

# Water Use

in the St. Johns River Water Management District

# 1997

## Water Use

Water use covers all water withdrawals from ground or surface water sources, expressed in million gallons per day (mgd). Water withdrawal information is reported for seven categories of use: public supply, domestic self-supply, commercial/industrial self-supply, agricultural irrigation, recreational irrigation, thermoelectric power generation, and abandoned artesian wells. The total amount of water used in the St. Johns River Water Management District (SJRWMD) in 1997, including fresh and saline water, was 2,133 mgd (Table 1).

County	Freshwater			Saline Water	Total Water Use
	Ground	Surface	Total	Surface	
*Alachua (AL)	30.3	0.2	30.5	0.0	30.5
*Baker (BK)	5.4	0.8	6.2	0.0	6.2
*Bradford (BF)	0.4	0.0	0.4	0.0	0.4
Brevard (BV)	100.6	19.1	119.7	427.0	546.7
Clay (CL)	20.2	0.3	20.5	0.0	20.5
Duval (DU)	151.9	0.7	152.6	542.3	694.9
Flagler (FL)	13.2	1.5	14.7	0.0	14.7
Indian River (IR)	54.4	87.0	141.4	42.0	183.4
*Lake (LK)	77.4	7.7	85.1	0.0	85.1
*Marion (MR)	39.0	1.1	40.1	0.0	40.1
Nassau (NS)	46.8	0.2	47.0	2.1	49.1
*Okeechobee (OK)	6.8	0.0	6.8	0.0	6.8
*Orange (OR)	136.3	20.4	156.7	0.0	156.7
*Osceola (OS)	4.8	7.5	12.3	0.0	12.3
*Polk (PK)	2.6	0.2	2.8	0.0	2.8
*Putnam (PT)	41.7	35.4	77.1	0.0	77.1
St. Johns (SJ)	43.2	0.8	44.0	0.0	44.0
Seminole (SM)	72.4	1.4	73.8	0.0	73.8
Volusia (VL)	80.2	7.6	87.8	0.0	87.8
<b>Total (mgd)</b>	<b>927.6</b>	<b>191.9</b>	<b>1,119.5</b>	<b>1,013.4</b>	<b>2,132.9</b>

Table 1. Total water use by county, SJRWMD, 1997 (in mgd). Orange and Duval counties used the most freshwater in SJRWMD.

\*Counties partially in SJRWMD

Category	Freshwater			Saline Water
	Ground	Surface	Total	Surface
Public supply	474.5	11.9	486.4	0.0
Domestic self-supply	82.8	0.0	82.8	0.0
Commercial/industrial self-supply	100.5	18.2	118.7	2.1
Agricultural irrigation	230.3	130.0	360.3	0.0
Recreation/landscape irrigation	27.2	11.5	38.7	0.0
Thermoelectric power generation	7.7	20.3	28.0	1,011.3
Abandoned artesian wells	4.6	0.0	4.6	0.0
<b>Total (mgd)</b>	<b>927.6</b>	<b>191.9</b>	<b>1,119.5</b>	<b>1,013.4</b>

Table 2. Total water use in the St. Johns River Water Management District, 1997. Fresh groundwater accounted for most of the freshwater used in SJRWMD.

Of that amount, 1,120 mgd was fresh, and 1,013 was saline, used primarily for thermoelectric power generation (Table 2). Groundwater use totaled 928 mgd, and fresh surface water totaled 192 mgd (Figure 1). The largest use of fresh groundwater in SJRWMD in 1997 was for public supply, which totaled 475 mgd, or 51 percent of the total groundwater use. This was followed by agricultural irrigation, which used 230 mgd, or 25 percent of the total groundwater.

## Public Supply

The public supply category consists of water supplied by privately and publicly owned water supply utilities to homes and industries. It includes both residential and nonresidential uses. Utilities that serve 400 or more people or that withdraw more than 0.01 mgd from ground or surface water sources are included in this category. Water use data come from utility records and are estimated to the nearest 0.01 mgd.

