

## Water Use in Florida<sup>1</sup>

---

Tatiana Borisova and Roy R. Carriker<sup>2</sup>

### Introduction

In the EDIS document "Florida's Water Resources" (FE757), the authors described Florida's abundant water resources. However, whether water is scarce or abundant depends not only upon available supplies, but also upon patterns of water use and demand. The United States Geological Survey (USGS) has developed estimates of water withdrawals and water use by several water-use categories over the years. These estimates provide a perspective on patterns of water use by sector and over time.

### Overview of Water Use in Florida

According to 2005 estimates, total water withdrawals averaged about 18 billion gallons per day (Marella 2008). Out of this, withdrawals of freshwater for all uses accounted for about 6.9 billion gallons per day, which is about 8 percent higher than the 1985 level but 9 percent lower than the 2000 level (Marella 2008; Marella 1999; Marella 1988). About 62 percent of freshwater withdrawals in 2005 were from groundwater, which is similar to the 1995 and 1985 levels. The freshwater withdrawal pattern varies across seasons and counties. For example, about 24 percent of statewide freshwater withdrawals occur in

April and May, and about 16 percent of the withdrawals occur in Palm Beach County. Even though most freshwater withdrawals in this county come from surface water (74 percent), Palm Beach County is one of the largest users of groundwater in Florida, along with Miami-Dade County.

In examining water-use statistics, it is important to distinguish between *withdrawal* of water and *consumptive use* of water. Water that is consumed is withdrawn from a freshwater source and is not returned to the same source or another usable source. Because consumed water remains unavailable for re-use for a longer period, it is not quickly returned to the hydrologic cycle. It is estimated that out of 6.9 billion gallons per day of fresh water withdrawn in Florida in 2005, 45 percent (about 3.1 billion gallons per day) was consumed (i.e., it evaporated or was incorporated into agricultural or manufactured products), and the remaining 55 percent (about 3.8 billion gallons per day) was returned to the hydrologic cycle as wastewater or runoff (Marella 2008). Agricultural irrigation is estimated to account for the largest consumption of freshwater largely due to high evapotranspiration (Marella 2008).

In addition to traditional ground and surface water, reclaimed wastewater and desalinated brackish

- 
1. This is EDIS document FE797, a publication of the Food and Resource Economics Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. Published April 2009. Please visit the EDIS website at <http://edis.ifas.ufl.edu>.
  2. Tatiana Borisova, assistant professor, and Roy R. Carriker, professor, Food and Resource Economics Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.

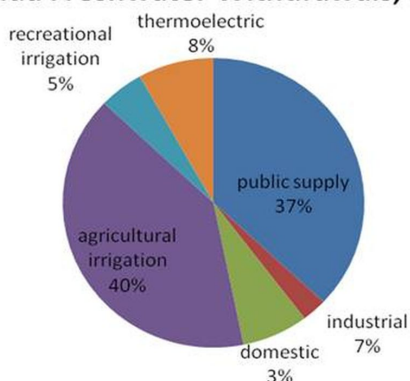
The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. U.S. Department of Agriculture, Cooperative Extension Service, University of Florida, IFAS, Florida A. & M. University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Mille Ferrer, Interim Dean

groundwater are small but growing sources of freshwater in Florida. In 2006, about 0.7 billion gallons per day of reclaimed water were produced by 468 domestic wastewater treatment facilities for which the permitted capacities were 0.1 million gallons per day (mgd) or above (FDEP 2008). Approximately one-half of the reclaimed water was used for agricultural and urban irrigation and for industrial purposes (Marella 2008).

Currently, there are more than one hundred desalination plants in Florida; only three of these treat sea water, while all the other plants purify brackish water (SFWMD 2009). The Tampa Bay seawater desalination plant produces 25 mgd, which makes it the largest seawater desalination plant in the United States (SFWMD 2009). The two oldest seawater desalination plants are in Key West, with a production capacity of 3 mgd (SFWMD 2009).

USGS identifies six categories of water withdrawals (referred to as "water use" categories): public supply, self-supplied domestic use, self-supplied commercial-industrial use, thermoelectric power generation, recreational irrigation, and agricultural use. In 2005, agriculture still represented the largest freshwater withdrawal category in Florida, followed by public supply, thermoelectric power generation, self-supplied commercial-industrial, recreational irrigation, and domestic water uses (Figure 1).

