospital | Institutional | 0.15 | 0.00 | 0.15 | 0.12 | 0.00 | 0.12 | 0.16 | 0.00 | 0.16 |
| Other small users | | 0.04 | 0.00 | 0.04 | 0.05 | 0.00 | 0.05 | 0.06 | 0.00 | 0.06 |
| Total | | 0.19 | 0.00 | 0.19 | 0.17 | 0.00 | 0.17 | 0.22 | 0.00 | 0.22 |
| Bradford County | | | | | | | | | | |
| Other small users | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 |
| Total | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 |
| Brevard County | | | | | | | | | | |
| Harris Corporation - Palm Bay | Industrial | 0.03 | 0.00 | 0.03 | 0.26 | 0.01 | 0.27 | 0.27 | 0.00 | 0.27 |
| Patrick AFB† | Institutional | 0.00 | 0.00 | 0.00 | 0.66 | 0.00 | 0.66 | 0.88 | 0.00 | 0.88 |
| JFK Space Center | Institutional | 1.65 | 0.00 | 1.65 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other small users | | 0.12 | 0.00 | 0.12 | 0.12 | 0.00 | 0.12 | 0.20 | 0.01 | 0.21 |
| Total | | 1.80 | 0.00 | 1.80 | 1.04 | 0.01 | 1.05 | 1.35 | 0.01 | 1.36 |
| Clay County | | | | | | | | | | |
| Camp Blanding Military Base | Institutional | 0.28 | 0.00 | 0.28 | 0.41 | 0.00 | 0.41 | 0.74 | 0.00 | 0.74 |
| E I Dupont - Maxville† | Industrial | 0.00 | 0.00 | 0.00 | 0.71 | 0.00 | 0.71 | 0.00 | 0.00 | 0.00 |
| E I Dupont - Trail Ridge | Industrial | 1.46 | 0.00 | 1.46 | 3.58 | 0.00 | 3.58 | 0.74 | 0.00 | 0.74 |
| Florida Rock Industries—Goldhead Sand | Industrial | 0.95 | 0.00 | 0.95 | 0.51 | 0.00 | 0.51 | 0.00 | 0.00 | 0.00 |
| Iluka Resources Inc | Industrial | 1.35 | 0.00 | 1.35 | 1.56 | 0.00 | 1.56 | 2.33 | 0.00 | 2.33 |
| Other small users | | 0.42 | 0.00 | 0.42 | 0.10 | 0.00 | 0.10 | 0.15 | 0.00 | 0.15 |
| Total | | 4.46 | 0.00 | 4.46 | 6.87 | 0.00 | 6.87 | 3.96 | 0.00 | 3.96 |

Table 12—*Continued*

| Facility | Category | 1995 Water Use | | | 2000Water Use | | | 2025 Projected Water Use Average Rainfall Year | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total |
| Duval County | | | | | | | | | | |
| Bacardi Bottling Corporation | Industrial | 0.09 | 0.00 | 0.09 | 0.09 | 0.00 | 0.09 | 0.27 | 0.00 | 0.27 |
| Barron's Wholesale Tire, Inc | Industrial | 0.48 | 0.00 | 0.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bush Boake & Allen Inc | Industrial | 1.73 | 0.00 | 1.73 | 1.04 | 0.00 | 1.04 | 1.33 | 0.00 | 1.33 |
| Celotex Corporation | Industrial | 0.12 | 0.00 | 0.12 | 0.13 | 0.00 | 0.13 | 0.16 | 0.00 | 0.16 |
| Cecil Field NAS[‡] | Institutional | 0.60 | 0.00 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jacksonville International Airport | Institutional | 0.16 | 0.00 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jacksonville NAS | Institutional | 1.52 | 0.00 | 1.52 | 1.26 | 0.00 | 1.26 | 1.97 | 0.00 | 1.97 |
| Jacksonville University[‡] | Institutional | 0.41 | 0.00 | 0.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jefferson Smurfit—Jacksonville[1] | Industrial | 6.69 | 0.00 | 6.69 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mayport NAS | Institutional | 1.44 | 0.00 | 1.44 | 1.32 | 0.00 | 1.32 | 2.23 | 0.00 | 2.23 |
| Millennium Specialty Chemicals | Industrial | 1.81 | 0.00 | 1.81 | 0.00 | 0.00 | 0.00 | 1.56 | 0.00 | 1.56 |
| Reichhold Chemical Company | Industrial | 0.14 | 0.00 | 0.14 | 0.14 | 0.00 | 0.14 | 0.18 | 0.00 | 0.18 |
| Stone Container Corporation | Industrial | 8.84 | 0.00 | 8.84 | 7.37 | 0.00 | 7.37 | 9.42 | 0.00 | 9.42 |
| Swisher & Son MFG Company | Industrial | 0.10 | 0.00 | 0.10 | 0.16 | 0.00 | 0.16 | 0.21 | 0.00 | 0.21 |
| US Gypsum Co | Industrial | 0.41 | 0.00 | 0.41 | 0.67 | 0.00 | 0.67 | 0.85 | 0.00 | 0.85 |
| Other small users | | 0.30 | 0.00 | 0.30 | 0.42 | 0.00 | 0.42 | 0.19 | 0.00 | 0.19 |
| Total | | 24.27 | 0.00 | 24.27 | 12.51 | 0.00 | 12.51 | 18.10 | 0.00 | 18.10 |
| Flagler County | | | | | | | | | | |
| Bulow Village | Institutional | 0.11 | 0.00 | 0.11 | 0.12 | 0.07 | 0.19 | 0.31 | 0.19 | 0.50 |
| Other small users | | 0.07 | 0.00 | 0.07 | 0.08 | 0.00 | 0.08 | 0.22 | 0.00 | 0.22 |
| Total | | 0.18 | 0.00 | 0.18 | 0.20 | 0.07 | 0.27 | 0.53 | 0.19 | 0.72 |
| Indian River County | | | | | | | | | | |
| Ocean Spray Cranberries Inc | Industrial | 0.10 | 0.00 | 0.10 | 0.12 | 0.00 | 0.12 | 0.17 | 0.00 | 0.17 |
| Other small users | | 0.06 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | | 0.16 | 0.00 | 0.16 | 0.12 | 0.00 | 0.12 | 0.17 | 0.00 | 0.17 |

Table 12—*Continued*

| Facility | Category | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total |
| **Lake County** | | | | | | | | | | |
| Cutrale Citrus Juices | Industrial | 0.51 | 0.00 | 0.51 | 1.64 | 0.00 | 1.64 | 2.51 | 0.00 | 2.51 |
| Eustis Sand Company | Industrial | 0.93 | 1.14 | 2.07 | 0.21 | 0.60 | 0.81 | 0.32 | 0.92 | 1.24 |
| Florida Select Citrus (B&W Canning) | Industrial | 0.21 | 0.00 | 0.21 | 0.15 | 0.00 | 0.15 | 0.23 | 0.00 | 0.23 |
| Florida Natural Growers—Umatilla | Industrial | 0.96 | 0.00 | 0.96 | 1.16 | 0.00 | 1.16 | 1.78 | 0.00 | 1.78 |
| Holiday Travel Resort | Commercial | 0.13 | 0.00 | 0.13 | 0.16 | 0.00 | 0.16 | 0.24 | 0.00 | 0.24 |
| Lake Correctional Facility | Institutional | 0.18 | 0.00 | 0.18 | 0.17 | 0.00 | 0.17 | 0.26 | 0.00 | 0.26 |
| Covanta Lake† | Industrial | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 0.31 | 0.47 | 0.00 | 0.47 |
| Silver Springs Citrus Plant† | Industrial | 0.00 | 0.00 | 0.00 | 0.25 | 0.00 | 0.25 | 0.38 | 0.00 | 0.38 |
| Tarmac America Inc | Industrial | 6.14 | 0.00 | 6.14 | 5.39 | 0.00 | 5.39 | 8.28 | 0.00 | 8.28 |
| Thousand Trails Campground | Commercial | 0.09 | 0.00 | 0.09 | 0.21 | 0.00 | 0.21 | 0.32 | 0.00 | 0.32 |
| Other small users | | 1.08 | 0.00 | 1.08 | 0.79 | 0.00 | 0.79 | 1.35 | 0.00 | 1.35 |
| Total | | 10.23 | 1.14 | 11.37 | 10.44 | 0.60 | 11.04 | 16.14 | 0.92 | 17.06 |
| **Marion County** | | | | | | | | | | |
| Florida Rock Industries—Marion Sand | Industrial | 0.83 | 0.00 | 0.83 | 0.92 | 0.00 | 0.92 | 1.37 | 0.00 | 1.37 |
| Marion Correctional Facility | Institutional | 0.26 | 0.00 | 0.26 | 0.21 | 0.00 | 0.21 | 0.32 | 0.00 | 0.32 |
| Other small users | | 0.76 | 0.00 | 0.76 | 0.82 | 0.00 | 0.82 | 1.15 | 0.00 | 1.15 |
| Total | | 1.85 | 0.00 | 1.85 | 1.95 | 0.00 | 1.95 | 2.84 | 0.00 | 2.84 |
| **Nassau County** | | | | | | | | | | |
| Jefferson Smurfit—Fernandina Beach | Industrial | 19.18 | 0.00 | 19.18 | 17.01 | 0.00 | 17.01 | 24.40 | 0.00 | 24.40 |
| Rayonier | Industrial | 15.28 | 2.25 | 17.53 | 15.44 | 0.00 | 15.44 | 19.00 | 2.00 | 21.00 |
| Other small users | | 0.03 | 0.00 | 0.03 | 0.01 | 0.00 | 0.01 | 0.02 | 0.00 | 0.02 |
| Total | | 34.49 | 2.25 | 36.74 | 32.46 | 0.00 | 32.46 | 43.42 | 2.00 | 45.42 |

Table 12—*Continued*

| Facility | Category | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total |
| Orange County | | | | | | | | | | |
| Aerated Concrete Corporation of America | Industrial | 0.01 | 0.00 | 0.01 | 0.08 | 0.00 | 0.08 | 0.11 | 0.00 | 0.11 |
| Central Florida Research Park | Industrial | 0.21 | 0.00 | 0.21 | 0.58 | 0.00 | 0.58 | 0.87 | 0.00 | 0.87 |
| Clarcona Resort RV Park | Commercial | 0.20 | 0.00 | 0.20 | 0.17 | 0.00 | 0.17 | 0.25 | 0.00 | 0.25 |
| Monterey Mushrooms Inc | Industrial | 0.13 | 0.00 | 0.13 | 0.15 | 0.00 | 0.15 | 0.22 | 0.00 | 0.22 |
| The Minute Maid Company—Plymouth | Industrial | 0.18 | 0.00 | 0.18 | 0.12 | 0.00 | 0.12 | 0.18 | 0.00 | 0.18 |
| University of Central Florida | Institutional | 0.57 | 0.00 | 0.57 | 1.15 | 0.00 | 1.15 | 1.73 | 0.00 | 1.73 |
| Winter Garden Citrus | Industrial | 1.99 | 0.00 | 1.99 | 0.61 | 0.00 | 0.61 | 0.92 | 0.00 | 0.92 |
| Other small users | | 0.32 | 0.00 | 0.32 | 0.18 | 0.00 | 0.18 | 0.26 | 0.00 | 0.26 |
| Total | | 3.61 | 0.00 | 3.61 | 3.04 | 0.00 | 3.04 | 4.54 | 0.00 | 4.54 |
| Putnam County | | | | | | | | | | |
| Feldspar Corporation—Edgar | Industrial | 0.22 | 1.85 | 2.07 | 0.24 | 0.84 | 1.08 | 0.34 | 1.23 | 1.57 |
| Florida Rock Industries—Grandin Sand | Industrial | 2.78 | 0.00 | 2.78 | 1.63 | 0.00 | 1.63 | 2.38 | 0.00 | 2.38 |
| Florida Rock Industries—Keuka Sand | Industrial | 0.55 | 0.00 | 0.55 | 0.39 | 0.00 | 0.39 | 0.57 | 0.00 | 0.57 |
| Georgia Pacific—Hawthorne | Industrial | 0.15 | 0.00 | 0.15 | 0.11 | 0.00 | 0.11 | 0.16 | 0.00 | 0.16 |
| Georgia Pacific—Palakta | Industrial | 7.40 | 32.89 | 40.29 | 16.68 | 30.28 | 46.96 | 1.50 | 26.32 | 27.82 |
| Other small users | | 0.41 | 0.00 | 0.41 | 0.09 | 0.00 | 0.09 | 0.13 | 0.00 | 0.13 |
| Total | | 11.51 | 34.74 | 46.25 | 19.14 | 31.12 | 50.26 | 5.08 | 27.55 | 32.63 |
| St. Johns County | | | | | | | | | | |
| Other small users | | 0.06 | 0.00 | 0.06 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Total | | 0.06 | 0.00 | 0.06 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Seminole County | | | | | | | | | | |
| Other small users | | 0.14 | 0.00 | 0.14 | 0.08 | 0.00 | 0.08 | 0.10 | 0.00 | 0.10 |
| Total | | 0.14 | 0.00 | 0.14 | 0.08 | 0.00 | 0.08 | 0.10 | 0.00 | 0.10 |

Table 12—*Continued*

| Facility | Category | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total |
| Volusia County | | | | | | | | | | |
| Ardmore Farms Inc | Industrial | 0.15 | 0.00 | 0.15 | 0.15 | 0.00 | 0.15 | 0.20 | 0.00 | 0.20 |
| Tyco Kendall Healthcare | Industrial | 0.18 | 0.00 | 0.18 | 0.20 | 0.00 | 0.20 | 0.27 | 0.00 | 0.27 |
| Other small users | | 0.36 | 0.00 | 0.36 | 0.14 | 0.00 | 0.14 | 0.19 | 0.00 | 0.19 |
| Total | | 0.69 | 0.00 | 0.69 | 0.49 | 0.00 | 0.49 | 0.66 | 0.00 | 0.66 |
| St. Johns River Water | | 95.55 | 38.13 | 133.68 | 90.56 | 31.80 | 122.36 | 98.63 | 30.67 | 129.30 |

All water use in million gallons per day
[1] Closed
[†] Tracking began in 2000
[‡] Converted to a public water supplier

category are Duval (24.27 mgd), Lake (11.37 mgd), Nassau (36.74 mgd), and Putnam (46.25 mgd). Approximately 28% of the total use came from surface water sources.

### Thermoelectric Power Generation Self-Supply

Total freshwater use for noncooling purposes in this category in 1995 was 22.18 mgd, of which 7.68 mgd came from groundwater sources (Tables 13 and 14). Water for cooling purposes from saline and fresh surface water sources totaled 1,825.99 mgd. Seven counties in SJRWMD had thermoelectric power generation facilities in 1995.

## REASONABLY ANTICIPATED FUTURE NEEDS FOR EACH WATER USE CATEGORY—2025

SJRWMD, based on the requirements of Subparagraph 373.036(2)(b)4a, F.S., and based on guidance provided by the WPCG, has determined reasonably anticipated future needs and reasonably anticipated sources of water and conservation efforts. Projections of reasonably anticipated future needs presented in WSA 2003 were developed based on the methodologies presented in the previous chapter.

Population in SJRWMD is expected to increase from about 3,516,494 in 1995 to 5,880,334 in 2025, an increase of 67% (Table 1). In a year of average rainfall, total water use in SJRWMD is projected to increase by about 30% to 1785.94 mgd from 1995 to 2025 (Table 2). Consistent with WSA 1998, the category with the most significant projected increase during this period is public supply, where water use is estimated to increase by about 84% to 835.56 mgd (Table 4). The projected increase in average districtwide public supply water use for 1995–2025 is greater than the projected population growth for the same period (84% and 71%, respectively). SJRWMD assumes that this is related to higher projected rates of growth in public supply service areas that are characterized by larger lawn and landscape areas, higher percentages of in-ground irrigation systems, and higher percentages of thicker, sandier soils (poorer water retention qualities) than in the past. However, the use of a gross per capita value instead of a strictly residential per capita value to calculate projections may also be a factor. Agricultural self-supply water use, the second largest category of use, is expected to decline by 11%. Although recreational self-supply water use is expected to increase by 58%, the amount used in this category is only a small fraction of the total projected use.

Table 13. Thermoelectric power generation water use for 1995, 2000 and 2025, by county, in the St. Johns River Water Management District

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change from 1995 to 2025 | | | Saline Surface Water Use | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | 1995 | 2025 |
| Alachua | 0.40 | 0.00 | 0.40 | 0.15 | 0.00 | 0.15 | 0.56 | 0.00 | 0.56 | 40 | 0 | 40 | 0.00 | 0.00 |
| Baker | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Bradford | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Brevard | 0.31 | 0.00 | 0.31 | 0.39 | 0.00 | 0.39 | 0.50 | 0.00 | 0.50 | 61 | 0 | 61 | 1,197.31 | 1,385.85 |
| Clay | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Duval[†] | 5.49 | 0.00 | 5.49 | 8.33 | 0.00 | 8.33 | 9.63 | 0.00 | 9.63 | 75 | 0 | 75 | 575.09 | 562.60 |
| Flagler | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Indian River | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 53.59 | 54.94 |
| Lake | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Marion | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Nassau | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Okeechobee | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Orange | 0.41 | 0.00 | 0.41 | 0.76 | 0.00 | 0.76 | 1.20 | 0.00 | 1.20 | 193 | 0 | 193 | 0.00 | 0.00 |
| Osceola | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Putnam | 0.70 | 14.50 | 15.20 | 0.69 | 13.90 | 14.59 | 0.84 | 21.90 | 22.74 | 20 | 51 | 50 | 0.00 | 0.00 |
| St. Johns | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Seminole | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 |
| Volusia | 0.37 | 0.00 | 0.37 | 0.54 | 5.01 | 5.55 | 0.69 | 6.54 | 7.23 | 86 | 100 | 1,854 | 0.00 | 0.00 |
| Total | 7.68 | 14.50 | 22.18 | 10.86 | 18.91 | 29.77 | 13.42 | 28.44 | 41.86 | 75 | 96 | 89 | 1,825.99 | 2,003.39 |

All water use in million gallons per day

Table 14. Thermoelectric power generation water use for 1995, 2000 and 2025, by county and user, in the St. Johns Water Management District

| Facility | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Saline Surface Water Use | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | 1995 | 2025 |
| Alachua | | | | | | | | | | | |
| Gainesville Regional Utilities—JR Kelly | 0.40 | 0.00 | 0.40 | 0.15 | 0.00 | 0.15 | 0.56 | 0.00 | 0.56 | 0.00 | 0.00 |
| Total | 0.40 | 0.00 | 0.40 | 0.15 | 0.00 | 0.15 | 0.56 | 0.00 | 0.56 | 0.00 | 0.00 |
| Brevard | | | | | | | | | | | |
| Florida Power and Light—Cape Canaveral | 0.18 | 0.00 | 0.18 | 0.20 | 0.00 | 0.20 | 0.25 | 0.00 | 0.25 | 680.79 | 823.00 |
| Reliant Energy Indian River (OUC)- Indian River | 0.13 | 0.00 | 0.13 | 0.19 | 0.00 | 0.19 | 0.25 | 0.00 | 0.25 | 516.52 | 562.85 |
| Total | 0.31 | 0.00 | 0.31 | 0.39 | 0.00 | 0.39 | 0.50 | 0.00 | 0.50 | 1,197.31 | 1,385.85 |
| Duval | | | | | | | | | | | |
| Cedar Bay Generating Facility | 0.91 | 0.00 | 0.91 | 0.97 | 0.00 | 0.97 | 1.23 | 0.00 | 1.23 | 0.00 | 0.00 |
| JEA—Northside | 1.01 | 0.00 | 1.01 | 0.39 | 0.00 | 0.39 | 0.57 | 0.00 | 0.57 | 442.44 | 488.30 |
| JEA—Southside[1] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 35.70 | 0.00 |
| JEA—Kennedy[1] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 16.80 | 0.00 |
| JEA—Brandy Branch[2] | 0.00 | 0.00 | 0.00 | 2.73 | 0.00 | 2.73 | 2.73 | 0.00 | 2.73 | 0.00 | 0.00 |
| SJR Power Park | 3.57 | 0.00 | 3.57 | 4.24 | 0.00 | 4.24 | 5.10 | 0.00 | 5.10 | 80.15 | 74.30 |
| Total | 5.49 | 0.00 | 5.49 | 8.33 | 0.00 | 8.33 | 9.63 | 0.00 | 9.63 | 575.09 | 562.60 |
| Indian River | | | | | | | | | | | |
| Vero Beach Municipal Power Plant | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 53.59 | 54.94 |
| Total | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 53.59 | 54.94 |
| Orange | | | | | | | | | | | |
| Orlando Utilities Commission—Stanton Power | 0.41 | 0.00 | 0.41 | 0.76 | 0.00 | 0.76 | 1.20 | 0.00 | 1.20 | 0.00 | 0.00 |
| Total | 0.41 | 0.00 | 0.41 | 0.76 | 0.00 | 0.76 | 1.20 | 0.00 | 1.20 | 0.00 | 0.00 |

Table 14—*Continued*

| Facility | 1995 Actual Water Use | | | 2000 Actual Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Saline Surface Water Use | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground | Surface | Total | Ground | Surface | Total | Ground | Surface | Total | 1995 | 2025 |
| Putnam | | | | | | | | | | | |
| Florida Power & Light—Palatka | 0.09 | 1.32 | 1.41 | 0.20 | 0.00 | 0.20 | 0.29 | 3.54 | 3.83 | 0.00 | 0.00 |
| Seminole Electric Cooperative—Palatka | 0.61 | 13.18 | 13.79 | 0.49 | 3.90 | 4.39 | 0.55 | 18.36 | 18.91 | 0.00 | 0.00 |
| Total | 0.70 | 14.50 | 15.20 | 0.69 | 13.90 | 14.59 | 0.84 | 21.90 | 22.74 | 0.00 | 0.00 |
| Volusia | | | | | | | | | | | |
| Florida Power & Light—Seminole | 0.36 | 0.00 | 0.36 | 0.42 | 5.01 | 5.43 | 0.54 | 6.54 | 7.08 | 0.00 | 0.00 |
| Florida Power Corporation—Debary | 0.01 | 0.00 | 0.01 | 0.12 | 0.00 | 0.12 | 0.15 | 0.00 | 0.15 | 0.00 | 0.00 |
| Total | 0.37 | 0.00 | 0.37 | 0.54 | 5.01 | 5.55 | 0.69 | 6.54 | 7.23 | 0.00 | 0.00 |
| St. Johns River Water Management District | 7.68 | 14.50 | 22.18 | 10.86 | 18.91 | 29.77 | 13.42 | 28.44 | 41.86 | 1,825.99 | 2,003.39 |

All water use in million gallons per day

[1]Plant offline in 2000
[2]Plant online in 2000

Although the water use from domestic self-supply and small public supply users shows a 42% increase, it is expected to decrease as the percentage of population served by public supply utilities increases along with service area expansions. (Water use in the domestic self-supply category reflects population growth outside the existing and proposed public supply utility service area boundaries.)

Total water use in a 1-in-10 rainfall year is expected to increase by 8.6% over an average rainfall year, or by 153.31 mgd (Table 2).

The projected percent increase in water use between 1995 and 2025, by county, ranges from a high of 135% in Clay County to a low of 6% in Indian River County, excluding changes in Baker and Bradford counties (Table 3). 1995 water use in the SJRWMD portion of Baker and Bradford counties was insignificant, so that the impact of a relatively small projected change in water use will result in a disproportionately large projected percentage change. Total water use is expected to remain unchanged in Osceola County and decrease in Brevard and Okeechobee by 3% and 5%, respectively, due to a decrease in agricultural irrigation (Tables 3 and 8).

## Public Supply

Public supply water use in SJRWMD has increased steadily over the years, from 295 mgd in 1980 (Marella 1980), to 444 mgd in 1990 (Florence 1990), to 564 mgd in 2000, and this trend is expected to continue through 2025. Total projected water use in this category is derived from population-based projections made by SJRWMD and reviewed by participating utilities. Public supply is projected to experience the greatest amount of change of all reported categories. Not only is water use projected to increase by about 84% from 1995–2025, but also this increase represents approximately 90% of the total projected change in water use (1995–2025) for all categories during an average rainfall year (Tables 2 and 4). Water use in this category is projected to increase from 2000–2025 by 48%, which represents 90% of the total projected change for all categories of water use. This relationship is consistent with the findings of the 1994 and 1998 assessments (Vergara 1994, 1998). The projected water use in Brevard County includes the water to be withdrawn in Orange and Osceola counties by the City of Cocoa, which serves a large population in Brevard County. There are no large public supply water uses projected for 2025 in SJRWMD portions of Baker, Bradford, Okeechobee, and Osceola counties. All remaining counties have projected increases of more than 50%. Alachua, Brevard, Duval, Marion, Orange, Putnam, Seminole, and

Volusia counties have projected increases between 50% and 100%. The relatively small percentage increase in Duval in comparison to the adjacent counties of Clay, Nassau, and St. Johns is probably due largely to the increasing role played by these counties as “bedroom” communities to the City of Jacksonville. The seven counties of Clay, Flagler, Indian River, Lake, Nassau, and St. Johns are expected to experience an increase in public supply water use of greater than 100% between 1995 and 2025. These counties are projected to experience significant increases in residential populations largely through the development of new subdivisions and other planned developments.

As in the 1994 needs and sources assessment and WSA 1998, groundwater is projected to continue to be the largest source of water to supply the projected water use in this category. By 2025, 809.88 mgd will be needed to support public supply water use, and SJRWMD expects that the use of groundwater will be maximized to supply this projected use. Although it is unlikely that this total projected amount will come from groundwater sources, SJRWMD has identified this projected water use from groundwater sources because groundwater is the source of choice of public supply utilities. WSA 2003 reflects the projected use of surface water sources to support projected public supply demands only in Brevard County. These projections include the continued use of surface water by both the City of Melbourne and the City of Cocoa from Lake Washington and the Taylor Creek Reservoir, respectively. Although the St. Johns River / Taylor Creek Reservoir Water Supply Development Project is projected to provide an additional 40–50 mgd of surface water for public supply to project partners in Brevard, Orange, and Osceola counties by 2025, the specific quantities to be provided to each project partner had not been finally identified at the time of preparation of WSA 2003.

An additional demand of approximately 50 mgd over the amount in an average rainfall year (from 835.56 mgd to 885.68 mgd, Table 4) is projected in a 1-in-10-rainfall year.

## Domestic Self-Supply and Small Public Supply Systems

The water use in this category is projected to increase by 42% based on an average rainfall year in 2025 (Table 6). Six counties are projected to experience a decrease in water use: Brevard, Duval, Flagler, Indian River, St. Johns, and Volusia. The increase in demand in this category reflects population growth beyond areas served by public supply utilities. However, this increase can be attributed mainly to the change in per capita values used to calculate water use as described in the section of this document titled “Methodology of Projections for All Water Use Categories.”

An additional demand of approximately 6 mgd over the amount in an average rainfall year (from 100.67 mgd to 106.72 mgd, Table 6) is projected in a 1-in-10-year drought event.

Public use water can be defined as water that meets the general needs of the population, and is the aggregate of the public supply and the domestic self-supply and small, public-supply water use categories. Public use water is estimated to increase 79%, from 524.35 mgd in 1995 to 936.23 mgd in 2025 (Table 15).

## Agricultural Self-Supply

Total irrigated agricultural acreage is projected to decline from approximately 330,826 acres to approximately 288,857 acres (about 12%) between 1995 and 2025 (Tables 7 and 8). Growth is projected in the greenhouse / nursery industry, particularly in Clay, Brevard, Lake, and Putnam counties. Increased sod production is expected to occur primarily in Brevard, Duval, and Putnam counties where land formerly used to grow pasture grass and potatoes is projected to be converted into sod production. In addition, citrus acreage is expected to decrease by about 41% in Lake County between 1995 and 2025.

The combined effect of a decline in acreage and shift in crop production is projected to result in an 11% decrease in total water use in 1995 to an average rainfall year in 2025 (584.31 to 522.11 mgd).

Water use in a 1-in-10-year drought event is projected to be 5% greater than in an average rainfall year, increasing from 584.31 mgd in 1995 to 615.29 mgd in 2025. The projected dry rainfall year water use was estimated using 1-in-10-year drought meteorological conditions; therefore, the supplemental irrigation water use is greater (Table 7).

