

TECHNICAL PUBLICATION SJ 84-1

ANNUAL REPORT OF
HYDROLOGIC CONDITIONS
1982 WATER YEAR

By

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INTRODUCTION

The Water Resources Department of the St. Johns River Water Management District has prepared an annual report for the water year 1982 (October 1981 through September 1982). This report is directed toward state, regional and local governmental units, planning agencies, agricultural and business concerns, and interested members of the public; and is intended to provide current information on hydrologic conditions in the District and on the activities of the Water Resources Department.

This report is divided into two parts. The first section deals with the status of the resource: 1. Precipitation, 2. Ground Water, 3. Surface Water, and 4. Water Use data for the 1982 water year are presented and compared with historical data. Rainfall statistics for the period 1941 to 1970 are presented in the appendices along with a list of current technical reports and information circulars available through the Department. Future annual reports will be expanded and modified, as data becomes available, to provide more detailed information on water quantity and quality, water use, and other water resources information of interest to the people of the District.

STATUS OF THE RESOURCE

RAINFALL

Precipitation in the St. Johns River Water Management District occurs primarily as rainfall. The isohyetal map of the normal rainfall which is the annual mean for the period 1941-1970 is shown in Figure 1.

The annual rainfall variation in the District for the water year 1982 is shown in Figure 2. Rainfall within the District during the 1982 water year ranged from a low 44.50 inches at Glen St. Mary in Baker County to a high of 81.00 inches at Ocala in Marion County. Average rainfall for the 1982 water year calculated using the isohyetal map (Figure 2) was 62.0 inches as compared to a District mean of 54.9 inches (based on Figure 1) for the period of 1941-1970. This higher than normal rainfall came as a relief to the District after it suffered from a severe drought for over a year.

The departure from the normal rainfall for the 1982 water year is illustrated on Figure 3. Rainfall was above normal almost through the entire District. Extreme northern parts of the District (Baker and Nassau Counties and portions of Clay and Duval Counties) and some areas near Palatka and Melbourne received below normal rainfall. Ocala area received heaviest rainfall resulting in floods in both the Ocala and Silver Springs areas; substantial flood damages were reported.

In summary, rainfall for most of the District during the 1982 water year was above the period of record normal rainfall.

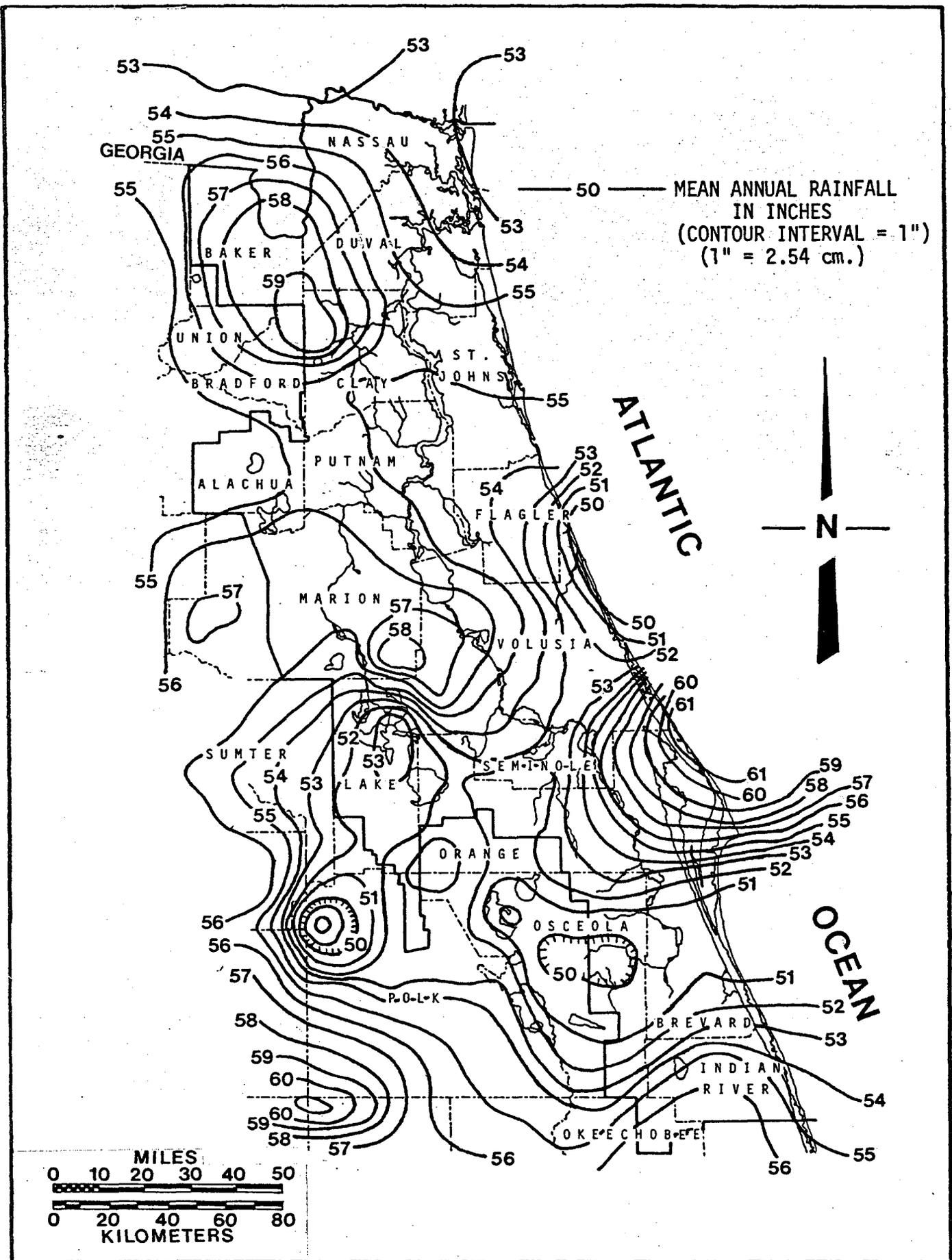


FIGURE 1. -- Mean Annual Rainfall in the SJRWMD, 1941-1970.