**Florida Freshwater Withdrawals, 2005**



**Figure 1.** Freshwater withdrawals in Florida, 2005. Source: based on Marella (2008).

## Agricultural Irrigation

Withdrawals of freshwater for agricultural use constitute 40 percent of total withdrawals for the state, and total almost 2,770 mgd. Forty-seven percent of agricultural freshwater withdrawals are groundwater. Eight counties report daily freshwater withdrawals for agricultural irrigation of almost 100 mgd or more, with Palm Beach (792 mgd) and Hendry (385 mgd) Counties being the largest users. Withdrawals for agricultural irrigation vary seasonally and are usually lower during the wet season (June through September) and higher at the end of the dry season, especially April and May (Marella 2008). In 2005, about 74 percent of agricultural water withdrawals were used to irrigate fruit crops (mostly citrus, at 996 mgd) and field crops (mostly sugarcane, at 875 mgd) (Marella 2008).

Freshwater withdrawals for agricultural use decreased by 15 percent between 1995 and 2005; the decrease is nearly 30 percent if one compares the data for 2000 and 2005 (Marella 2008). This reduction can be explained by variations in annual precipitation, reduction in irrigated acreage due to disease and urbanization, improved water conservation methods, and changes in estimation methodology (Marella 2008).

## Public Supply

Water withdrawn for public supply in Florida totaled 2,541 mgd in 2005, or 37 percent of total freshwater withdrawals in the state. Between 1990 and 2005, withdrawals for public supply increased 32 percent, while population served by public supply increased by 44 percent (in addition to the increase in water demands by commercial and industrial facilities that are supplied by public water systems).

In 2005, 16.1 million people, or 90 percent of the state population, were served by public-supply systems. In 2005, estimated gross public-supply per capita water use was 158 gallons per day, which is 9 percent less than in 2000 (Marella 2008). This indicator accounts for all water supplied by public water supply systems, including residential, commercial, industrial, and thermoelectric power water use, as well as water leaks and public water use such as fire fighting (FDEP and FSU 1996). Out of

this, residential per capita water use accounted for 95 gallons daily, which is 10 percent less than in 2000 (Marella 2008). The reduction in per capita water use can be attributed to the effect of conservation programs and to the availability of reclaimed water for lawn irrigation (Marella 2008).

Geographically, Miami-Dade County is the largest user (400 mgd), accounting for 16 percent of the freshwater withdrawals for public supply for the entire state. Six counties report water withdrawals for water consumption of more than 100 mgd. Groundwater sources supply most of the water needed by every county making significant freshwater withdrawals. An exception is Hillsborough County, which is ranked fourth in the overall freshwater withdrawals for public supply. In this county, over 70 percent of public water supply is from surface water sources (USGS 2007). Water withdrawals for public supply vary seasonally, with the peak at the end of dry period (April and May).

### **Power Generation**

Water withdrawals for self-supplied thermoelectric powerplants in Florida total about 12 billion gallons per day, but only 5 percent of the total (558 mgd) is freshwater withdrawals. Of the total freshwater withdrawn, 97 percent is surface water (USGS 2007). Almost all of the water used for thermoelectric power generation is for cooling purposes. Because most of the water used for cooling is returned to its source, actual consumptive water use for thermoelectric power generation is quite low. Total water withdrawals are highest in Pasco, Hillsborough, Citrus, Broward, and St. Lucie Counties, but most of this is saline water. The largest freshwater withdrawals occur in Escambia (225 mgd), Jackson (103 mgd), and Volusia (89 mgd) Counties. Monthly freshwater withdrawals for power generation can fluctuate seasonally, with higher withdrawals during the summer as power demands increase due to hotter weather.

### **Commercial Use**

Self-supplied commercial use includes water withdrawn at commercial, industrial, and mining facilities (Marella 2008). In 2005, total water withdrawn by self-supplied commercial-industrial

systems was 488 mgd, of which 75 percent were from groundwater sources. The largest water users included the mining industry at 40 percent (mostly from limestone, sand, and phosphate mining) and pulp and paper manufacturing at 28 percent (Marella 2008). The highest freshwater withdrawals were in Polk (62 mgd) and Escambia (56 mgd) Counties, which together accounted for 26 percent of total commercial-industrial withdrawals in the state.

Between 1995 and 2005, withdrawals for the commercial-industrial sector decreased, which is similar to the trend observed in the previous decade. Possible causes of the decrease in commercial and industrial withdrawals are conversion of self-supplied users to public water supply and a greater reliance on more water-efficient technologies.