## Recreational Self-Supply

Recreational self-supply (golf course irrigation) water use is projected to increase from 99.13 mgd in 1995 to 156.44 mgd in 2025, an increase of approximately 58% (Table 10). This represents an increase of about 57 mgd.

Table 15. Demand for public use water, 1995, 2000 and 2025, in the St. Johns River Water Management District

| County | 1995 Water Use | | | 2000 Water Use | | | 2025 Projected Water Use Average Rainfall Year | | | Percent Change 1995–2025 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Public Supply | Domestic Self-Supply and Small Public Supply | Total Public Use | Public Supply | Domestic Self-Supply and Small Public Supply | Total Public Use | Public Supply | Domestic Self-Supply and Small Public Supply | Total Public Use | Public Supply | Domestic Self-Supply and Small Public Supply | Total Public Use |
| Alachua | 20.73 | 2.28 | 23.01 | 25.71 | 3.42 | 29.13 | 32.68 | 3.42 | 36.10 | 58 | 50 | 57 |
| Baker | 0.65 | 1.51 | 2.16 | 0.81 | 3.89 | 4.7 | 0.94 | 3.89 | 4.83 | 45 | 158 | 124 |
| Bradford | 0.00 | 0.12 | 0.12 | 0.00 | 0.19 | 0.19 | 0.00 | 0.19 | 0.19 | 0 | 58 | 58 |
| Brevard | 51.09 | 6.22 | 57.31 | 53.04 | 1.96 | 55 | 78.87 | 1.96 | 80.83 | 54 | -68 | 41 |
| Clay | 11.78 | 3.03 | 14.81 | 14.46 | 5.35 | 19.81 | 37.54 | 5.35 | 42.89 | 219 | 77 | 190 |
| Duval | 96.72 | 7.96 | 104.68 | 117.47 | 6.46 | 123.93 | 150.02 | 6.46 | 156.48 | 55 | -19 | 49 |
| Flagler | 4.40 | 1.19 | 5.59 | 5.94 | 0.78 | 6.72 | 21.44 | 0.78 | 22.22 | 387 | -34 | 297 |
| Indian River | 10.70 | 3.99 | 14.69 | 13.81 | 1.67 | 15.48 | 22.54 | 1.67 | 24.21 | 111 | -58 | 65 |
| Lake | 23.51 | 6.02 | 29.53 | 37.76 | 14.50 | 52.26 | 63.18 | 14.50 | 77.68 | 169 | 141 | 163 |
| Marion | 13.41 | 10.40 | 23.81 | 17.28 | 16.55 | 33.83 | 24.05 | 16.55 | 40.60 | 79 | 59 | 71 |
| Nassau | 4.43 | 2.63 | 7.06 | 6.33 | 10.90 | 17.23 | 13.14 | 10.90 | 24.04 | 197 | 314 | 241 |
| Okeechobee | 0.00 | 0.06 | 0.06 | 0.00 | 0.17 | 0.17 | 0.00 | 0.17 | 0.17 | 0 | 183 | 183 |
| Orange | 104.60 | 3.79 | 108.39 | 129.37 | 12.32 | 141.69 | 173.19 | 12.32 | 185.51 | 66 | 225 | 71 |
| Osceola | 0.00 | 0.04 | 0.04 | 0.00 | 0.63 | 0.63 | 0.00 | 0.63 | 0.63 | 0 | 1,475 | 1475 |
| Putnam | 3.14 | 5.10 | 8.24 | 2.74 | 9.62 | 12.36 | 4.73 | 9.62 | 14.35 | 51 | 89 | 74 |
| St. Johns | 10.42 | 4.24 | 14.66 | 15.91 | 3.65 | 19.56 | 34.83 | 3.65 | 38.48 | 234 | -14 | 162 |
| Seminole | 49.95 | 2.56 | 52.51 | 66.46 | 4.28 | 70.74 | 90.39 | 4.28 | 94.67 | 81 | 67 | 80 |
| Volusia | 47.73 | 9.95 | 57.68 | 56.46 | 4.33 | 60.79 | 88.02 | 4.33 | 92.35 | 84 | -56 | 60 |
| Total | 453.26 | 71.09 | 524.35 | 563.55 | 100.67 | 664.22 | 835.56 | 100.67 | 936.23 | 84 | 42 | 79 |

All water use in million gallons per day

It is expected that a portion of the projected water use will be supplied by reclaimed water and storm water. SJRWMD, through its consumptive use permitting program, routinely requires the use of reclaimed water and stormwater when such use is technically, environmentally, and economically feasible.

SJRWMD recognizes the need to more accurately assess the impact of using reclaimed water on demands for groundwater and surface water. SJRWMD will work toward addressing this need in its analysis of water use reports from CUP permit holders and an ongoing survey of wastewater treatment and reuse. This information will be included in the next scheduled update of the water supply assessment.

The total water use is projected to increase from 156.44 mgd in an average rainfall year to 160.40 mgd in a drought year (Table 10).

### Commercial/Industrial/Institutional Self-Supply

A decrease in commercial/industrial/institutional self-supply water use of approximately 3%, to a total of 129.30 mgd, is projected to occur between 1995 and 2025 (Tables 11 and 12). The total amount of projected water use in this category may not appear to be significant in comparison to other categories. However, withdrawals of water by individual users to support demands in this category are often relatively large withdrawals that are concentrated in relatively small areas, a combination that often results in concerns regarding the hydrologic impacts of withdrawals.

### Thermoelectric Power Generation Self-Supply

The use of freshwater for noncooling purposes for thermoelectric power generation is projected to increase by 89% from 22.18 mgd in 1995 to 41.86 mgd in 2025 (Tables 13and 14). This is attributed to large increases in surface water use in Putnam and Volusia counties. Saline and fresh surface water use for cooling purposes is expected to increase by 10% to 2,003.39 mgd in 2025 from 1,825.99 mgd in 1995.

## SOURCE EVALUATION

SJRWMD identified its entire jurisdictional area as one water supply planning region pursuant to the requirements of Subparagraph 373.036(2)(b)2, F.S. Therefore, WSA 2003 includes an evaluation of the groundwater and surface water resources in the 18-county area of SJRWMD. This evaluation was performed to assess the availability of these resources to supply existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems through 2025.

## OVERVIEW OF HYDROLOGIC SYSTEM

Water supplies in SJRWMD are available from both ground and surface water systems, including seawater. These systems contain an abundance of water, but the nature of these systems and their relationship to one another must be carefully considered when planning the development of water supplies.

### Overview of Groundwater Resources

Three aquifer systems supply groundwater in SJRWMD: the surficial, intermediate, and Floridan (Figure 5). The Southeastern Geological Society (1986) has described the hydrogeologic nature of these aquifer systems.

**Surficial Aquifer System.** The surficial aquifer system consists primarily of sand, silt, and sandy clay. It extends from land surface downward to the top of the confining unit of the intermediate aquifer system, where present, or to the top of the confining unit of the Floridan aquifer system. The surficial aquifer system contains the water table, which is the top of the saturated zone within the aquifer. Water within the surficial aquifer system occurs mainly under unconfined conditions, but beds of low permeability cause semiconfined or locally confined conditions to prevail in its deeper parts.

Water quality in the surficial aquifer system is generally good. Based on a review of USGS and SJRWMD data, chloride, sulfate, and total dissolved solids (TDS) concentrations are generally below the secondary drinking water standards of 250, 250, and 500 milligrams per liter (mg/L), respectively (Subsection 62-550.320(1), *F.A.C.*). Iron concentrations, however, are often high and in many places exceed the secondary drinking water standard of 0.3 mg/L (Subsection 62-550.320(1), *F.A.C.*). In coastal areas such as the barrier islands, this aquifer system is prone to saltwater intrusion.

The surficial aquifer system is a source of water for public supply in St. Johns, Flagler, Brevard, and Indian River counties. It is also used as a source of water for domestic self-supply, mainly along the coastal portions of SJRWMD but also in inland areas scattered throughout SJRWMD.

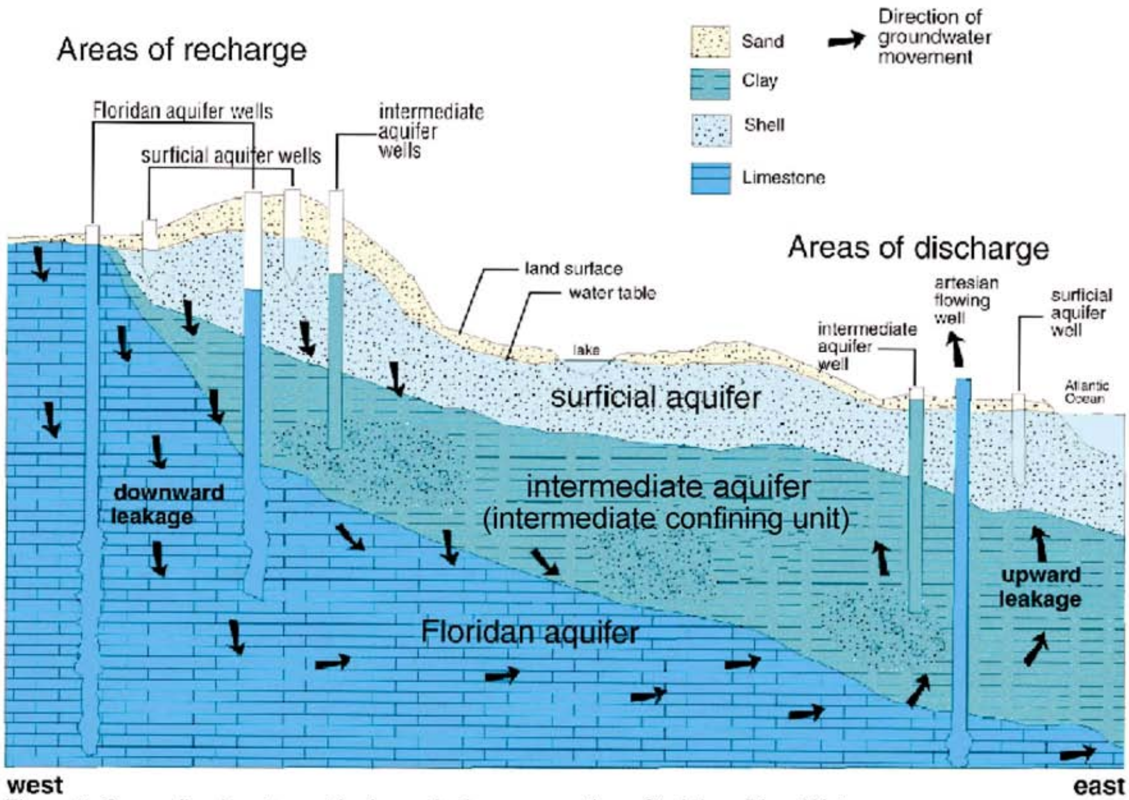



Figure 5. Generalized east-west hydrogeologic cross section. St. Johns River Water Management District (not to scale)

**Intermediate Aquifer System.** The intermediate aquifer system, also known as the intermediate confining unit, consists of fine-grained clastic deposits of clayey sand to clay interlayered with thin water-bearing zones of sand, shell, and limestone (Southeastern Geological Society 1986). In most places in SJRWMD, poorly yielding to non-water-yielding strata occurs in this system. In other places, one or more low-to-moderate yielding aquifers may be interlayered with relatively impermeable confining beds. The aquifers within this system contain water under confined conditions. They occur in Nassau, Duval, Clay, Orange, and Indian River counties. The intermediate aquifer system occurs throughout most of SJRWMD. It is absent from southern Flagler, northwestern Brevard, western Alachua, western Marion, and parts of Volusia and Lake counties (Davis and Boniol 2002). This unit lies between and collectively retards the exchange of water between the overlying surficial aquifer system and the underlying Floridan aquifer system.

The available USGS and SJRWMD data suggest water quality in the intermediate aquifer system is generally good in the northern part of SJRWMD where chloride, sulfate, and TDS concentrations are below the secondary drinking water standards. Water quality in the southern part of SJRWMD approaches or exceeds the secondary drinking water standards for chloride and TDS concentrations.

The intermediate aquifer system is used as a water source for domestic self-supply in Duval, Clay, and Orange counties.

**Floridan Aquifer System.** The Floridan aquifer system is one of the world's most productive aquifers. The rocks, primarily limestone and dolomite, that compose the Floridan aquifer system, underlie the entire state, although this aquifer system does not contain potable water at all locations. Water in the Floridan aquifer system occurs under confined conditions throughout most of SJRWMD. Unconfined conditions occur in parts of Alachua and Marion counties, where the top of the Floridan aquifer system is at or near land surface.

Ground water recharge to the Floridan aquifer is the addition of water to the Floridan aquifer from the overlying surficial aquifer. Recharge rates to the Floridan aquifer are based on hydraulic pressure differences between the water table of the surficial aquifer and the potentiometric surface of the Floridan aquifer and on the leakance of the upper confining unit separating the aquifers.

Recharge to the Floridan aquifer occurs in areas where the elevation of the water table of the surficial aquifer is higher than the elevation of the potentiometric surface of the Floridan aquifer. In these areas, water moves from the surficial aquifer in a downward direction through the upper confining unit to the Floridan aquifer. Recharge also occurs directly from infiltrating rainfall where the limestones of the Floridan aquifer are at or near land surface. In addition, significant local recharge may occur where sinkholes have breached the upper confining unit.

Discharge from the Floridan aquifer occurs in areas where the elevation of the Floridan aquifer potentiometric surface is higher than the elevation of the water table. In these areas, water moves from the Floridan aquifer in an upward direction through the upper confining unit to the surficial aquifer.

Where the elevation of the Floridan aquifer potentiometric surface is higher than land surface, springs and free-flowing artesian wells occur.

The Floridan aquifer system is subregionally divided on the basis of the vertical occurrence of two zones of relatively high permeability (Miller 1986). These zones are called the Upper and Lower Floridan aquifers. A less permeable limestone and dolomitic limestone sequence, referred to as the middle semiconfining unit, generally separates the Upper and Lower Floridan aquifers. Throughout much of Baker, Bradford, western Alachua, and northwestern Marion counties, the middle semiconfining unit is missing and the Lower Floridan aquifer does not occur (Miller 1986).

USGS and SJRWMD data indicate that water quality in the Upper Floridan aquifer varies, depending on its location in SJRWMD. Water quality in this aquifer is generally good in the northern and western portions of SJRWMD where chloride, sulfate, and TDS concentrations are below the secondary drinking water standards. Chloride and TDS concentrations in the Upper Floridan aquifer generally exceed the secondary drinking water standards in the following areas:

- Brevard and Indian River counties
- Southern St. Johns County and most of central and northern Flagler County
- Areas bordering the St. Johns River south of Clay County
- Eastern Volusia County

Sulfate concentrations also often exceed the secondary drinking water standards.

USGS and SJRWMD data indicate that water quality in the Lower Floridan aquifer also varies depending on its location in SJRWMD. Water quality in this aquifer is generally good in the northern and western portions of SJRWMD where chloride and TDS concentrations are below the secondary drinking water standards. However, chloride concentrations in the Lower Floridan aquifer generally exceed the secondary drinking water standards throughout the following areas:

- All of Flagler, Brevard, and Indian River counties
- Eastern Nassau and Volusia counties

- Areas bordering the St. Johns River in Putnam, Marion, Lake, Volusia, Seminole, Orange, and Osceola counties (Sprinkle 1989)

TDS concentrations in the Lower Floridan aquifer generally exceed the secondary drinking water standards throughout the following areas:

- All of St. Johns, Flagler, Brevard, and Indian River counties
- Most of Nassau and Duval counties
- Eastern Clay and Volusia counties
- Areas bordering the St. Johns River in Putnam, Marion, Lake, Volusia, Seminole, Orange, and Osceola counties (Sprinkle 1989)

The Upper Floridan aquifer is the primary source of water for public supply water use in SJRWMD, primarily in the northern and central portions of SJRWMD where the aquifer contains water that generally meets primary and secondary drinking water standards. The Upper Floridan aquifer also serves as a source of water for public supply in the southern portion of SJRWMD where water withdrawn from the aquifer is treated by reverse osmosis. Because the Floridan aquifer system in the southern portion of SJRWMD generally contains water that exceeds secondary drinking water standards for chloride, sulfate, and TDS, this portion of the aquifer generally supplies water only for irrigation.

Portions of the Lower Floridan aquifer furnish water for public supply in Duval, central and western Orange, and southern and southwestern Seminole counties.

## Overview of Surface Water Resources

Streams, lakes, canals, and other surface water bodies in SJRWMD provide water for various consumptive and nonconsumptive uses. Although aquifers usually contain relatively high-quality water and are likely to remain the most widely used freshwater supply sources in SJRWMD, pressure to develop surface water sources is expected to increase as groundwater becomes less available. If environmentally and economically feasible, additional surface water could be made available for future use.

Water quality can limit surface water availability for certain uses if it is not economically feasible to treat the water to the level required for those intended uses. Surface water quality in SJRWMD varies both spatially and temporally due to natural processes and human activities that affect the chemical and microbiological character of water bodies. The linkage between water quality and water availability is determined by the quality requirements for different intended uses. For example, TDS concentrations of 35,000 mg/L (equivalent to seawater) can be used by some industries, whereas a maximum of 500 mg/L is recommended for public supply (Prasifka 1988).

Compared to most groundwater sources in SJRWMD, surface water sources generally are of lower quality. Surface waters tend to contain silts and suspended sediments, dissolved organic matter from topsoil, and chemical and microbiological contaminants from municipal wastewater discharges, stormwater runoff, and industrial and agricultural activities. The quality of surface water may vary seasonally with variation in flow rates or water levels.

Salinity is one of the most important water quality considerations in SJRWMD. In the coastal rivers of SJRWMD and the tidal reaches of the St. Johns, St. Marys, and Nassau rivers (Figure 1), the influx of seawater limits potential water uses to recreation and power plant cooling unless costly treatment is implemented. Chloride concentrations generally decrease upstream from the mouths of these rivers as tidal influence diminishes.

In addition to the influence of tides, inflows of groundwater with salinities higher than in receiving waters affect the spatial distribution of chloride concentrations in the St. Johns River. During low-flow periods, when there is little dilution from freshwater inflows, higher chloride concentrations occur in the tidally influenced lower reach of the river and in an upper reach between Lakes Harney and Poinsett (Figure 1). The higher chloride concentrations in the upper reach of the St. Johns River are due to inflows of groundwater with higher chloride concentrations than in the receiving water, primarily through diffuse upward leakage and possible spring discharge (Tibbals 1990).

**Water Availability From Streams.** Monthly stream discharges generally reflect the seasonal distribution of annual rainfall. Streams in SJRWMD usually exhibit at least two high- and low-flow seasons over the course of the year. The highest average monthly discharges throughout SJRWMD tend to occur in August, September, and October, when summer thunderstorms are common and tropical storms are most likely to occur. The high-flow period in

March and April is more significant in the northern area of SJRWMD than in the southern area. More important, the lowest average monthly discharges tend to occur during the late fall to early winter months (November and December) and the late spring to early summer months (May and June). Some of the highest demands for surface water occur during these low-flow periods. High irrigational water use often occurs during May, June, and December. December is the beginning of the season for frost-and-freeze protection. USGS publishes *Water Resources for Northeast Florida* on a water year basis (October through September) for all active surface water gages. These reports are the most comprehensive sets of surface water stage and discharge data available for water bodies in SJRWMD.

A review of available USGS discharge data indicates that there are very few sites in SJRWMD where substantial quantities of water are likely to be available throughout the year. With the rare exception of streams with very stable base flows resulting from constant groundwater discharge, most streams in SJRWMD would require artificial storage for an assured supply of water. An example is Lake Washington (Figure 1), which is a natural water body with a dam to improve its water storage, located within the St. Johns River near Melbourne. The City of Melbourne receives reliable water supplies from Lake Washington even though flow ceases occasionally in the St. Johns River.

Required storage may also be provided by treating surface water when available and then storing the treated water in surface water reservoirs, aboveground storage tanks, or aquifer storage and recovery (ASR) wells for later withdrawal and use during low streamflow periods. Treated water ASR will likely be a key component of any significant development of surface water resources, because it offers a significant cost advantage over surface reservoirs and aboveground storage tanks. SJRWMD is currently conducting an ASR construction and testing program to investigate technical and environmental feasibility as well as to better establish associated costs.

Quantities of water that can be developed from surface water sources will be limited by the requirements of natural systems and the costs of treatment, storage, and distribution facilities. Streams with high flows generally offer greater potential as sources of water to meet projected needs. The feasibility of developing potential sites for water supply should be assessed based upon the quantity of water to be withdrawn, the associated impacts on natural systems, and the cost of treatment, storage, and distribution facilities.

SJRWMD has assessed the feasibility of withdrawing surface water from the following sources:

- St. Johns River, from its upper basin downstream to DeLand
- Lower Ocklawaha River, below its confluence with the Silver River
- Haines Creek in Lake County between Lakes Eustis and Griffin
- Taylor Creek
- Lake Apopka

Information developed through these assessments will be used to identify future water supply project options in DWSP 2005.

**Water Availability From Stormwater Retention/Detention Facilities.** Storm water throughout the developed areas of SJRWMD is typically captured in constructed stormwater drainage and retention / detention systems. Water from these systems can be directly used to meet many nonpotable water needs. Storm water is commonly used as a source of golf course irrigation water.

Storm water, because of its diffuse and intermittent nature, is not generally considered to be a viable option for direct public supply applications where reliability is a major consideration. However, stormwater management practices that provide for increased soil infiltration and groundwater recharge opportunities should be considered as a means to protect and possibly enhance existing groundwater resources.

A comprehensive assessment of the availability of storm water has not been performed as part of this water supply assessment.

**Water Availability From Lakes.** Most of the larger lakes in SJRWMD are part of the Ocklawaha or St. Johns river systems (Figure 1), and the water quality and stage fluctuations of these lakes are similar to those of the rivers of which they are a part. Major lakes in the upper Ocklawaha River chain of lakes include Apopka, Harris, Eustis, Griffin, and Dora. Major lakes of the St. Johns River system include George, Harney, Monroe, Jesup, Poinsett, Washington, and Crescent. Other major lakes, including Newnans, Lochloosa, and Orange, are located in the Lower Ocklawaha River Basin.

Reservoirs also have the potential for providing water supply. Taylor Creek Reservoir, a tributary to the St. Johns River, has been incorporated into an integrated water supply system by the City of Cocoa, Florida. Increased production from this reservoir is now the focus of the St. Johns River / Taylor Creek Reservoir Water Supply Project, which is proposed for implementation by six water supply entities, and SJRWMD and SJWMD.

SJRWMD is in the process of setting minimum lake levels pursuant to the provisions of Section 373.042, F.S. These minimum lake levels may restrict the amount of water available from lakes and groundwater aquifers. Levels established to date are included in Chapter 40C-8, *F.A.C.* (Appendix A). The plan for establishment of additional levels is described in Appendix C.

**Seawater Availability.** Seawater and associated saline estuary and bay water provide a significant potential source of water supply. These are also an inherently reliable and virtually drought-proof source. In addition, the potential sources of supply (Atlantic Ocean and / or Intracoastal Waterway) are located in close proximity to a substantial portion of the SJRWMD population. Nine of the 18 counties contained wholly or in part within SJRWMD are coastal counties containing over half of SJRWMD's population.

Seawater is relatively expensive and energy intensive to treat. The TDS of seawater is approximately 35,000 mg / L, whereas the secondary drinking water standard is 500 mg / L. Thus, demineralization on the order of 99% is required to convert seawater to drinking water. Demineralization of this magnitude using current technology (reverse osmosis) will produce a concentrate byproduct stream with a TDS concentration approximately twice that of the original seawater. Management of this byproduct stream, in an environmentally acceptable and permittable manner, can present significant challenges to the development of seawater for water supply applications.

Significant transport costs would also be incurred if demineralized seawater were used to meet the needs of water supply demand centers located inland from the coastal source of supply.

## ASSESSMENT CRITERIA USED

Subparagraph 373.036(2)(b)4, F.S., requires that SJRWMD determine whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for all existing uses and reasonably anticipated future needs and to sustain the water resources and related natural systems.

SJRWMD has made this determination based on a comparison of water resource constraints to the results of hydrologic impact assessments, which were based on projected 2025 water use.

The following water resource constraints were considered:

- Natural systems
- Groundwater quality (saltwater intrusion)

Areas within which anticipated sources of water and conservation efforts are determined not to be adequate to supply all existing and reasonably anticipated future needs are identified as priority water resource caution areas. Within these identified PWRCAs, the impacts of current or projected water use exceed the water resource constraints for natural systems or groundwater quality.

### Impacts to Natural Systems

SJRWMD assessed the following four factors in identifying areas as PWRCAs due to impacts to natural systems:

- Impacts to native vegetation (wetlands)
- Impacts to lakes
- Impacts to springs
- Impacts to minimum flows and levels

**Impacts to Native Vegetation.** SJRWMD's process for assessing impacts to native vegetation is described in Kinser and Minno (1995) and Kinser et al. (2003). The relative likelihood of harm to wetland vegetation due to projected 2025 groundwater withdrawals was assessed using a geographical information system (GIS) model. The GIS model integrated soil permeabilities, sensitivity of wetlands to dewatering, and projected declines in the water levels of the surficial aquifer system to predict the likelihood of harm to wetland plant communities. The wetland constraints for WSA 2003 as described in Kinser et al. (2003) are as follows:

- Lower likelihood of harm (<0.35 ft surficial drawdown)
- Moderate likelihood of harm (surficial drawdown >0.35 to <1.2 ft)

- Higher likelihood of harm (surficial drawdown >1.2 ft)

**Impacts to Lakes.** SJRWMD assessed the relative likelihood of harm to lakes due to projected changes in groundwater withdrawals (1995–2025) using a GIS model developed by Kinser et al. (2003). Six GIS data layers, each influencing or expressing groundwater-surface water interactions, were chosen as input to the model. These data layers are

- Thickness of the upper confining unit separating the surficial and Floridan aquifer systems
- Head difference between surficial and Floridan aquifer systems
- Soil permeability
- Wetlands
- Topographic curvature
- Topographic deviation

These GIS layers were overlaid to identify regions susceptible to harm due to projected 2025 groundwater withdrawals. The output is a map representing the relative likelihood of harm to lakes produced by overlaying the lake susceptibility and modeled surficial aquifer drawdown layers. Susceptible areas are those identified as having a surficial drawdown ≥0.5 ft. This value is based on the lakes constraint identified in the *Water 2020 Constraints Handbook* (SJRWMD et al. 2005).

**Impacts to Springs.** SJRWMD used four regional groundwater flow models (the northeast Florida [NEF], north-central Florida [NCF], east-central Florida [ECF], and Volusia County [Volusia] models) to evaluate the potential impacts of 2025 projected increases in Floridan aquifer groundwater withdrawals on discharges from 35 springs or spring groups (Table 16). In general, a projected decrease of greater than 15% in the long term measured average annual spring flow was considered to be enough decrease to pose a reasonable likelihood of unacceptable natural systems conditions and to warrant further investigation in order to establish minimum discharges (Kinser and Minno, pers. com. 1994). Likelihood of harm is expected if reduction in spring flow is greater than the 15% screening flow threshold.

