

ESTIMATED IRRIGATION WATER USE
IN FLORIDA, 1980By
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FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
SOUTH FLORIDA WATER MANAGEMENT DISTRICT
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
SUWANNEE RIVER WATER MANAGEMENT DISTRICT
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INTRODUCTION

Estimates of water use in Florida in 1980 indicate that about 7,309 Mgal/d (million gallons per day) were withdrawn for all purposes, including public supply, rural, industrial, thermoelectric power, and irrigation (Leach, 1982). The greatest use of freshwater was for irrigation, which accounted for 2,997 Mgal/d or 41 percent of the total freshwater used. The amount of water used for irrigation in 1980 was more than eight times the amount of water used for irrigation in 1950. This rapid and continuing growth in irrigation has put increasing demands on available freshwater supplies in much of Florida.

DATA COLLECTION

In 1980, as in several previous years, the U.S. Geological Survey and the five Florida Water Management Districts conducted a detailed inventory of water use. This map presents information on irrigation water use, including data on the source and quantity of water used for irrigation, acres irrigated, and the types of crops irrigated.

Water used for irrigation includes water derived from ground- and surface-water sources. As there are over 2 million acres irrigated from thousands of wells and surface-water sources, only a small percentage of the sites have been inventoried. The water used at the sites not inventoried has been estimated by comparison with data from inventoried sites. Water use for irrigation in 1980, reported as the amount taken from the source, includes conveyance losses from irrigation canals and ponds, as well as the amount applied to the irrigated acreage.

FACTORS AFFECTING IRRIGATION WATER USE

The amount of water used for irrigation depends on a variety of factors including the quantity of rainfall, type of crop, length of growing season, location, crop growth stage, temperature, hours of daylight, soil characteristics, method of irrigation, humidity, and wind movement. The most important factor affecting the quantity of water used for irrigation is rainfall. Irrigation is generally greater during periods of deficient rainfall in order to maintain or increase agricultural yields.

The mean annual rainfall (1931-55), shown in figure 1, varies from about 40 inches in the Florida Keys to more than 64 inches in southeast and northwest Florida, and is greater than 50 inches over most of the State (Hughes and others, 1971). The distribution of rainfall through the years has not been uniform, especially in the central and southern parts of the State. In these areas, more than 50 percent of the annual total rainfall occurs from June through September (Butson and Prine, 1968). Rainfall is generally lowest during the fall and early spring, which corresponds to the growing seasons for many Florida crops.

In addition to rainfall, the number of daylight hours, temperature, crop growth stage, and location are other factors that affect the amount of water used for irrigation. For a given temperature and growth stage of a plant, the amount of water used during the summer months increases with latitude because of the longer periods of sunlight. In southern Florida, especially those counties south of Lake Okechobee, the milder winters allow for longer, multiple growing seasons, resulting in greater irrigation water use.

The irrigation method also influences the amount of water used. Irrigation methods currently used in Florida can be broadly classified as sprinkler, seepage, and drip or trickle, which vary in efficiency. Of the three types of irrigation methods, drip or trickle has the highest water-application efficiency, with values ranging from 80 to 95 percent. Sprinkler system values range from 70 to 90 percent, and seepage systems, which have the lowest water application efficiency, range from 30 to 60 percent (Harrison, 1981, p.1). The most significant losses of water during irrigation result from surface runoff, from losses to deep percolation below the root zone, from evaporation from the soil, and from the evaporation from the surface of flowing water or evaporation in the air from sprinkler or nozzle spray.

IRRIGATION WATER USE BY COUNTY

Most irrigation occurs in the central and southern parts of the State. As indicated on the large map and in table 1, 16 counties reported irrigation water use exceeding 50 Mgal/d, accounting for 83 percent of the total irrigation in the State. Seven counties, Brevard, Glades, Hendry, Indian River, Martin, Palm Beach, and St. Lucie, reported irrigation water use exceeding 100 Mgal/d. These seven counties, which represent 56 percent of the irrigated land, accounted for 60 percent of all irrigated water used during 1980. Palm Beach County reported the most water used for irrigation with approximately 614 Mgal/d of water used to irrigate 542,500 acres, mostly sugarcane.

Counties in the northern part of the State used the least amount of freshwater for irrigation. Of the 35 counties reporting 10 Mgal/d or less, 30 were north of Marion County. Five of these counties, Franklin, Gulf, Liberty, Wakulla, and Washington, reported no water used for irrigation. Another 13 counties in the northern part used less than 1 Mgal/d each and 12 counties used between 1 and 10 Mgal/d each. The 30 northern counties combined used only 46 Mgal/d—approximately 2 percent of the total freshwater used for irrigation.