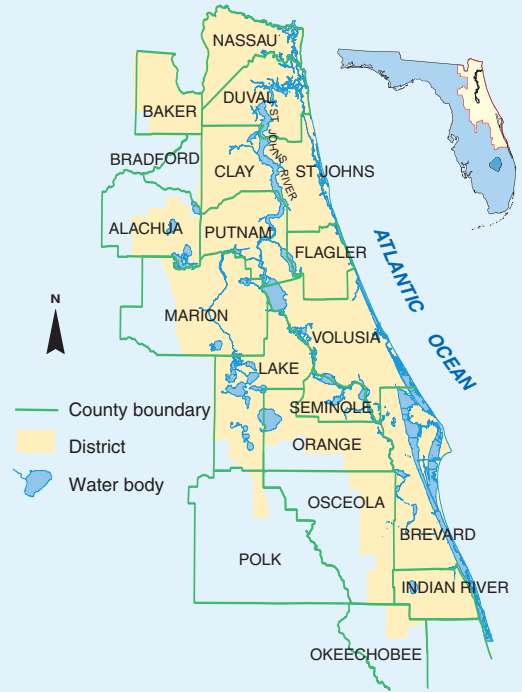
The St. Johns River Water Management District water use program has published water use reports annually since 1978. Each report assesses the total quantities of water used arranged by source, category of use and county; the report is distributed to a wide variety of state and local government agencies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



## Physiographic Setting

SJRWMD is one of five water management districts in Florida encompassing 12,300 square miles in the northeastern part of the state.

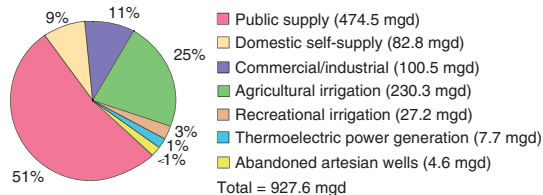
SJRWMD includes all or part of 19 counties with over three and a half million people, or 25 percent of the state's population. Within SJRWMD's boundaries are the entire St. Johns and Nassau river basins, the Indian River Lagoon and Northern Coastal basins and Florida's portion of the St. Marys River Basin (*Water Resources Atlas of Florida*). SJRWMD's normal annual rainfall for the period 1961–90 was 49.84 inches. The driest year of the period was 1990, with an average of 38.85 inches, or 22 percent below normal. Nearly 70 percent of rainfall is returned to the atmosphere through evapotranspiration, while the remaining 30 percent is run off to surface waters or recharged to aquifers (Fernald and Patton 1984).



In 1997, 312 public supply utilities served an estimated 3,136,658 people, or 85 percent of the total population in SJRWMD. Total water use from both ground and surface water sources was 486 mgd, nearly 10 percent above the average annual use of 443 mgd for the 10-year period from 1988 to 1997. The average per capita use, based on the population served by public supply, was 155 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 variation. Water use tends to increase during the warm season (April through October) when outdoor use is highest. In 1997, water use ranged from a low of 419 mgd (134 gal/person/d) in December to a high of 527 mgd (166 gal/person/d) in May. Ninety-seven percent of the water withdrawn for public supply was groundwater. The remaining 3 percent was surface water used in Brevard County.

### Fresh Groundwater



### Fresh Surface Water

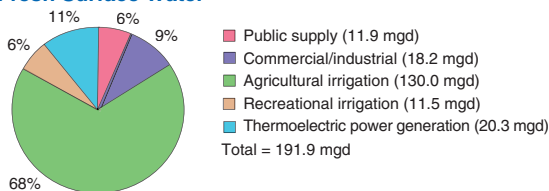


Figure 1. Total freshwater use, 1997. Most of the freshwater used in the St. Johns River Water Management District came from groundwater sources. Surface water is used primarily for agricultural irrigation.



Approximately 89 percent of the groundwater was withdrawn from the Floridan aquifer; the remaining 11 percent was withdrawn from the intermediate and surficial aquifers.