Table 16. Predicted changes in average spring flow, 1995–2025

| Spring | County | Estimated Actual 1995 Flow (cfs) | Predicted Average 2025 Flow (cfs) | Screening Flow (cfs) | Regional Model Used |
|---|---|---|---|---|---|
| Alexander Springs | Lake | 98 | 97 | 86 | NCF |
| Apopka Spring | Lake | 32 | 25 | 27 | ECF |
| Beecher Springs | Putnam | 9 | 8 | 8 | NEF |
| Blackwater Springs near Cassia | Lake | 2 | 2 | 1 | NCF |
| Blue Spring near Orange City | Volusia | 150 | 145 | 134 | VCM |
| Blue Springs | Citrus | 12 | 12 | 11 | NCF |
| Blue Springs | Lake | 3 | 2 | 3 | ECF |
| Bugg Spring | Lake | 11 | 10 | 8 | ECF |
| Crescent Beach Submarine Spring | St. Johns | 30 | 29 | ND | NEF |
| Croaker Hole Springs | Putnam | 71 | 71 | 70 | NCF |
| Fenney Springs (Shady Brook Creek Spring 1) | Sumter | 16 | 16 | 15 | NCF |
| Gemini Springs | Volusia | 8 | 8 | 9 | VCM |
| Green Springs | Volusia | 2 | 2 | 1 | VCM |
| Gum Springs | Sumter | 76 | 74 | 68 | NCF |
| Holiday Springs | Lake | 4 | 2 | 3 | ECF |
| Island Spring | Lake | 6 | 5 | 5 | ECF |
| Juniper and Fern Hammock springs* | Marion | 25 | 24 | 19 | NCF |
| Little Johns Creek Spring 2 | Sumter | 5 | 5 | 5 | NCF |
| Little Johns Creek Spring 3 | Sumter | 3 | 3 | 3 | NCF |
| Mosquito Springs Run | Lake | 2 | 2 | 2 | NCF |
| Orange Spring | Marion | 2 | 2 | 2 | NCF |
| Ponce De Leon Springs | Volusia | 27 | 26 | 23 | VCM |
| Rainbow Springs | Marion | 652 | 646 | 637 | NCF |
| Salt Springs | Marion | 74 | 74 | 68 | NCF |
| Shady Brook Creek Spring 2 | Sumter | 3 | 3 | 3 | NCF |
| Shady Brook Creek Spring 3 | Sumter | 3 | 3 | 3 | NCF |
| Shady Brook Creek Spring 4 | Sumter | 3 | 3 | 3 | NCF |
| Shady Brook Creek Spring 5 | Sumter | 3 | 3 | 3 | NCF |
| Silver Glen Springs | Marion | 106 | 105 | 84 | NCF |
| Silver Springs | Marion | 708 | 682 | 661 | NCF |
| Sweetwater Springs | Marion | 13 | 13 | 11 | NCF |
| Tobacco Patch Landing Springs group | Marion | 3 | 3 | 3 | NEF |
| Wells Landings Springs | Marion | 9 | 9 | 8 | NEF |
| Wilson Head Springs | Marion | 2 | 2 | 2 | NCF |
| Witherington Spring | Orange | 4 | 4 | 3 | ECF |

Below screening flow At screening flow
Note: ND = not determined
*Springs combined in groundwater flow models
Groundwater flow models: ECF = east-central Florida NCF = north-central Florida
NEF = northeast Florida Volusia = Volusia County

**Impacts to Minimum Flows and Levels (MFLs).** SJRWMD identified water bodies for which projected 2025 flows and / or levels would be less than MFLs for springs and lakes established in Chapter 40C-8, *F.A.C.*, if projected 2025 water use plans of major users are implemented.

- **Springs.** SJRWMD has established minimum levels for eight springs. These are second- and third magnitude springs within the Wekiva River Basin in western Seminole and northwestern Orange counties (Table 17). The ECF regional groundwater flow model was used to evaluate the effects of 2025 projected increases in groundwater withdrawals from the Floridan aquifer on discharges from these springs.

- **Lakes, Rivers, and Wetlands**. The SJRWMD MFLs program relies on the use of surface water models for implementation. MFLs are compared to results of long-term hydrologic model simulations to determine if MFLs are being met. MFLs are affected by direct surface water withdrawals and withdrawals from groundwater systems.

Table 17. Comparison of minimum spring flow to predicted changes in average spring flows, 1995–2025, using the east-central Florida model (ECF)

| Spring* | County | Estimated Actual 1995 Flow (cfs) | Projected Average 2025 Flow (cfs) | Minimum Flow (cfs) |
|---|---|---|---|---|
| Messant Spring | Lake | 16 | 15 | 12 |
| Miami Springs | Seminole | 6 | 5 | 4 |
| Palm and Sanlando springs | Seminole | 29 | 22 | 22 |
| Rock Springs | Orange | 61 | 55 | 53 |
| Seminole Spring | Lake | 39 | 35 | 34 |
| Starbuck Spring[†] | Seminole | 15 | 12 | 13 |
| Wekiwa Springs | Orange | 73 | 67 | 62 |

*Springs of the greater Wekiva River Basin that have minimum flows established by rule (Chapter 40C-8, *F.A.C.*)
[†]Below minimum flow

Many lakes have significant connections to the Floridan aquifer and are, therefore, more susceptible to impacts from long-term Floridan aquifer water level declines. The degree of hydrologic connection (i.e., seepage loss) between a surface water body and the Floridan aquifer becomes apparent during the model calibration process. In this type of surface water system, seepage losses can be estimated by incorporating long-term Floridan aquifer water level data into the model simulations.

SJRWMD has established MFLs by rule (Chapter 40C-8, *F.A.C.*) for 101 lakes, seven wetlands, and five rivers or stream reaches (Appendix C). Of the 108 lakes and wetlands with MFLs, 61 have available water budget models. However, of these modeled systems, only 42 systems show significant Floridan aquifer connections. Therefore, only these 42 systems were assessed to determine the direct impacts of proposed 2025 Floridan aquifer water level declines on established MFLs (Table 18). Localized, 2025-Floridan aquifer water level declines, predicted based on regional groundwater model simulations, were incorporated into each surface water model to determine the potential impact of proposed 2025 groundwater withdrawals on MFLs.

**Impacts to Groundwater Quality (Saltwater Intrusion)**

The WSA 2003 methodology differs from the methodology employed in previous assessments (Vergara 1994, 1998). In past assessments, the subregional groundwater flow and water quality model results were used to project the magnitude of saltwater intrusion based on changes in the location of the 250 mg/L isochlor.

Since 1998, SJRWMD has further considered the value of these transport models for predicting area-specific change in chloride concentrations. SJRWMD has concluded that these models do not provide chloride concentration predictions that are reliable enough for water supply assessment purposes. In addition, the models have been developed in only a small area of SJRWMD. Therefore, a more consistent districtwide methodology has been developed for WSA 2003.

The SJRWMD process for assessing impacts of projected saltwater intrusion on the future availability of groundwater is described in Appendix D. The likelihood of unacceptable changes in the concentrations of chloride in water in the Floridan aquifer system was the basis of assessing the likelihood of unacceptable impacts to groundwater quality. For purposes of WSA 2003, SJRWMD evaluated two factors to identify geographic areas where the potential for water quality change due to proposed increases in groundwater withdrawals through 2025 are likely to result in unacceptable water quality impacts. These factors are

Table 18. Water bodies with established minimum flows and levels and water budget models

| Water Body | County | Predicted 2025 Floridan Aquifer Drawdown | Significant Connection to Floridan Aquifer |
|---|---|---|---|
| Tuscawilla Lake | Alachua | 0.2 | Yes |
| Fox Lake | Brevard | 0.4 | Yes |
| Lake Washington | Brevard | 0.8 | No |
| South Lake | Brevard | 0.4 | Yes |
| St. Johns River at Lake Washington | Brevard | NA | NA |
| Blue Pond | Clay | 1.7 | No |
| Lake Brooklyn | Clay | 1.2 | Yes |
| Lake Geneva | Clay | 0.9 | Yes |
| Lake Magnolia | Clay | 1.3 | Yes |
| Lake Sandhill/Lowery | Clay | 1.4 | No |
| Gore Lake | Flagler | 3.2 | No |
| Lake Disston | Flagler | 0.4 | No |
| Blue Cypress Water Management Area | Indian River | 0.0 | No |
| Lake Apshawa North | Lake | 2.0 | Yes |
| Lake Apshawa South | Lake | 2.1 | Yes |
| Blackwater Creek at SR 44 | Lake and Orange | NA | NA |
| Cherry Lake | Lake | 1.4 | Yes |
| Lake Dorr | Lake | 0.5 | No |
| Lake Emma | Lake | 1.6 | Yes |
| Lake Louisa | Lake | 1.9 | Yes |
| Lake Lucy | Lake | 0.6 | Yes |
| Lake Minneola | Lake | 2.5 | Yes |
| St. Johns River at SR 44 | Lake, Seminole, Volusia | NA | NA |
| Wekiva River at SR 46 | Lake and Orange | NA | NA |
| Bowers Lake | Marion | 0.8 | Yes |
| Halfmoon Lake | Marion | 0.2 | Yes |
| Hopkins Prairie | Marion | 0.0 | Yes |
| Nicotoon Lake | Marion | 0.6 | Yes |
| Smith Lake | Marion | 0.7 | Yes |
| Lake Charles | Marion | 0.0 | No |
| Lake Kerr | Marion | 0.0 | Yes |
| Lake Weir | Marion | 1.1 | Yes |
| Lake Burkett | Orange | 5.4 | No |
| Lake Irma | Orange | 5.5 | No |
| Lake Martha | Orange | 5.4 | No |
| Lake Pearl | Orange | 5.3 | No |
| Prevatt Lake | Orange | 1.8 | Yes |
| Taylor Creek | Orange | NA | NA |
| Dream Pond | Putnam | 0.2 | Yes |
| Lake Broward | Putnam | 0.1 | Yes |
| Lake Nettles/English | Putnam | 0.2 | Yes |

Table 18—Continued

| Water Body | County | Predicted 2025 Floridan Aquifer Drawdown | Significant Connection to Floridan Aquifer? |
|---|---|---|---|
| Lake Orio | Putnam | 0.0 | Yes |
| Lake Stella | Putnam | 0.4 | Yes |
| Lake Swan | Putnam | 0.7 | Yes |
| Silver Lake | Putnam | 0.0 | Yes |
| Mills Lake | Seminole | 2.3 | Yes |
| Lake Brantley | Seminole | 2.9 | Yes |
| Lake Howell | Seminole | 5.2 | No |
| Sylvan Lake | Seminole | 3.7 | Yes |
| Big Lake | Volusia | 0.9 | Yes |
| Cow Pond | Volusia | 0.7 | Yes |
| Davis Lake | Volusia | 0.4 | Yes |
| Lake Ashby | Volusia | 0.4 | No |
| Lake Daugharty | Volusia | 1.1 | Yes |
| Lake Dias | Volusia | 0.4 | No |
| Lake Drudy | Volusia | 0.4 | No |
| Lake Emporia | Volusia | 0.5 | Yes |
| Lake Helen | Volusia | 0.8 | Yes |
| Lake Hires | Volusia | 1.0 | Yes |
| Lake Pierson | Volusia | 0.5 | No |
| Lake Winnemisett | Volusia | 0.6 | Yes |
| Lake Winona | Volusia | 0.0 | Yes |
| Lower Lake Louise | Volusia | 0.8 | Yes |
| North Lake Talmadge | Volusia | 0.9 | No |
| The Savannah | Volusia | 0.8 | Yes |
| Upper Lake Louise | Volusia | 0.6 | Yes |

Not meeting minimum flow and level
NA = not applicable

- Chloride concentration trends in existing wellfields
- Location of wellfields within areas with chloride concentrations greater than 250 mg/L in the Upper Floridan aquifer

The evaluation was performed based on the following steps:

1. Identify public supply wellfields that include wells that are experiencing or have experienced significant increasing trends in chloride concentrations based on information contained in the document *Evaluation*

*of Upper Floridan aquifer water quality to design a monitoring network in the St. Johns River Water Management District* (Boniol 2002).

2. Identify those wellfields not included in the subset identified in step 1 that are located in areas where the Upper Floridan aquifer contains chloride concentrations greater than or equal to 250 mg/L, as described in Figure 3 in Boniol (2002).

3. Eliminate from the subset of wellfields identified in steps 1 and 2 any wellfields belonging to utilities that are currently using or have proposed to use sources of water requiring demineralization treatment technologies.

4. Identify any wellfields and associated service areas identified in step 3 for which corrective actions have been identified and approved for implementation by the appropriate authority.

This approach to identify areas likely to experience unacceptable groundwater impacts is not intended to be comprehensive. A lack of adequate districtwide groundwater quality data limits the scope of this effort. Groundwater quality data associated with public supply wellfields are generally available. However, these data are not always of high enough quality for evaluation. It is intended, rather, to identify areas with the greatest likelihood of experiencing unacceptable impacts.

## HYDROLOGIC IMPACTS DUE TO PROJECTED WATER USE

The hydrologic impacts of projected groundwater withdrawals were estimated by application of regional groundwater flow models and more localized groundwater flow models, which simulate steady-state conditions based on long-term, average groundwater withdrawals. Groundwater modeling results for 2025-projected groundwater withdrawals were compared to the modeling results for the base year 1995.

If major water users' current water supply plans for 2025 are implemented, the elevation of the potentiometric surface of the Floridan aquifer system would decline regionally in response to the cumulative withdrawals of water from the Floridan aquifer system (Figure 6). In response to these declines and in response to withdrawals from the intermediate and surficial aquifer systems, the water levels in the surficial aquifer system would decline (Figure 7) and contribute to unacceptable impacts to wetlands and lakes. Also in response to these declines, the discharge of Starbuck Spring and a total of

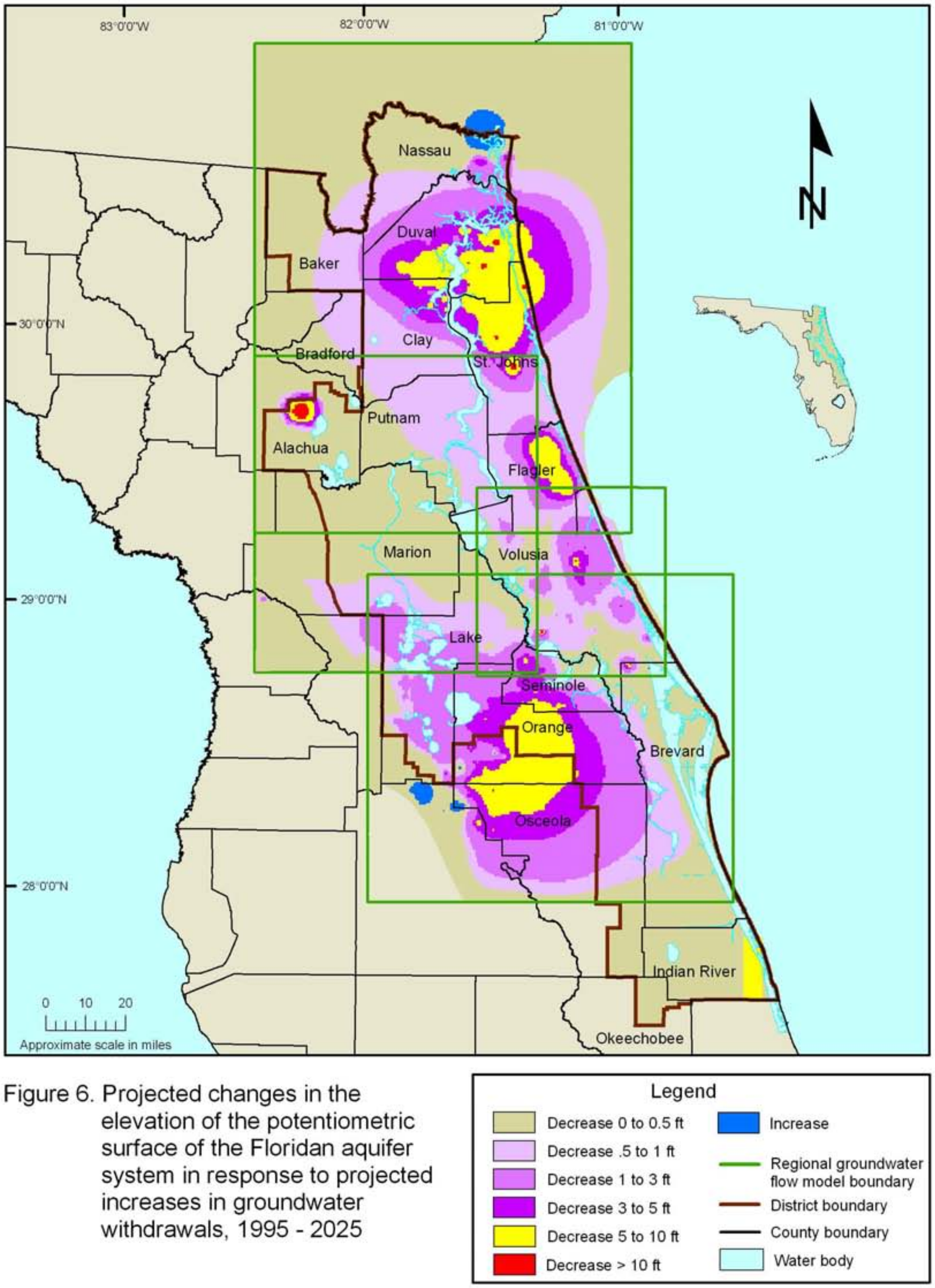



Figure 6. Projected changes in the elevation of the potentiometric surface of the Floridan aquifer system in response to projected increases in groundwater withdrawals, 1995 - 2025

*Note: This map is a composite of the results of simulations of four regional groundwater flow models. In areas where the boundaries of these models overlap, professional judgment was applied to determine the extent of potentiometric surface changes.*

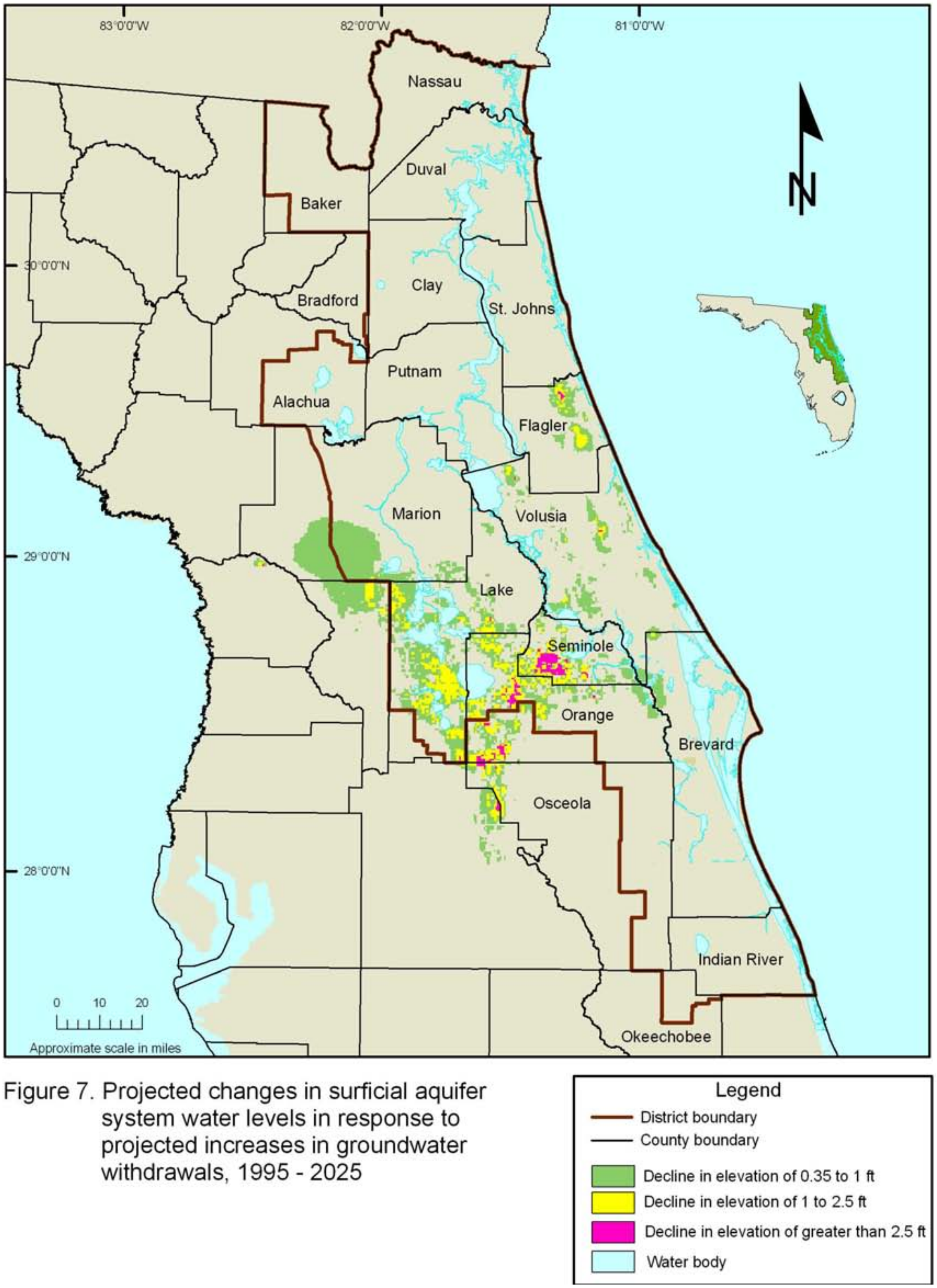



Figure 7. Projected changes in surficial aquifer system water levels in response to projected increases in groundwater withdrawals, 1995 - 2025

14 lakes would likely fall below established minimum flows and levels and chloride concentrations would increase to unacceptable levels in public supply wells resulting in unacceptable impacts by year 2025.

The accuracy of the assessments of these impacts can be improved through use of improved groundwater models. Improvement of the groundwater models as well as other analytical tools is an ongoing process at SJRWMD.

## ADEQUACY OF REGIONAL SOURCES

The primary focus of this water supply assessment is the identification of areas where existing and reasonably anticipated sources of water and conservation efforts are not adequate to supply water for all existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems through 2025. These areas are identified as priority water resource caution areas (PWRCAs) (Figure 3).

These PWRCAs include

- Areas likely to experience unacceptable impacts as a result of projected water withdrawals for one or more water resource constraint categories
- Public supply service areas associated with the projected water withdrawals, which are projected to contribute to the unacceptable impacts
- Areas where groundwater withdrawals are expected to result in declines in the elevation of the potentiometric surface of the Floridan aquifer that contribute to the unacceptable impacts

Projected declines in the elevation of the potentiometric surface of the Floridan aquifer of generally $\geq$0.5 ft are used to describe the outer limit of the area where cumulative groundwater withdrawals contribute to projected unacceptable impacts. Use of this 0.5-ft limit results in the identification of an area of contribution that is somewhat smaller than the true area of contribution. In reality, groundwater withdrawals occurring anywhere within the area of projected decline in the potentiometric surface of the Floridan aquifer will contribute to the projected decline and, therefore, to the projected impacts. However, including the entire area of projected decline would result in including large areas within which withdrawals probably contribute insignificantly to the projected decline and associated projected impacts. The 0.5-ft limit was chosen to represent the outer limit of the area that most likely contributes significantly to the decline and associated impacts, and is based on best professional judgment. In some cases slight deviations from the 0.5-ft limit were considered appropriate and were incorporated because of a desire to follow political or other significant geographic boundaries.

These PWRCAs cover about 39% of SJRWMD. Changes in projected quantities and locations of 2025 groundwater and surface water withdrawals can change the boundaries of these areas. Therefore, areas located outside of the identified PWRCAs should not be assumed to be able to support future groundwater and surface water withdrawals without resulting in unacceptable water resource conditions.

Projected 2025 water use in areas to the south and west of the SJRWMD boundary, in SFWMD and SWFWMD, respectively, would contribute to the anticipated unacceptable water resource conditions (Figures 10 through 14). SJRWMD is coordinating closely with SFWMD and SWFWMD concerning this matter, based on the provisions of a memorandum of understanding entered into by the three water management districts.

Projections of possible future water resource conditions identified as part of WSA 2003 are not considered by SJRWMD to represent conditions that are certain to exist. The projections were developed using modeling and other assessment techniques that used the best information available. However, the lack of sufficient data in some areas could affect the accuracy of the projections. Additional data collection and modeling have been identified as a means of improving the accuracy of the projections.

## Results: Impacts to Natural Systems

**Impacts to Native Vegetation.** The likelihood of harm to native vegetation related to projected groundwater withdrawals varies throughout SJRWMD (Figure 8). The likelihood of harm is lower in most of the northern and extreme southern portions of SJRWMD, including all of Nassau, Baker, Duval, Clay, Alachua, St. Johns, Putnam, Indian River, and Okeechobee counties. Most of the remainder of SJRWMD is identified as having moderate-to-higher likelihood of harm to wetland vegetation (Figure 8). The regions showing the highest likelihood of wetland impacts occur along major landscape ridges throughout SJRWMD. These include the Atlantic Coastal Ridge in Volusia and Flagler counties, the DeLand Ridge in northwestern and central Volusia County, the Groveland Karst and Lake Wales Ridge regions

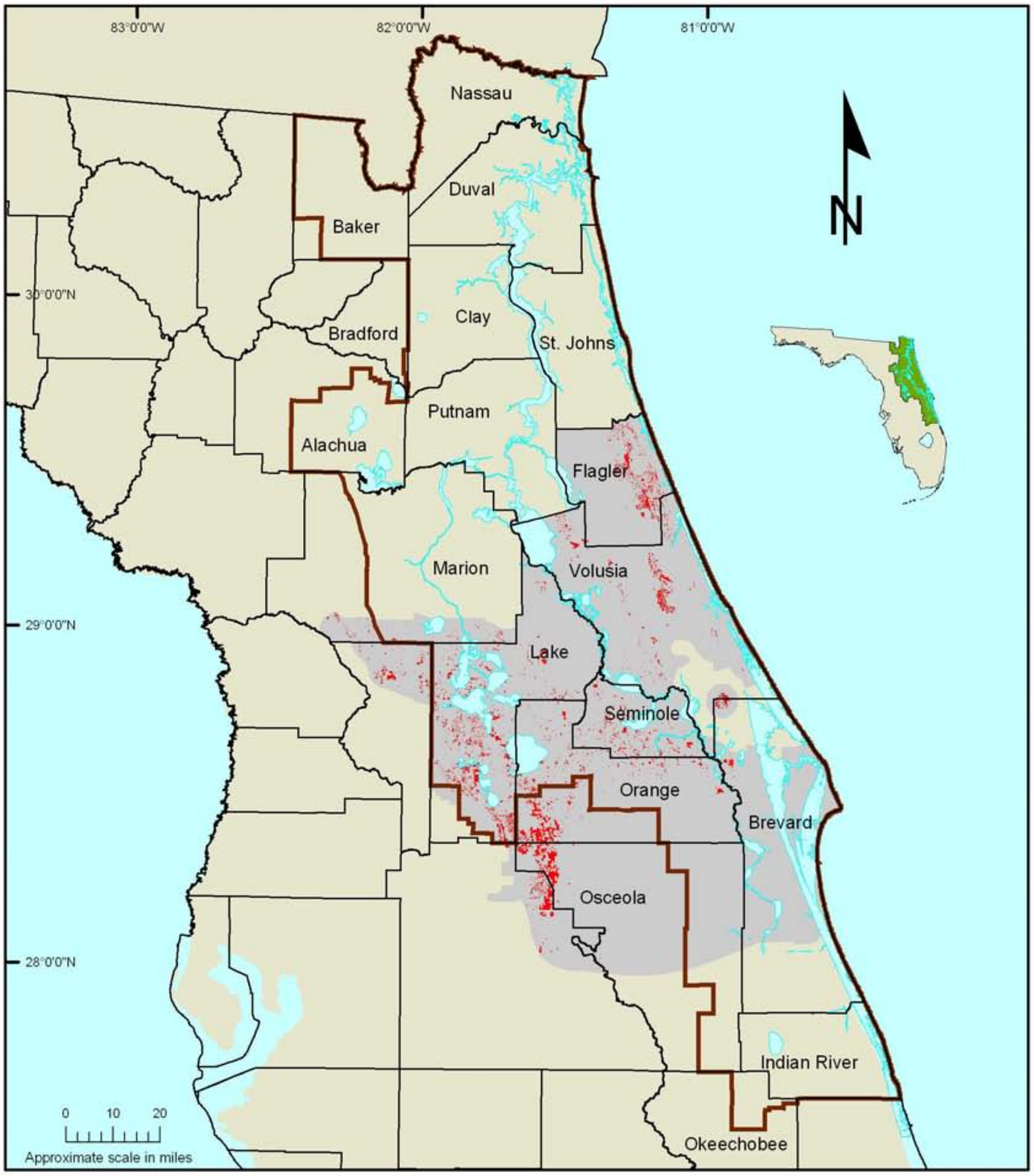



Figure 8. General areas within which anticipated water sources are not adequate to supply projected 2025 demands based on projected impacts to native vegetation

**Legend**

- District boundary
- County boundary
- Area projected to have a high likelihood of harm to native vegetationas a result of projected water use increases from 1995 to 2025
- Area where groundwater withdrawals and service areas contribute to the likelihood of harm to native vegetation
- Water body

of central and south Lake County, the Apopka Uplands and the Orlando Promontory of western Orange County, and the Casselberry-Oviedo-Geneva-Chuluota Hills region of west-central Seminole County.