SOURCES OF SUPPLY

Of the 2,997 Mgal/d of water used for irrigation in 1980, 1,574 Mgal/d or 53 percent was from ground-water sources and 1,423 Mgal/d was from surface-water sources (table 1). Six counties near Lake Okechobee, Glades, Hendry, Indian River, Martin, Palm Beach, and St. Lucie, rely more heavily on surface water for their irrigation needs than other counties in the State due to the accessibility of an adequate supply. Water from these six counties accounted for 1,303 Mgal/d or 92 percent of the total amount of surface water pumped for irrigation use.

There is an increasing trend in the total quantity of freshwater withdrawn for irrigation use in Florida from 1950 to 1980 (fig. 2). From 1950 to 1980, the use of irrigation water increased from 366 Mgal/d to 2,997 Mgal/d. Figure 2 also shows the trends of ground- and surface-water use for irrigation from 1950 to 1980. In 1950, ground water supplied approximately 143 Mgal/d and in 1980, 1,574 Mgal/d, 11 times the 1950 amount. The use of surface water for irrigation was more variable. In 1950, surface water supplied approximately 223 Mgal/d for irrigation and 1,991 Mgal/d in 1980, nearly nine times the 1950 amount. In 1980, surface water supplied 1,423 Mgal/d, a decrease of about 29 percent since 1965, indicating a greater use of ground water during this period. The amount of surface water used for irrigation in 1980 was more than six times the 1950 amount.

ACREAGE AND CROP TYPES IRRIGATED

In 1980, an estimated 2,041,400 acres were irrigated in Florida (S.D. Leach, written commun., 1982). Palm Beach and Hendry Counties ranked first and second in acreage irrigated, about 542,500 and 189,100 acres, respectively (fig. 3 and table 1). Five counties, Franklin, Gulf, Liberty, Wakulla, and Washington, reported insignificant or no acreage irrigated. Counties in central and southern Florida generally have the largest areas of irrigated land due mainly to the milder climate and longer growing season.

Figure 4 shows the major irrigated crop type for each county in Florida in terms of irrigated acreage. Citrus, the major crop in the State, accounted for 30 percent of the total irrigated acreage. Pasture and sugarcane accounted for 24 and 23 percent, respectively.

The total acreage irrigated in 1980 for the crops shown was: citrus, 610,580; pasture, 488,276; sugarcane, 473,000; truck farming, 237,024; corn, 49,207; watermelon, 20,659; tobacco, 6,782; and 155,875 for all other types of crops.

There is an increasing trend in the total acreage irrigated. From 1960 to 1980, the number of acres irrigated increased from 680,000 to 2,041,000 acres, three times the 1960 amount, with a corresponding increase in total water used for irrigation from 660 Mgal/d to 3,000 Mgal/d, about three and one-half times the 1960 amount (fig. 2). Excluding data for 1965 when the irrigation water used was four times the 1960 amount, there has been a steady increase in the quantity of water applied per acre. In 1960, irrigation water use averaged 13.0 inches per acre per year compared with 17.3 inches per acre per year in 1970, and 19.8 inches per acre per year in 1980; a per acre increase in the use of water for irrigation of nearly 50 percent. This trend indicates an increasing dependency on the use of irrigation for agricultural purposes in Florida. At the same time, ground-water sources are being utilized to supply much of this increased demand.

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Table 1.—Acres irrigated and water use by counties, in 1980

