

TECHNICAL PUBLICATION SJ 84-14

GROUND WATER WITHDRAWALS FROM
THE FLORIDAN AQUIFER IN CLAY AND
PORTIONS OF BRADFORD COUNTIES
1983 - 1984

BY

RICHARD MARELLA

PREPARED BY THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

Clay County is located in northeast Florida (Inset A) and covers approximately 644 square miles. The county has a population of 74,524 and contains four prominent cities: Green Cove Springs, Keystone Heights, Orange Park and Penney Farms. Major activities in Clay County include mineral mining, silviculture, dairy farming, recreation and miscellaneous manufacturing. The northeast portion of Clay County (Orange Park area) is highly developed in residential and commercial activities tied to the metropolitan Jacksonville area. Bordered by Alachua County, Baker County and Bradford County to the west, Duval County (Jacksonville) to the north, St. Johns County to the east and Putnam County to the south, the county has an excellent supply of fresh ground water.

The major source of potable water in Clay County is the Floridan aquifer, a confined unit of Eocene age limestone which transmits significant amounts of water. The Floridan aquifer is the preferred water source in north and central Florida due to its productivity potential and general good quality. In Clay County, the potable portion of the Floridan aquifer is approximately 25 to 1,800 feet below mean sea level. Southwestern Clay County (Keystone Heights area) is an area of high recharge to the Floridan aquifer. Northeast and southeast Clay County (Orange Park, Green Cove Springs) and the Black Creek-Middleburg area are discharge areas of the Floridan aquifer. This discharge of the Floridan aquifer is evident by the presence of flowing artesian wells and two major springs (Green Cove Springs and

Wadesboro Springs). Figure 1 shows the recharge and discharge areas of the Floridan aquifer in Clay County.

In 1983, the St. Johns River Water Management District (SJRWMD) conducted a study at the request of the Clay County Board of County Commissioners to determine water use, water quality and water availability in Clay County. This report details the amount and locations of ground water withdrawals in Clay County. Due to close proximity to the Keystone Heights area, a small portion of Bradford County (six square miles) within the SJRWMD boundary is included. Water use for this report is shown in million gallons per day (MGD). Only those withdrawal locations using more than 0.001 MGD (1,000 gallons per day) of ground water from the Floridan aquifer in 1983 were considered in this study. Due to the specific detail in this report, water use values may vary from those reported in the 1983 Annual Water Use Survey (Technical Publication SJ 84-5).

WATER USE BY CATEGORY

An important component of this report is the identification of the characteristics of water use in the Clay County area. In Table 1, water use is shown for the following categories: Public Supply, Industrial, Institutional, Recreation, Irrigation (agricultural and commercial), and Free-Flowing Wells. Domestic self-supplied water use is not included because of the vast number of domestic wells (estimated approximately 7,000 wells), most of which do not meet the minimum withdrawal requirement as an individual system or do not derive water from the Floridan aquifer. Estimated domestic self-supplied water use for Clay County in 1983 was 2.34 MGD. This estimate is based on 19,999 people on self-supplied systems and 117 gallons per capita day (GPCD). Clay County's per capita use is 24% lower than the District's average of 153 GPCD, due primarily to less tourism than other counties within the District.

Public supply water use is the largest consumption category in the study area accounting for 6.7094 MGD (Figure 2). Private or municipal suppliers account for 6.6322 MGD of the public water use and the remaining 0.0772 MGD is withdrawn by mobile home parks.

Industrial water use amounts to 5.8918 MGD of which 94% (5.5336 MGD) is withdrawn for mineral mining. The remaining 0.3582 MGD is for food and dairy processing, building material manufacturing, and other miscellaneous manufacturing.

Irrigation water use totals 1.6520 MGD, of which 68% (1.0584 MGD) is withdrawn for livestock drinking and dairy washdown.

Nursery, pasture, and blueberry irrigation accounts for 0.4832 MGD. The remaining 0.1104 MGD is for commercial and cemetery irrigation.

Institutional water use amounts to 1.3130 MGD with the majority of the use (76%) for military installations. The remaining use is for schools and churches.

Recreation water use amounts to 0.8759 MGD with the majority of use (67%) for golf course irrigation. The remaining use is for parks, camps and recreation facilities.