SJRWMD has identified areas with a moderate-to-higher likelihood of harm to wetland vegetation, areas where projected changes in the elevation of the potentiometric surface of the Floridan aquifer system would contribute to this condition (declines ≥0.5 ft), and areas served by public supply utilities with projected groundwater withdrawals that will contribute to these projected declines to be in PWRCAs (Figure 8).

**Impacts to Lakes.** The regional patterns of likelihood of harm to lakes is very similar to that observed for likelihood of harm to wetland vegetation (Figure 9). Likelihood of harm is lower in most of the northern and extreme southern portions of SJRWMD, including all of Nassau, Baker, Duval, Clay, Alachua, Putnam, St. Johns, Indian River, and Okeechobee counties. Most of the remainder of SJRWMD is identified as experiencing high likelihood of harm to lakes regionally. The areas showing the highest densities of high likelihood of harm to lakes occur along major landscape ridges throughout SJRWMD. These include the Atlantic Coastal Ridge in Volusia County, the DeLand Ridge in northwestern and central Volusia County, the Groveland Karst and Lake Wales Ridge regions of central and south Lake County, the Apopka Uplands and the Orlando Promontory of western Orange County, and the Casselberry-Oviedo-Geneva-Chuluota Hills region of west-central Seminole County.

SJRWMD has identified areas with a higher likelihood of harm to lakes, areas where projected changes in the elevation of the potentiometric surface of the Floridan aquifer system would contribute to this condition (declines ≥0.5 ft), and areas served by public supply utilities with projected groundwater withdrawals that will contribute to these projected declines to be in PWRCAs (Figure 9).

**Impacts to Springs.** SJRWMD used four regional groundwater flow models (the NEF, NCF, ECF, and Volusia models) to evaluate the potential impacts of 2025 projected increases in Floridan aquifer withdrawals on discharges from 35 springs or spring groups (Table 16). Groundwater modeling results indicate that four springs (Apopka Spring, Blue Spring in Lake County, Holiday Springs, and Gemini Springs) would experience flow reductions greater than 15% if the proposed 2025 increases in groundwater withdrawals were realized (Figure 10, Table 16). These springs are located in Lake and

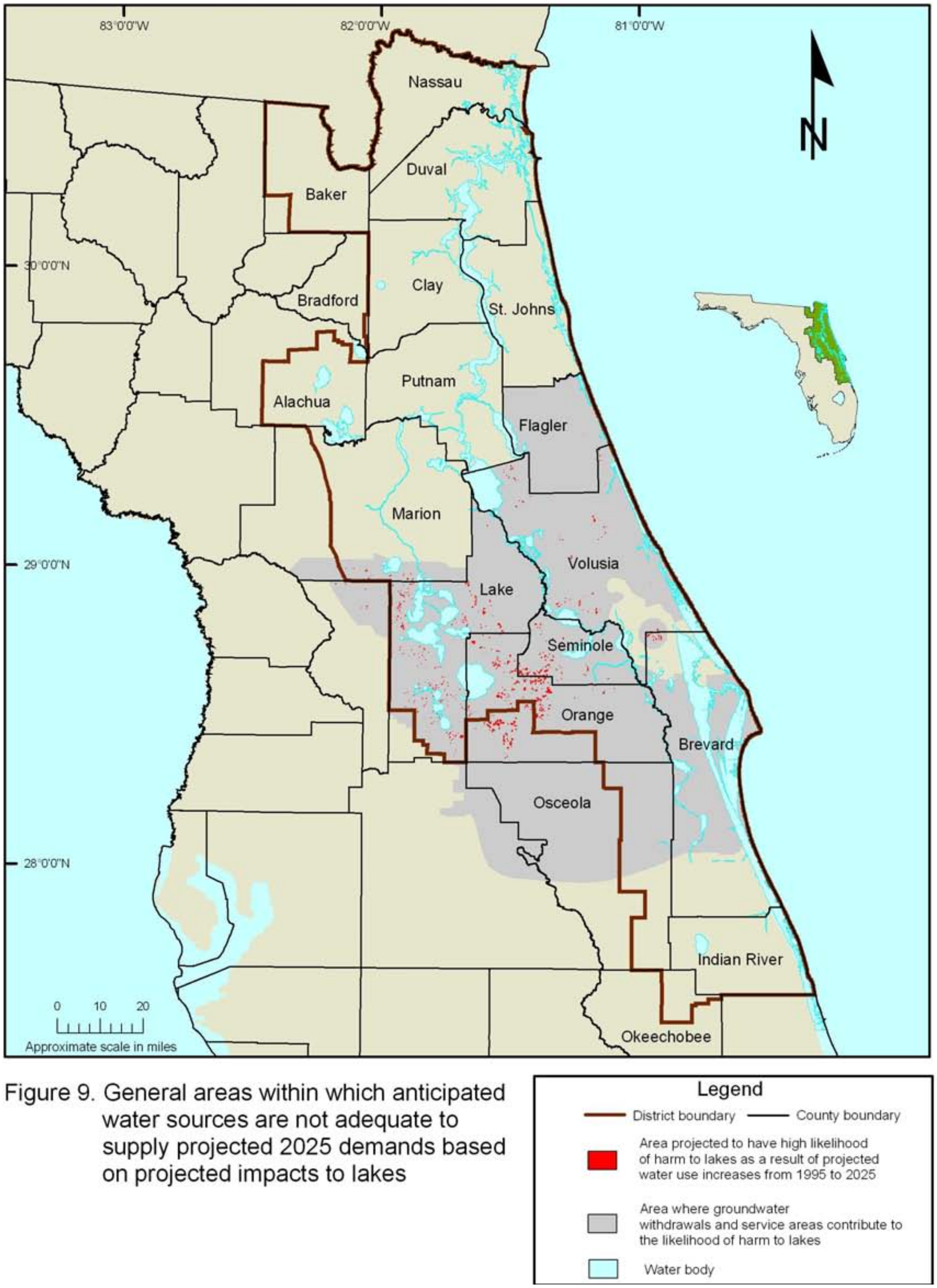



Figure 9. General areas within which anticipated water sources are not adequate to supply projected 2025 demands based on projected impacts to lakes

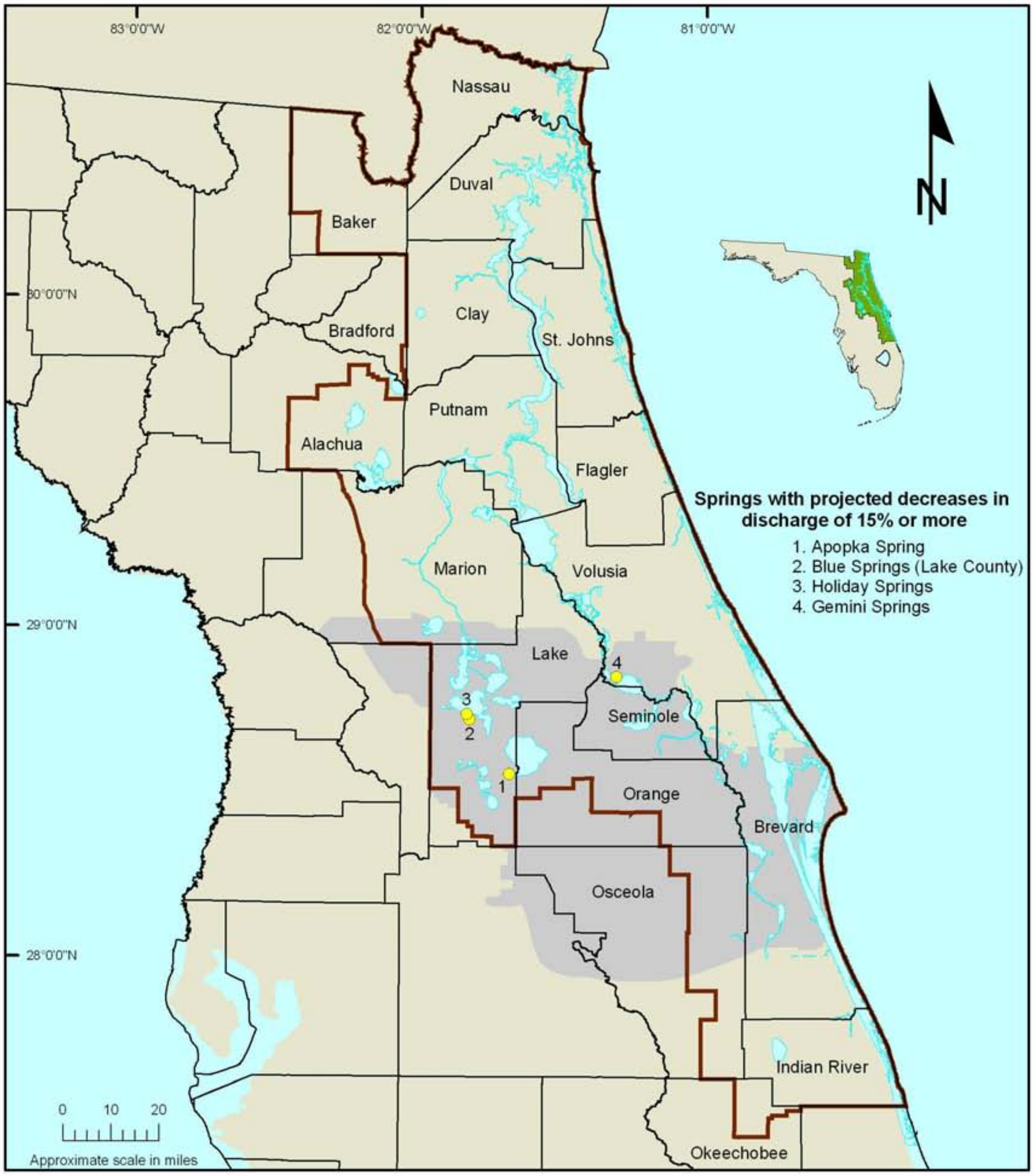
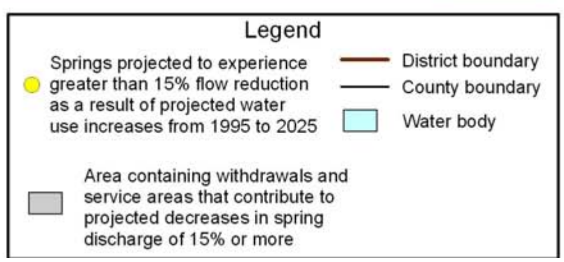



Figure 10. General areas within which anticipated water sources are not adequate to supply projected 2025 demands based on projected impacts to springs



Volusia counties. Additionally, 12 springs would be at the screening flow based upon proposed 2025 groundwater withdrawals (Table 16).

SJRWMD has identified springs with projected decreases in discharge of greater than 15%, areas where projected changes in the elevation of the potentiometric surface of the Floridan aquifer system would contribute to this condition (declines $\geq$0.5 ft), and areas served by public supply utilities with projected groundwater withdrawals that will contribute to these projected declines to be in PWRCAs (Figure 10).

**Impacts to Minimum Flows and Levels.** Based on projected declines in groundwater levels, SJRWMD has identified areas where projected 2025 flows and / or levels will be less than minimum flows and / or levels for springs and lakes contained in Chapter 40C-8, *F.A.C.* (Appendixes C and E).

- **Springs.** Proposed increases in groundwater withdrawals are projected to result in water resource conditions that are likely to cause the discharge of Starbuck Spring to fall below the minimum discharge set forth in Chapter 40C-8, *F.A.C.*

  SJRWMD has identified the area in the immediate vicinity of Starbuck Spring, areas where projected changes in the elevation of the potentiometric surface of the Floridan aquifer system would contribute to this condition (declines $\geq$0.5 ft), and areas served by public supply utilities with projected groundwater withdrawals that will contribute to these projected declines to be in PWRCAs (Figure 11).

- **Lakes, Rivers, and Wetlands**. SJRWMD model simulations indicate that projected increases in groundwater withdrawals, if they occur, would result in water resource conditions that are likely to cause 14 lakes to fall below their established MFLs (Figure 12). These lakes include Apshawa North, Apshawa South, Big, Brantley, Cherry, Cow Pond, Davis, Emporia, Louisa, Lower Louise, Minneola, Prevatt, Sylvan, and Upper Louise. Only one of these lakes, Lower Lake Louise in Volusia County, is currently not meeting established MFLs.

  SJRWMD has identified areas where lakes are below or are projected to fall below established MFLs, areas where projected changes in the elevation of the potentiometric surface of the Floridan aquifer system

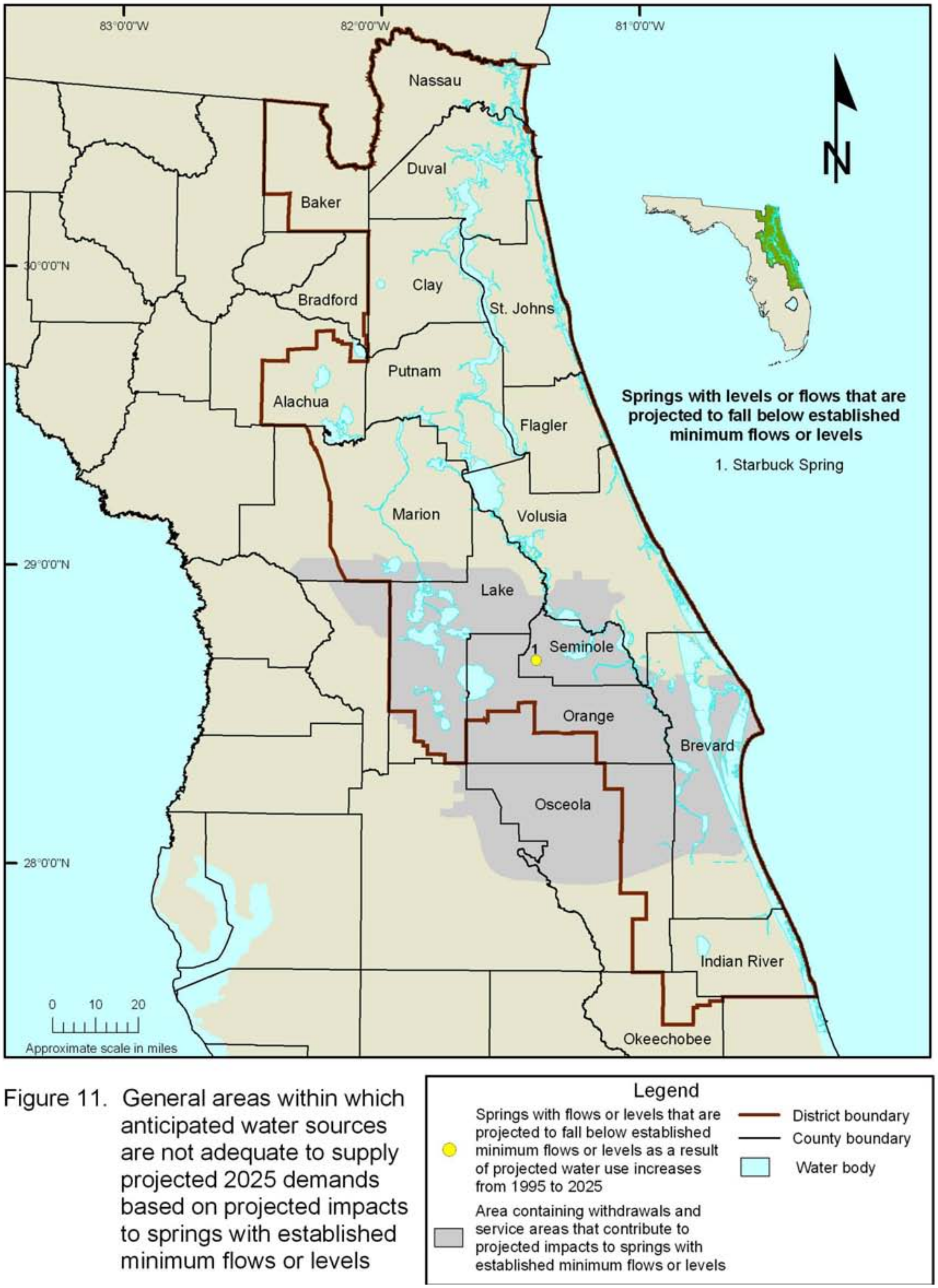



Figure 11. General areas within which anticipated water sources are not adequate to supply projected 2025 demands based on projected impacts to springs with established minimum flows or levels

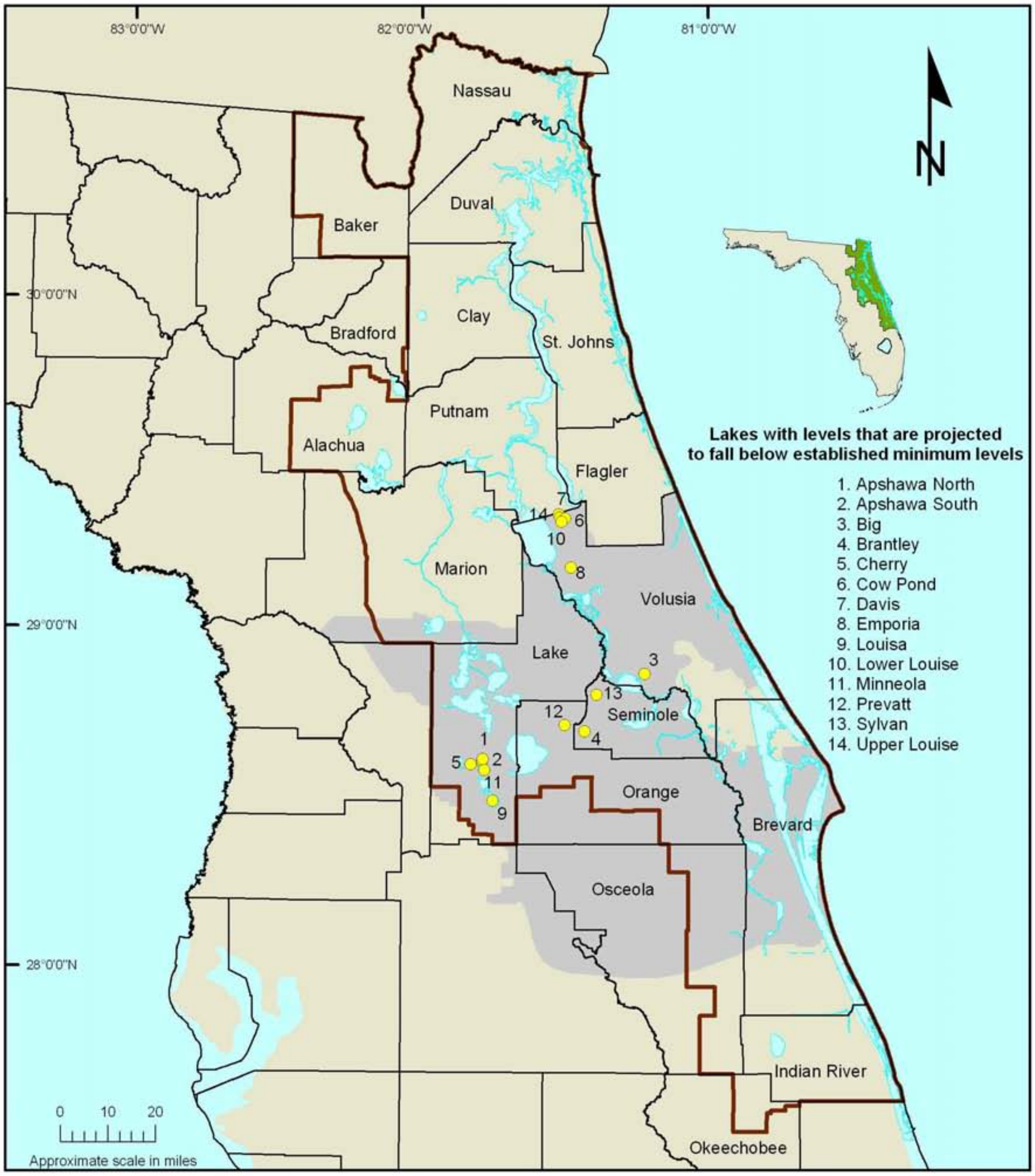
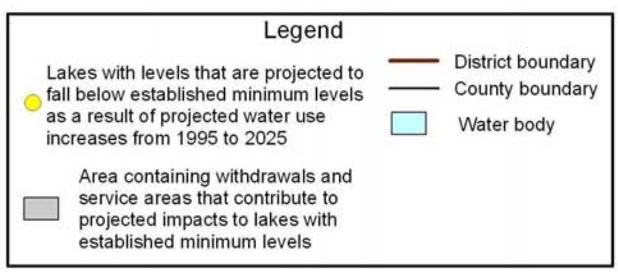



Figure 12. General areas within which anticipated water sources are not adequate to supply projected 2025 demands based on projected impacts to lakes with established minimum levels



would contribute to this condition (declines ≥0.5 ft), and areas served by public supply utilities with projected groundwater withdrawals that will contribute to these projected declines to be in PWRCAs (Figure 12).

**Results: Impacts to Groundwater Quality (Saltwater Intrusion)**

Areas of SJRWMD with the highest likelihood of unacceptable impacts to groundwater quality due to projected groundwater withdrawals include 12 public supply wellfields and their associated public-supply service areas. These wellfields and service areas are located in Brevard, Flagler, Seminole, and Volusia counties (Figure 13).

SJRWMD has identified public supply wellfields and their associated public-supply service areas with the highest likelihood of experiencing unacceptable impacts to groundwater quality due to projected groundwater withdrawals to be PWRCAs (Figure 13).

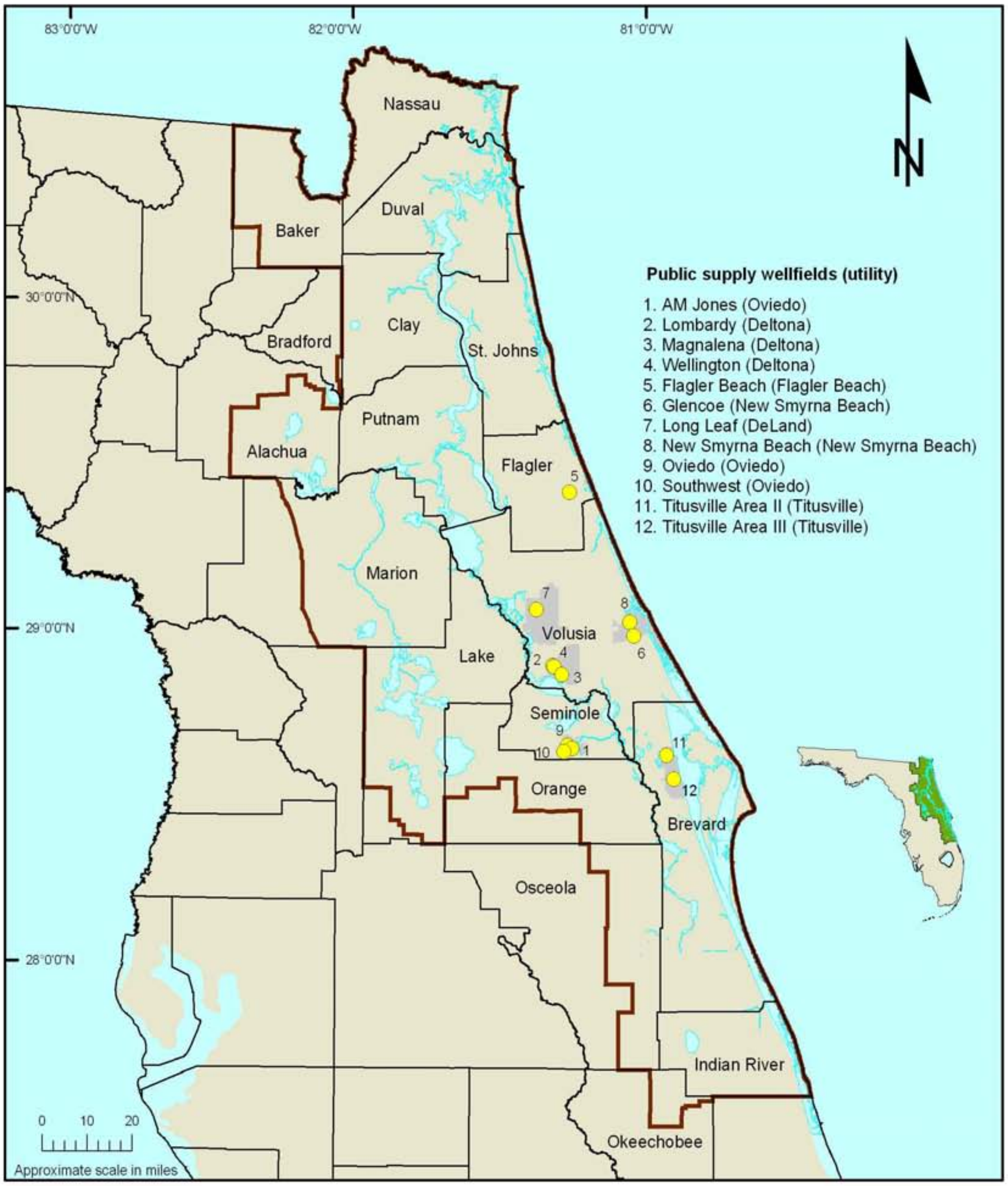



Figure 13. General areas within which anticipated water sources are not adequate to supply projected 2025 demands based on projected impacts to groundwater quality

Legend

- Public supply wellfields projected to have the greatest likelihood of unacceptable impacts to groundwater quality as a result of projected water use increases from 1995 to 2025
- Service areas that contribute to the likelihood of unacceptable impacts to groundwater quality
- District boundary
- County boundary
- Water body

# CONCLUSIONS AND RECOMMENDATIONS

## PROJECTED 2025 WATER RESOURCE CONDITIONS

Water use is expected to increase by 422.29 mgd, from 1,363.65 to 1,785.94 mgd, between 1995 and 2025. Of this projected increase, 90% is for public supply use. SJRWMD performed assessments to determine the impacts of projected 2025 water use on groundwater and surface water resources. If the current water supply plans of major water users were implemented, the elevation of the potentiometric surface of the Floridan aquifer system would decline regionally in response to the cumulative withdrawals of water from the Floridan aquifer system. In response to these declines in the elevation of the potentiometric surface and in response to withdrawals from the intermediate and surficial aquifer systems, the water levels in the surficial aquifer system would decline and contribute to unacceptable impacts to water resources and related natural systems in all or parts of Brevard, Flagler, Marion, Lake, Orange, Seminole, and Volusia counties.

The accuracy of the assessments of these impacts can be improved through use of improved groundwater models and other assessment techniques. Improved groundwater models are currently being developed by SJRWMD. SJRWMD plans to continue to refine the groundwater flow models and will use these models to assist in the development of updated assessments of the hydrologic impacts of projected water use. These updated impact assessments will be used in the development of water supply plans, which will focus on priority water resource caution areas identified in future water supply assessments.

## PRIORITY WATER RESOURCE CAUTION AREAS

SJRWMD has identified PWRCAs based on a comparison of water resource constraints to the results of assessments of hydrologic impacts due to projected 2025 water use. These are areas within which anticipated sources of water and conservation efforts would not be adequate to supply water for all existing uses and reasonably anticipated future needs and to sustain the water resources and related natural systems through 2025 if the water supply plans of major users were implemented. Within these identified PWRCAs, the impacts of current or projected water use exceed the water resource constraints for natural systems and/or groundwater quality.

With the exception of areas associated with unacceptable impacts to groundwater quality, SJRWMD's designated PWRCAs include

- Areas likely to experience unacceptable impacts as a result of projected water withdrawals for all water resource constraint categories
- Public supply service areas associated with the projected water withdrawals, which are projected to contribute to the unacceptable impacts
- Areas where groundwater withdrawals are expected to result in declines in the elevation of the potentiometric surface of the Floridan aquifer that contribute to the unacceptable impacts

Projected declines in the elevation of the potentiometric surface of the Floridan aquifer of generally greater than or equal to 0.5 ft are used to describe the outer limit of the area where cumulative groundwater withdrawals contribute to projected unacceptable impacts. Use of this 0.5-ft limit results in the identification of an area of contribution that is somewhat smaller than the true area of contribution. In reality, groundwater withdrawals occurring anywhere within the area of projected decline in the potentiometric surface of the Floridan aquifer will contribute to the projected decline and, therefore, to the projected impacts. However, including the entire area of projected decline would result in including large areas within which withdrawals probably contribute insignificantly to the projected decline and associated projected impacts. The 0.5-ft limit was chosen to represent the outer limit of the area that most likely contributes significantly to the decline and associated impacts, and is based on best professional judgment. In some cases, slight deviations from the 0.5-ft limit were considered appropriate and were incorporated because of a desire to follow political or other significant geographic boundaries.