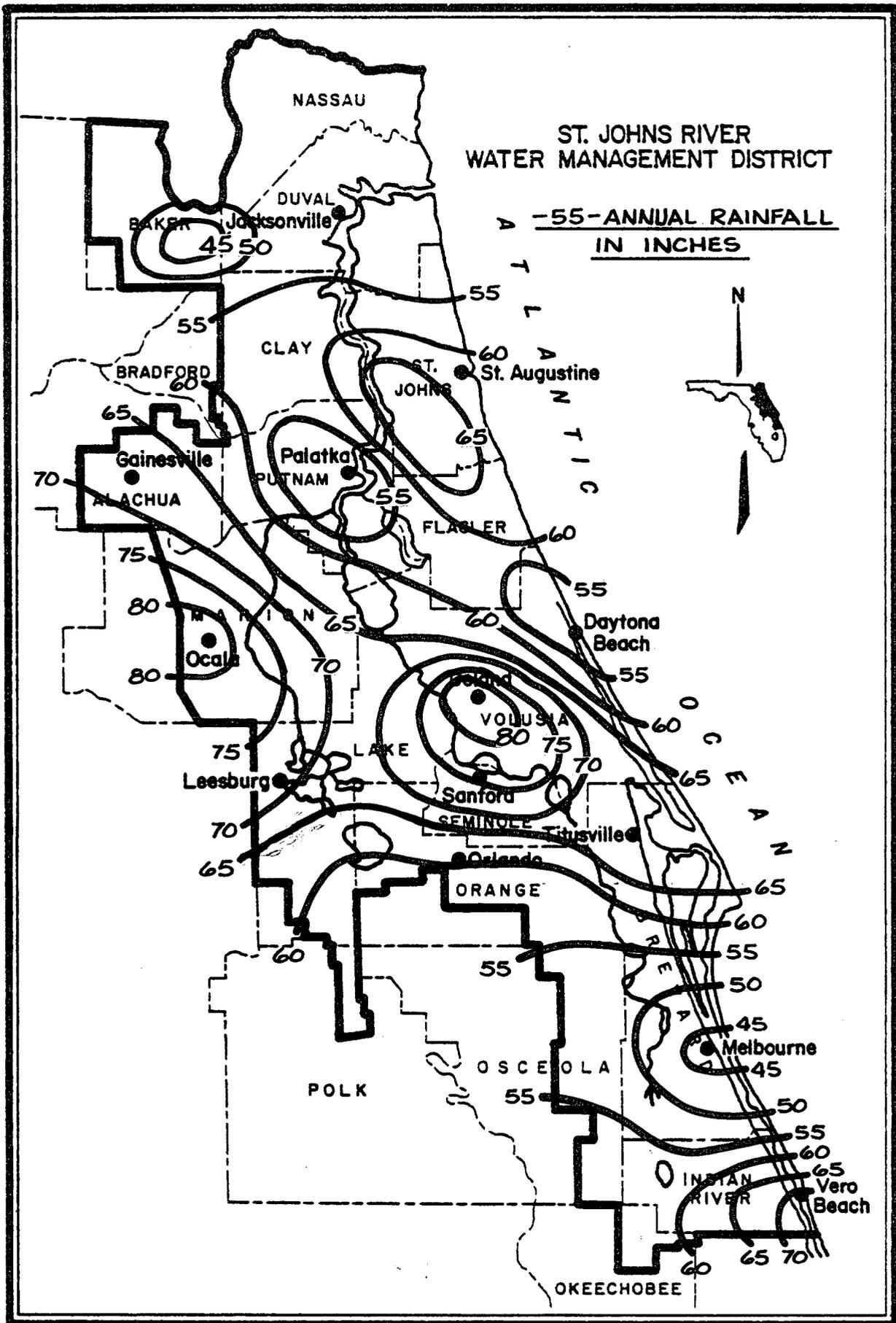


FIGURE 2. -- 1982 Rainfall in Inches (October 1981 - September 1982)

FLORIDAN AQUIFER

Figures 4 and 5 display the potentiometric surface of the Floridan aquifer during May and September 1982, respectively. The potentiometric change of water level surfaces between the normal seasonal low in May and the seasonal high in September is shown in Figure 6. All areas of the District experienced an increase in the potentiometric head during the 1982 water year. The greatest increases were observed in an area Northwest of Orlando and between St. Augustine and Green Cove Springs in St. Johns County. Even with the rising potentiometric head in the Floridan aquifer for the last two water years, the levels in most wells are closer to the record lows than record highs.

Figure 7 shows the locations of four long-term monitor wells in the District. All four wells showed net increases in levels during the 1982 water year (Figure 8). The net rises in the four wells ranged from 2 feet in the Alamana well, in Volusia County, to 4 feet in the Neptune Beach and Platt wells, in Duval and Brevard counties, respectively. The Keystone Heights in Clay County well recorded a total rise of approximately 3 feet during the 1982 water year.

The Keystone Heights and Alamana wells are located in recharge areas which are sparsely populated. Variations of water levels in these two wells are the result of differences in natural recharge and discharge. The overall increase in water level at the Keystone Heights well indicates greater recharge during the water year than discharge in the hydraulically connected areas down gradient in the Floridan aquifer. The Alamana well recorded a total increase of 2 feet. This rise brought the water level to near normal from the record low of 25.32 feet above MSL attained during the 1980-1981 drought. By the end of the 1982 water year, the aquifer in the vicinity of the Alamana well had recovered to near normal levels.