Uncontrolled free-flowing wells are those wells that are flowing unused water or are abandoned with leaking or broken control devices. To date, nine free-flowing wells have been inventoried since a survey was begun in 1981. The exact number of free-flowing wells are unknown in Clay County, but estimates of up to 40 have been made by the United States Geological Survey (USGS). Efforts by the District to locate, plug or control these wells are ongoing. Of the nine wells inventoried, five are uncontrolled and four have leaking or broken control devices. Total flow from these nine wells amounted to approximately 0.7938 MGD. In addition to Floridan aquifer water lost to flowing wells, substantial amounts of ground water are discharged through natural springs. Five springs are located in Clay County (Inset B). Green Cove Springs discharge equals $3.84 \text{ Ft}^3/\text{per sec}$ or 2.48 MGD. Wadesboro Springs discharge is $1.29 \text{ Ft}^3/\text{per sec}$ or 0.834 MGD. The output from the many seeps at Gold Head Branch Springs is $3.19 \text{ Ft}^3/\text{per sec}$ or 2.065 MGD (discharge measurements were taken 8-22-84). The other springs within Clay County are

Magnolia Springs, and Pecks Mineral Springs. These springs have no flow data but have been inventoried by the USGS.

WATER WITHDRAWAL LOCATIONS

A major purpose of this report is to identify withdrawal locations from the Floridan aquifer in Clay and southeast Bradford counties. A total of 82 withdrawal locations were identified (79 in Clay and 3 in southeast Bradford) and plotted on the large map. This map shows the density of various water withdrawals (users) within the study area. Each dot represents a well or well field (more than one) with a 4-inch or greater well that use more than 0.001 MGD. The greatest densities of withdrawal locations are along Doctors Lake, Black Creek and State Road 21.

Of the total 82 withdrawal locations, 27 are Public Supply, 16 Recreation, 13 Irrigation, 9 Industrial, 9 Free-Flowing Wells and 8 Institutional. Of the 27 Public Supply withdrawal locations, 23 are for private or municipal suppliers.

REGIONAL WATER WITHDRAWALS

To show the magnitude and distribution of water use in Clay County and the small portion of Bradford County within the SJRWMD, the study area was divided into four regions (Figure 3). These regions are northeast region (Orange Park-Doctors Lake area), central region (Middleburg-Black Creek area), southeast region (Green Cove Springs-Penney Farms area), and southwest region (Keystone Heights-Kingsley Lake area, and six square miles of Bradford County).

Northeast Clay County accounts for 36% (6.2069 MGD) of water use in the study area (Figure 4). Public Supply (5.4663 MGD) accounts for the majority of the water use in northeast Clay County (Table 1). Southeast Clay County accounts for 33% (5.6774 MGD) of the water use in the study area. The water use in this region includes 3.5468 MGD of Industrial and 1.2316 MGD of Irrigation water use. Southwest Clay County accounts for 23% (3.9655 MGD) of the total water use. The major uses in this region are Industrial (2.3370 MGD) and Institutional (1.0000 MGD). Central Clay County accounts for 8% (1.3861 MGD) of the total water use in the study area. The major use in this region is Recreation (0.4830 MGD).

CONCLUSION

Total water use for 1983 in Clay and portions of Bradford counties within the District equaled 17.2359 MGD. This figure does not include domestic water use (2.34 MGD), Spring Discharge (5.379 MGD) and unknown free-flowing wells (estimated approximately 40 additional wells). Although Clay County has an abundant supply of fresh ground water, current growth and potential future development is causing concern for the water resources of the county. A projected population in Clay County of 124,100 by the year 2000 will mean an increased demand for potable water.

This report is the first step in determining the relationship of water quality and quantity changes with pumpage. The results of this study will help local governments protect and manage ground water supplies and provide a basis for future resource investigation.