In the case of unacceptable impacts to groundwater quality, public supply wellfields and associated public supply service areas with the highest likelihood of experiencing unacceptable impacts to groundwater quality (saltwater intrusion) are included in the designation of PWRCAs.

These PWRCAs cover nearly 39% of SJRWMD and include all or parts of Brevard, Flagler, Lake, Marion, Orange, Osceola, Seminole, and Volusia counties. PWRCA boundaries described in WSA 2003 include areas that were not within the 1998 boundaries: portions of Brevard, Flagler, Marion, and Volusia counties. These areas are identified based on projected impacts to natural systems. Based on projected 2025 groundwater withdrawals, newly designated PWRCAs within Flagler, Marion, and Volusia counties are anticipated to experience unacceptable impacts to native vegetation and lakes. Additionally, it is anticipated that newly designated PWRCAs in Marion and Volusia counties are likely to contribute to declines in spring discharge and/or lake levels below established minimum flows and levels. Newly designated PWRCAs within Brevard, Flagler County are also anticipated to experience unacceptable increases in chloride concentrations.

PWRCAs described in WSA 1998 that are no longer designated as a PWRCA in WSA 2003 include portions of Duval, northeast Putnam, St. Johns, and southern Volusia counties. The PWRCA designation has been removed in Duval, northeast Putnam, and St. Johns counties for reasons described in the Water Supply Planning Accomplishments section of this document. Southern Volusia County is no longer included in a PWRCA due to refinements in the methodology used to delineate the PWRCAs. Areas included in the 1998 PWRCA for which an authorized plan to address potential unacceptable impacts was identified during the WSA 2003 process include southern Duval County and portions of St. Johns County.

Changes in projected quantities and locations of 2025 groundwater and surface water withdrawals can change the boundaries of the PWRCAs. Therefore, areas located outside of the identified PWRCAs should not be assumed to be able to support future groundwater and surface water withdrawals without resulting in unacceptable water resource conditions.

Projected 2025 water use in areas to the south and west of the SJRWMD boundary, in SFWMD and SWFWMD, respectively, would contribute to the anticipated unacceptable water resource conditions if the plans of major water users were implemented. SJRWMD is coordinating closely with SFWMD and SWFWMD concerning this matter, based on the provisions of a memorandum of understanding entered into by the three water management districts.

The SJRWMD 2005 water supply plan development process should focus on identifying strategy that will assure that adequate and sustainable water supply is available to meet projected future water supply needs without unacceptable impacts in the east-central Florida area including all or parts of Brevard, Flagler, Lake, Marion, Orange, Osceola, and Seminole counties.

## RECOMMENDED ADDITIONAL DATA COLLECTION AND WATER RESOURCE INVESTIGATIONS

Based on the results of the water use, groundwater, and surface water assessments, and as a result of the coordination process, SJRWMD identified data collection and water resource investigation needs that will support more accurate identification of PWRCAs in future water supply assessments. These needs include

- Reclaimed water availability (assessing where reclaimed water is currently being applied and can potentially be applied in the future)
- Improved golf course water use data
- Agricultural crop acreage trend data for specific crops and counties
- Development and implementation of a new AFSIRS crop model
- Transient groundwater model development
- Groundwater quality monitoring network expansion
- Improved groundwater quality data collection and compilation from all available sources (CUPs, USGS, SJRWMD, etc.)
- Residential irrigation investigations

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# APPENDIX A—ST. JOHNS RIVER WATER MANAGEMENT DISTRICT PUBLIC SUPPLY UTILITIES: YEAR 2025 GROSS PER CAPITA VALUES AND PERCENT OF CUP-ALLOCATED WATER USE BY CATEGORY

| Utility Name | Gross per Capita* (gpd) | Household** (%) | Commercial Industrial (%) | Irrigation*** (%) | Water Utility (%) | Unaccounted Use (%) |
|---|---|---|---|---|---|---|
| Alachua County | | | | | | |
| Gainesville Regional Utilities | 151.49 | 63.0 | 31.5 | | 5.5 | |
| Hawthorne, City of | 139.51 | 91.7 | 3.3 | 0.9 | 4.1 | |
| Kincaid Hills | 131.01 | 80.0 | | 7.0 | 13.0 | |
| Baker County | | | | | | |
| Macclenny, City of | 184.49 | 90.0 | | | 10.0 | |
| Brevard County | | | | | | |
| Brevard County Utilities —Barefoot Bay | 50.63 | 100.0 | | | | |
| Brevard County Utilities —North Brevard System | 108.81 | 100.0 | | | | |
| Cocoa, City of | 153.49 | 39.0 | 61.0 | | | |
| Melbourne, City of | 124.15 | 84.9 | 3.4 | | 4.0 | 7.6 |
| Palm Bay, City of | 67.25 | 63.0 | 15.0 | | 20.0 | 2.0 |
| Titusville, City of | 90.13 | 80.5 | 7.3 | 0.5 | 11.8 | |
| Clay County | | | | | | |
| Clay County Utility Authority —Fleming/Pace† | 127.49 | 98.0 | | | 2.0 | |
| Clay County Utility Authority —Keystone Heights | 94.01 | 87.1‡ | | | 12.9‡ | |
| Clay County Utility Authority —Mid-Clay† | 127.49 | 95.3 | | | 4.7 | |
| Clay County Utility Authority —Orange Park Grid† | 127.49 | 99.0 | | | | 1.0 |
| Clay County Utility Authority —Orange Park South Grid† | 127.49 | 95.0 | | | 5.0 | |
| Clay County Utility Authority —Pier Station† | 127.49 | 87.0 | | | 13.0 | |
| Clay County Utility Authority —Postmaster Village | 94.01 | 93.0 | | | 7.0 | |
| Clay County Utility Authority —Spencers Crossing† | 127.49 | 94.0 | | | 6.0 | |
| Clay County Utility Authority —The Ravines† | 127.49 | 95.0 | | | 5.0 | |
| Green Cove Springs, City of | 238.92 | 48.2 | 42.7 | | 9.1 | |
| Orange Park, Town of | 169.38 | 91.2 | | | 8.8 | |
| Duval County | | | | | | |
| Atlantic Beach, City of | 137.81 | 87.0 | | | 13.0 | |
| Baldwin, Town of | 89.38 | 92.0 | | | 8.0 | |
| Jacksonville Beach, City of | 159.88 | 78.0 | | | 5.0 | 17.0 |
| JEA—Arlington Service Area† | 131.44 | 86.1 | | | | 13.9 |
| JEA—Beacon Hills, Cobbleston, Woodmere | 151.19 | 91.5 | | | | 8.5 |

| Utility Name | Gross per Capita* (gpd) | Household** (%) | Commercial Industrial (%) | Irrigation*** (%) | Water Utility (%) | Unaccounted Use (%) |
|---|---|---|---|---|---|---|
| JEA—Hyde Grove† | 131.44 | 82.0 | | | 18.0 | |
| JEA—Jacksonville Heights† | 131.44 | 88.0 | | | 12.0 | |
| JEA—Lake Forest† | 131.44 | 73.0 | | | 27.0 | |
| JEA—Magnolia Gardens† | 131.44 | 83.0 | | | 17.0 | |
| JEA—Monument Road† | 131.44 | 90.0 | | | 10.0 | |
| JEA—North Grid | 143.64 | 90.0 | | | 10.0 | |
| JEA—Ortega Hills† | 131.44 | 83.8 | | | | 16.2 |
| JEA —San Jose & Royal Lakes† | 131.44 | 90.0 | | | | 10.0 |
| JEA—San Pablo/Marshview† | 131.44 | 86.0 | | | 14.0 | |
| JEA—South Grid | 163.48 | 90.0 | | | 10.0 | |
| JEA—Venetia Terrace† | 131.44 | 88.0 | | | 12.0 | |
| Neptune Beach, City of | 184.34 | 93.9 | | | 6.1 | |
| Normandy Village Utility Co. | 121.53 | 93.5 | | | | 6.5 |
| Flagler County | | | | | | |
| Bunnell, City of | 124.33 | 48.6 | 40.5 | 1.4 | 9.5 | |
| Flagler Beach, City of | 144.02 | 92.0 | | | 8.0 | |
| Palm Coast, City of | 130.66 | 65.0 | 5.0 | 9.0 | 18.0 | 3.0 |
| Indian River County | | | | | | |
| Fellsmere, City of | 79.81 | 71.9 | 6.0 | | 19.5 | 2.6 |
| Indian River County | 101.29 | 59.8 | 20.7 | | 19.5 | |
| Vero Beach, City of | 266.95 | 57.0 | 24.5 | 3.4 | 8.9 | 6.2 |
| Lake County | | | | | | |
| Aquasource Utility Inc. —Kings Cove Subdivision | 184.00 | 88.5 | | 1.5 | 10.0 | |
| Astor—Astor Park Water Association | 117.35 | 84.0 | 9.0 | 7.0 | | |
| Chateau Land Development —Orange Lake MHP | 216.68 | 77.0 | | 3.0 | 1.0 | 19.0 |
| Clerbrook RV and Golf Resort | 465.36 | 61.0 | 16.0 | 19.0 | | 4.0 |
| Clermont, City of | 246.29 | 75.0 | | 17.0 | 8.0 | |
| Eustis, City of | 128.36 | 78.1 | 19.6 | | 1.3 | 0.6 |
| Fruitland Park, City of | 237.41 | 83.3 | 6.2 | 2.4 | 8.2 | |
| FWS —Silver Lakes/Western Shores | 265.64 | 77.3 | 1.4 | | 21.3 | |
| FWS—Valencia Terrace | 201.88 | 76.0 | | | 24.0 | |
| Groveland, City of | 150.61 | 79.0 | 14.0 | 2.0 | 5.0 | |
| Groveland, City of—Palisades | 305.11 | 52.0 | 32.0 | | 6.0 | 10.0 |
| Harbor Hills Utilities | 882.49 | 49.0 | 32.0 | 7.0 | 3.0 | 9.0 |
| Hawthorne at Leesburg | 276.65 | 73.3 | 15.9 | 9.2 | 1.6 | |
| Howey in the Hills, Town of | 221.14 | 75.0 | 6.5 | 8.5 | 10.0 | |
| Lady Lake, Town of | 110.83 | 89.0 | 4.5 | 1.5 | 5.0 | 0.0 |
| Leesburg, City of | 238.84 | 58.3 | 41.8 | 1.5 | 0.6 | –2.2 |
| Mascotte, City of | 121.28 | 94.2 | | | 5.8 | |
| Mid Florida Lakes MHP | 225.67 | 86.0 | 8.0 | 1.0 | 5.0 | |
| Minneola, City of | 147.60 | 74.0 | 13.0 | | 13.0 | |
| Montverde, Town of | 167.11 | 70.0 | 27.0 | | | 3.0 |
| Mount Dora, City of | 211.24 | 80.0 | 11.0 | 2.0 | 3.0 | 4.0 |
| Oak Springs MHP | 270.52 | 87.0 | | 4.0 | 5.0 | 4.0 |
| Pennebrook Utilities Inc. | 423.70 | 100.0 | | | | |
| Southlake Utilities Inc. | 673.10 | 99.0 | | | | 1.0 |

| Utility Name | Gross per Capita* (gpd) | Household** (%) | Commercial Industrial (%) | Irrigation*** (%) | Water Utility (%) | Unaccounted Use (%) |
|---|---|---|---|---|---|---|
| Sunlake Estates | 882.31 | 55.3 | | 39.0 | 5.7 | |
| Tavares, City of | 183.90 | 82.0 | 10.0 | 2.5 | 5.5 | |
| UIF—Lake Groves | 270.13 | 91.4 | 1.6 | 7.0 | | |
| UIF—Lake Utility Services Inc. | 199.99 | 80.8 | 5.3 | 3.9 | 4.2 | 5.8 |
| Umatilla, City of | 172.98 | 69.5 | 24.1 | 0.4 | | 6.0 |
| Villages of Lake-Sumter | 254.86 | 80.9 | 4.0 | 7.3 | 7.8 | |
| Water Oak Country Club Estates | 337.58 | 82.2 | 1.7 | 2.6 | 2.5 | 11.0 |
| Wedgewood Homeowners Assoc Inc | 347.40 | 84.0 | | 5.6 | 5.2 | 5.2 |
| Marion County | | | | | | |
| Aquasource Utility Inc. | 115.53 | 100.0 | | | | |
| Marion County Utilities —Silver Springs | 156.76 | 73.0 | 22.0 | | 5.0 | |
| Marion County Utilities —Spruce Creek Golf & Country Club | 735.95 | 77.9 | 16.9 | | 0.2 | 5.0 |
| Marion County Utilities —Spruce Creek South | 444.80 | 74.0 | 10.2 | 3.6 | 3.1 | 9.1 |
| Marion County Utilities — Stonecrest | 443.42 | 41.0 | 14.0 | 40.0 | 4.0 | 1.0 |
| Marion Utilities Inc. —Greenfields† | 168.10 | 100.0 | | | | |
| Marion Utilities Inc. —Turning Pointe† | 149.05 | 100.0 | | | | |
| Ocala East Villas | 368.70 | 55.0 | | 45.0 | | |
| Ocala, City of | 158.92 | 48.7 | 40.3 | | 11.0 | |
| Sunshine Utilities —Fore Oaks† | 430.79 | 96.0 | | | 4.0 | |
| Sunshine Utilities —Whispering Sands† | 430.79 | 93.0 | | | 7.0 | |
| Nassau County | | | | | | |
| Fernandina Beach, City of | 256.36 | 87.0 | | | 3.0 | 10.0 |
| JEA—Nassau Regional | 255.36 | 92.0 | | | 8.0 | |
| Nassau County —Amelia Island | 378.57 | 94.5 | | | 0.5 | 5.0 |
| Orange County | | | | | | |
| Apopka, City of | 210.79 | 80.0 | 11.0 | | 9.0 | |
| Eatonville, Town of | 201.20 | 51.0 | 40.0 | | 9.0 | |
| Maitland, City of | 302.93 | 57.0 | 25.0 | 8.0 | 1.0 | 9.0 |
| Oakland, Town of | 151.96 | 74.4 | 14.2 | 1.9 | 4.0 | 5.5 |
| Ocoee, City of | 200.00 | 69.0 | 20.0 | | 11.0 | |
| Orange County Utilities —East Service Area† | 186.35 | 72.6 | 18.2 | | 0.1 | 9.1 |
| Orange County Utilities —West Service Area† | 186.35 | 80.0 | 9.2 | | 0.2 | 10.6 |
| Orlando Utilities Commission | 228.59 | 52.8 | 39.1 | | 1.0 | 7.1 |
| Rock Springs MHP | 189.09 | 86.8 | | 10.3 | | 2.9 |
| Shadow Hills Association | 94.81 | 92.0 | 0.5 | 5.5 | | 2.0 |
| UIF—Wedgefield | 134.02 | 95.4 | 3.3 | | 1.3 | |
| Winter Garden, City of | 123.79 | 80.0 | 15.0 | 0.0 | 5.0 | |
| Winter Park, City of | 209.20 | 66.5 | 23.5 | 1.0 | 9.0 | |
| Zellwood Station Utilities | 361.18 | 100.0 | | | | |

| Utility Name | Gross per Capita* (gpd) | Household** (%) | Commercial Industrial (%) | Irrigation*** (%) | Water Utility (%) | Unaccounted Use (%) |
|---|---|---|---|---|---|---|
| Zellwood Water Association | 178.43 | 100.0 | | | | |
| Putnam County | | | | | | |
| Crescent City | 179.73 | 79.0 | 12.5 | | 2.4 | 6.1 |
| Palatka, City of | 252.21 | 59.0 | 12.6 | 15.2 | 13.2 | |
| Seminole County | | | | | | |
| Altamonte Springs, City of | 138.32 | 51.0 | 16.0 | 28.0 | | 5.0 |
| Casselberry, City of | 132.27 | 88.3 | | | 11.7 | |
| FWS—Apple Valley | 184.65 | 83.0 | 3.0 | 1.0 | 13.0 | |
| FWS—Chuluota | 97.81 | 87.0 | 1.0 | | 4.0 | 8.0 |
| FWS—Druid Hills | 184.95 | 77.0 | 17.0 | | 1.0 | 5.0 |
| FWS—Meredith Manor | 233.24 | 69.0 | 9.0 | | 7.0 | 15.0 |
| Lake Mary, City of | 257.56 | 42.0 | 48.0 | 1.0 | 9.0 | |
| Longwood, City of | 149.29 | 78.9 | 13.9 | 2.0 | | 5.2 |
| Oviedo, City of | 158.78 | 78.0 | 13.0 | 2.0 | 7.0 | |
| Palm Valley MHP | 193.96 | 82.4 | 8.2 | 0.2 | 9.2 | |
| Sanford, City of | 146.30 | 70.0 | 13.0 | 5.0 | 2.0 | 10.0 |
| Seminole County —Greenwood Lakes/Country Club | 151.47 | 72.0 | | 15.0 | 5.0 | 8.0 |
| Seminole County —Hanover/Heathrow/Monroe | 381.34 | 85.0 | 6.0 | | 9.0 | |
| Seminole County —Lynwood/Belaire | 143.83 | 76.0 | 13.0 | | 3.0 | 8.0 |
| Seminole County —South Central | 210.87 | 81.0 | 10.0 | | 9.0 | |
| UIF—Oakland Shores | 313.87 | 94.0 | | | 6.0 | |
| UIF—Ravenna Park | 102.64 | 85.0 | 4.0 | | 11.0 | |
| UIF—Sanlando Utilities Corp. | 282.63 | 82.0 | 5.0 | 7.0 | | 6.0 |
| UIF—Weathersfield | 112.27 | 90.0 | | | 10.0 | |
| Winter Springs, City of | 138.36 | 70.0 | 24.0 | | 3.0 | 3.0 |
| St. Johns County | | | | | | |
| Intercoastal Utilities Inc | 264.62 | 85.2 | | | 7.0 | 7.8 |
| JEA—Julington Creek | 143.73 | 95.0 | | | 5.0 | |
| JEA—Ponce de Leon/Pirates Landing† | 153.91 | 95.0 | | | 5.0 | |
| JEA—Ponte Vedra† | 153.91 | 70.0 | 25.0 | 5.0 | | |
| JEA—St Johns Forest† | 153.91 | 90.0 | | | 10.0 | |
| JEA —St Johns North Service Area† | 153.91 | 90.0 | | | 10.0 | |
| North Beach Utilities Inc | 130.70 | 88.0 | | | 10.0 | 2.0 |
| St. Augustine, City of | 83.57 | 90.0 | | | 10.0 | |
| St Johns Service Company, Inc—Inlet Beach | 199.61 | 96.4 | | | 3.6 | |
| St. Johns County Utilities —Northwest | 135.14 | 91.0 | | 4.0 | 5.0 | |
| St. Johns County Utilities— (1) Historic population-gpd (2) Future population-gpd Tillman Ridge | (1) 127.93 (2) 142.15 | 82.0 | 12.0 | | 6.0 | |
| Volusia County | | | | | | |
| Daytona Beach, City of | 148.46 | 100.0 | | | | |
| Deland, City of | 109.61 | 75.5 | 14.0 | 0.5 | 10.0 | |

| Utility Name | Gross per Capita* (gpd) | Household** (%) | Commercial Industrial (%) | Irrigation*** (%) | Water Utility (%) | Unaccounted Use (%) |
|---|---|---|---|---|---|---|
| Deltona, City of —Deltona Lakes | 168.96 | 90.0 | | | 10.0 | |
| Edgewater, City of | 96.00 | 81.0 | 2.0 | 1.0 | 6.0 | 10.0 |
| Holly Hill, City of | 100.06 | 55.6 | 27.8 | | 6.6 | 10.0 |
| Lake Beresford Water Association | 143.70 | 83.0 | 7.0 | | 10.0 | |
| Lake Helen, City of | 121.00 | 76.0 | 6.0 | | 11.0 | 7.0 |
| New Smyrna Beach, City of | 171.47 | 61.4 | 27.1 | | 5.1 | 6.5 |
| Orange City | 130.74 | 41.8 | 40.3 | 13.4 | 4.5 | |
| Ormond Beach, City of | 128.98 | | | 46.5 | | 53.5 |
| Pierson, Town of | 52.18 | 87.0 | 12.0 | | 1.0 | |
| Port Orange, City of | 98.49 | 62.4 | 18.7 | 11.5 | 1.1 | 6.2 |
| Volusia County—Cassadaga† | 153.52 | 90.0 | | | 5.0 | 5.0 |
| Volusia County —Deltona North† | 153.52 | 85.0 | 5.0 | | 5.0 | 5.0 |
| Volusia County —Golden Bay Colony† | 153.52 | 100.0 | | | | |
| Volusia County—Halifax† | 153.52 | 75.0 | | | | 25.0 |
| Volusia County—Southeast† | 153.52 | 90.0 | | | 5.0 | 5.0 |
| Volusia County—Southwest† | 153.52 | 90.0 | | | 5.0 | 5.0 |
| Volusia County —Spruce Creek† | 153.52 | 75.0 | | | 20.0 | 5.0 |

*Gross per capita is NOT strictly a residential per capita. All water use types served by the utility are included (e.g., commercial, industrial, residential). This is the gross per capita for year 2025.
** Household (%) includes residential customer irrigation
*** Irrigation (%) does not include residential customer irrigation
†Gross per capita value represents the utility as a whole
‡An unknown portion of each of the use types straddled contributes to the percent listed
Note: Blank cells indicate no water use in this category

The percent water use by category was obtained from information provided in the CUP, technical staff report. The most current percent water use by category may not be reflected for permits that are pending.

# APPENDIX B—ST. JOHNS RIVER WATER MANAGEMENT DISTRICT WASTEWATER/REUSE CAPACITIES AND FLOWS, BY COUNTY*

| County | Total Plant | | Reuse | | |
|---|---|---|---|---|---|
| | Capacity (mgd) | Flow (mgd) | Capacity (mgd) | Flow (mgd) | |
| | | | | SJRWMD (preferred) | FDEP |
| Alachua | 20.65 | 16.21 | 25.84 | 1.79 | 9.66 |
| Baker | 0.64 | 0.52 | 0.25 | 0.00 | 0.56 |
| Brevard | 63.21 | 36.28 | 38.40 | 14.95 | 17.11 |
| Clay | 13.24 | 7.09 | 2.15 | 0.91 | 0.99 |
| Duval | 120.57 | 84.05 | 10.33 | 4.76 | 5.05 |
| Flagler | 11.46 | 5.54 | 10.89 | 3.68 | 4.77 |
| Indian River | 10.56 | 7.37 | 11.67 | 5.81 | 7.37 |
| Lake | 16.60 | 11.18 | 15.26 | 1.06 | 9.84 |
| Marion | 12.43 | 7.69 | 15.10 | 1.73 | 7.98 |
| Nassau | 5.10 | 3.05 | 1.14 | 0.61 | 1.01 |
| Orange | 35.45 | 21.95 | 30.56 | 13.83 | 20.65 |
| Putnam | 3.25 | 2.62 | 0.03 | 0.03 | 0.03 |
| St. Johns | 15.92 | 8.95 | 11.18 | 3.01 | 3.70 |
| Seminole | 77.21 | 49.02 | 71.35 | 28.63 | 38.51 |
| Volusia | 61.89 | 33.48 | 26.95 | 15.54 | 17.12 |
| Totals | 468.17 | 294.99 | 271.10 | 96.34 | 144.35 |

mgd =million gallons per day
FDEP =Florida Department of Environmental Protection
SJRMWD =St. Johns River Water Management District

*Data represent values for the year 2000

NOTE: The FDEP regards several applications of reclaimed water as reuse that the SJRWMD does not. Therefore, it is common for SJRWMD's reuse quantity to be lower than the FDEP's for a given facility. Specifically, SJRWMD excludes absorption fields and underground injection and many instances of rapid infiltration basins, surface water augmentation, other crops (nonedible) irrigation, and artificial wetlands. SJRWMD requires the application to be beneficial in order to qualify as reuse. Beneficial reuse must take the place of an existing or potential use of higher quality water. If water is applied to grow useful crops, restore or maintain wetlands, or effectively recharge a useable aquifer, if is considered to be reuse. An application that does not meet any of these criteria is considered by SJRWMD to be disposal.

# APPENDIX C—ST. JOHNS RIVER WATER MANAGEMENT DISTRICT, CHAPTER 40C-8, *F.A.C.*, MINIMUM FLOWS AND LEVELS

(Revised May 11, 2003)

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
MINIMUM FLOWS AND LEVELS



**40C-8.011 Policy and Purpose.**

(1) This chapter establishes minimum flows and levels for surface watercourses and minimum levels for groundwater at specific locations within the St. Johns River Water Management District.

(2) Where appropriate, minimum flows and levels may reflect seasonal and long-term variations and may include a schedule of variations and other measures appropriate for the protection of nonconsumptive uses of a water resource.

(3) In establishing minimum flows and levels, the Governing Board shall use the best information and methods available to establish limits that prevent significant harm to the water resources or ecology. The Governing Board will also consider, and at its discretion provide for, the protection of nonconsumptive uses, including navigation, recreation, fish and wildlife habitat, and other natural resources.

(4) Where a minimum flow has been established for a specific watercourse or a minimum level has been established for a specific surface water body, the flow or level is expressed as a fluctuation regime which will include a series of minimum flows or levels reflecting a temporal hydrologic regime that will prevent significant harm to water resources or ecology.

(5) Minimum flows and levels prescribed in this chapter are used as a basis for imposing limitations on withdrawals of groundwater and surface water, for reviewing proposed surface water management and storage systems and stormwater management systems, and for imposing water shortage restrictions. The limitations and review criteria that relate to these minimum flows and levels are prescribed in other rule chapters of the District.

*Specific Authority: 373.044, 373.113* F.S. *Law Implemented: 373.042, 373.415* F.S. *History—New 9-16-92. Amended 8-17-94.*

**40C-8.021 Definitions.** Unless the context indicates otherwise, the following terms shall have the following meanings.

(1) "Blackwater Creek" means that watercourse designated Blackwater Creek within the Wekiva River Hydrologic Basin as defined by section 40C- 41.023, F.A.C.

(2) "Determined minimum surface water flow," means a flow, expressed in cubic feet per second combined with a temporal element. The temporal element may be specifically expressed as a duration and return interval or may be generally expressed as a hydroperiod category.

(3) "Determined minimum surface water level" means an elevation in feet NGVD combined with a temporal element. The temporal element, for purposes of this chapter may be specifically expressed as a duration and return interval or may be generally expressed as a hydroperiod category.

(4) "Intermittently exposed," means a hydroperiod category where surface water is present throughout the year except in years of extreme drought. In most lakes this category does not typically support emergent vegetation and would be characterized as open water or floating-leaved deep marsh. Water levels causing inundation are expected to occur more than 90% of the time over a long-term period of record.

(5) "Intermittently flooded," means a hydroperiod category where the substrate is usually exposed, but surface water is present with variable frequency and duration. Water levels causing inundation are expected to occur on average approximately once every ten years or more. Years may intervene between periods of inundation. On recharge lakes (sand hill-type lakes), the dominant vegetation growing at this elevation can change as soil moisture conditions change, from a dominance of upland species to wetland species or the reverse. Duration of inundation is on the order of several months. Water levels are expected to inundate less than 2%of the time over a long-term period of record.

(6) "Long term or "long-term period of record" means at least a 30-year continuous period.

(7) "Minimum frequent high" means a chronically high surface water level or flow with an associated frequency and duration that allows for inundation of the floodplain at a depth and duration sufficient to maintain wetland functions.

(8) "Minimum infrequent high" means an acutely high surface water level or flow with an associated frequency and duration that is expected to be reached or exceeded during or immediately after periods of high rainfall so as to allow for inundation of a floodplain at a depth and duration sufficient to maintain biota and the exchange of nutrients and detrital material.