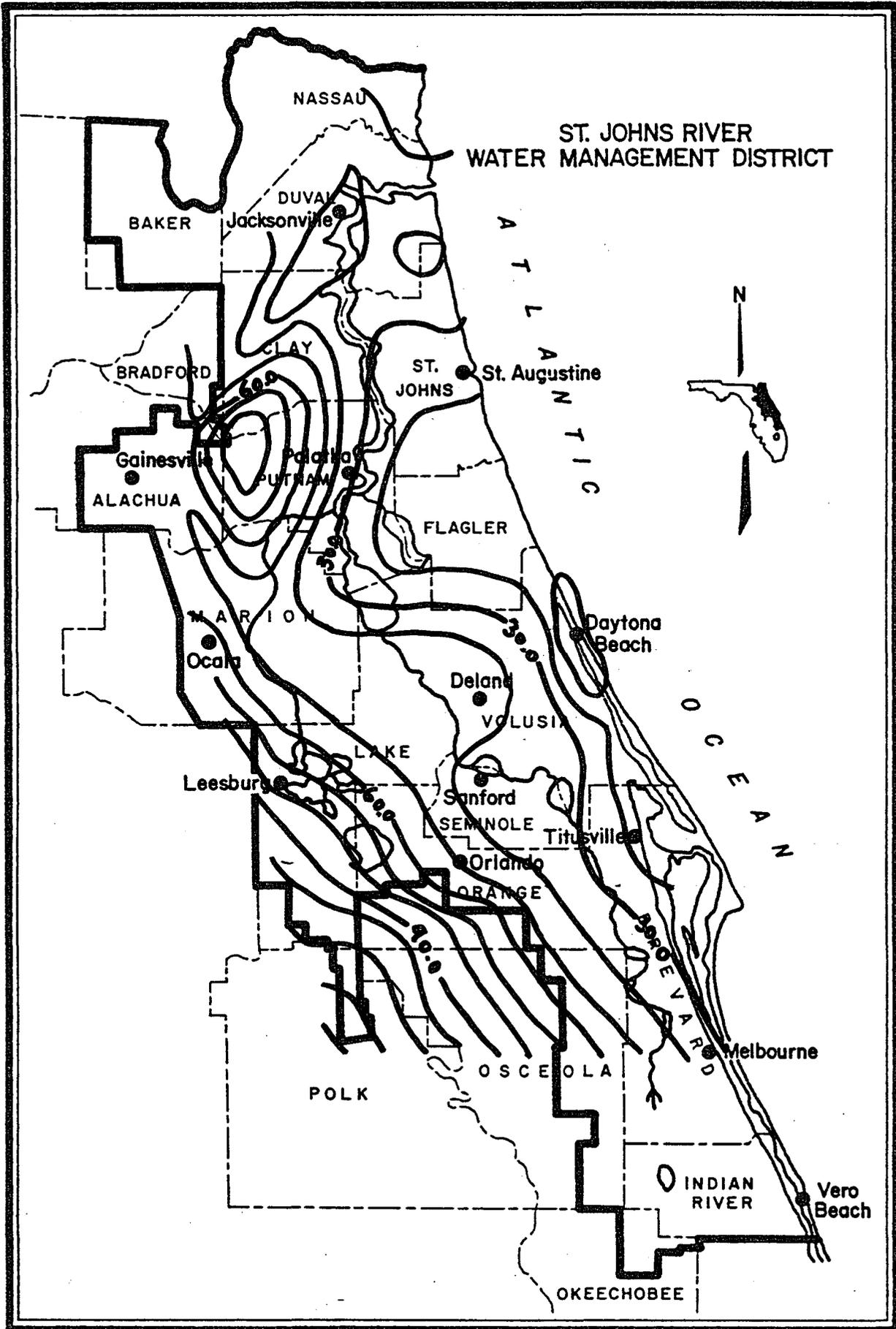


FIGURE 4. -- Potentiometric Level of the Floridan Aquifer, May 1982

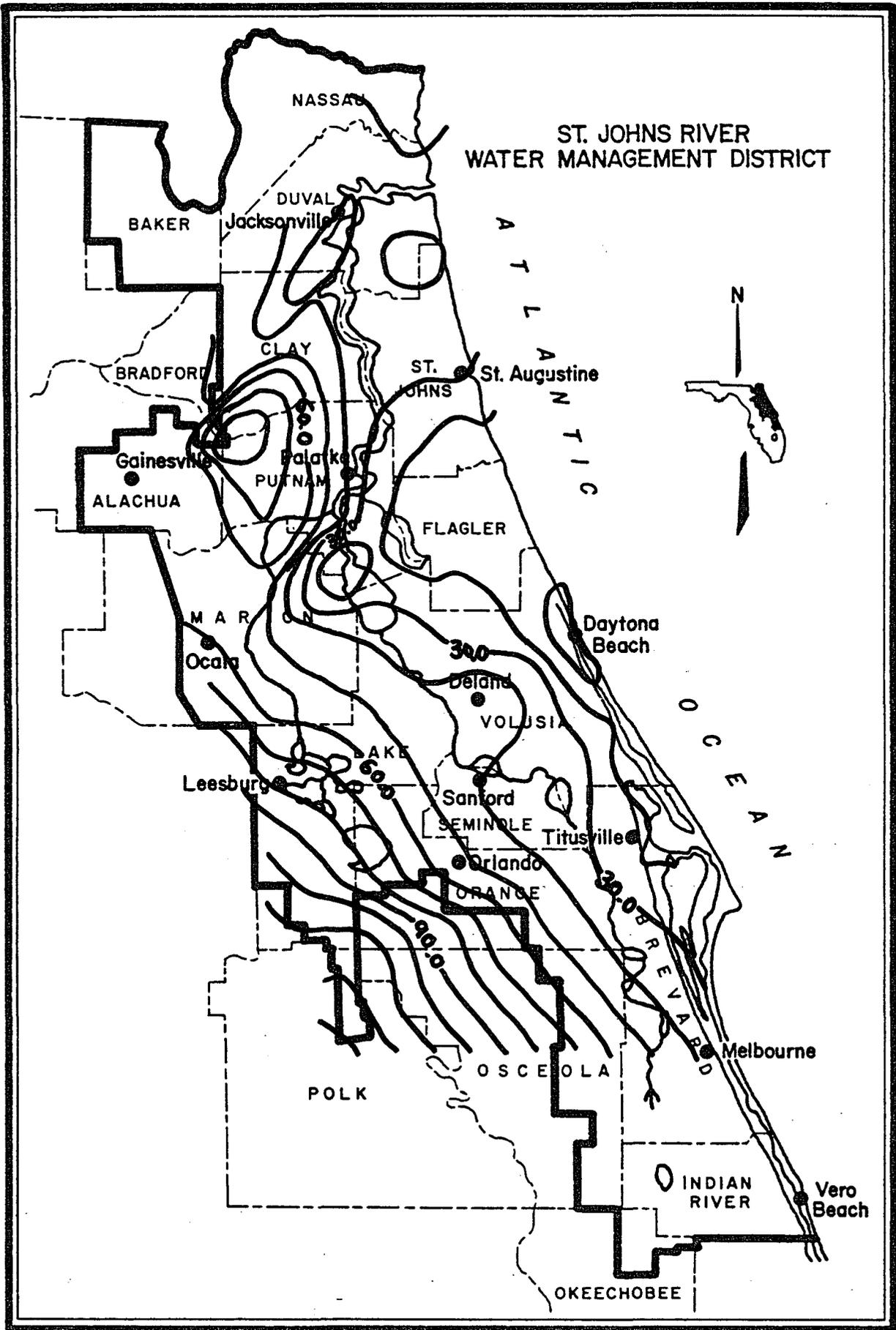


FIGURE 5. -- Potentiometric Level of the Floridan Aquifer, September 1982

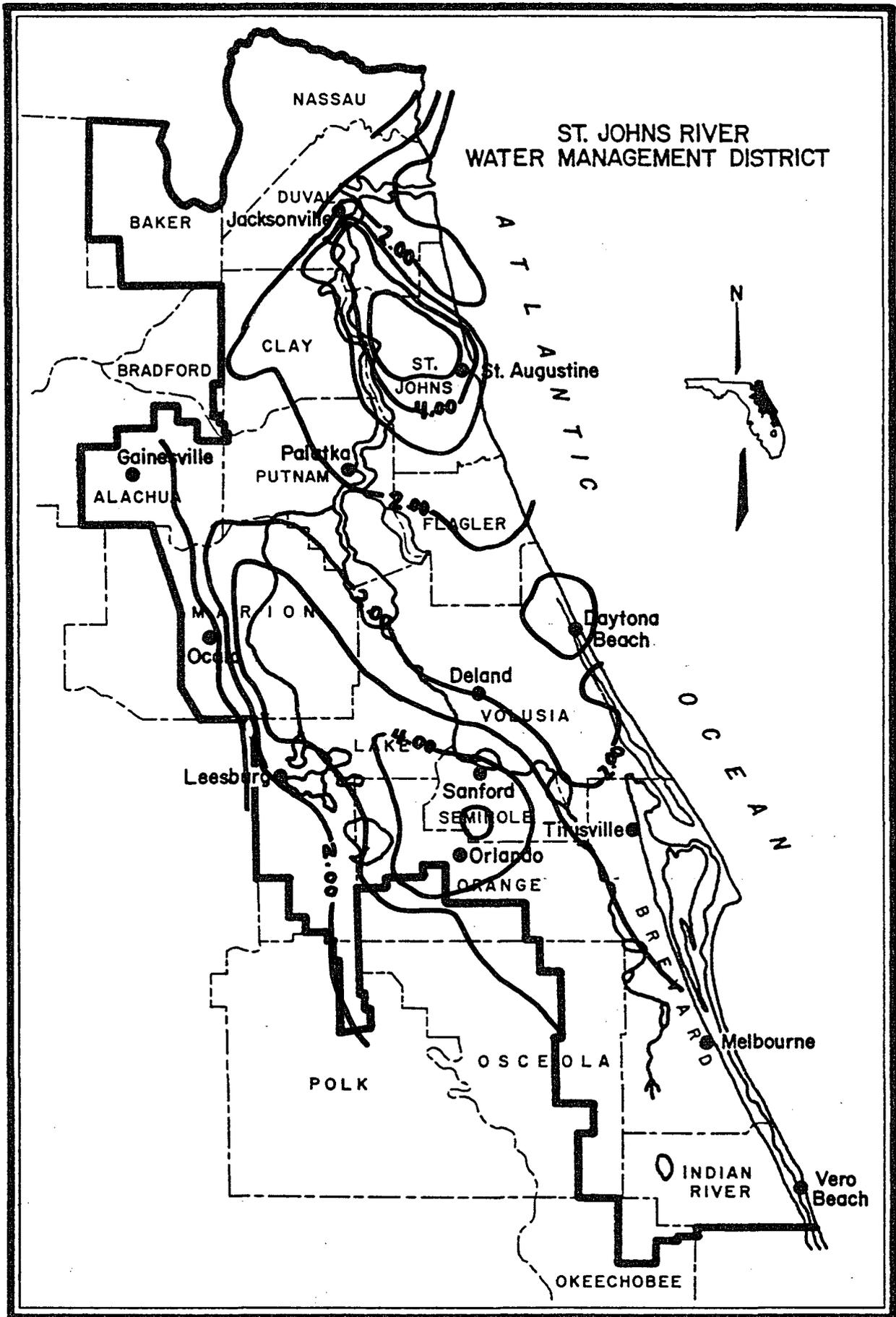


FIGURE 6. -- Change in the Potentiometric Surface of the Floridan Aquifer
May 1982 - September 1982

