

# Water Use

in the St. Johns River Water Management District

# 2000

## Physiographic Setting

The St. Johns River Water Management District (SJRWMD) is one of five water management districts in Florida, encompassing 12,300 square miles in the northeast and east-central part of the state.

SJRWMD includes all or part of 18 counties<sup>1</sup> with nearly four million people, or 25% of the state's population. Within SJRWMD's boundaries are the entire St. Johns and Nassau river basins, the Indian River Lagoon and Northern Coastal basins and Florida's portion of the St. Marys River Basin. SJRWMD's normal annual rainfall for the period 1991–2000 was 52.37 inches. The driest year of the period was 2000, with an

average of 37.56 inches of rainfall, or 28% below normal districtwide. In the year 2000, Lake, Marion, Orange, Polk, Seminole, and Volusia counties experienced rainfall deficits from 10 inches to 20 inches below normal. Between 1991 and 2000, groundwater levels declined three to four feet, while groundwater levels in southwest Orange County declined almost nine feet. During the same period, lake levels dropped from three feet to nine feet, with the greatest decline in lake levels occurring in Lake County.

<sup>1</sup>As of July 1, 2003, the portion of the St. Johns River Water Management District that was in Polk County became part of the Southwest Florida Water Management District.

The St. Johns River Water Management District has published an annual water use report since 1978. Each report assesses the total quantities of water used arranged by source, category of use and county; the report is distributed to a wide variety of state and local government agencies and private organizations. SJRWMD cooperates with the U.S. Geological Survey, which compiles national estimates of water use every five years.

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## Water Use

This document reports water use for water withdrawals from ground or surface water sources, expressed in million gallons per day (mgd). Water withdrawal information is reported for six categories of use: public supply, domestic self-supply, commercial/industrial/institutional self-supply, agricultural irrigation self-supply, recreational irrigation self-supply, and thermoelectric power generation self-supply. The total amount of water used in SJRWMD in 2000, including fresh and saline water, was 3,268.39 mgd (Table 1).

Of that amount, 1,487.77 mgd was freshwater and 1,780.62 mgd was saline water used primarily for thermoelectric power generation (Table 2). Groundwater use totaled 1,176.84 mgd, and fresh surface water use totaled 310.93 mgd (Figure 1). The largest use of fresh groundwater in SJRWMD in 2000 was for public supply, which totaled 558.65 mgd, approximately 48% of the total groundwater use. This was followed by agricultural irrigation, which used 392.33 mgd, approximately 33% of the total groundwater.

Freshwater is defined as water with a total dissolved solids (TDS) concentration less than or equal to 1,000 milligrams per liter (mg/L). Saline water has a TDS concentration greater than 3,000 mg/L or a chloride concentration greater than 1,000 mg/L.

County	Freshwater		Saline Water		Total Water Use
	Ground	Surface	Total	Surface	
Alachua*	36.91	0.28	37.19	0.00	37.19
Baker*	5.64	1.73	7.37	0.00	7.37
Bradford*	0.43	0.02	0.45	0.00	0.45
Brevard	169.14	39.20	208.34	1,079.28	1,287.62
Clay	33.57	0.52	34.09	0.00	34.09
Duval	154.33	1.65	155.98	661.15	817.13
Flagler	24.55	3.60	28.15	0.00	28.15
Indian River	87.36	161.08	248.44	39.01	287.45
Lake*	88.61	9.63	98.24	0.00	98.24
Marion*	43.92	1.94	45.86	0.00	45.86
Nassau	46.53	0.48	47.01	1.18	48.19
Okeechobee*	15.28	0.00	15.28	0.00	15.28
Orange*	157.28	5.32	162.60	0.00	162.60
Osceola*	29.48	19.06	48.54	0.00	48.54
Polk*	5.28	0.46	5.74	0.00	5.74
Putnam*	40.35	48.92	89.27	0.00	89.27
St. Johns	52.55	3.16	55.71	0.00	55.71
Seminole	88.47	1.78	90.25	0.00	90.25
Volusia	97.16	12.10	109.26	0.00	109.26
<b>Total</b>	<b>1,176.84</b>	<b>310.93</b>	<b>1,487.77</b>	<b>1,780.62</b>	<b>3,268.39</b>

Note: Public supply figures based on water withdrawals at 0.01 mgd and above

\*Counties partially in SJRWMD

Table 1. Total water use by county in SJRWMD, 2000 (in million gallons per day)

## Public Supply

The public supply category consists of water supplied by both privately and publicly owned water supply utilities. This category includes both residential and nonresidential uses. Utilities that withdraw more than 0.01 mgd from ground or surface water sources are included in this category. Water use data are obtained from utility records and are estimated to the nearest 0.01 mgd.