### **Recreational Irrigation**

Recreational irrigation is a relatively new category, beginning with the USGS 1995 compilation. This category includes golf course recreation, public-place landscapes, and water used for aesthetic purposes (Marella 2008). Approximately 330 mgd of freshwater was withdrawn for recreational irrigation purposes in 2005. Nearly 52 percent was from groundwater and the remaining 48 percent was from surface water. In addition, 321 mgd of reclaimed water was used. Palm Beach (51 mgd) and Broward (37 mgd) Counties are among the largest recreational water users, accounting for over one-quarter of total recreation irrigation withdrawals.

Between 1995 and 2005, freshwater withdrawals for recreational irrigation increased by 17 percent; however, the freshwater withdrawals decreased between 2000 and 2005 (Marella 2008).

### **Domestic Self-Supplied**

Self-supplied domestic water is provided by individual domestic wells or by small utility companies. In 2005, users of self-supplied water systems withdrew about 185 mgd, almost entirely groundwater. The largest withdrawals occurred in Marion County (15 mgd), followed by Orange (11 mgd) and Putnam (10 mgd) Counties.

For self-supplied domestic use, the increasing trend observed during the 1985–1995 period reversed during the 1995–2005 period, with water withdrawals for this category decreasing by 37 percent, which can be partially explained by changes in USGS estimation methodology.

## Conclusions

Florida is rich in water resources. Annually, it receives about 54 inches of rainfall (compared to 30 inches nationwide), and it overlies prolific aquifers. However, intensive use for public water supplies, agricultural irrigation, and industries put Florida's rich water resources under significant stress. Withdrawals of freshwater for all uses averaged about 7 billion gallons per day in 2005, and it is estimated that by 2025, water demands will increase to 8.5 billion gallons per day (FDEP 2007). A balanced approach to water resource management is required to address water demands for public supply and economic activities without compromising the integrity of the environment.

## References

FDEP. 2008. *2006 Reuse Inventory*. Florida Department of Environmental Protection, Tallahassee, FL (August 2007, revised June 30, 2008).

<http://www.dep.state.fl.us/water/reuse/docs/inventory.htm>

FDEP. 2007. *Tapping New Sources: Meeting 2025 Water Supply Needs*. Annual Status Report on Regional Water Supply Planning. Florida Department of Environmental Protection, Tallahassee, FL.

[http://www.dep.state.fl.us/water/waterpolicy/docs/RWSP\\_ASR\\_2006.pdf](http://www.dep.state.fl.us/water/waterpolicy/docs/RWSP_ASR_2006.pdf)

Florida Department of Environmental Protection (FDEP) and the Florida Center for Public Management of Florida State University (FSU). 1996. *Strategic Assessment of Florida's Environment (SAFE)*. Florida Center for Public Management, Tallahassee, FL.

<http://www.pepps.fsu.edu/safe/pdf/sc1.pdf>

Marella, Richard L. 2008. *Water Use in Florida, 2005 and Trends 1950–2005*. Report prepared in cooperation with the Florida Department of Environmental Protection (Florida Water Management District Fact Sheet 2008–3080). Florida Department of Environmental Protection and Florida Water Management District Headquarters, Tallahassee, FL.  
<http://pubs.usgs.gov/fs/2008/3080/>

Marella, Richard L. 1999. *Water Withdrawals, Use, Discharge, and Trends in Florida, 1995*. Water Resources Investigations Report 99-4002, United States Department of the Interior, U.S. Geological Survey, Washington, D.C.  
[http://fl.water.usgs.gov/PDF\\_files/wri99\\_4002\\_marella.pdf](http://fl.water.usgs.gov/PDF_files/wri99_4002_marella.pdf)

Marella, Richard L. 1988. *Water Withdrawals, Use, and Trends in Florida, 1985*. Water Resources Investigations Report 88-4103, United States Department of the Interior, U.S. Geological Survey, Washington, D.C.  
<http://sofia.usgs.gov/publications/wri/88-4103/wri-88-4103.pdf>

South Florida Water Management District (SFWMD). 2009. Water Desalination Overview.  
[https://my.sfwmd.gov/pls/portal/url/page/PG\\_GRP\\_SFWMD\\_WATERSUPPLY/PG\\_SFWMD\\_WATERSUPPLY\\_DESALINATION](https://my.sfwmd.gov/pls/portal/url/page/PG_GRP_SFWMD_WATERSUPPLY/PG_SFWMD_WATERSUPPLY_DESALINATION)

USGS. 2007. *Water Use Data Tables, 2005*. United States Geological Service, Washington, D.C.  
<http://fl.water.usgs.gov/infodata/wateruse/datatables2005.html>