**ST. JOHNS RIVER
WATER MANAGEMENT DISTRICT**

MILES: 0 10 20 30 40 50

KILOMETERS: 0 20 40 60 80

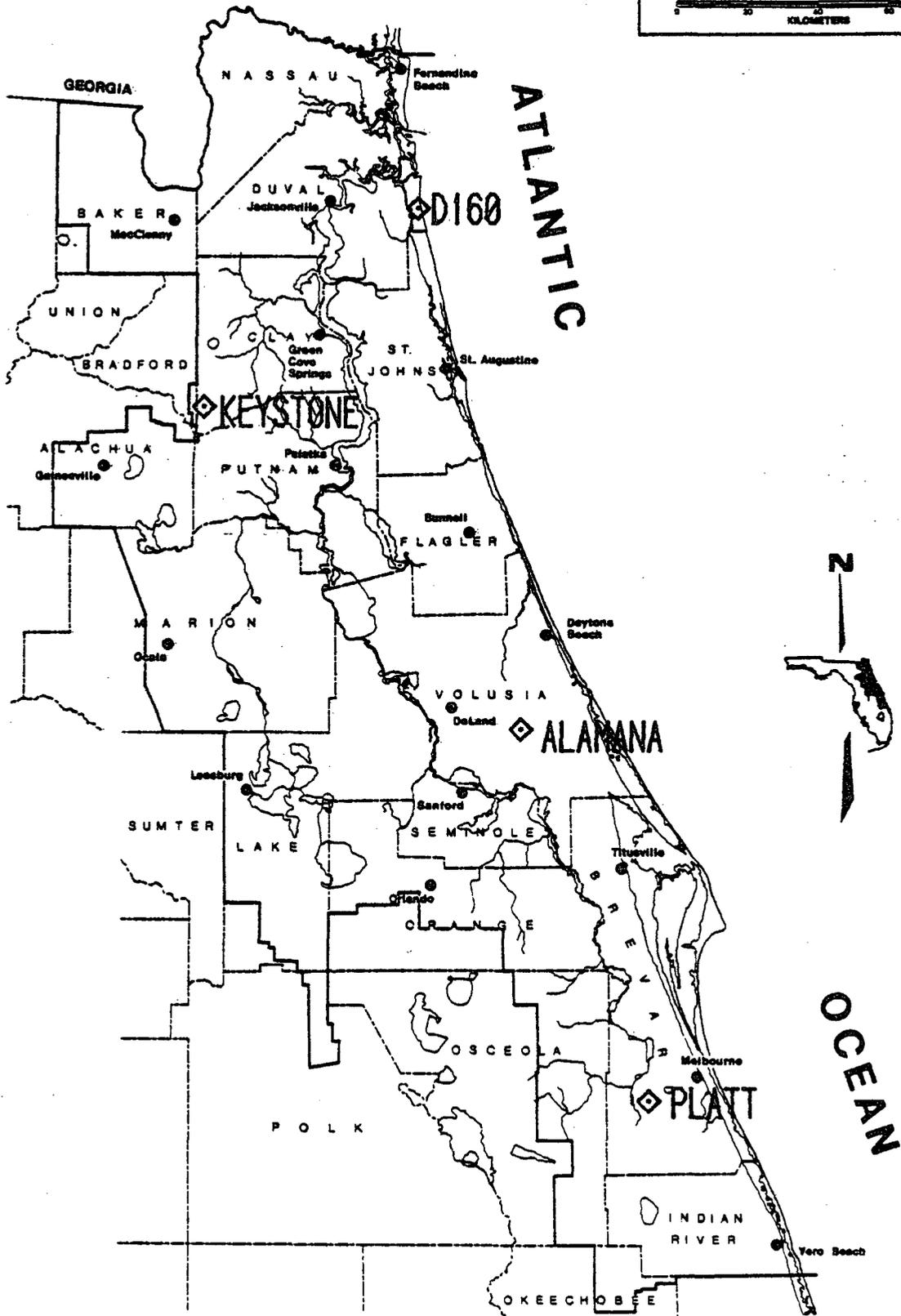


FIGURE 7. -- Long Term Monitor Well Location

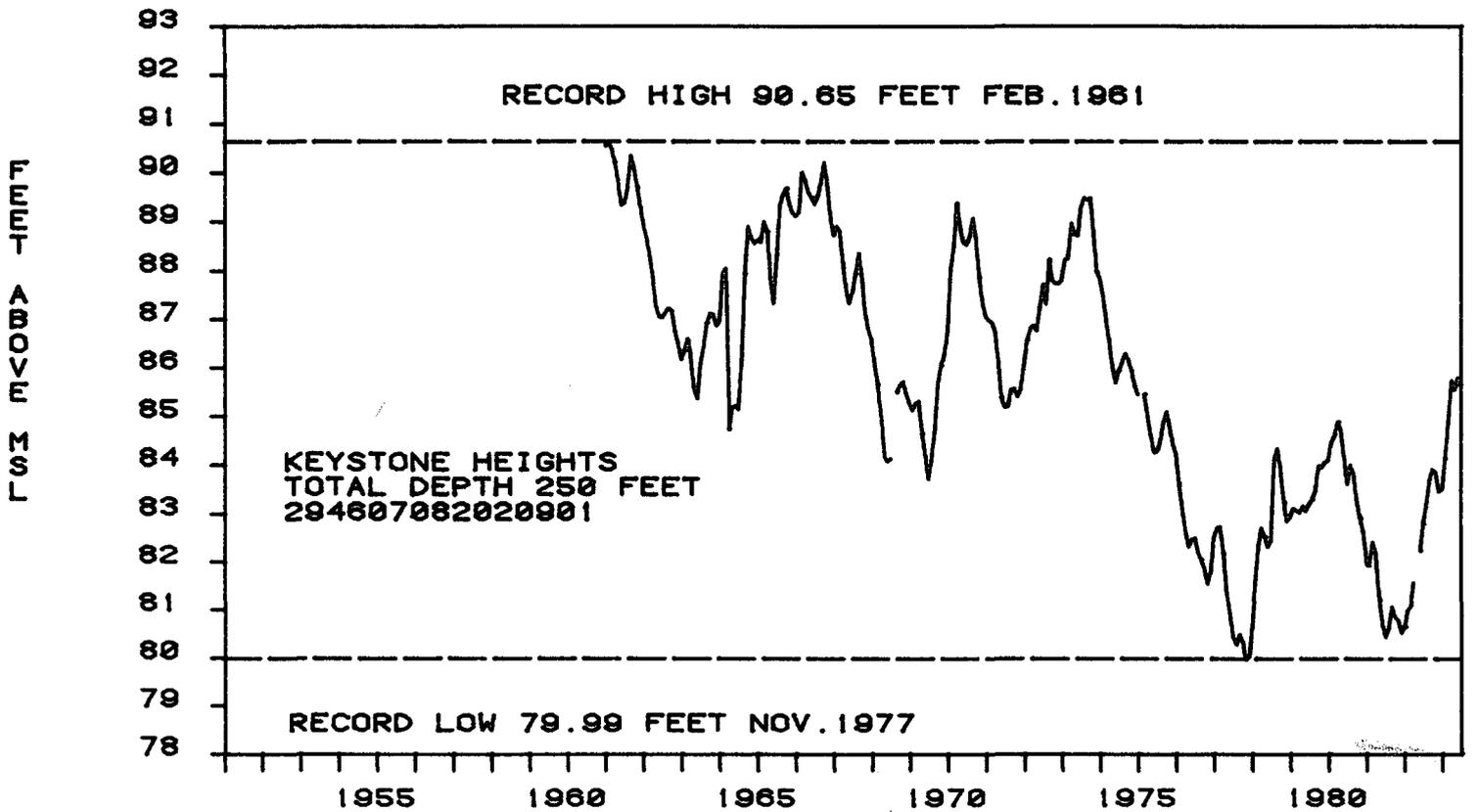
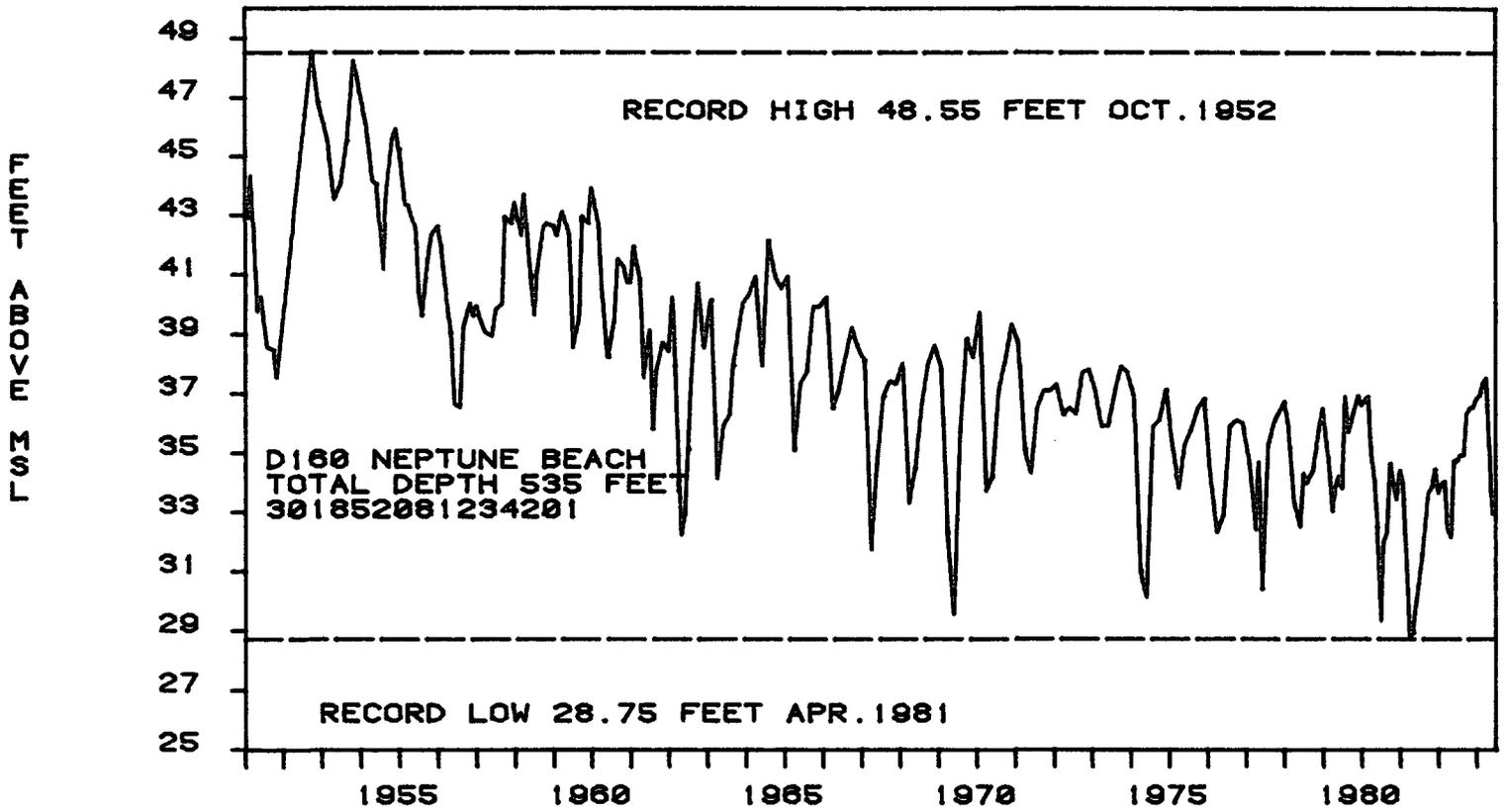
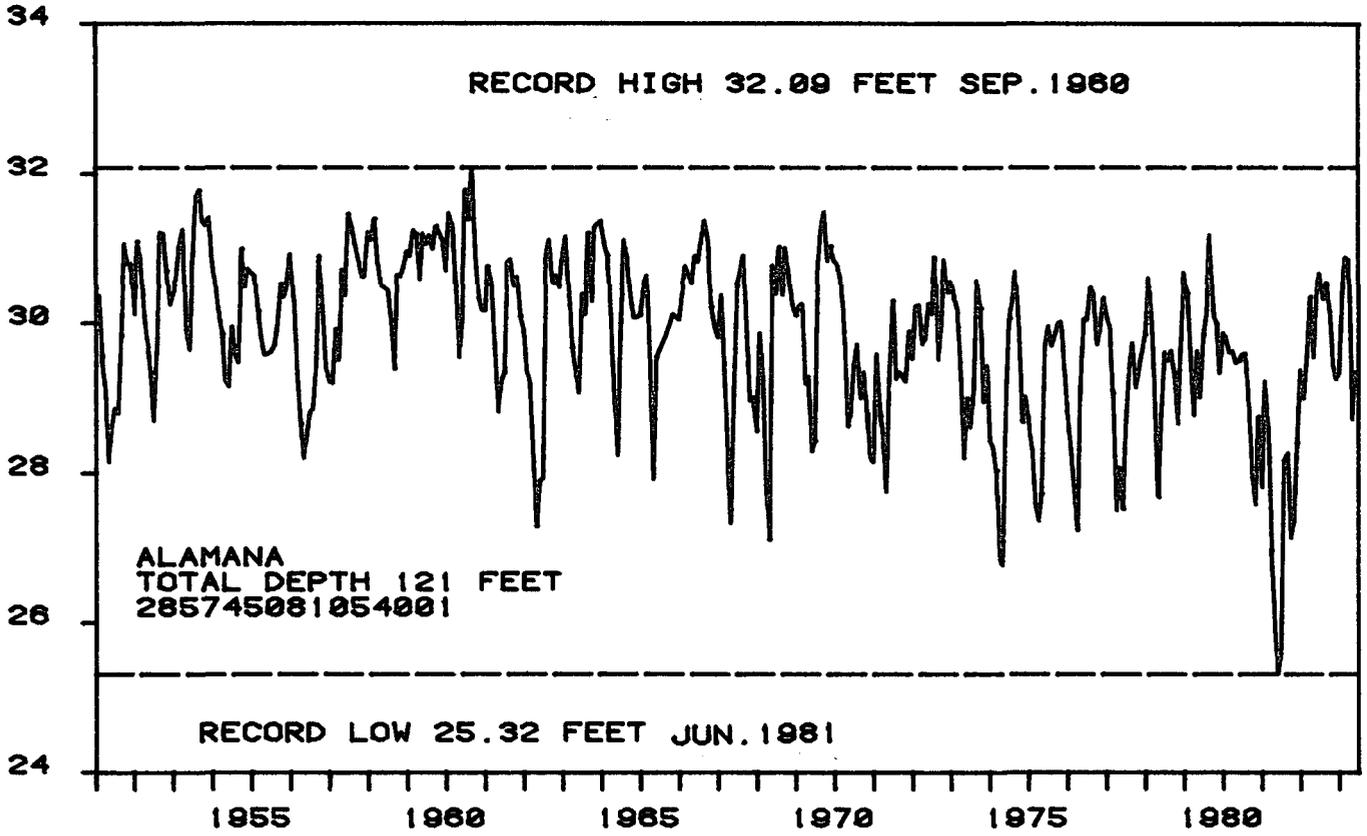