In 2000, 292 public supply utilities served an estimated 3,402,521 people, approximately 88% of the total population in SJRWMD.

Category	Freshwater		Saline Water	
	Ground	Surface	Total	Surface
Public supply	558.65	14.08	572.73	0.00
Domestic self-supply	51.70	0.00	51.70	0.00
Commercial/industrial use	90.64	31.80	122.44	1.18
Agricultural irrigation	392.33	214.20	606.53	0.00
Recreational irrigation	72.66	31.94	104.60	0.00
Thermoelectric power generation	10.86	18.91	29.77	1,779.44
<b>Total</b>	<b>1,176.84</b>	<b>310.93</b>	<b>1,487.77</b>	<b>1,780.62</b>

Table 2. Total water withdrawals by category in SJRWMD, 2000 (in million gallons per day)

Total water use from both ground and surface water sources was 572.73 mgd, nearly 20% above the average annual use of 479.39 mgd for the 10-year period from 1991 to 2000. The average per capita use, based on the population served by public supply, was 168 gallons per day (gpd), compared to the average per capita use of 158 gpd for the same 10-year period. Public supply water use typically fluctuates during the year in response to seasonal rainfall and temperature variations. Water use tends to increase during the warm season (April through October), when outdoor use is highest. In 2000, water use ranged from a low of 497.54 mgd (146 gpd) in January to a high of 709.02 mgd (208 gpd) in May.

Approximately 98% of the water withdrawn for public supply was groundwater, and approximately 89% of the groundwater was withdrawn from the Floridan aquifer; the remaining 11% was withdrawn from the intermediate and surficial aquifers.

The counties with the largest public supply water use in SJRWMD were Orange County (130.27 mgd serving 614,510 people) and Duval County (119.12 mgd serving 736,838 people). Together, these counties represented about 44% of the public supply water use and about 40% of the public supply water use population (Figures 2 and 3). There is no public supply water use in the portions of Okeechobee and Osceola counties within SJRWMD.

## Domestic Self-Supply

The domestic self-supply category includes water withdrawn from individual domestic wells. Water use for domestic self-supply is not inventoried, so water use is estimated from population and per capita water use figures.

In 2000, an estimated 487,809 people used 51.70 mgd of domestic self-supply water, or approximately 4% of the total fresh groundwater use in SJRWMD. All of the domestic self-supply water was assumed to be groundwater. Marion County had the largest self-supplied population with 83,642

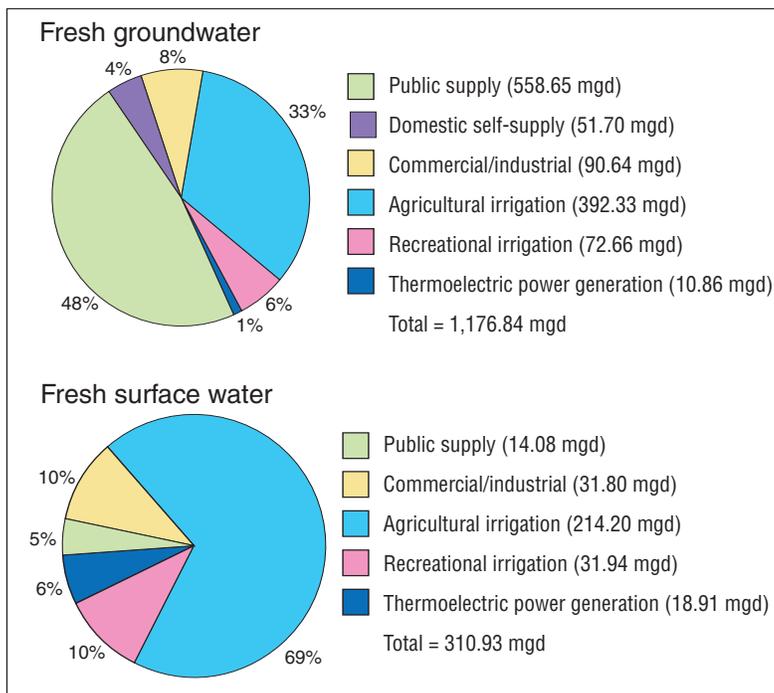


Figure 1. Total freshwater use, 2000. Most of the freshwater used in SJRWMD came from groundwater sources. Surface water is used primarily for agricultural irrigation.