(9) "Minimum average" means the surface water level or flow necessary over a long period to maintain the integrity of hydric soils and wetland plant communities.

(10) "Minimum frequent low" means a chronically low surface water level or flow that generally occurs only during periods of reduced rainfall. This level is intended to prevent deleterious effects to the composition and structure of floodplain soils, the species composition and structure of floodplain and instream biotic communities, and the linkage of aquatic and floodplain food webs.

(11) "Minimum infrequent low" means an acutely low surface water level or flow with an associated frequency and duration which may occur during periods of extreme drought below which there will be a significant negative impact on the biota of the surface water, which includes associated wetlands.

(12) "NGVD" means National Geodetic Vertical Datum of 1929.

(13) "Permanently flooded," means a hydroperiod category where water covers the land surface throughout the year in all years. Vegetation, if present, is composed of aquatic macrophytes.

(14) "Phased Restriction" means the level or flow (based on the past 30-consecutive day average level or flow) at which a water use shortage phase (Phase I–IV as defined by 40C-21.251, F.A.C.), is declared and its associated restrictions imposed.

(15) "Seasonally flooded," means a hydroperiod category where surface water is typically present for extended periods (30 days or more) during the growing season, resulting in a predominance of submerged or submerged and transitional wetland species. During extended periods of normal or above normal rainfall, lake levels causing inundation are expected to occur several weeks to several months every one to two years.

(16) "Semi-permanently flooded" means a hydroperiod category where surface water inundation persists in most years. When surface water is absent the water table is usually near the land surface. In many lakes with emergent marshes this water level is near the lower elevation that supports emergent marsh or floating vegetation and peat substrates, or other highly organic hydric substrates. This characterization may not be true for herbaceous wetlands around sand hill-type lakes, which often have emergent vegetation that follows declining water levels to below the lower elevation of peat substrate. Water levels causing inundation are expected to occur approximately 80% of the time over a long-term period of record. Exposure of these ground elevations are expected to re-occur, on average, about every 5 to 10 years for extended periods (several or more months) during moderate droughts.

(17) "Temporarily Flooded" means a hydroperiod category where surface water is present or the substrate is flooded for brief periods (up to several weeks) approximately every 5 years. Plants of upland and wetland species are characteristic. The composition of the vegetation at this water level is dependent upon whether the flooding predominantly occurs in the growing season, whether seepage from higher elevations is pronounced, and the nature of the soil. Lake water levels are expected to equal or exceed this elevation 5% of the time or less over a long-term period of record.

(18) "Typically saturated" means a hydroperiod category where for extended periods of the year the water level should saturate or inundate. This results in saturated substrates for periods of one-half year or more during non-flooding periods of typical years. Water levels causing inundation are expected to occur fifty to 60% of the time over a long-term period of record. This water level is expected to have a recurrence interval, on the average, of one or two years over a long-term period of record. Obligate wetland plant species are expected to be predominating near this water level.

(19) "Wekiva River" means that watercourse designated Wekiva River within the Wekiva River Hydrologic Basin as defined by section 40C-41.023, F.A.C.

*Specific Authority: 373.044, 373.113* F.S. *Law Implemented: 373.042, 373.415* F.S. *History—New 9-16-92. Amended 8-17-94, 6-8-95, 3-19-02.*

**40C-8.031 Minimum Surface Water Levels and Flows and Groundwater Levels.**

(1) The following minimum surface water levels and flows and minimum groundwater levels are established:

(a) Wekiva River at the SR 46 bridge

| | Level | Flow | Duration | Return |
|---|---|---|---|---|

| | | | | Interval |
|---|---|---|---|---|
| | (ft NGVD) | (cfs) | (days) | (years) |
| Minimum Infrequent High | 9.0 | 880 | ≥7 | ≤5 |
| Minimum Frequent High | 8.0 | 410 | >30 | <2 |
| Minimum Average | 7.6 | 240 | <180 | >1.7 |
| Minimum Frequent Low | 7.2 | 200 | <90 | >3 |
| Phase 1 Restriction | 7.0 | 190 | NA | NA |
| Phase 2 Restriction | 6.9 | 180 | NA | NA |
| Phase 3 Restriction | 6.7 | 160 | NA | NA |
| Phase 4 Restriction | 6.5 | 150 | NA | NA |
| Minimum Infrequent Low | 6.1 | 120 | <7 | >100 |

(b) Wekiva River minimum groundwater levels and spring flows

| | Head (ft NGVD) | Discharge (cfs) |
|---|---|---|
| Messant Spring | 32 | 12 |
| Seminole Spring | 34 | 34 |
| Rock Spring | 31 | 53 |
| Wekiva Spring | 24 | 62 |
| Miami Spring | 27 | 4 |
| Sanlando Spring | 28 | 15 |
| Starbuck Spring | 31 | 13 |
| Palm Spring | 27 | 7 |

(c) Black Water Creek at the SR 44 bridge

| | Level (ft NGVD) | Flow (cfs) | Duration (days) | Return Interval (years) |
|---|---|---|---|---|
| Minimum Infrequent High | 27.0 | 340 | >7 | <5 |
| Minimum Frequent High | 25.8 | 145 | >30 | <2 |
| Minimum Average | 24.3 | 33 | <180 | >1.7 |
| Minimum Frequent Low | 22.8 | 2.5 | <90 | >15 |
| Phase 1 Restriction | 22.7 | 2 | NA | NA |
| Phase 2 Restriction | 22.5 | 1 | NA | NA |
| Phase 3 Restriction | 22.4 | 0.6 | NA | NA |
| Phase 4 Restriction | 22.3 | 0.3 | NA | NA |
| Minimum Infrequent Low | 21.9 | 0 | <7 | >100 |

(d) St. Johns River 1.5 miles downstream of Lake Washington weir

| | Level (ft NGVD) | Flow (cfs) | Hydroperiod Category |
|---|---|---|---|
| Minimum Frequent High | 15.3 | 1,450 | Seasonally flooded |
| Minimum Average | 12.7 | 240 | Typically saturated |
| Minimum Frequent Low | 11.3 | 28 | Semipermanently flooded |

(e) Taylor Creek 1.7 miles downstream of structure S-164

| | Flow (cfs) | Hydroperiod Category |
|---|---|---|
| Minimum Frequent High | 95 | Seasonally flooded |
| Minimum Average | 17 | Typically saturated |
| Minimum Frequent Low | 0.5 | Semipermanently flooded |

(2) The following minimum surface water levels are established:

| LAKE NAME | COUNTY | HYDROPERIOD CATEGORY | MINIMUM INFREQUENT HIGH | MINIMUM FREQUENT HIGH | MINIMUM AVERAGE LEVEL | MINIMUM FREQUENT LOW | MINIMUM INFREQUENT LOW |
|---|---|---|---|---|---|---|---|
| (a) APSHAWA NORTH | Lake | Seasonally Flooded | | 85.0 | | | |
| | | Typically Saturated | | | 83.3 | | |
| | | Semipermanently Flooded | | | | 81.3 | |
| (b) APSHAWA SOUTH | Lake | Seasonally Flooded | | 86.0 | | | |
| | | Typically Saturated | ` | | 84.7 | | |
| | | Semipermanently Flooded | | | | 83.2 | |
| (c) ARGENTA | Putnam | Seasonally Flooded | | 50.1 | | | |
| | | Typically Saturated | | | 47.7 | | |
| | | Semipermanently Flooded | | | | 46.3 | |
| (d) ASHBY | Volusia | Seasonally Flooded | | 13.8 | | | |
| | | Typically Saturated | | | 12.1 | | |
| | | Semipermanently Flooded | | | | 11.1 | |
| (e) BANANA | Putnam | Seasonally Flooded | | 38.0 | | | |
| | | Typically Saturated | | | 36.2 | | |
| | | Semipermanently Flooded | | | | 34.4 | |
| (f) BELL | Putnam | Temporarily Flooded | | 42.5 | | | |
| | | Typically Saturated | | | 40.5 | | |
| | | Semipermanently Flooded | | | | 38.7 | |
| (g) BIG | Volusia | Seasonally Flooded | | 26.1 | | | |
| | | Typically Saturated | | | 25.0 | | |
| | | Semipermanently Flooded | | | | 23.7 | |
| (h) BIRD POND | Putnam | Temporarily Flooded | | 41.8 | | | |
| | | Typically Saturated | | | 39.5 | | |
| | | Semipermanently Flooded | | | | 38.1 | |

| LAKE NAME | COUNTY | HYDROPERIOD CATEGORY | MINIMUM INFREQUENT HIGH | MINIMUM FREQUENT HIGH | MINIMUM AVERAGE LEVEL | MINIMUM FREQUENT LOW | MINIMUM INFREQUENT LOW |
|---|---|---|---|---|---|---|---|
| (i) BLUE POND | Clay | Temporarily Flooded | | 174.1 | | | |
| | | Typically Saturated | | | 173.3 | | |
| | | Semipermanently Flooded | | | | 171.7 | |
| (j) BOGGY MARSH | Lake | Seasonally Flooded | | 117.3 | | | |
| | | Typically Saturated | | | 115.9 | | |
| | | Semipermanently Flooded | | | | 114.5 | |
| (k) BRANTLEY | Seminole | Seasonally Flooded | | 46.3 | | | |
| | | Typically Saturated | | | 45.6 | | |
| | | Semipermanently Flooded | | | | 44.1 | |
| (l) BROOKLYN | Clay | Temporarily Flooded | | 114.6 | | | |
| | | Typically Saturated | | | 108.0 | | |
| | | Semipermanently Flooded | | | | 101.0 | |
| (m) BROWARD | Putnam | Temporarily Flooded | | 40.0 | | | |
| | | Typically Saturated | | | 38.25 | | |
| | | Semipermanently Flooded | | | | 36.5 | |
| (n) BURKETT | Orange | Seasonally Flooded | | 53.5 | | | |
| | | Typically Saturated | | | 52.6 | | |
| | | Semipermanently Flooded | | | | 51.2 | |
| (o) CHARLES | Marion | Seasonally Flooded | | 40.6 | | | |
| | | Typically Saturated | | | 39.3 | | |
| | | Semipermanently Flooded | | | | 37.9 | |
| (p) CHERRY | Lake | Seasonally Flooded | | 96.0 | | | |
| | | Typically Saturated | | | 94.9 | | |
| | | Semipermanently Flooded | | | | 93.4 | |
| (q) CLEAR | Putnam | Temporarily Flooded | | 37.4 | | | |
| | | Typically Saturated | | | 36.4 | | |
| | | Semipermanently Flooded | | | | 34.9 | |
| (r) COLBY | Volusia | Seasonally Flooded | | 28.3 | | | |
| | | Typically Saturated | | | 26.6 | | |
| | | Semipermanently Flooded | | | | 25.2 | |
| (s) COMO | Putnam | Seasonally Flooded | | 38.0 | | | |
| | | Typically Saturated | | | 36.2 | | |
| | | Semipermanently Flooded | | | | 34.4 | |
| (t) COMO, LITTLE LAKE | Putnam | Seasonally Flooded | | 38.0 | | | |
| | | Typically Saturated | | | 36.6 | | |
| | | Semipermanently Flooded | | | | 35.2 | |
| (u) COWPEN | Putnam | Temporarily Flooded | | 89.1 | | | |
| | | Typically Saturated | | | 85.7 | | |
| | | Semipermanently Flooded | | | | 84.2 | |
| (v) COW POND | Volusia | Seasonally Flooded | | 40.5 | | | |
| | | Typically Saturated | | | 39.8 | | |
| | | Semipermanently Flooded | | | | 37.6 | |

| LAKE NAME | COUNTY | HYDROPERIOD CATEGORY | MINIMUM INFREQUENT HIGH | MINIMUM FREQUENT HIGH | MINIMUM AVERAGE LEVEL | MINIMUM FREQUENT LOW | MINIMUM INFREQUENT LOW |
|---|---|---|---|---|---|---|---|
| (w) COON POND | Volusia | Seasonally Flooded | | 35.7 | | | |
| | | Typically Saturated | | | 34.6 | | |
| | | Semipermanently Flooded | | | | 33.1 | |
| (x) CRYSTAL / BAKER | Putnam | Seasonally Flooded | | 35.5 | | | |
| | | Typically Saturated | | | 33.9 | | |
| | | Semipermanently Flooded | | | | 33.0 | |
| (y) DAUGHARTY | Volusia | Seasonally Flooded | | 44.8 | | | |
| | | Typically Flooded | | | 42.6 | | |
| | | Semipermanently Flooded | | | | 41.2 | |
| (z) DAVIS | Volusia | Seasonally Flooded | | 36.2 | | | |
| | | Typically Saturated | | | 35.4 | | |
| | | Semipermanently Flooded | | | | 34.0 | |
| (aa) DEEP | Putnam | Seasonally Flooded | | 35.0 | | | |
| | | Typically Saturated | | | 33.1 | | |
| | | Semipermanently Flooded | | | | 32.2 | |
| (bb) DIAS | Volusia | Seasonally Flooded | | 34.5 | | | |
| | | Typically Flooded | | | 34.1 | | |
| | | Semipermanently Flooded | | | | 32.8 | |
| (cc) DISSTON | Flagler | Seasonally Flooded | | 13.8 | | | |
| | | Typically Flooded | | | 13.2 | | |
| | | Semipermanently Flooded | | | | 12.5 | |
| (dd) DORR | Lake | Seasonally Flooded | | 43.5 | | | |
| | | Typically Saturated | | | 43.1 | | |
| | | Semipermanently Flooded | | | | 42.1 | |
| (ee) DREAM POND | Putnam | Seasonally Flooded | | 49.0 | | | |
| | | Typically Saturated | | | 47.5 | | |
| | | Semipermanently Flooded | | | | 46.0 | |
| (ff) DRUDY | Volusia | Seasonally Flooded | | 42.1 | | | |
| | | Typically Saturated | | | 40.6 | | |
| | | Semipermanently Flooded | | | | 39.1 | |
| (gg) ECHO | Putnam | Seasonally Flooded | | 38.8 | | | |
| | | Typically Flooded | | | 36.7 | | |
| | | Semipermanently Flooded | | | | 35.2 | |
| (hh) EMMA | Lake | Seasonally Flooded | | 94.1 | | | |
| | | Typically Saturated | | | 92.5 | | |
| | | Semipermanently Flooded | | | | 91.1 | |
| (ii) EMPORIA | Volusia | Seasonally Flooded | | 38.9 | | | |
| | | Typically Saturated | | | 35.8 | | |
| | | Semipermanently Flooded | | | | 34.3 | |
| (jj) ESTELLA | Putnam | Seasonally Flooded | | 38.6 | | | |
| | | Typically Saturated | | | 37.2 | | |
| | | Semipermanently Flooded | | | | 36.5 | |

| LAKE NAME | COUNTY | HYDROPERIOD CATEGORY | MINIMUM INFREQUENT HIGH | MINIMUM FREQUENT HIGH | MINIMUM AVERAGE LEVEL | MINIMUM FREQUENT LOW | MINIMUM INFREQUENT LOW |
|---|---|---|---|---|---|---|---|
| (kk) FOX | Brevard | Temporarily Flooded | | 16.7 | | | |
| | | Typically Saturated | | | 15.3 | | |
| | | Semipermanently Flooded | | | | 13.8 | |
| (ll) GENEVA | Clay | Seasonally Flooded | | 103.0 | | | |
| | | Typically Saturated | | | 101.0 | | |
| | | Semipermanently Flooded | | | | 98.5 | |
| (mm) GEORGES LAKE | Putnam | Seasonally Flooded | | 98.4 | | | |
| | | Typically Saturated | | | 97.8 | | |
| | | Semipermanently Flooded | | | | 97.0 | |
| (nn) GERTIE | Volusia | Temporarily Flooded | | 27.5 | | | |
| | | Typically Saturated | | | 25.6 | | |
| | | Semipermanently Flooded | | | | 23.3 | |
| (oo) GORE | Flagler | Seasonally Flooded | | 21.6 | | | |
| | | Typically Saturated | | | 20.8 | | |
| | | Semipermanently Flooded | | | | 19.8 | |
| (pp) GRANDIN | Putnam | Seasonally Flooded | | 81.8 | | | |
| | | Typically Saturated | | | 81.3 | | |
| | | Semipermanently Flooded | | | | 80.1 | |
| (qq) HALFMOON | Marion | Seasonally Flooded | | 49.7 | | | |
| | | Typically Saturated | | | 47.9 | | |
| | | Semipermanently Flooded | | | | 46.5 | |
| (rr) HELEN | Volusia | Temporarily Flooded | | 46.1 | | | |
| | | Typically Saturated | | | 44.2 | | |
| | | Semipermanently Flooded | | | | 43.6 | |
| (ss) HIRES | Volusia | Seasonally Flooded | | 41.0 | | | |
| | | Typically Saturated | | | 39.5 | | |
| | | Semipermanently Flooded | | | | 38.0 | |
| (tt) HOKEY | Volusia | Seasonally Flooded | | 35.4 | | | |
| | | Typically Saturated | | | 33.7 | | |
| | | Semipermanently Flooded | | | | 32.3 | |
| (uu) HOWELL | Putnam | Seasonally Flooded | | 34.5 | | | |
| | | Typically Saturated | | | 33.6 | | |
| | | Semipermanently Flooded | | | | 31.8 | |
| (vv) HOWELL | Seminole | Seasonally Flooded | | 53.7 | | | |
| | | Typically Saturated | | | 52.9 | | |
| | | Semipermanently Flooded | | | | 51.5 | |
| (ww) IRMA | Orange | Seasonally Flooded | | 55.1 | | | |
| | | Typically Saturated | | | 54.8 | | |
| | | Semipermanently Flooded | | | | 53.4 | |
| (xx) KERR | Marion | Seasonally Flooded | | 24.4 | | | |
| | | Typically Saturated | | | 22.9 | | |
| | | Semipermanently Flooded | | | | 21.5 | |

| LAKE NAME | COUNTY | HYDROPERIOD CATEGORY | MINIMUM INFREQUENT HIGH | MINIMUM FREQUENT HIGH | MINIMUM AVERAGE LEVEL | MINIMUM FREQUENT LOW | MINIMUM INFREQUENT LOW |
|---|---|---|---|---|---|---|---|
| (yy) LIZZIE | Putnam | Seasonally Flooded | | 43.9 | | | |
| | | Typically Saturated | | | 42.7 | | |
| | | Semipermanently Flooded | | | | 41.7 | |
| (zz) LOUISA | Lake | Seasonally Flooded | | 96.5 | | | |
| | | Typically Saturated | | | 95.4 | | |
| | | Semipermanently Flooded | | | | 94.0 | |
| (aaa) LOWER LAKE LOUISE | Volusia | Seasonally Flooded | | 31.8 | | | |
| | | Typically Saturated | | | 31.2 | | |
| | | Semipermanently Flooded | | | | 29.7 | |
| (bbb) LOWERY | Polk | Temporarily Flooded | 130.0 | | | | |
| | | Typically Saturated | | | 128.0 | | |
| | | Semipermanently Flooded | | | | 126.5 | |
| (ccc) LUCY | Lake | Seasonally Flooded | | 94.1 | | | |
| | | Typically Saturated | | | 92.5 | | |
| | | Semipermanently Flooded | | | | 91.1 | |
| (ddd) MAGNOLIA | Clay | Seasonally Flooded | | 124.7 | | | |
| | | Typically Saturated | | | 124.2 | | |
| | | Semipermanently Flooded | | | | 121.4 | |
| (eee) MALL, LITTLE LAKE | Putnam | Seasonally Flooded | | 38.7 | | | |
| | | Typically Saturated | | | 36.8 | | |
| | | Semipermanently Flooded | | | | 35.2 | |
| (fff) MARGARET | Putnam | Seasonally Flooded | | 35.2 | | | |
| | | Typically Saturated | | | 34.5 | | |
| | | Semipermanently Flooded | | | | 32.5 | |
| (ggg) MARTHA | Orange | Seasonally Flooded | | 53.5 | | | |
| | | Typically Saturated | | | 52.6 | | |
| | | Semipermanently Flooded | | | | 51.2 | |
| (hhh) MARVIN | Putnam | Seasonally Flooded | | 38.6 | | | |
| | | Typically Saturated | | | 37.3 | | |
| | | Semipermanently Flooded | | | | 36.3 | |
| (iii) MCGRADY | Putnam | Seasonally Flooded | | 41.5 | | | |
| | | Typically Saturated | | | 39.9 | | |
| | | Semipermanently Flooded | | | | 37.8 | |
| (jjj) MCKASEL | Putnam | Temporarily Flooded | | 36.7 | | | |
| | | Typically Saturated | | | 35.5 | | |
| | | Semipermanently Flooded | | | | 34.1 | |
| (kkk) MELROSE | Putnam | Seasonally Flooded | | 105.2 | | | |
| | | Typically Saturated | | | 104.2 | | |
| | | Semipermanently Flooded | | | | 102.8 | |
| (lll) MILLS | Seminole | Temporarily Flooded | | 42.5 | | | |
| | | Typically Saturated | | | 41.4 | | |
| | | Semipermanently Flooded | | | | 39.9 | |

| LAKE NAME | COUNTY | HYDROPERIOD CATEGORY | MINIMUM INFREQUENT HIGH | MINIMUM FREQUENT HIGH | MINIMUM AVERAGE LEVEL | MINIMUM FREQUENT LOW | MINIMUM INFREQUENT LOW |
|---|---|---|---|---|---|---|---|
| (mmm) MINNEOLA | Lake | Seasonally Flooded | | | 96.0 | | |
| | | Typically Saturated | | | 95.3 | | |
| | | Semipermanently Flooded | | | | 93.9 | |
| (nnn) NETTLES/ ENGLISH | Putnam | Seasonally Flooded | | 44.3 | | | |
| | | Typically Saturated | | | 42.7 | | |
| | | Semipermanently Flooded | | | | 41.7 | |
| (ooo) NORRIS | Lake | Seasonally Flooded | | 30.5 | | | |
| | | Typically Saturated | | | 29.7 | | |
| | | Semipermanently Flooded | | | | 29.1 | |
| (ppp) NORTH COMO PARK | Putnam | Seasonally Flooded | | 41.3 | | | |
| | | Typically Saturated | | | 39.7 | | |
| | | Semipermanently Flooded | | | | 38.5 | |
| (qqq) NORTH TALMADGE | Volusia | Seasonally Flooded | | 55.6 | | | |
| | | Typically Saturated | | | 54.4 | | |
| | | Semipermanently Flooded | | | | 52.9 | |
| (rrr) OMEGA | Putnam | Temporarily Flooded | | 57.4 | | | |
| | | Typically Saturated | | | 56.1 | | |
| | | Semipermanently Flooded | | | | 54.0 | |
| (sss) ORIO | Putnam | Seasonally Flooded | | 37.1 | | | |
| | | Typically Saturated | | | 35.6 | | |
| | | Semipermanently Flooded | | | | 34.7 | |
| (ttt) PAM | Putnam | Temporarily Flooded | | 39.3 | | | |
| | | Typically Saturated | | | 37.5 | | |
| | | Semipermanently Flooded | | | | 36.1 | |
| (uuu) PEARL | Orange | Seasonally Flooded | | 53.5 | | | |
| | | Typically Saturated | | | 52.6 | | |
| | | Semipermanently Flooded | | | | 51.2 | |
| (vvv) PIERSON | Volusia | Seasonally Flooded | | 34.4 | | | |
| | | Typically Saturated | | | 33.8 | | |
| | | Semipermanently Flooded | | | | 32.4 | |
| (www) PINE ISLAND | Lake | Seasonally Flooded | | 107.7 | | | |
| | | Typically Saturated | | | 106.8 | | |
| | | Semipermanently Flooded | | | | 105.4 | |
| (xxx) PREVATT | Orange | Seasonally Flooded | | 56.0 | | | |
| | | Typically Saturated | | | 53.0 | | |
| | | Semipermanently Flooded | | | | 50.9 | |
| (yyy) PRIOR | Putnam | Seasonally Flooded | | 42.3 | | | |
| | | Typically Saturated | | | 40.0 | | |
| | | Semipermanently Flooded | | | | 39.0 | |

| LAKE NAME | COUNTY | HYDROPERIOD CATEGORY | MINIMUM INFREQUENT HIGH | MINIMUM FREQUENT HIGH | MINIMUM AVERAGE LEVEL | MINIMUM FREQUENT LOW | MINIMUM INFREQUENT LOW |
|---|---|---|---|---|---|---|---|
| (zzz) PURDOM | Volusia | Seasonally Flooded | | 37.0 | | | |
| | | Typically Saturated | | | 36.4 | | |
| | | Semipermanently Flooded | | | | 35.0 | |
| (aaaa) SAND | Putnam | Seasonally Flooded | | 40.9 | | | |
| | | Typically Saturated | | | 39.0 | | |
| | | Semipermanently Flooded | | | | 36.6 | |
| (bbbb) SAND HILL | Clay | Seasonally Flooded | | 132.0 | | | |
| | | Typically Saturated | | | 131.65 | | |
| | | Semipermanently Flooded | | | | 129.5 | |
| (cccc) SAVANNAH | Volusia | Seasonally Flooded | | 31.1 | | | |
| | | Typically Saturated | | | 29.5 | | |
| | | Semipermanently Flooded | | | | 28.0 | |
| (dddd) SCOGGIN | Volusia | Seasonally Flooded | | 35.0 | | | |
| | | Typically Saturated | | | 34.1 | | |
| | | Semipermanently Flooded | | | | 32.7 | |
| (eeee) SHAW | Volusia | N / A | 38.5 | | | | |
| | | N / A | | 36.9 | | | |
| | | N / A | | | 36.2 | | |
| | | N / A | | | | 34.0 | |
| | | N / A | | | | | 32.0 |
| (ffff) SILVER | Putnam | Seasonally Flooded | | 36.8 | | | |
| | | Typically Saturated | | | 35.1 | | |
| | | Semipermanently Flooded | | | | 33.7 | |
| (gggg) SOUTH | Brevard | Temporarily Flooded | | 16.7 | | | |
| | | Typically Saturated | | | 15.3 | | |
| | | Semipermanently Flooded | | | | 13.8 | |
| (hhhh) SOUTH COMO PARK | Putnam | Seasonally Flooded | | 38.1 | | | |
| | | Typically Saturated | | | 36.7 | | |
| | | Semipermanently Flooded | | | | 35.3 | |
| (iiii) STAR | Putnam | Seasonally Flooded | | 77.5 | | | |
| | | Typically Saturated | | | 75.4 | | |
| | | Semipermanently Flooded | | | | 74.0 | |
| (jjjj) STELLA | Putnam | Seasonally Flooded | | 39.4 | | | |
| | | Typically Saturated | | | 38.6 | | |
| | | Semipermanently Flooded | | | | 37.2 | |
| (kkkk) SUNSET | Lake | Seasonally Flooded | | 85.9 | | | |
| | | Typically Saturated | | | 83.5 | | |
| | | Semipermanently Flooded | | | | 81.0 | |
| (llll) SWAN | Putnam | Temporarily Flooded | | 93.0 | | | |
| | | Typically Saturated | | | 90.3 | | |

| LAKE NAME | COUNTY | HYDROPERIOD CATEGORY | MINIMUM INFREQUENT HIGH | MINIMUM FREQUENT HIGH | MINIMUM AVERAGE LEVEL | MINIMUM FREQUENT LOW | MINIMUM INFREQUENT LOW |
|---|---|---|---|---|---|---|---|
| (mmmm) SYLVAN | Seminole | Seasonally Flooded | | 40.4 | | | |
| | | Typically Saturated | | | 38.9 | | |
| | | Semipermanently Flooded | | | | 37.5 | |
| (nnnn) TARHOE | Putnam | Seasonally Flooded | | 37.0 | | | |
| | | Typically Saturated | | | 36.0 | | |
| | | Semipermanently Flooded | | | | 35.2 | |
| (oooo) THREE ISLAND LAKES | Volusia | Seasonally Flooded | | 23.4 | | | |
| | | Typically Saturated | | | 21.8 | | |
| | | Semipermanently Flooded | | | | 18.8 | |
| (pppp) TRONE | Putnam | Seasonally Flooded | | 37.5 | | | |
| | | Typically Flooded | | | 35.7 | | |
| | | Semipermanently Flooded | | | | 34.3 | |
| (qqqq) TROUT | Volusia | Seasonally Flooded | | 23.3 | | | |
| | | Typically Saturated | | | 20.9 | | |
| | | Semipermanently Flooded | | | | 17.7 | |
| (rrrr) UPPER LAKE LOUISE | Volusia | Seasonally Flooded | | 35.3 | | | |
| | | Typically Saturated | | | 34.6 | | |
| | | Semipermanently Flooded | | | | 33.2 | |
| (ssss) WASHINGTON | Brevard | Seasonally Flooded | | 15.6 | | | |
| | | Typically Saturated | | | 14.2 | | |
| | | Semipermanently Flooded | | | | 12.8 | |
| (tttt) WAUBERG | Alachua | Seasonally Flooded | | 67.4 | | | |
| | | Typically Saturated | | | 67.1 | | |
| | | Semipermanently Flooded | | | | 65.6 | |
| (uuuu) WEIR | Marion | Seasonally Flooded | | 57.2 | | | |
| | | Typically Saturated | | | 56.4 | | |
| | | Semipermanently Flooded | | | | 54.9 | |
| (vvvv) WINNEMISETT | Volusia | Seasonally Flooded | | 59.5 | | | |
| | | Typically Saturated | | | 57.8 | | |
| | | Semipermanently Flooded | | | | 56.0 | |
| (wwww) WINONA | Volusia | Seasonally Flooded | | 36.1 | | | |
| | | Typically Saturated | | | 33.5 | | |
| | | Semipermanently Flooded | | | | 32.0 | |

(3) The following minimum levels are established for Blue Cypress Water Management Area (BCWMA):

(a) The minimum average level, calculated as the long-term mean of BCWMA water levels, is 24 ft NGVD. Water levels shall be at or above this level at least 75% of time over the long term.