FIGURE 8. -- Hydrographs of Selected Wells in the SJRWMD

FEET ABOVE MSL



FEET ABOVE MSL

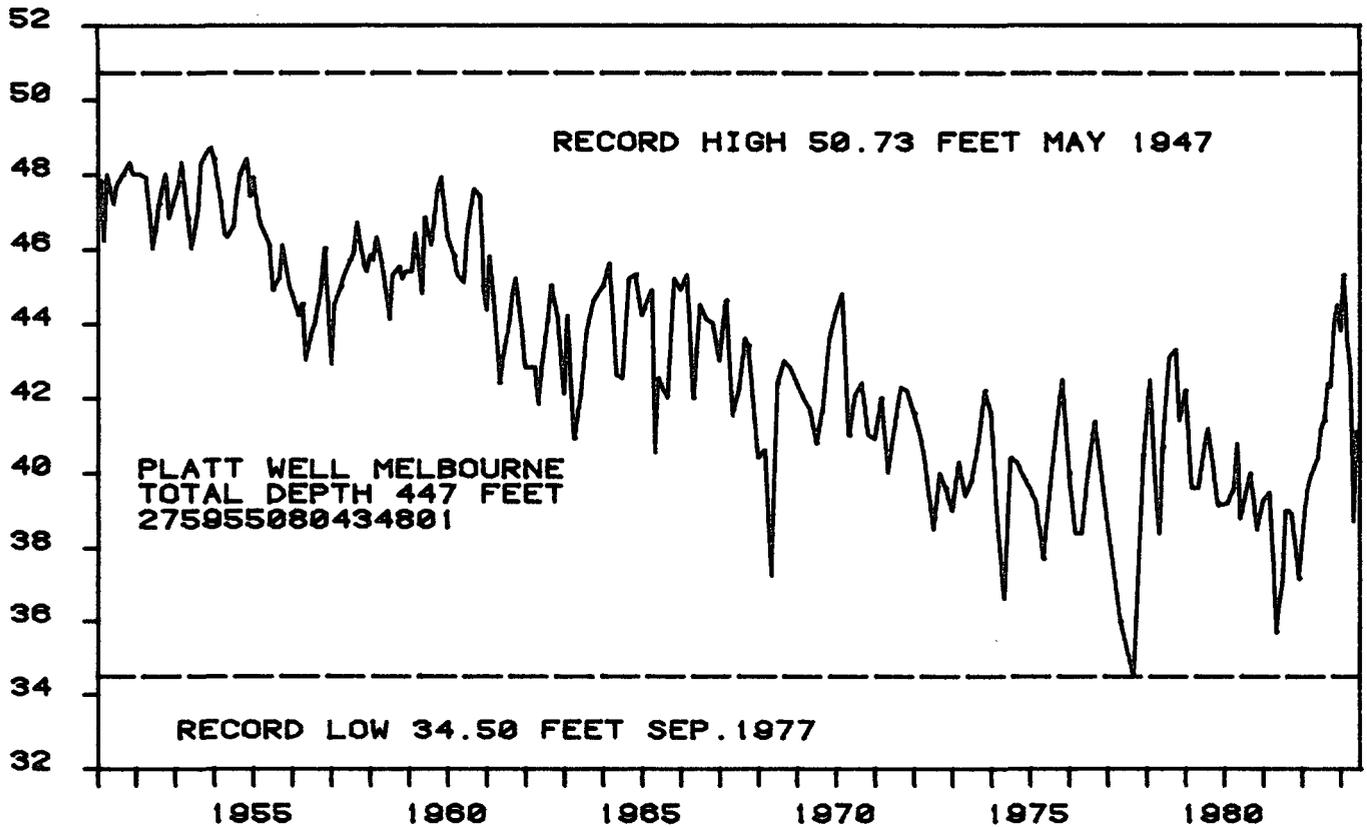


FIGURE 8. (Cont.) -- Hydrographs of Selected Wells in the SJRWMD

The Neptune Beach and Platt wells are located in areas of high demands on the Floridan aquifer. The fluctuations in water levels are directly affected by heavy ground water pumpage. The Neptune Beach well, in Duval County, reflects heavy urban withdrawals. The Platt well, in Brevard County, reflects predominately agricultural demands. Both wells recorded approximately 4 feet of rise during the 1982 water year because aquifer recharge regionally exceeded discharge.