The counties with the largest public supply water use in SJRWMD were Orange County

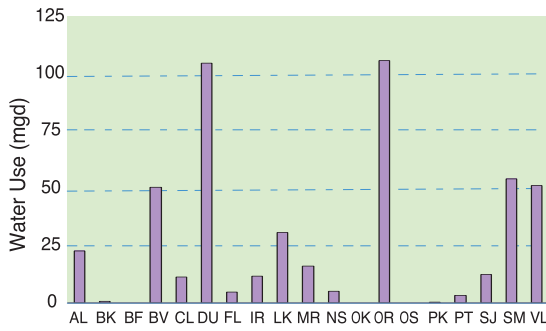


Figure 2. Freshwater use for public supply in SJRWMD 1997. Duval and Orange counties are the largest water users in SJRWMD.

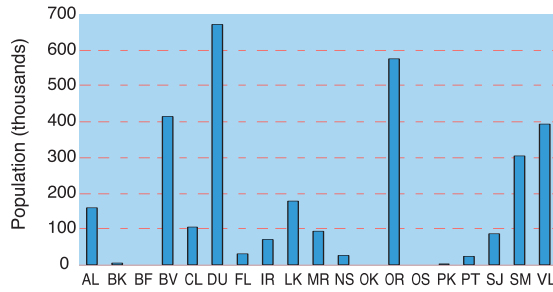


Figure 3. Population served by public supply in SJRWMD, 1997. Duval and Orange counties are the largest in population in SJRWMD.

(105 mgd serving 575,412 people) and Duval County (104 mgd serving 670,323 people). Together, these counties represented about 44 percent of the public supply water use and about 40 percent of the public supply water use population (Figures 2 and 3). There is no public supply water use in the portions of Osceola and Okeechobee counties within SJRWMD.

### Domestic Self-Supply

The domestic self-supply category includes water withdrawn from individual domestic wells or provided by utilities that serve less than 400 people. Water use from these facilities is not inventoried, so water use in this category is estimated from population and per capita water use figures.

In 1997, an estimated 523,144 people used 83 mgd of domestic self-supply water, or 9 percent 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 91,350 people, Duval County had the second largest with 71,185 people, followed by Orange County with 59,443 people.

Domestic self-supply water use has fluctuated over the 10-year period between 87 mgd in 1988 and 83 mgd in 1997. The average for this 10-year period is 86 mgd; water use in 1997 was about 4 percent below the average.

### Commercial/Industrial Self-Supply

The commercial/industrial self-supply use category consists of the larger (more than 0.01 mgd) commercial and industrial users not served by public supply utilities. 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. Seventy-seven commercial users, including 72 institutions, and 56 industrial users, are included in this report of 1997 water use.

The total freshwater use in the commercial/industrial category was 119 mgd, or 11 percent of the total freshwater use in SJRWMD. Of this total, 101 mgd was groundwater and 18 mgd was fresh surface water. In addition, 2 mgd of saline water was used.

Most of the water withdrawn for commercial/industrial purposes supplied the pulp and paper industries in Putnam, Nassau, and Duval counties. In 1997, water use for pulp and paper production included 67 mgd of fresh groundwater, 15 mgd of fresh surface water, and 2 mgd of saline surface water. The second largest water user in this category was the mining industry, which accounted for 13 mgd of fresh groundwater and 3 mgd of fresh surface water. Together, pulp and paper production and mining accounted for 98 mgd of freshwater, or 82 percent of the commercial/industrial freshwater use.

The largest amount of freshwater used for commercial/industrial purposes by county

was in Nassau County. Putnam and Duval counties also had significant amounts of freshwater use in this category. Of the total freshwater used for commercial/industrial purposes, 81 percent was used in these three counties.

Commercial/industrial self-supply water use was highest in 1988 (150 mgd) and lowest in 1997 (119 mgd) with an overall average decline of 26 percent in this 10-year period. The average for this 10-year period is 135 mgd; water use in 1997 was 12 percent below the average.

Commercial/industrial freshwater use in 1997 varied from a low of 111 mgd in June to a high of 137 mgd in January.

### Agricultural Irrigation

The agricultural irrigation category consists of estimated water withdrawals from ground and surface 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 crops have specific consumptive use requirements.

Total freshwater use for agricultural irrigation was estimated at 360 mgd, or 32 percent of the total freshwater use in SJRWMD in 1997. Of this total, 230 mgd, or 64 percent of the total water used for agriculture irrigation, was groundwater (Figure 1).