(b) The minimum frequent low is 23.0 ft NGVD. The daily BCWMA water level shall not fall to this level or below more often than once every 2.5 years over the long term.

(c) The minimum infrequent low is 22.5 ft NGVD. The BCWMA water level shall not fall to this level or below for 60 continuous days more frequently than once every 10 years over the long term.

(4) Ground or surface water withdrawals or surface water works must not cause the infrequent high or frequent high surface water flows and levels to occur less frequently or for lesser duration than stated. Ground or surface water withdrawals or surface water works must not cause the minimum average, frequent low, or infrequent low surface water levels and flows to occur more frequently or for longer durations than stated.

*Specific Authority: 373.044, 373.113* F.S. *Law Implemented: 373.042, 272.0421 373.103, 373.415* F.S. *History--New 9-16-92. Amended 8-17-94, 6-8-95, 1-17-96, 8-20-96, 10-20-96, 11-4-98, 6-27-00, 2-13-01, 3-19-02, 5-11-03.*

# APPENDIX D—EVALUATION OF THE LIKELIHOOD OF IMPACTS TO GROUNDWATER QUALITY AS A RESULT OF PROJECTED 2025 WATER USE

**MEMORANDUM:**

Date: August 12, 2003

To: Barbara Vergara, Director
Division of Water Supply Management

From: Mary Beth Wilder, Water Use Specialist III
Division of Water Supply Management

Subject: Evaluation of the likelihood of impacts to groundwater quality as a result of projected 2025 water use

**Impacts to Groundwater Quality**

The impacts of projected changes in groundwater quality on the future availability of groundwater were assessed in association with St. Johns River Water Management District's (SJRWMD) 2003 Water Supply Assessment. The likelihood of unacceptable changes in the concentrations of chloride in water in the groundwater system was the basis of assessing the likelihood of unacceptable impacts to groundwater quality. For purposes of the 2003 water supply assessment SJRWMD evaluated two factors to identify geographic areas where the potential for water quality change due to proposed increases in groundwater withdrawals through 2025 are likely to result in unacceptable water quality impacts. These factors include

- Chloride concentration trends in existing public supply wellfields
- Location of public supply wellfields within areas with chloride concentrations greater than 250 mg/L in the Upper Floridan aquifer

The evaluation was performed based on the following steps:

**Step 1**. Identify public supply wellfields that include wells that are experiencing increasing trends in chloride concentrations or have experienced significant increasing trends in chloride concentrations greater than 3.0 mg/L per year based on information contained in the document, *Evaluation of Upper Floridan Aquifer Water Quality to Design a*

*Monitoring Network in the St. Johns River Water Management District* (Boniol 2002). Following is a list of the identified wellfields.

- Cocoa
- DeLand–Longleaf
- Deltona, City of (Deltona Lakes) –Lombardy, Magnalena and Wellington
- Flagler Beach
- Indian River County–North
- Jacksonville (JEA)–Alderman Park, Deerwood 1, Deerwood 3, Lovegrove, Lake Lucina and Oakridge
- Jacksonville Beach
- New Smyrna Beach–Glencoe
- Ormond Beach
- Oviedo
- Titusville–Area II & III well fields

**Step 2**. Identify those wellfields, not included in the subset identified in Step 1, that are located in areas where the Upper Floridan aquifer contains chloride concentrations greater than 250 mg/L as described in Figure 3 in Boniol 2002. This was accomplished by overlaying SJRWMD's current chloride concentrations GIS layer with SJRWMD's current wellfields GIS layer.

The following wellfields are located within areas where the Upper Floridan aquifer contains chlorides greater than 250 mg/L.

- Brevard County–Barefoot Bay
- Fellsmere
- Palm Coast
- Indian River County–South
- Melbourne
- New Smyrna Beach–New Smyrna Beach
- Palm Bay
- St. Johns County
- Vero Beach

**Step 3**. Eliminate from the subset of wellfields identified in Steps 1 and 2, any wellfields belonging to utilities that currently use or have proposed to use the wellfields as sources of water to be treated with demineralization treatment technologies.

The following wellfields are eliminated as a result of this step.

- Palm Coast
- Indian River County–North and South
- Melbourne
- Ormond Beach
- Palm Bay
- St. Johns County
- Vero Beach

**Step 4**. Eliminate from the subset of wellfields identified in Steps 1 and 2 and remaining after Step 3, any wellfields where the surficial aquifer is the water source and no significant changes in water quality have been observed in water produced from the wellfield.

The following wellfields are eliminated as a result of this step.

- Brevard County–Barefoot Bay
- Fellsmere

**Step 5**. Eliminate from the subset of wellfields remaining after consideration of Steps 1 through 4 any wellfields for which corrective actions have been identified and implemented.

The following wellfields are eliminated as a result of this step.

- JEA–Alderman Park and Lake Lucina (abandon 2003)
- Jacksonville Beach (abandon two of three wells within the affected wellfield, one to serve as backup, 2003)

**Step 6**. Identify any wellfields (and associated service areas) remaining after consideration of Steps 1 through 5 for which corrective actions have been identified and approved by the appropriate authority, but have not been fully implemented.

The following wellfields are eliminated as a result of this step.

- Cocoa
- JEA–Deerwood 1, Deerwood 3, Lovegrove and Oakridge

**Step 7**. Identify the remaining wellfields (and associated service areas) as those considered to have the greatest likelihood of experiencing unacceptable impacts to groundwater quality.

These wellfields and potable service areas are as follows.

- DeLand–Longleaf
- Deltona, City of (Deltona Lakes) –Lombardy, Magnalena and Wellington
- Flagler Beach
- New Smyrna Beach–Glencoe
- New Smyrna Beach–New Smyrna Beach
- Oviedo
- Titusville–Area II well field
- Titusville–Area III well field

This approach to identify areas likely to experience unacceptable groundwater quality impacts is not intended to be comprehensive. A lack of adequate districtwide groundwater quality data limits the scope of this effort. Groundwater quality data associated with public supply wellfields is generally available. However, this data is not always of high enough quality for evaluation. This approach is intended, rather to identify areas with the greatest likelihood of experiencing unacceptable impacts to groundwater quality.

# APPENDIX E—UNCERTAINTY ANALYSIS

## ST. JOHNS RIVER WATER MANAGEMENT DISTRICT WATER SUPPLY PLANNING UNCERTAINTIES

## ABSTRACT

Water supply planning requires prediction of future conditions. Included are predictions of future water supply needs, and predictions of the environmental and cost consequences of alternative water supply development scenarios. Any and all attempts to predict future conditions will be imperfect. Therefore, uncertainty is encountered and introduced in each step of the planning process. This paper discusses the sources of uncertainty in the St. Johns River Water Management District water supply planning process, major steps taken to minimize and manage uncertainty, the likely impact of the remaining uncertainty, and decision-making implications.

Uncertainty in the water supply planning process is associated with the prediction of future water use, the estimation of water supply deficits, and the estimation of costs for developing water supply options and alternatives.

The recommended approach to address this uncertainty is to (1) identify sources of uncertainty, (2) define nature and effect of each source, (3) manage each source to minimize its effect to the extent possible, and (4) apply a flexible approach to the long term planning and decision process.

## WATER SUPPLY PLANNING GOALS AND MAJOR STEPS

The primary goal of water supply planning is to identify acceptable alternative approaches for meeting future water needs, including both human needs and natural system needs. The process requires estimation of all future water needs and the identification and evaluation of alternatives adequate to meet these needs.

Major steps include the following:

- Estimation of future water supply needs
- Estimation of future water supply deficits
- Alternative development and evaluation
- Plan selection

### Water Supply Needs

Estimation of future water supply needs requires estimation of future population, agricultural activity, and commercial and industrial activities within the planning area, as well as within individual water supply service areas. It also requires estimation of the environmental and hydrologic conditions necessary to maintain healthy natural systems within lakes, rivers, springs, and wetlands.

### Water Supply Deficits

Water supply source deficits are the difference between water supply needs and the quantity of water a source can supply. If an existing or preferred source cannot meet all future needs then alternative sources must be identified and evaluated.

### Alternatives

Alternative development and evaluation involves identification of alternative sources of supply and alternative resource management and development techniques. Once identified, each alternative is evaluated based on (1) its ability to meet all, or a portion of, future water supply needs (both human and natural system needs) (2) the total cost of the alternative, and (3) the relative ability to implement the alternative.

### Plan Selection

Once the alternative evaluation is complete certain alternatives will be identified as technically and environmentally feasible, while others may be identified as infeasible. All options and alternatives that have been determined to be technically and environmentally feasible will be included in the resulting water supply plan. The plan will be as inclusive as possible. However, the least cost acceptable solution will also be identified to help guide economically sound options development and facilities planning for individual water users.

## WATER SUPPLY PLANNING TOOLS

The St. Johns River Water Management District (SJRWMD) water supply planning process is an ambitious regional planning initiative. It involves estimation of future water supply needs for one of the fastest growing regions in the State of Florida. It involves development of environmental, hydrologic, and water quality criteria to define natural system needs, and the development and evaluation of complex water supply management alternatives. All planning activities are conducted with public involvement and the participation of all affected and interested parties is actively solicited.

Because of the magnitude and complexity of the task at hand several tools have been developed to assist in the planning process, these include the following:

- Groundwater flow models
- Groundwater allocation models
- Economic optimization models

Each of these models is designed to help define and evaluate the nearly limitless number of options and alternatives available within the planning area. The groundwater flow models provide a particularly important function. These models estimate the hydrologic and water quality response of the aquifer system to groundwater withdrawals and provide the basic foundation for all other planning tools.

# SOURCES OF UNCERTAINTY

**Water Supply Needs (Water Use Projections)**

Water use projections are typically based on knowledge of historical use and assumptions about the future. This is equally true for both complex demand models and for simple demand equations. In areas or times of stable growth, historical use has been found to be a reliable indicator of aggregate future water use. In the public water supply use category, areas that are "built-out" to their permitted or physical capacity are typical of this group. There are numerous examples of such areas in the District, particularly in municipalities located near the center cores of heavily urbanized metropolitan areas, as well as in mobile home parks or older planned developments. Knowledge of historical use is also found to be fairly reliable for the other major use categories, in areas or among crops that are well established.

Recently however, urban and commercial development in key counties within the District has occurred at such a rapid pace that it is difficult to predict with any great level of certainty when the rate of development will level off. In these areas, the uncertainty associated with water use projections is high, compared to the more stable, urbanized areas. However, projections must be made so that strategies can be developed to preserve the continued viability of water related resources while meeting the growing need for water. Projections are made by SJRWMD using the best available information, but are recognized as having inherent uncertainty.

There are multiple issues of uncertainty associated with water use projections, many of which are interrelated. For instance, in the public supply category, there is uncertainty over the extent of geographic area that will fall within a given utility's service area. There is uncertainty over whether the composition of the aggregate demand will be altered significantly in favor of one or another sector (i.e., single vs. multi-family residential, commercial vs. residential). This uncertainty could impact total demand estimates and ratios of average day demand to maximum day demand made with current information. There is the unknown element of where or when new developments will occur, or even whether growth in known planned developments will progress as scheduled. In some areas, large planned developments have taken considerably longer to get off the ground, impacting the timing of increases in water use. Other uncertainties in the public supply category relate to the potential impact of water conserving technologies at both the utility and the user level, and the extent to which reuse of reclaimed water can diminish demand for potable water.

**Public Supply**

SJRWMD developed population-based public supply water use projections, calculated using the median projections of population growth published by the Bureau of Economic and Business Research (BEBR) and historic estimates of per capita use. The District's projections assumed a constant per capita use throughout the planning period and no change in the composition of the aggregate demand.

According to BEBR median projections, SJRWMD total population is expected to increase from about 3.52 million in 1995 to 5.88 million in 2025, an increase of 67%. The portion of the population served by public supply utilities is expected to increase from 2.96 million to 5.08 million, or nearly 72%. It is this expected increase in public supply population that drives increased water supply needs.

BEBR recognizes uncertainty in the population projections and quantifies this uncertainty by publishing an expected range in population including low and high projections as well as the median or expected projection.

Considering total growth within the fifteen (15) SJRWMD counties that contribute to the public supply demand, BEBR estimated population growth rates range from a low of 1.15% per year, to a high of 2.62% per year, with a median projected growth rate of 1.91% per year. Over a projected 30-year period (1995 to 2025), this fairly narrow range in projected growth rate can represent a rather large uncertainty in actual population growth. For example, compared to the median growth rate, the low BEBR growth rate would be about 53% of the projected median population growth, whereas the high BEBR growth rate would be about 154% of the median project growth. This range in population growth estimates is considered a good estimate of the possible range of public supply growth. Therefore, the predicted 72% growth in public supply demand could actually range from a low of about 39 % to a high of approximately 111%, with the median value of 72% being the most likely.

**Agricultural Irrigation**

In the agricultural use category, uncertainty is related more to the question of how much acreage will be in production than to crop irrigation requirements. District-wide agricultural water use is expected to change little during the planning period. Agricultural irrigation use totaled 584 mgd in 1995 and is projected to total 522 mgd in 2025, a decrease of 11%. The major change will be redistribution of irrigational water use as agricultural land use and cropping patterns change.

Agriculture has made great advances in the development and adoption of more efficient irrigation practices, and it is unlikely that significant changes in water use will occur in response to better irrigation management practices. There is some question over which of the several methods for estimating irrigation demand should be used in demand calculations, especially for citrus crops, which represent almost 45% of the total agricultural water use. Water use permit allocations issued by SJRWMD are based on 30-year mean Blaney-Criddle estimates of supplemental irrigation requirements. These tend to be high compared to measurements of actual use. For example, the Blaney-Criddle estimate for citrus supplemental irrigation requirements is roughly 60% higher on average than measurements of actual use. However, out of deference to the agricultural community, SJRWMD agreed to use the Blaney-Criddle estimates in the WSA for all crops except fern and potatoes. The irrigation requirements for the latter two crops were obtained from the District Benchmark Farms Project, with the approval of the agricultural community.

On average over all the crops and counties, the Blaney-Criddle estimates were approximately 20% higher than estimates of actual use reported in the District Annual Water Use Survey, which use measurements of actual rainfall for the year. This range is interpreted by SJRWMD as the range of uncertainty in estimates of crop supplemental irrigation requirements.

However, SJRWMD believes the greatest uncertainty in projecting agricultural water use lies in how much acreage will be in production, where production will occur, and which crops will be grown. Urbanization has taken a toll on agriculture, and is likely to continue to encroach on agricultural land found on the fringes of major urban centers. Increased market competition and erratic, damaging climate have also combined to make agriculture a less stable economic venture than in the past. An abrupt decline in a competitive market could stimulate interest in certain crops, or new higher value crops could be introduced. Higher value crops tend to require more reliable water sources, which would increase demand for irrigation water. Nothing on the horizon points to these events, however they cannot be ruled out.

**Recreation (Golf Course Irrigation)**

While it is certain that the golf course industry will continue to grow, it is difficult to determine how much of their irrigation needs will be obtained from ground or surface water sources as opposed to being obtained from reuse of reclaimed water or above ground retention ponds. Districtwide golf course irrigation totaled 99 mgd in 1995, and is expected to increase to 156 mgd by 2025, a significant increase. Estimates of future water use for the golf course industry are acknowledged in the Water Supply Assessment to be among the less reliable of the water use categories, because of the uncertainty associated with the source. There is also uncertainty associated with the calculation of irrigation demand. The golf course industry has made significant progress in the adoption of better irrigation management, and many of the larger, more affluent courses now use computers to manage their irrigation. Greens are irrigated at a different rate than are roughs and fairways. Without knowing the ratio of greens to roughs and fairways, it is difficult to correctly assess the irrigation demand of an entire system.

### Commercial and Industrial

The historic trend in the commercial / industrial / institutional category has been one of relatively insignificant growth compared to growth in the public supply sector. However, in some areas there is evidence of new activity in the commercial sector, again on the fringes of larger metropolitan areas. The uncertainty lies in the intensity and duration of this growth phase, and what its ultimate impact on overall water use will be. Currently these demands are expected to decline slightly, from 134 mgd in 1995 to 129 mgd by 2025.

### Thermoelectric Power Generation

Deregulation of the electric power utilities, expected to occur within a few years, has lead to significant uncertainty in water use projections for thermoelectric power plants. No one has a clear understanding of how deregulation will change the current industry. However, the large majority of water used in this industry is saline surface water. It is unlikely that even significant changes in water use for electric power will impact demand for groundwater by these few utilities.

### Natural Systems Needs (Withdrawal Constraints)

Water withdrawal constraints applied in the water supply planning process are of three types.

- Minimum flows and levels (MFLs)
- Native vegetation (primarily wetlands drawdown)
- Groundwater quality

In aggregate the water withdrawal constraints define natural systems needs. That is, the purpose of the withdrawal constraints is to insure that a proposed groundwater withdrawal scenario will protect natural systems, including the aquifer, and will not cause unacceptable harm. The water withdrawal constraints are designed to parallel consumptive use permitting criteria, as much as practical at a regional planning scale. The constraints applied in the water supply planning process are described in detail in the *Water 2020 Constraints Handbook* (St. Johns River Water Management District and CH2M HILL 2005).

### Minimum Flows and Levels (MFLs)

Minimum flows and levels are flow values or water levels below which significant harm to the water resource or ecology of the region would occur. MFLs are established for specific water bodies by the SJRWMD Governing Board; based on results of site-specific investigations. The water bodies are selected, and the MFLs are established, from a priority list also approved by the Governing Board.

Within the planning area, MFLs have been established for a number of lakes and certain streams including the Wekiva River. As a result, specific minimum mean flow values have been established for the major springs within the Wekiva River basin. These values are used as constraints in the groundwater allocation and decision models to evaluate various water supply withdrawal scenarios and water supply alternatives. Where established, by the SJRWMD Governing Board, there is no institutional uncertainty associated with actual MFL values. That is, these values have been defined by Governing Board action. However, there can be some uncertainty that adopted MFLs do indeed adequately protect the intended resource. The District addresses this concern through monitoring of hydrologic and ecological conditions.

To protect lakes with established MFLs, the adopted minimum average lake level is used as a planning constraint. Using this constraint, the allowable change in average lake level is used as the maximum allowable change in the surficial aquifer water level, as determined by application of the regional groundwater flow model. This approach implies that eventually a reduction in the average surficial aquifer level adjacent to a lake will result in an equal reduction in the average lake level.

Many lakes exist within the planning area and only a small sub-set has adopted MFLs at this time. SJRWMD plans to adopt MFLs for many additional lakes. For that reason, a generalized constraint, set equal to 0.5 feet of reduction in average lake level, was assumed for selected lakes not currently covered by adopted MFLs.

Similarly, many significant springs exist within the planning areas that do not have adopted MFLs at this time. In order to protect these springs, and to provide for future MFLs determinations, a maximum reduction of 15% of historic median spring flow is used as the constraint for springs not currently covered by adopted MFLs. There is some uncertainty introduced by this procedure because actual adopted MFLs, for individual water bodies, may vary from the assumed values. However, these surrogate planning values have been set based on experience in setting MFLs for lakes and springs, and the associated level of uncertainty, on a regional basis, should be rather small.

### Native Vegetation

Changes in a wetland’s hydrologic regime, including a lowering of the average water level, may affect the structure and species composition of the vegetative community. Changes in the basic vegetative community within a wetland is considered significant harm, according to current SJRWMD consumptive use permitting criteria, and is to be avoided. The wetland constraint establishes maximum drawdown values for specific wetland community types, which if exceeded are likely to result in the replacement of dominant vegetative species by those characteristic of drier community types.

Ten wetland types were identified and a specific maximum allowable drawdown limit was established for each. These limits range from 0.35 feet to 1.20 feet. This approach is very similar to the lake level MFLs approach and implies that eventually a reduction in the average surficial aquifer level adjacent to a wetland will result in an equal reduction in the average wetland water level.

**Uncertainty Associated With Prediction of Lake Level and Wetlands Water Level Reductions**

Uncertainty associated with prediction of lake level and wetland water level reductions is associated with the ability to accurately predict changes in surficial aquifer water levels and in the hydrologic linkage of the surface water feature (lake or wetland) with the surficial aquifer. Uncertainty associated with prediction of surficial aquifer water level changes is discussed in the groundwater flow models section of this paper. This discussion focuses on uncertainty associated with the hydrologic linkage between lakes and wetlands and the surficial aquifer.

In the water supply planning analysis, a change in average surficial aquifer water level is assumed to result in an equal change in average lake or wetland water level. This will be true only if there is a hydraulic connection between the surface water feature and the surficial aquifer, and where surface water inflow into the lake or wetland is negligible. The lake and wetlands drawdown constraint actually identifies areas where significant harm may occur, or has the opportunity to occur. Drawdown constraints can help identify areas where significant harm will likely occur, when care is taken in identification of lake and wetland control points most vulnerable to changes in surficial aquifer levels.

In general terms, lakes and wetlands can be divided into two types, based on tributary area characteristics. These are, *isolated* lakes and wetlands, and *flow through* lakes and wetlands, as illustrated in Figure 1. Isolated lakes and wetlands have little or no tributary area. The major source of inflow is direct rainfall and the major source of outflow is evapotranspiration and seepage to groundwater (recharge to the surficial aquifer). Water levels in isolated systems that are hydraulically connected to the surficial aquifer are likely to respond as assumed. That is, a change in the average surficial aquifer water level will result in an equal change in the average lake or wetland water level.

Flow through lakes and wetlands, on the other hand, are part of larger surface water systems. They receive significant inflow from upstream tributary areas and discharge, or spillover, to downstream hydrologic systems. In this case, reduction in the surficial aquifer water levels beneath the wetland is unlikely to influence water levels within the wetland. Even if the rate of groundwater seepage (i.e. recharge) is increased, it is likely that this effect will be reflected in reduced spillover volume rather than reduced water levels.

In summary, the uncertainty associated with changes in lake or wetlands water levels, resulting from changes in surficial aquifer water levels results primarily from uncertainty related to the quantity of direct surface water inflow received from upstream tributary area and the degree of hydraulic connection with the surficial aquifer.

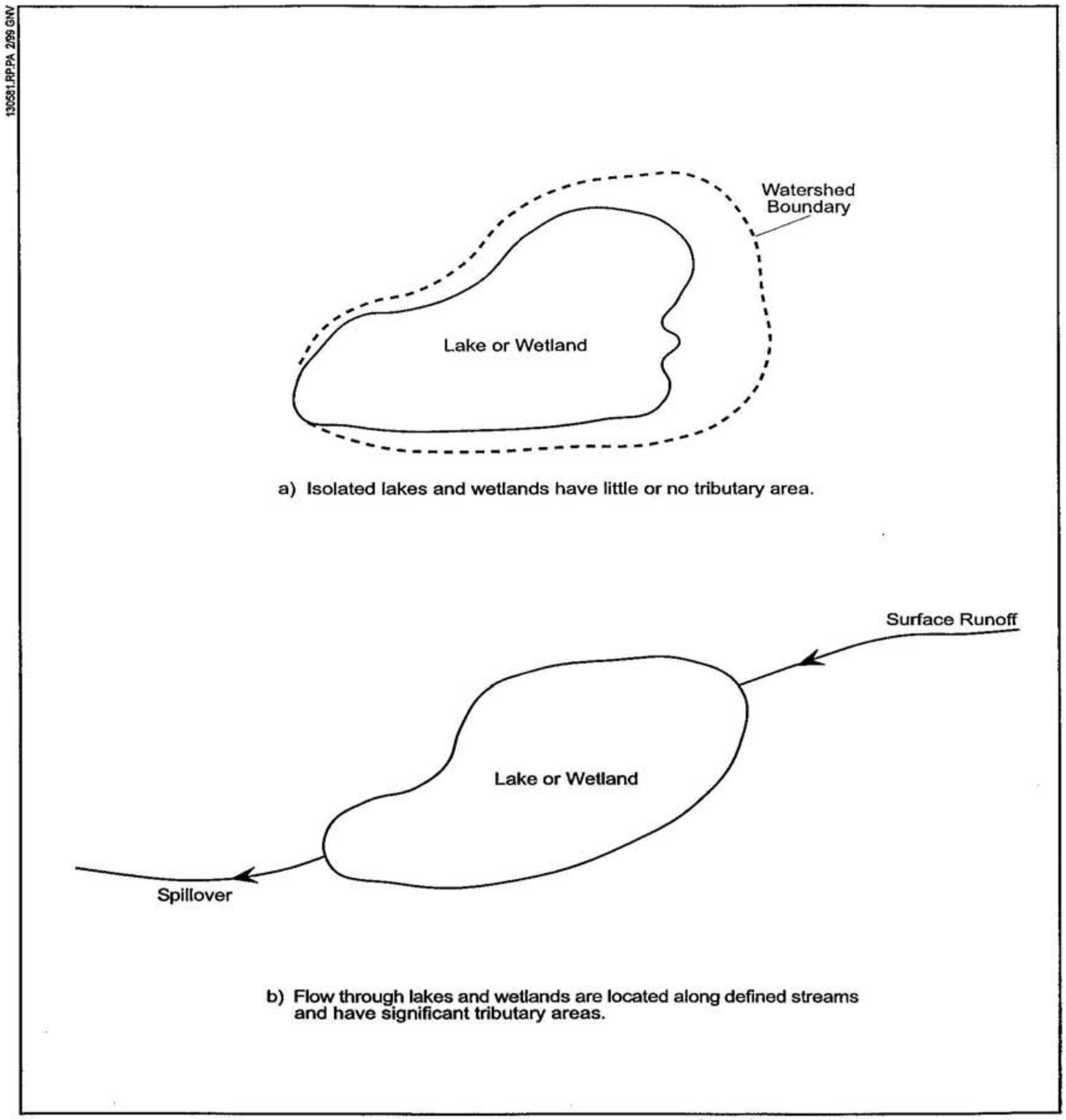


**Figure 1.** Isolated and Flow Through Lakes and Wetlands.

### Groundwater Quality

The Floridan aquifer was formed as a result of marine deposits and is composed of limestone and dolomites, with varying hydraulic properties. The uppermost parts of the aquifer generally contain fresh water and with depth water quality deteriorates, with concentration of chlorides and other dissolved constituents approaching that of seawater. Conceptually, fresh water exists as a lens that is underlain by denser highly mineralized brackish to saline water.

If fresh water is withdrawn at too great a rate, the underlying mineralized water can replace the fresh water and the aquifer water quality will deteriorate. The purpose of the water quality constraint is to protect the fresh water portion of the Floridan aquifer and to prevent deterioration in water quality that would result in exceedence of primary and / or secondary drinking water standards for dissolved constituents.