Due to the increased rainfall during the 1982 water year, the District's water levels recovered to pre-drought levels of 1981. However, the four observation wells continue to indicate a long term decline in the water levels of the Floridan aquifer.

SURFACE WATER

The streams and rivers of the St. Johns River Water Management District derive their flows from runoff of precipitation and from ground water discharge. Overall rainfall was about 13% above normal for the District during the 1982 water year. However, the effect of prolonged drought which began in the later months of the 1980 water year, is reflected in the streamflow conditions through the middle of the 1982 water year. Discharges and water surface elevations were below median during the first half and above median during the second half of 1982 water year for most water bodies in the District with the exception of St. Marys River. Locations of stream or lake gaging stations used in the preparation of this report are shown in Figure 9.

Figures 10 through 16 present monthly streamflow data for water years 1979-1982 for selected gaging stations in the District. On some of the figures, the monthly median flows for the period of record are also shown. The median flow indicates the flow value equaled or exceeded for 50 percent of time during the period of record.

Table 1 presents the annual mean flow data for different tributaries in the lower St. Johns River Basin. Figures 17 through 21 show monthly elevations for some principal lakes in the District.

TABLE 1. Annual Mean Flows for Selected Gaging Stations in the Lower St. Johns River Basin

Gaging Station	Mean Flow in cfs		
	1980	1981	1982
Etonia Creek at Bardin	105	72.0	108.
Rice Creek near Springdale	36.8	17.3	52.
Simms Creek near Bardin	47.0	24.4	41.3
South Fork Black Creek near Penney Farms	169	68.8	171
North Fork Black Creek near Middleburg	274	79.4	174
Ortega River at Jacksonville	28.2	9.85	33.13
Pablo Creek at Jacksonville	33.4	8.73	30.49

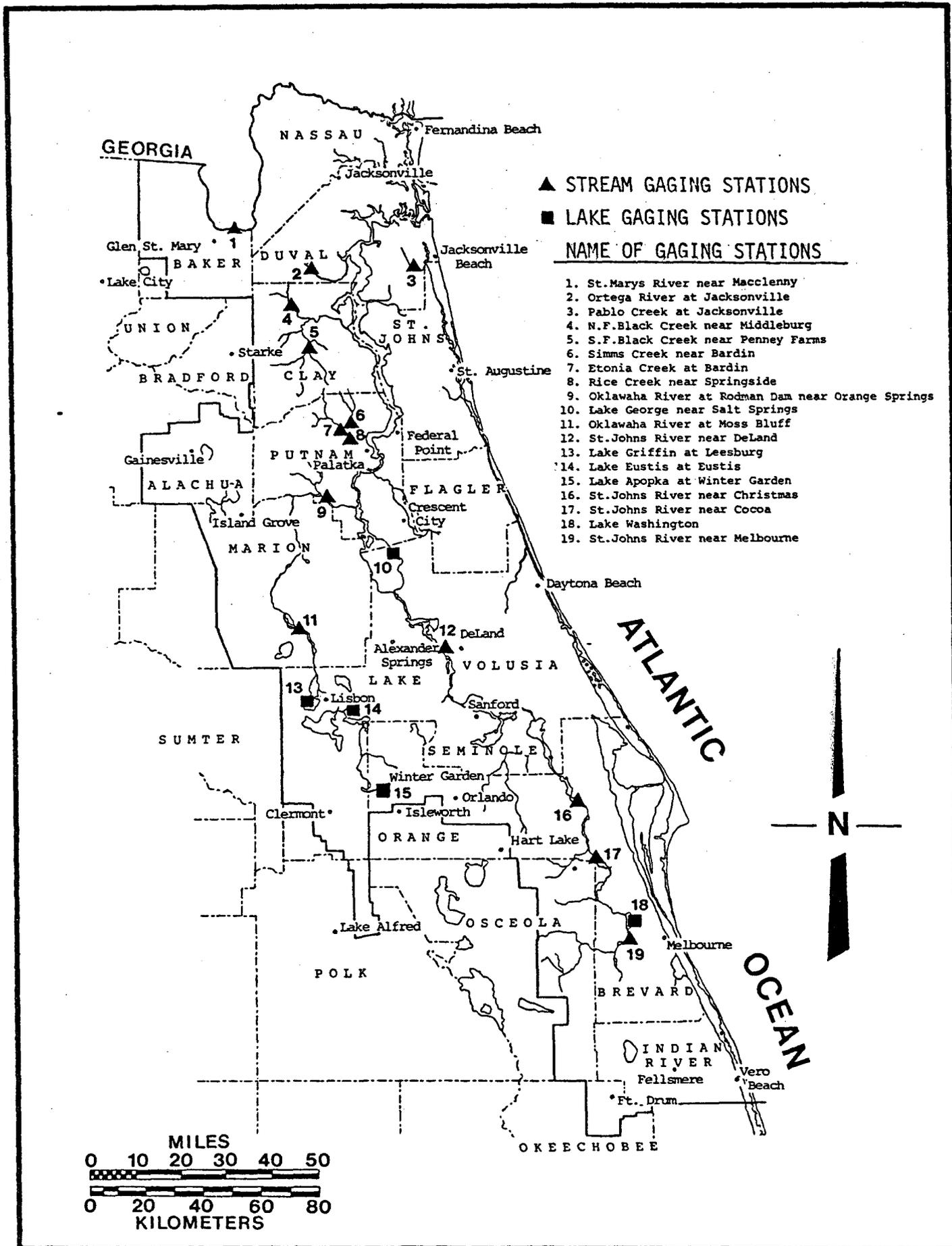


FIGURE 9. -- Location of Stream and Lake Gaging Stations Used in this Report.