County	Acres irrigated	Water used, in million gallons per day			County	Acres irrigated	Water used, in million gallons per day		
		Surface water	Ground water	All water			Surface water	Ground water	All water
Alachua	19,655	3.79	15.44	19.23	Lake	75,932	7.21	64.91	72.12
Baker	711	.91	0.91	1.82	Lee	20,300	7.09	39.33	46.42
Bay	1,724	.28	0.37	0.65	Leon	502	0.00	2.35	2.35
Bradford	475	.01	0.05	0.06	Levy	6,155	0.42	1.68	2.10
Brevard	71,880	7.12	158.64	165.76	Liberty	0	0.00	0.00	0.00
Broward	19,540	10.90	32.69	43.59	Madison	5,750	0.16	0.91	1.07
Calhoun	2,654	0.12	1.54	1.66	Manatee	33,314	0.66	64.94	65.60
Charlotte	13,589	2.50	22.49	24.99	Marion	12,487	0.97	18.50	19.47
Citrus	2,115	0.23	3.93	4.16	Martin	58,500	106.81	32.12	138.93
Clay	500	0.05	1.04	1.09	Monroe	177	0.00	0.49	0.49
Collier	39,500	3.48	83.48	86.96	Nassau	50	0.00	0.39	0.39
Columbia	2,625	0.18	0.75	0.93	Okaloosa	543	0.00	0.12	0.12
Dade	52,750	2.69	86.90	89.59	Okechobee	25,100	11.61	70.81	82.42
De Soto	43,085	1.03	33.31	34.34	Orange	44,656	12.19	81.28	93.47
Dixie	1,045	0.12	0.17	0.29	Osceola	10,536	2.23	17.99	20.22
Duval	124	0.25	0.12	0.37	Palm Beach	542,500	558.95	55.28	614.23
Escambia	865	1.30	1.00	2.30	Pasco	22,755	0.78	19.29	20.07
Flagler	4,050	0.00	4.07	4.07	Pinellas	4,200	0.46	8.74	9.20
Franklin	0	0.00	0.00	0.00	Polk	93,915	3.69	51.01	54.70
Gadsden	4,617	6.05	0.24	6.29	Putnam	17,736	3.63	32.67	36.30
Gilchrist	2,962	0.24	0.96	1.20	St. Johns	26,900	0.00	29.55	29.55
Glades	92,300	106.80	17.41	124.22	St. Lucie	97,900	182.71	48.57	231.28
Gulf	0	0.00	0.00	0.00	Santa Rosa	1,339	0.21	0.60	0.81
Hamilton	3,200	0.13	0.57	0.70	Sarasota	9,722	0.41	20.39	20.80
Hardee	32,665	0.00	38.91	38.91	Seminole	12,213	1.05	23.63	24.68
Hendry	189,100	133.94	109.59	243.53	Sumter	8,575	0.33	16.34	16.67
Hernando	3,510	0.00	3.97	3.97	Suwannee	18,748	1.22	7.18	8.40
Highlands	98,200	11.72	75.85	87.57	Taylor	88	0.01	0.02	0.03
Hillsborough	43,952	2.18	70.70	72.88	Union	555	0.05	0.07	0.12
Holmes	490	0.18	0.07	0.25	Volusia	6,128	6.02	17.30	23.32
Indian River	95,928	214.22	64.06	278.28	Wakulla	0	0.00	0.00	0.00
Jackson	21,574	2.34	9.12	11.46	Walton	12,267	1.06	8.12	9.18
Jefferson	1,498	0.05	0.68	0.73	Washington	0	0.00	0.00	0.00
Lafayette	5,237	0.27	0.80	1.07	Total	2,041,403	1,423.01	1,574.41	2,997.42

EXPLANATION

—40— Line of equal rainfall. Interval 4 inches.

Figure 1.—Mean annual rainfall in Florida, 1931-1955 (from Hughes and others, 1971).

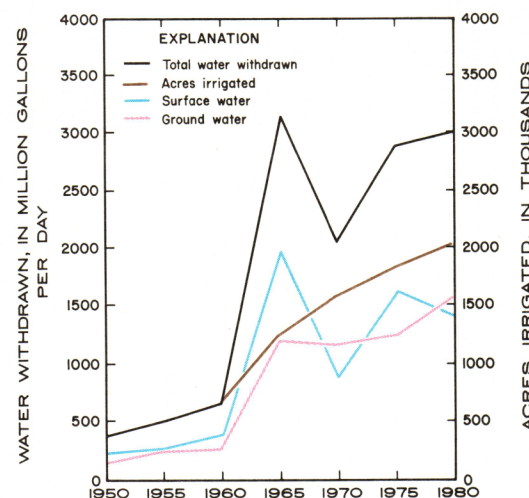


Figure 2.—Trends in water withdrawn for irrigation and acres irrigated, 1950-1980.

EXPLANATION

- Zero
- Less than 1000
- 1000-10,000
- 10,000-40,000
- 40,000-100,000
- Greater than 100,000

Figure 3.—Acres irrigated.

EXPLANATION

- None
- Citrus
- Truck farming
- Pasture
- Watermelon
- Corn
- Tobacco
- Sugarcane
- Others

Figure 4.—Major irrigated crop types.