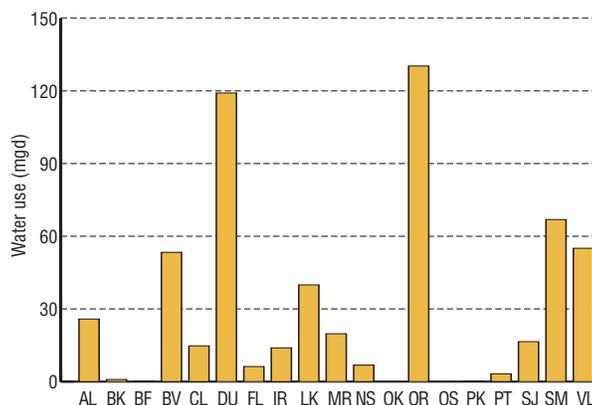


Figure 2. Freshwater use for public supply in SJRWMD 2000. Duval and Orange counties are the largest water users in SJRWMD.

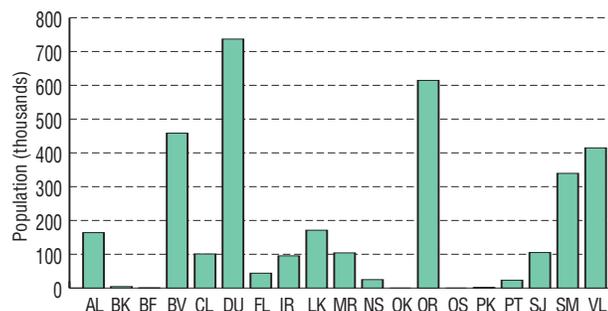


Figure 3. Population served by public supply in SJRWMD, 2000. Duval and Orange counties are the largest in public supply population in SJRWMD.

people; Orange County had the second largest with 57,748 people, followed by Putnam County with 47,112 people.

Domestic self-supply water use has fluctuated over the 10-year period between 51.70 mgd in 2000 and 93.42 mgd in 1995. The average for this 10-year period was 83.46 mgd; water use in 2000 was about 38% below the average. Fluctuations in water use are mainly due to changes in water use estimating methodologies employed over the years. In 2000, the statewide domestic per capita of 106 gpd was used to estimate the domestic self-supplied water use.

### Commercial/Industrial/Institutional Self-Supply

The commercial/industrial/institutional self-supply use category consists of the larger commercial and industrial users not served by public supply utilities that pump more than 0.01 mgd. The commercial category includes businesses and institutions, such as government facilities, military installations, schools, prisons and hospitals. The industrial category includes mining, processing and manufacturing facilities; it does not include water used for power generation by thermoelectric power plants. Water used for transporting materials from the mine pit to the plant and for dewatering mine pits is considered conveyance and also is not included in estimates of water use. Fifty-two industrial users, 43 institutions, and 26 commercial users are included in this report of 2000 water use.

The total freshwater use in the commercial/industrial/institutional category was 122.44 mgd, approximately 8% of the total freshwater use in SJRWMD. Of this freshwater total, 90.64 mgd was groundwater and 31.80 mgd was surface water. In addition, 1.18 mgd of saline surface water was used.

Most of the water withdrawn for commercial/industrial/institutional purposes supplied the pulp and paper industries in Putnam, Nassau and Duval counties. In 2000, water use for pulp and paper production included 56.61 mgd of fresh groundwater, 30.28 mgd of fresh surface water, and 1.18 mgd of saline surface water. The second largest water user in this category was the mining industry, which accounted for 13.68 mgd of fresh groundwater and 1.44 mgd of fresh surface water. Together, pulp and paper production and mining accounted for 102.01 mgd of freshwater, 84% of the commercial/industrial freshwater use.

Commercial/industrial/institutional self-supply water use was highest in 1992 (148.20 mgd) and lowest in 1997 (118.72 mgd). The average for the 10-year period 1991–2000 was 131.05 mgd; water use in 2000 was 7% below the average. Commercial/industrial/institutional freshwater use in 2000 varied from a low of 109.65 mgd in October to a high of 143.42 mgd in May.

### Agricultural Irrigation Self-Supply

The agricultural irrigation self-supply category consists of estimated water withdrawals from ground and surface water sources for supplemental crop irrigation. Estimates of the acreage planted in various crops are multiplied by estimates of the quantity of water per acre necessary to irrigate those crops. Water use for irrigation is assessed by crop, because different crops have different consumptive use requirements.

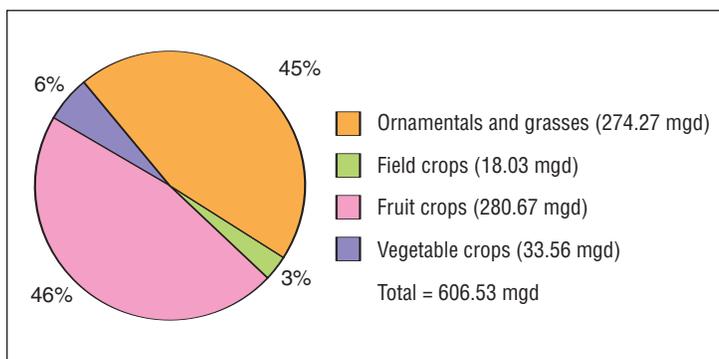


Figure 4. Agricultural irrigation water use in SJRWMD for four crop types, 2000. Fruit crops (46%) and ornamentals and grasses (45%) were the largest water use crop types of agricultural irrigation in 2000.