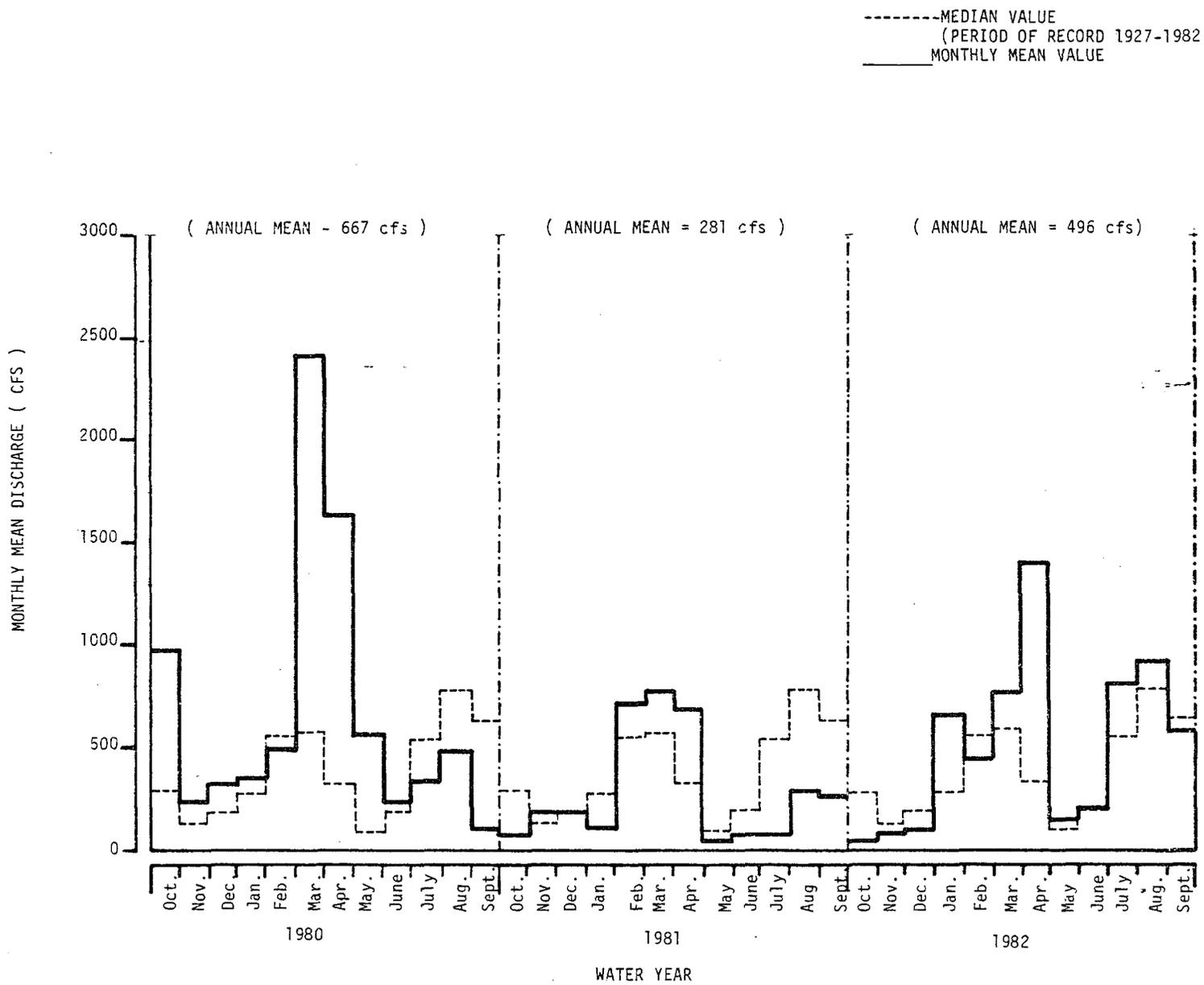


FIGURE 10. -- Streamflows, St. Marys River Near Macclenny

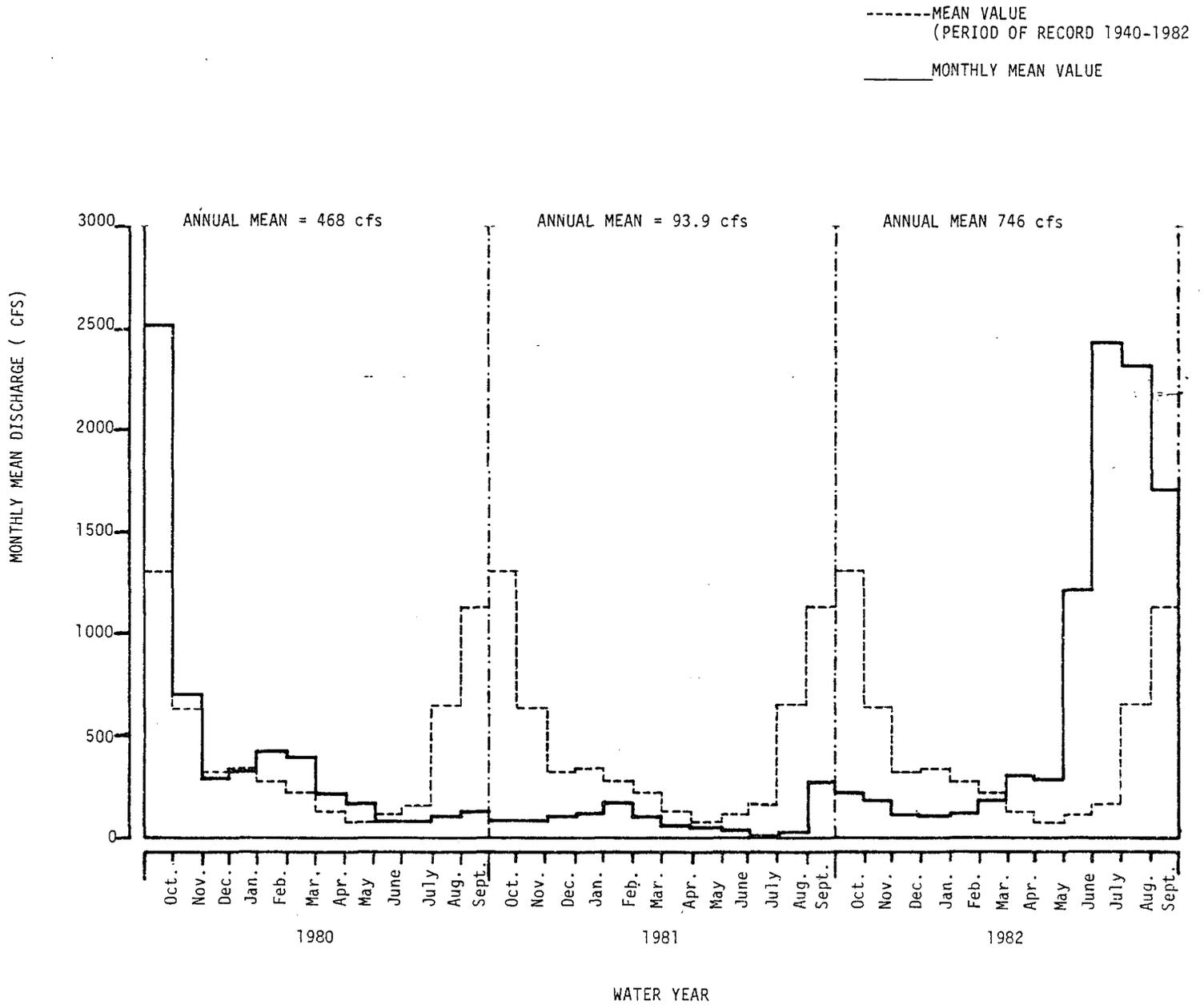


FIGURE 11. -- Streamflows, St. Johns River at Melbourne

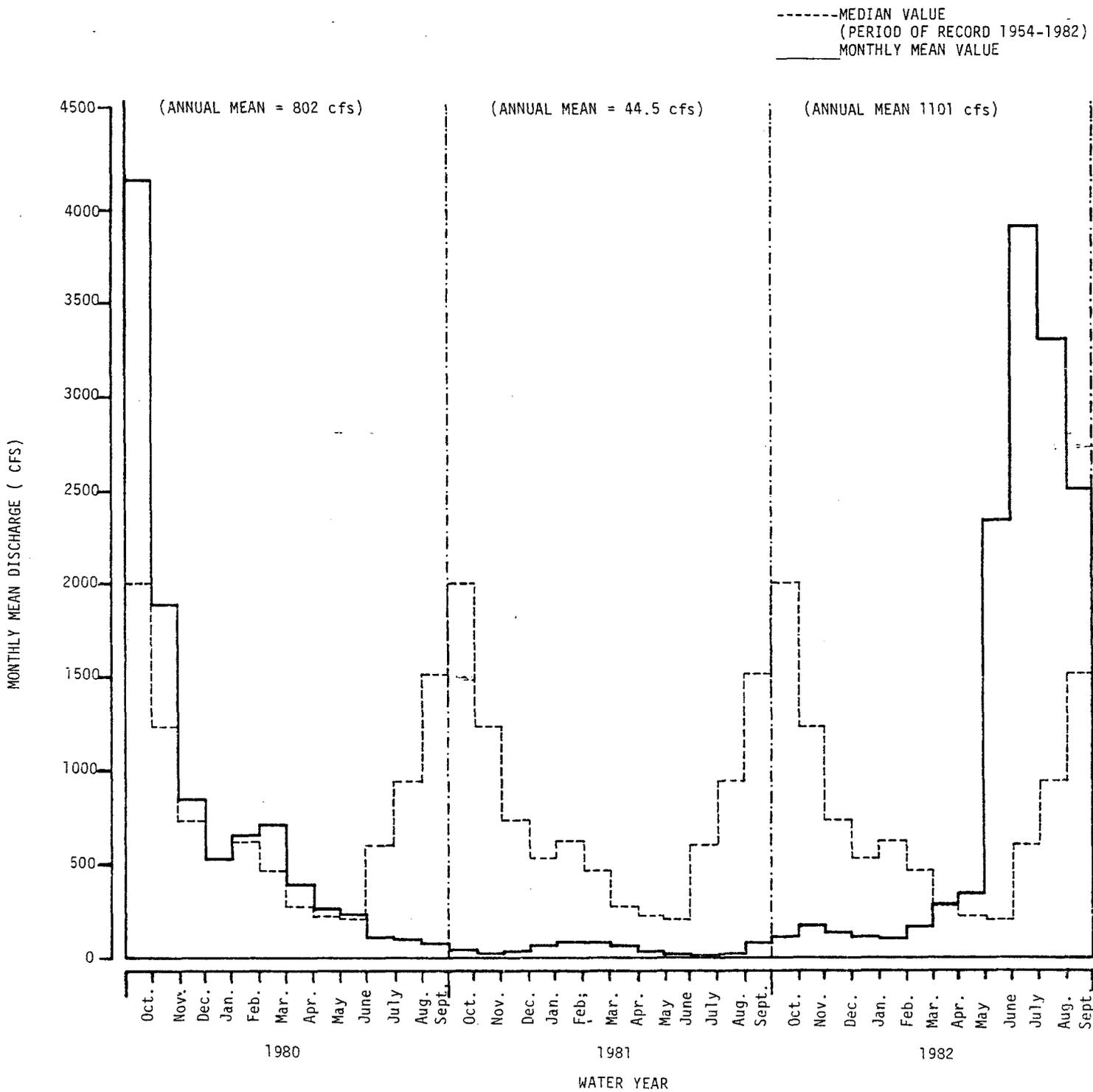