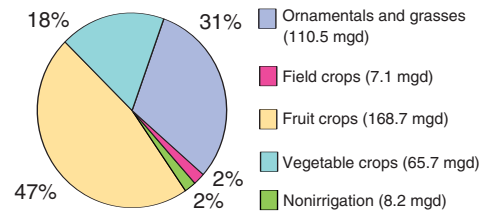


Figure 4. Agricultural irrigation water use in SJRWMD for five crop types, 1997. Fruit crops accounted for 47 percent of the agricultural irrigation water use in 1997.

It was assumed that most groundwater used for agricultural irrigation came from the Upper and Lower Floridan aquifers.

An estimated 878,163 acres were farmed in SJRWMD in 1997, of which 327,627 acres were irrigated. Of the total acreage irrigated, 229,783 acres were irrigated by flood systems, 56,977 acres were irrigated by low-pressure/low-volume systems, and 40,867 acres were irrigated by sprinkler systems.

The largest water use for agricultural irrigation by county occurred in Indian River County—120 mgd of freshwater, or 33 percent of the agricultural irrigation by county. Most of this amount was fresh surface water. The second largest water use for agriculture was in Brevard County—56 mgd, most of which was groundwater. The combined water use

in these two counties was 176 mgd, or 49 percent of the total agricultural irrigation water use.



The largest water use for a crop type was for fruit crops, which accounted for 226 mgd, or 47 percent of the agricultural irrigation water use (Figure 4).

The largest water use for a single crop was for citrus irrigation, which accounted for 166 mgd, or 46 percent of the agricultural irrigation water use. Irrigation of improved pastureland accounted for 60 mgd, or 17 percent of the agricultural irrigation water use. Potato irrigation water use was estimated at 31 mgd, and fern water use (including freeze protection) was estimated at 21 mgd.

## Recreational Irrigation

The recreational irrigation category includes water used to irrigate turf grass for golf courses. An estimated 15,508 of 24,932 acres were irrigated using sprinkler systems. Water used in the recreational irrigation category totaled 39 mgd, or about 3 percent of the total freshwater use in 1997. Of this amount, 27 mgd was groundwater.



The largest water uses by county for recreational irrigation occurred in Volusia County (6 mgd) and Seminole County (5 mgd). Between 1988 and 1997, combined agricultural and recreational irrigation water use was highest in 1992 (642 mgd) and lowest in 1997 (399 mgd). The average for this 10-year period was 571 mgd; water use in 1997 for this category was 30 percent below the average.

Agricultural and recreational combined irrigation water use in 1997 had a greater seasonal fluctuation than any other water use category, from a low of 37 mgd in December to a high of 1,181 mgd in May. These fluctuations are typical of irrigation water use and are inversely correlated to rainfall. December 1997 was atypically wet, and almost no irrigation occurred during the month.



## Thermoelectric Power Generation

The thermoelectric power generation category consists of water used by power plants primarily for cooling. In 1997, water use data were collected for 12 self-supplied thermoelectric power plants. Total water use accounted for 1,011 mgd of saline surface water, 20 mgd of fresh surface water, and 8 mgd of fresh groundwater. The largest amount of saline water used by county for thermoelectric power generation was in Duval County (542 mgd), while the largest amount of freshwater used was in Putnam County (18 mgd).

Thermoelectric power generation freshwater use in 1997 fluctuated from a low of 19 mgd in February to a high of 30 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.

## Abandoned Artesian Wells

The abandoned artesian wells category consists of water flowing from abandoned artesian wells. According to available data, all abandoned artesian wells are supplied by the Floridan aquifer system. In 1997, there were 466 wells the SJRWMD inventory of wells under investigation for permanent abandonment. The overwhelming majority of these wells have valves or temporary plugs, which effectively stop or greatly reduce the flow from the wells. The estimated actual total flow from these wells (districtwide) was approximately 5 mgd.



## SUMMARY

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



Water Use Survey (AWUS), has been a gradual increase in demand. While the public supply population within SJRWMD has increased nearly 75 percent since 1978, water use for public supply has nearly doubled. Improved irrigation management by growers has brought a decrease in agricultural irrigation water use.



## Water Management

The primary goal of Florida's water management districts is the protection of water resources. Their 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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