Total freshwater use for agricultural irrigation was estimated at 606.53 mgd, or approximately 41% of the total freshwater use in SJRWMD in 2000. Of this total, 392.33 mgd, approximately 65% of the total water used for agricultural irrigation, was groundwater. Most groundwater used for agricultural irrigation came from the Upper and Lower Floridan aquifers because of the available quantities and suitable water quality.

An estimated 1,394,512 acres were farmed in SJRWMD in 2000, of which 282,809 acres were irrigated. Of the total acreage irrigated, 147,443 acres were irrigated by flood systems, 82,930 acres were irrigated by low-pressure/low-volume systems, and 52,436 acres were irrigated by sprinkler systems.



The largest water use for agricultural irrigation by county occurred in Indian River County—222.49 mgd of freshwater, approximately 37% of the agricultural irrigation. Most of this amount was fresh surface

water. The second largest water use for agricultural irrigation by county was in Brevard County—136.82 mgd, most of which was groundwater. The combined water use in these two counties was 359.31 mgd, approximately 59% of the total agricultural irrigation water use.

The crop types with the largest water use were fruit (280.67 mgd, 46% of the agricultural irrigation water use) and ornamentals and grasses (274.27 mgd, or 45% of the agricultural irrigation water use) (Figure 4). The largest water use for a single crop was for citrus irrigation, which accounted for 276.43 mgd, approximately 45% of the agricultural irrigation water use.

## Recreational Irrigation Self-Supply

The recreational irrigation self-supply category includes water used to irrigate turf grass for golf courses. An estimated 24,323 of 35,679 acres were irrigated using sprinkler systems. Water used in the recreational irrigation category totaled 104.60 mgd, about 7% of the total freshwater use in 2000. Of this amount, 72.66 mgd was groundwater. The largest water uses by county for recreational irrigation occurred in Brevard County (14.83 mgd), Volusia County (12.25 mgd), and Orange County (12.22 mgd).

Between 1991 and 2000, combined agricultural and recreational irrigation water use was highest in 2000 (711.13 mgd) and lowest in 1999 (377.01 mgd). The average for this 10-year period was 562.82 mgd. In 2000, agricultural and recreational combined irrigation water use was 26% above the average.

Agricultural and recreational combined irrigation water use in 2000 had a greater seasonal fluctuation than any other water use category, from a low of 120.60 mgd in September to a high of 2,161.94 mgd in May. These fluctuations are typical of irrigation water use and are inversely correlated to rainfall.

## Thermoelectric Power Generation Self-Supply

The thermoelectric power generation self-supply category consists of water used by power plants primarily for cooling. In 2000, water use data were collected for 12 self-supplied thermoelectric power plants. Water use in this category totaled 1,809.21 mgd, and of this amount, 1,779.44 mgd was saline surface water, 18.91 mgd was fresh surface water, and 10.86 mgd was fresh groundwater. The largest amount of saline water used by county for thermoelectric power generation was in Brevard County (1,079.28 mgd), while the largest amount of freshwater used was in Putnam County (14.59 mgd).

Thermoelectric power generation freshwater use was highest in 1994 (142.37 mgd) and lowest in 1999 (25.78 mgd). The average for this 10-year period was 79.57 mgd; water use in 2000 was 63% below the average. Thermoelectric power generation freshwater use in 2000 fluctuated from a low of

24.11 mgd in September to a high of 40.63 mgd in May. Fluctuations in water use are related to power plant shutdowns for maintenance or increased power demands during periods of extremely high or low temperatures.

## SUMMARY



Increases in population, development, and tourism have played a significant role in water use in SJRWMD. The trend in freshwater use since 1978, when SJRWMD first published the

Annual Water Use Survey, has been a gradual increase in demand. In 2000, increased water use was also due to drought conditions in SJRWMD. Both the public supply population and water use for public supply within SJRWMD have more than doubled since 1978. Improved irrigation management by growers, however, has brought a decrease in agricultural irrigation water use. In general, the trend in agricultural irrigation is static, if not declining, in SJRWMD.



## Water Management

The primary goal of Florida's water management districts is the protection of water resources. The mission is to manage water resources to ensure the continued availability of those resources, while maximizing environmental and economic benefits. This is accomplished through regulation of consumptive uses; providing assistance to federal, state and local governments; operation and maintenance of control works; land acquisition and management; and applied research.

For additional information or specific water use data, contact the following:

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