The water quality constraint used in the water supply planning analysis is to allow increased withdrawals as long as the quality of the water withdrawn does not exceed the current drinking water standard of 250 parts per million (ppm) chloride concentration, or the existing chloride concentration if it is currently greater than 250 ppm.

Uncertainty associated with the application of this criterion is associated with the accuracy of the water quality data for the Floridan aquifer, and with prediction of water quality changes as a function of pumping rate and duration.

## Groundwater Flow Models

### Introduction

Groundwater flow models are used to predict the long-term response of the aquifer system to water supply withdrawal. Under natural conditions aquifers exist in a state of dynamic equilibrium. That is, over long periods of time recharge and discharge virtually balance. Water supply withdrawals upset the natural balance, and, if operated at near steady state conditions, will eventually generate a new balance. In the short term, water is withdrawn from storage. In the long term, this water is replaced in the aquifer by increased recharge, or a decrease in natural discharge, or a combination of both.

Groundwater flow models are used to quantify these recharge / discharge / water supply withdrawal relationships for a given aquifer system and water supply withdrawal scenario. These models are mathematical representations of the physical system. As such, they produce estimates of aquifer response to water supply withdrawal, expressed in terms of changes in Floridan aquifer pressure (potentiometric surface elevation), surficial aquifer water levels, recharge rates, and spring flow discharges.

For the water supply planning process, the important variables are those that significantly impact water supply withdrawal decision-making. These are the change in surficial aquifer water levels beneath sensitive wetlands and changes in spring flow. The groundwater flow models have been developed by SJRWMD to provide the best predictions currently available of the response of the Floridan and surficial aquifers to various water supply withdrawal scenarios.

There are several sources of model uncertainty including: limitations inherent in the available model computer codes; horizontal and vertical resolution (discretization) of the model framework; uncertainty in the model input data; and uncertainty in model calibration.

**Groundwater Model Peer Review**

All major groundwater models developed by SJRWMD, including the east-central Florida, Volusia, and Northeast Florida groundwater flow models are subject to periodic peer review as these models are constructed and updated.

**Limitations in Model Computer Codes**

By inputting an area's unique relevant hydrologic parameters, modelers create a computer code that is used to construct a groundwater flow simulation model. The hydrologic parameters that describe the "real" system are applied within the framework of the model computer code and thereby result in a groundwater flow model.

The model code used in the water supply planning models is MODFLOW—a published, long-accepted, peer-reviewed set of computer-coded instructions authored by Michael McDonald and Arlen Harbaugh (U.S. Geological Survey) that have been used throughout the United States for more than 15 years.

The regional groundwater flow models will do a good job of predicting 2025 Floridan aquifer drawdowns and spring flows, and they will do a reasonably good job of identifying potential Floridan water quality trouble spots. However, the model's abilities' to accurately predict 2025 drawdown in the surficial aquifer and in the wetlands is hampered, in part by limitations inherent in MODFLOW.

MODFLOW's governing equations accurately describe the groundwater hydrology, but only the Floridan spring flow and evapotranspiration (ET) portions of the surface-water hydrology can be explicitly computed in a reasonably straightforward manner. MODFLOW allows "capture" of water due to reduced Floridan spring flows caused by drawdown in the Floridan. Similarly, MODFLOW allows capture of water due to reduced ET as a result of water-table drawdown in the surficial aquifer. ET capture tends to offset water table drawdown as does surface water capture. However, MODFLOW's equations do not adequately describe "capture" of runoff (surface and subsurface) in response to drawdown in the surficial aquifer caused by changes in leakage rates through the confining beds that overlie the Upper Floridan aquifer.

MODFLOW's DRAIN or RIVER functions can compute changes in surface discharge from the surficial, but only if composite "fixed heads" and composite "DRAIN or RIVER coefficients" can be determined for individual model grid-cells. Those parameters are difficult to accurately determine, especially in grid cells that contain more than one ditch, stream, or river.

MODFLOW does not account for hydrologic connectivity of wetlands with other wetlands, streams, or with upland drainage, where such connectivity exists. Hence surface water routing is not simulated or quantified from one grid cell to another. This factor causes MODFLOW to overestimate drawdown in the surficial because it doesn't allow for surface water inflow to help offset the effects of local drawdown caused by increased downward leakage. MODFLOW's inability to adequately describe surface water capture (discussed previously) exacerbates the problem.

### Horizontal and Vertical Discretization

Model horizontal grid discretization is large (2,500 feet on each side) with respect to the size of certain types of wetlands. For example, in the coastal zone of the District, many wetlands are elongate and coast-parallel, and, in many cases, their narrow dimensions are considerably smaller than 2,500 feet. The geometry of wetlands (size, shape, grid-cell overlap) cannot be explicitly described in MODFLOW. Storage coefficients for the surficial aquifer must therefore be a composite value of that part of the grid cell that represents free-water surfaces and that which represents land surfaces. It is important to recognize that storage coefficient considerations will not affect the current steady-state models but it will have an effect on future transient simulations.

Horizontal grid discretization can affect the areal extent of the "deficits" computed by the Decision / Optimization model. For example, the deficit amount for a large grid cell will likely be larger than that for a smaller grid cell because it will likely contain more pumping sites. It is possible that the sheer number of affected deficit small grid cells might account for the same amount of deficit in a larger cell of the same equivalent area contained in the small cells. In a more highly discretized model, the tendency will be for a smaller total area to be included in deficit areas; hence some pumping cells could escape being labeled as deficit cells.

Vertical discretization refers to the number of aquifer and confining bed layers simulated. Aquifers simulated with only 1 layer cannot account for vertical anisotropy, that is, the tendency for horizontal aquifer hydraulic conductivities to be greater than their vertical hydraulic conductivities. Such anisotropy tends to allow water within the aquifer itself to more easily flow horizontally than vertically. Subdividing the aquifer vertically into several layers can account for vertical anisotropy by incorporating quasi-confining beds that couple the individual layers and offer resistance to vertical flow between the aquifer layers. Confining beds can be similarly discretized.

Vertical discretization of vertically anisotropic aquifers tends to simulate Floridan pumping cones of depression that are shallower and of larger aerial extent than would be the case if that aquifer was simulated as only one layer. Shallower, broader Floridan cones of depression would tend to reduce downward leakage from the surficial aquifer in the areas nearest the pumping centers but would tend to increase downward leakage near the outermost edges of the cone.

More highly discretized models result in models with more grid cells, sometimes many multiples of those contained in the current SJRWMD models. This presents data and computational problems that are beyond the scope of this discussion, but they are substantial.

## Errors in Model Input Data

### Bias and Random Errors

All model input data are subject to errors. There are essentially two types of error—bias error and random error. Bias error occurs when data are collected in such a manner that measurements are “biased” toward values that are consistently too high or too low. Bias error typically occurs when the measurement technique is flawed. Random error occurs when some of the measurements are too high while others are too low. Random errors are inherent in all measurements to one degree or another but tend to cancel out over a series of many measurements.

Measured model input data are carefully collected to eliminate bias errors and to minimize random errors to the extent possible. The following discussion lists major sources of random error in model input data.

### Spring Flow Measurements

The accuracy of USGS measured Floridan aquifer spring flows are typically rated as “good,” meaning the gaging technician believes the measurement is accurate to within 10% of its actual value. In recent years, springs in the District have been measured from 6 to 12 times per year. Prior to that time, most springs were measured only twice per year with Blue Spring (8 times / yr.) and Silver Spring (8 times / yr. *and* computed daily discharge) being the exceptions. The errors in discharge measurements are random errors and are not believed to contain bias error. Therefore, during any year that contains 8 time-weighted discharge measurements, the random errors should tend to balance out and thus leave a reasonably accurate determination of the average discharge for that year. Multiyear average discharges are even more accurate.

### Rainfall Measurements

Rainfall in Florida is highly variable, both temporally and spatially. SJRWMD must assume that the gauged rainfall data are accurate. Theissen polygons or other methods are used to interpolate between stations.

### Land Surface Elevations

Land-surface altitudes are gleaned from USGS topographic maps or from the USGS topographic databases. In either case, those data might be considered the “gold” standard for data derived by indirect means such as photogrammetry augmented by known control points such as surveyed benchmarks. Even so, the USGS rates their interpolated topographic data as accurate to within plus or minus one-half a contour interval (+- 2.5 feet for 1:24,000, 7.5’ quadrangle map sheets). It is believed that the USGS understates the accuracy of their maps. Nevertheless, some error exists even here.

### Water Level Measurements

Water-level measurements in Floridan aquifer wells are used to develop potentiometric surface data points from which potentiometric maps are constructed. Almost all water-level measurements are collected with an accuracy of 0.01 foot. Potentiometric map data points are fixed in space and time but the potentiometric maps are constructed from numerous data that were not all collected at the same time. Thus, the maps represent a “snapshot” in time that may actually span 1 or more weeks. Further, the data at the data points are interpolated in space by either an experienced hydrologist or by a computer. Regardless of which does the best job, there is some error inherent in the potentiometric maps.

### Thickness of Geologic Strata

There is uncertainty in determining aquifer and confining bed thicknesses. Such information is obtained from geologic data gathered from individual wells or test holes and then, by interpolation, rendered into areal maps.

### Transmissivity and Leakance

Floridan aquifer transmissivity (T) and upper confining bed leakance (L) are typically first rough-estimated using available aquifer-test data and are then fine-tuned as part of the iterative calibration process. This process is aided in spring basins where the actual groundwater flux is known in terms of gaged spring flow. Calibrated T’s and L’s are typically within +- 20% to 30%.

### Recharge

Uncertainty in net recharge to the surficial aquifer is derived from uncertainties in: rainfall data; estimates of run-off (surface and sub-surface) to streams and ditches; evapotranspiration rates; and estimates of recharge from septic systems, rapid infiltration basins, recharge due to lawn and agricultural irrigation, and other types of surface and subsurface applications.

## Model Calibration Errors

In brief, the steady-state model calibration process consists of adjusting the “soft” input parameters of Floridan aquifer Transmissivities (T) and upper confining bed leakance coefficients (L) so the model output response due to pumping or other imposed hydraulic stresses matches the “hard” data such as observed aquifer heads and spring flows. An important aspect of the initial calibration effort consists of determining the proper boundary conditions for the model.

Nonsteady-state calibration typically occurs after steady-state calibration is accomplished. Here, the previously determined boundary condition coefficients, T’s, and L’s are held unchanged and aquifer and confining bed storage coefficients are adjusted to match aquifer responses due to pumping or other hydraulic stresses observed over a given period of time.

The steady-state calibration process typically yields non-unique “working” combinations of T and L for individual grid cells. These working combinations can yield calibrated Floridan aquifer responses within a few percent even though the individual T’s and L’s may be considerably less accurate. This is adequate for predicting steady-state aquifer responses in the Floridan but the errors in L directly affect the leakage rates to and from the surficial and, hence, can cause errors in the computed drawdowns in the surficial.

Models are typically considered calibrated if the computed Floridan aquifer heads match observed heads within approximately 2 feet (+,-), whereas the wetland drawdown constraint can be as small as 0.35 foot. It is unlikely that the accuracy of the computed wetlands drawdown in the less well calibrated surficial aquifer exceeds the calibration criterion for the calibrated Floridan aquifer where fluxes are reasonably well known.

There may be considerable lag between the time that 2025 drawdowns are seen in the Upper Floridan and when they are seen in the surficial aquifer. Where Upper Floridan confining beds are thin or permeable, drawdowns in the surficial will be reasonably contemporaneous with those in the Upper Floridan. Where confining beds are thick or less permeable, drawdowns in the surficial can lag those in the Upper Floridan by several years. The steady-state versions of the models will not account for lag but the transient versions will be able to simulate drawdown in wetlands as a function of time.

## Water Allocation and Economic Optimization Models

The water allocation model and the decision model are closely related linear programming applications. These models are based on proven mathematical optimization algorithms. The water allocation model duplicates the hydrologic response predicted by the groundwater flow models and is designed to optimize groundwater withdrawals given aquifer response and water withdrawal constraints. The decision model is an extension of the groundwater allocation model and is designed to identify least cost alternative water sources to meet the identified water supply deficits.

The water allocation and decision models rely on input data provided by other aspects of the planning process, including groundwater flow model results and the withdrawal constraints. All uncertainties associated with these planning steps are carried forward, but no new significant sources of uncertainty are introduced by proper application of the groundwater allocation model. With accurate input data these models will always provide accurate results.

The decision model does require life cycle cost estimates associated with development of the alternative water supplies considered. Cost estimates are developed at the cost curve or conceptual planning level of accuracy. As such there is a significant degree of uncertainty associated with any individual facility cost estimate. For example, the estimated cost of a surface water treatment plant located on Lake Griffin, or a given water transmission main could be in error as much as 50%. This is because at this regional planning scale, exact sites or routes have not been identified and site-specific conditions cannot be accounted for. At this level of planning it is important that the relative differences in cost among alternatives be accurately represented, and that the costs for all alternatives be developed on a consistent and comparable basis.

## UNCERTAINTY MANAGEMENT

Uncertainty cannot be avoided, but to a great extent it can be managed. Major areas of uncertainty, previously discussed, include the accuracy of water use projections, uncertainties associated with the application of lake and wetland drawdown constraints, and the accuracy of predicted surficial aquifer water level changes using existing models and hydrogeologic data.

### Water Use Projections

The major area of uncertainty associated with the 2025 water-use projection is the accuracy of the projected growth in the public supply category. Growth in public supply water use represents the vast majority of the expected growth in water use by 2025. Public supply water use projections are based on expected population growth, using median growth estimates published by the Bureau of Economic and Business Research (BEBR) and historic per capita use.

As previously discussed, BEBR quantifies uncertainty associated with population projections by publication of low estimates and high estimates, in addition the median or expected estimate. For the 15 SJRWMD counties that contribute to public supply water use, the annual population growth rates associated the low, median and high projections are 1.15%, 1.91% and 2.62% respectively. Uncertainty is managed by using the median or expected value population predictions and associated growth rate. In this manner it is equally likely that the difference between actual 2025 population and predicated population will be higher or lower than the values used in the planning process. That is the median values provide the most unbiased estimate available.

It is informative to note that the actual population growth rate for the fifteen SJRWMD public supply counties between 1995 and 2003 is 2.19% per year, which compares well with the predicted, 30-median growth rate of 1.91% per year.

### Application of Lake and Wetlands Drawdown Constraints

If the average water level of lakes and wetlands are reduced sufficiently, dominant vegetative patterns will change and such change is consider significant harm under current SJRWMD water use permitting criteria. The relationship between reduction in long term average water levels and changes in vegetation type is fairly well known. However, water levels in lakes and wetlands respond to many variables and only one, surficial aquifer water level, is affected by groundwater pumping. Other important hydrologic variables include the lake or wetlands tributary area size, soils type, land use, and other characteristics that may influence the lake or wetland water budget. Therefore, a level of uncertainty exists related to the cause and effect relationship between reduction in surficial aquifer water levels and resulting reduction in water levels in nearby lakes and wetlands as previously discussed. This uncertainty is managed, in the planning process, by careful selection of the lakes and wetlands used as control points in the decision model.

The control points used in the decision model were chosen to geographically cover the entire planning area and to represent those lakes and wetlands most likely to be affected by reductions in surficial aquifer water levels. The selected control points are primarily isolated lakes and wetlands as illustrated on Figure 1. Lakes or wetlands that are directly connected to larger surface water hydrologic systems were not chosen as control points because reduction in surficial aquifer water levels near these flow through systems is unlikely to result in reduction in the lake or wetland water levels. That is, only sensitive isolated lakes and wetlands were used as water supply withdrawal control points in the application of the decision model.

Because the response of individual lakes or wetlands cannot be accurately predicted at this regional planning scale the results of the groundwater allocation and decision models are open to some interpretation. Specifically, an exceedance of the drawdown constraint at a given lake or wetland control point does not necessarily mean that the lake or wetland drawdown limit *will* be exceeded; it means that the limit *may* be exceeded, depending on effects of other hydrologic variables not directly included in the analysis. Without a doubt, a decrease in the surficial aquifer level beneath a lake or wetland will increase the potential for seepage (i.e. recharge) from the surface water body to the aquifer. However, the actual magnitude of the increased seepage will depend on the degree of hydraulic connection between the two hydrologic systems, and surface water inflow, as well as the magnitude of surficial aquifer drawdown.

### Groundwater Flow Models

The most significant uncertainty associated with application of the groundwater flow models is the accuracy of predicted of surficial aquifer water levels. Although many groundwater-modeling uncertainties exist, as previously discussed, this is the most important for two reasons. First, water supply deficits are controlled, for the most part, by the wetlands drawdown constraint. That is, wetland drawdown considerations control the total volume of water that can be withdrawn from the aquifer without causing unacceptable harm. This constraint is more important to limiting water supply withdrawal from the Floridan aquifer, than the MFLs constraints (including springflow concerns), and the Floridan aquifer water quality constraint. Second, prediction of surficial aquifer water levels is one of the least accurate of the parameters predicted by the groundwater flow models.

The uncertainty associated with the surficial aquifer water level projections is mitigated somewhat by the fact that the absolute accuracy of the projected surficial aquifer water levels is not as important as the predicted change in water levels due to an increase in water supply withdrawal. That is, the important variable, for water supply decision-making, is the change in predicted water levels, rather that the exact value of the predicted water level. It is generally believed that the range of uncertainty associated with prediction of surficial water level change is considerably less than the uncertainty associated with prediction of exact surficial water level elevations.

Although many factors influence surficial aquifer drawdown resulting from a given Floridan aquifer drawdown, the most important, currently included in the model, is likely the leakance value (L), which is an indicator of the degree of hydraulic connection between the surficial aquifer and the Floridan aquifer. Very high leakance indicates a well-connected system and a very low leakance indicates nearly independent hydrologic systems. Therefore, where leakance is high the change in surficial aquifer levels, due to increased Floridan aquifer withdrawals, will be greater than where leakance is low, all else being equal.

As previously discussed leakance is a calibration parameter. Reasonable leakance (L) and transmissivity (T) values are assumed and these values are adjusted until predicted potentiometric elevations match observed potentiometric elevations, within an allowable range. Under theses conditions, the model is considered *calibrated*. There is however, a range of leakance values that could be used in the model and still meet calibration criteria.

In an effort to quantify the degree of uncertainty associated with predicted change in surficial aquifer water levels, the leakance values were adjusted, within the range of model calibration, to determine the resulting change in predicted surficial aquifer water levels and in estimated water supply deficits. The adjustment was a one-way adjustment, assessing only the effects of decreasing the leakance. This leakance sensitivity analysis was performed as part of the original SJRWMD 2000 DWSP but was not repeated for the current 2005 DWSP.

It has also been noted that there is uncertainty related to the length of time between a water supply withdrawal and an observed response in the surficial aquifer and affected wetlands. This lag time, while important for interpreting monitoring results, has no bearing on water supply planning or decision-making. Because the surficial aquifer will eventually react to any lowering of the Floridan aquifer potentiometric pressure and thereby impact sensitive wetlands, the planning effort strives to prevent such events from ever occurring.

**Planning Level Cost Estimates**

All cost estimates developed in the water supply plan, are conceptual planning level cost estimates. As such any individual estimate, for a given treatment plant or transport facility for example, may be in error by as much as 50%. This is essentially true for all regional planning activities not just DWSP.

The accuracy of the individual cost estimates are however not as important to the planning process as the relative life cycle cost among the alternative water supply sources. That is, it is important for the costs associated with various water supply sources such as fresh groundwater, brackish groundwater, and surface water from the St. Johns River, to be accurate relative to each other. That is, if all life cycle cost estimates are say 25% high or 25% low, the cost estimates will still be relatively comparable and will well serve their primary purpose.

Steps were taken to ensure that all conceptual planning level life cycle cost estimates used in the water supply planning process were compatible and comparable. Early in the process a consistent set of cost estimating and economic criteria were established so that all cost estimates were based on the same set of assumptions. In this manner the uncertainty associated with conceptual planning level cost estimates was minimized.

## DECISION-MAKING IMPLICATIONS

It is acknowledged that there are considerable areas of uncertainty in the regional water supply planning process. Each source of uncertainty has relative degrees of importance and can often be minimized, or at least managed.

Planning uncertainty will never be fully eliminated. Therefore, waiting until all is known is not an option. The best decisions possible must be made based on our current understanding, recognizing that this understanding may change in the future.

Water supply planning and decision-making must proceed on a regional scale. Individual (user-by-user) decision-making is no longer a valid approach to long-term water supply decision-making, and resource management, for large portions of SJRWMD. This is definitely true for east-central Florida where the Floridan aquifer currently provides a single source water supply with approximately 1,000 public supply wells in operation. Regional interactions of the individual withdrawals must be considered in both planning and permitting. Individual wellfields cannot be examined in isolation if adverse impacts are to be avoided, and adequate affordable water supplies are to be developed.

Although not perfect, the water supply planning tools and procedures developed by SJRWMD are the best water supply planning tools currently available for the planning area. These tools and procedures provide the most comprehensive regional scale water supply planning approach currently available.

We must recognize and acknowledge the limits of the current analysis. An exact upper limit on Floridan aquifer withdrawal cannot be established at this time. However, water supply alternatives based on the lower end of the maximum withdrawal estimates will present less resource impact risk than will water supply alternatives based on the higher end of the maximum withdrawal estimates. Cost follows an inverse relationship. The lower risk alternatives that involve development of alternative water supplies involve higher costs. Therefore decision-making will involve a risk versus cost assessment.

New institutional relationships may be needed to implement regional solutions. At the very least a significant level of cooperation will be needed among the individual public supply utilities currently operating within the priority water resource caution area.

The water supply plan will be updated at least every 5 years, possibly more often, and continuous upgrades and revisions to the planning tools will be necessary to improve the accuracy and reduce the uncertainty in future updates. Therefore, it is important to maintain flexibility in the process and to the greatest extent possible maximize choices available and to characterize the choices in terms of relative cost and risk. The worst-case scenario of course is to construct high-risk water supply facilities that later have to be abandoned because of unacceptable environmental impacts.

It is clear that an adaptive approach will be needed both for long term resource monitoring and management and to provide the new information necessary to improve future prediction and to decrease uncertainty.

# REFERENCES

St. Johns River Water Management District and CH2M HILL. 2005. *Water 2020 Constraints Handbook.* Special Publication SJ2005–SP8. Palatka, Fla.: St. Johns River Water Management District.

# APPENDIX F—PRIORITY LIST AND SCHEDULE FOR ESTABLISHING MINIMUM FLOWS AND LEVELS

## Priority List and Schedule for Establishing Minimum Flows and Levels

**St. Johns River Water Management District**
**January 24, 2003**

## Introduction

SJRWMD has prepared a priority list and schedule (attached hereto) for establishing minimum flows and levels (MFLs) as required by Subsection 373.042 (2), F.S. The document lists those water bodies for which SJRWMD intends to establish MFLs during 2003–2007, along with an indication of those water bodies for which SJRWMD intends to voluntarily perform peer review. The priority list must be submitted for approval annually, by November 15, to the Florida Department of Environmental Protection (FDEP) before the SJRWMD Governing Board approves and publishes the list in the *Florida Administrative Weekly*. A public workshop is held annually to receive public comment on the proposed Priority System List and Schedule.

The SJRWMD Governing Board adopted a District Minimum Flows and Levels program in June 1994. This plan sets forth a comprehensive program for SJRWMD's MFLs program, including data collection and data management, applied research, a priority list for setting specific MFLs, follow-up monitoring to verify MFLs, and implementation of MFLs through permitting and water supply planning. In 1996, the MFL Plan was updated and a priority list and schedule was created in response to Executive Order 96-297. Starting in 2001, the MFL Program Plan has been revised annually to provide program organization, direction, and priorities.

Formulation of the schedule for setting MFLs considers established priorities, legislative mandates, and the ability of SJRWMD to perform the needed tasks with budgeted staff and funds. Additionally, SJRWMD prioritizes water bodies for the establishment of MFLs at locations where hydrologic change resulting from regional groundwater withdrawals would occur first. Establishment of MFLs at these key locations should provide adequate regional water resource protection while minimizing the number of MFLs that must be established. This new initiative, which is part of SJRWMD's

Adaptive Management Program, will begin in the east-central Florida area. Most MFL priorities are located within the priority water resource caution area (PWRCA).

## Summary of Established MFLs

Under the SJRWMD MFL Program Plan, MFLs have already been established for the following watercourses, water bodies, and aquifers:

**Surface Waters**

- 101 lakes districtwide
- Blue Cypress Water Management Area

**Surface Watercourses**

- Wekiva River at SR 46
- Blackwater Creek at SR 44
- Taylor Creek, 1.7 miles downstream of structure S-164
- St. Johns River, 1.5 miles downstream of Lake Washington weir

**Aquifers**

- 8 springs (minimum spring flow and a level in the aquifer at the springhead) in the Wekiva River Basin

In addition, technical work on another six lakes, Blue Spring, and the St. Johns River near DeLand (SR 44) has been completed. Rulemaking for these systems is scheduled to be complete in fiscal year (FY) 2003. Work is ongoing for the St. Johns River near Christmas (SR 50), Lake Monroe near Sanford, and additional lakes. Field data collection will be initiated on a number of priority springs during FY 2004.

As MFLs are established, they are implemented primarily through the SJRWMD Water Supply Planning (Water Supply Management) and Consumptive Use Permitting programs.

## 2002 Priority Water Body List and Schedule for the Establishment of MFLs, 2003–2007

### Year 2003

| Water Body Type | Water Body Name | County | Voluntary Peer Review |
|---|---|---|---|
| Rivers | St. Johns River, SR 44* | Volusia / Lake | Yes |
| | St. Johns River, SR 50* | Brevard / Orange | Yes |
| Aquifer (springs) | Blue Spring | Volusia | Yes |
| Lakes | Bowers | Marion | — |
| | Indian | Volusia | — |
| | Monroe | Seminole / Volusia | — |
| | Nicotoon | Marion | — |
| | Smith | Marion | — |
| Wetlands | Hopkins Prairie | Marion | — |
| | Tuscawilla | Alachua | — |
| Re-evaluations | To be determined | — | — |

*Minimum flows and levels location may be adjusted as needed to protect the river from impacts of selected withdrawal sites.

### Year 2004

| Water Body Type | Water Body Name | County | Voluntary Peer Review |
|---|---|---|---|
| Rivers | None | — | — |
| Aquifer (springs) | None | — | — |
| Lakes | Banana | Seminole | |
| | Bear Gully | Seminole | |
| | Bel-Air | Seminole | Yes |
| | Deforest | Seminole | Yes |
| | East Crystal | Seminole | Yes |
| | Flat | Lake | — |
| | Gleason | Volusia | — |
| | Hiawassee | Orange | — |
| | Horseshoe | Seminole | — |
| | Johns | Orange | — |
| | Johnson | Clay | — |
| | McGarity | Volusia | — |
| | Pebble | Clay | — |
| | Rose | Orange | — |
| | Sawgrass | Lake | — |
| | Theresa | Volusia | — |
| | West Crystal | Seminole | Yes |
| Wetlands | None | — | — |
| Re-evaluations | To be determined | — | — |

### Year 2005

| Water Body Type | Water Body Name | County | Voluntary Peer Review |
|---|---|---|---|
| Rivers | None | — | — |
| Aquifers (springs) | Bugg Spring | Lake | Yes |
| | Ponce de Leon Springs | Volusia | Yes |
| | Gemini Springs | Volusia | Yes |
| | Green Springs | Volusia | Yes |
| Lakes | To be determined | — | — |
| Wetlands | To be determined | — | — |
| Re-evaluations | To be determined | — | — |

### Year 2006

| Water Body Type | Water Body Name | County | Voluntary Peer Review |
|---|---|---|---|
| Rivers | Silver River | Marion | Yes |
| Aquifers (springs) | Apopka Spring | Lake | Yes |
| | Silver Springs | Marion | Yes |
| Lakes | To be determined | — | — |
| Wetlands | To be determined | — | — |
| Re-evaluations | To be determined | — | — |

### Year 2007

| Water Body Type | Water Body Name | County | Voluntary Peer Review |
|---|---|---|---|
| Rivers | None | — | — |
| Aquifers (springs) | Alexander Spring | Lake | Yes |
| | Silver Glen Springs | Marion / Lake | Yes |
| Lakes | To be determined | — | — |
| Wetlands | To be determined | — | — |
| Re-evaluations | To be determined | — | — |