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EXPLANATION

Public

- (M) Mobile Home Park
- (R) Private or Municipal Supplier

Industrial

- (B) Building Materials
- (F) Food and Dairy Processing
- (M) Mineral Mining
- (O) Miscellaneous Manufacturing

Institutional

- (M) Military Installation
- (O) Other
- (S) School

Recreation

- (G) Golf Course
- (P) Park or Camp

Irrigation

- (C) Cemetery
- (D) Dairy Livestock
- (L) Commercial Lawn
- (N) Nursery
- (O) Other
- (P) Pasture

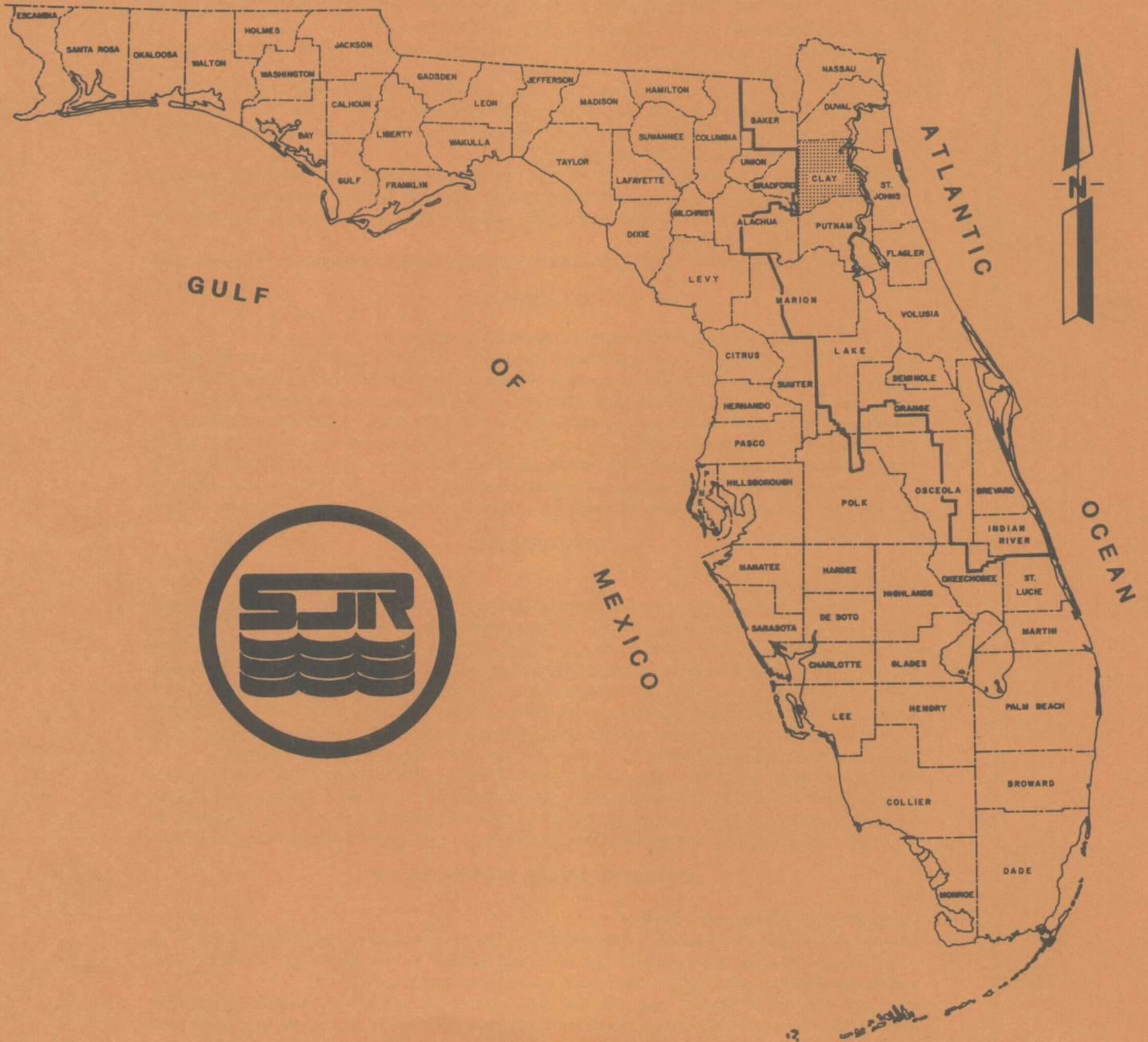
Free Flowing Wells

- (C) Controlled
- (U) Uncontrolled

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by Richard Marella
St. Johns River Water Management District
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