FIGURE 12. -- Streamflows, St. Johns River Near Cocoa

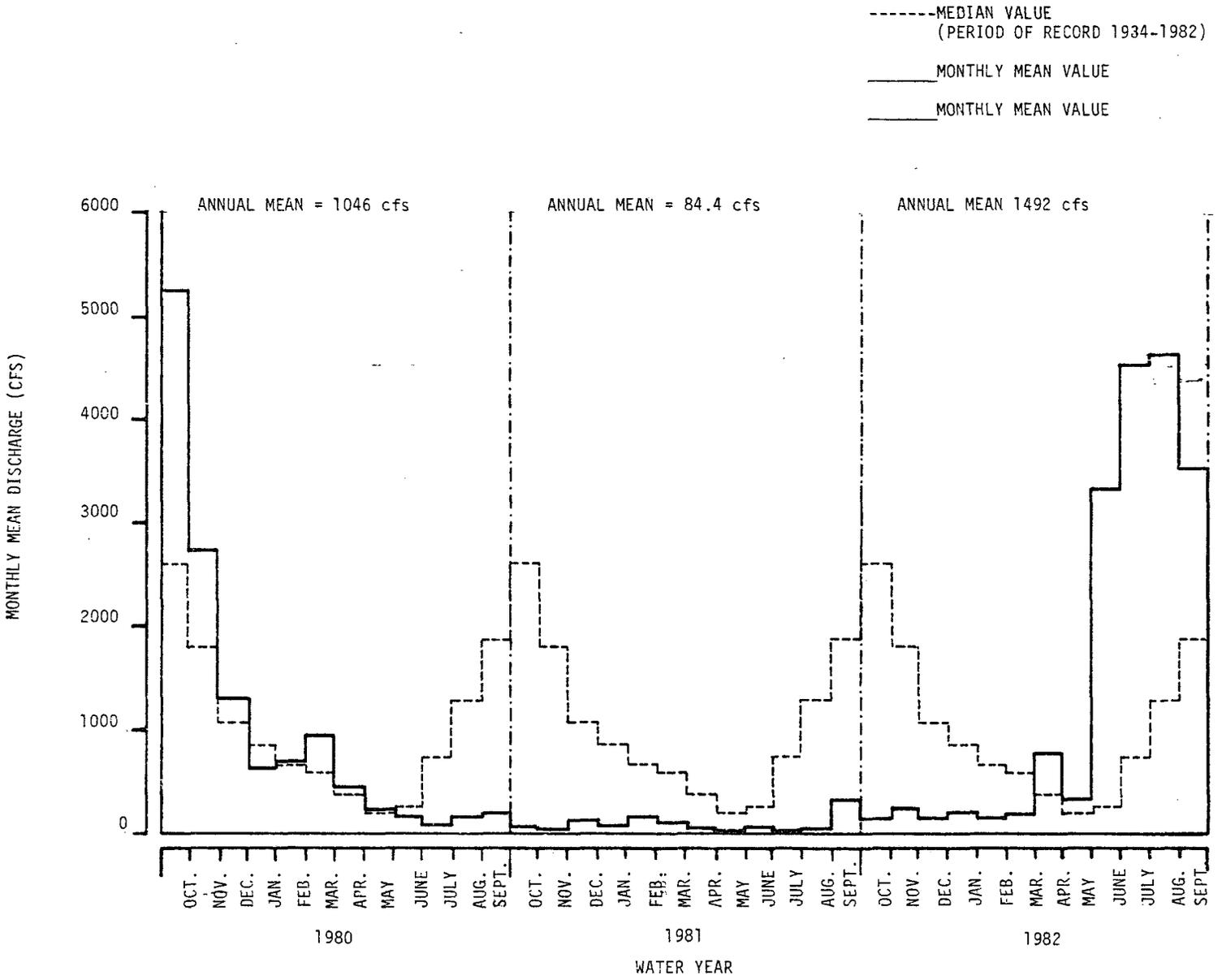


FIGURE 13. -- Streamflows, St. Johns River Near Christmas

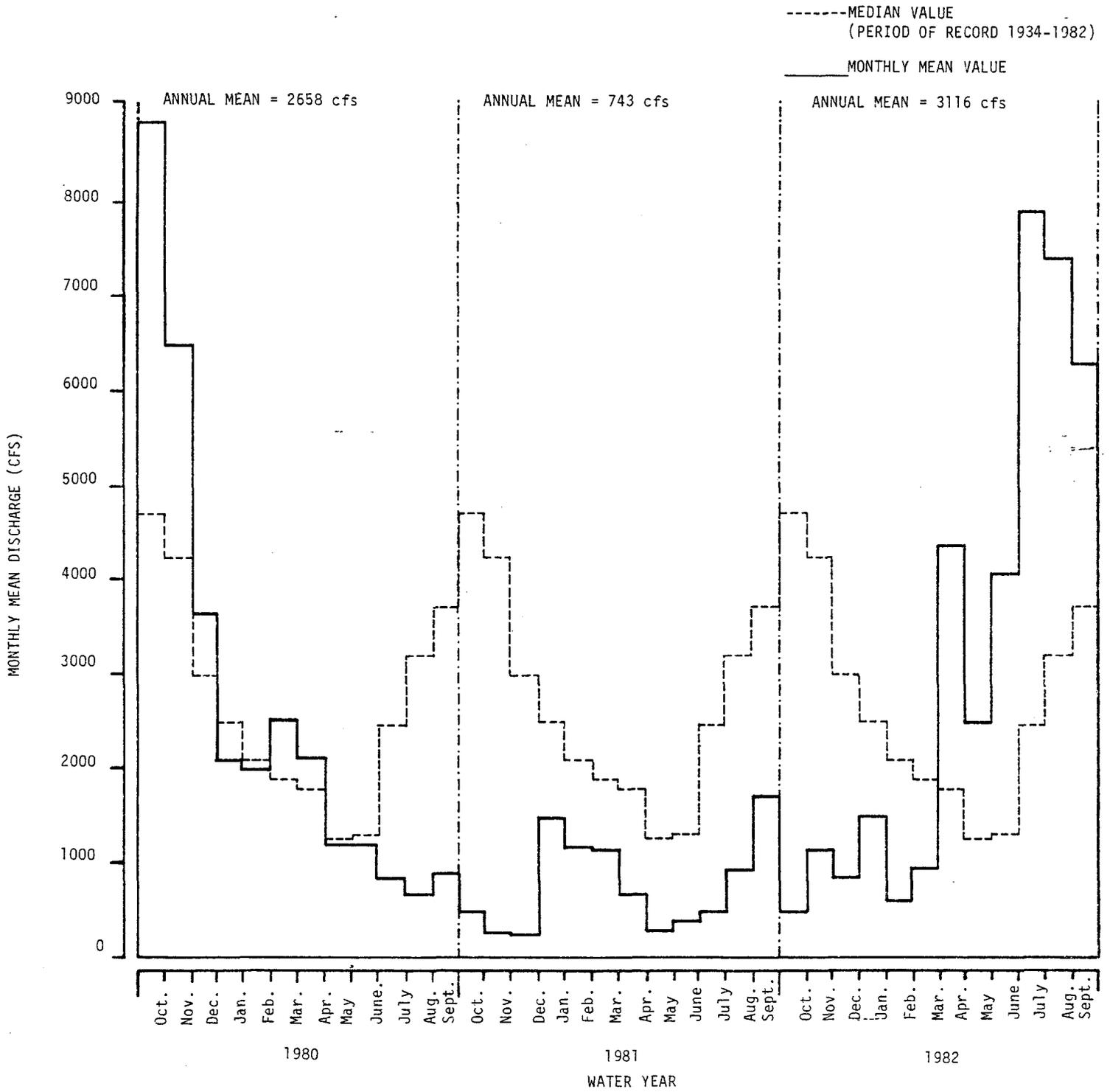


FIGURE 14. -- Streamflows, St. Johns River Near Deland

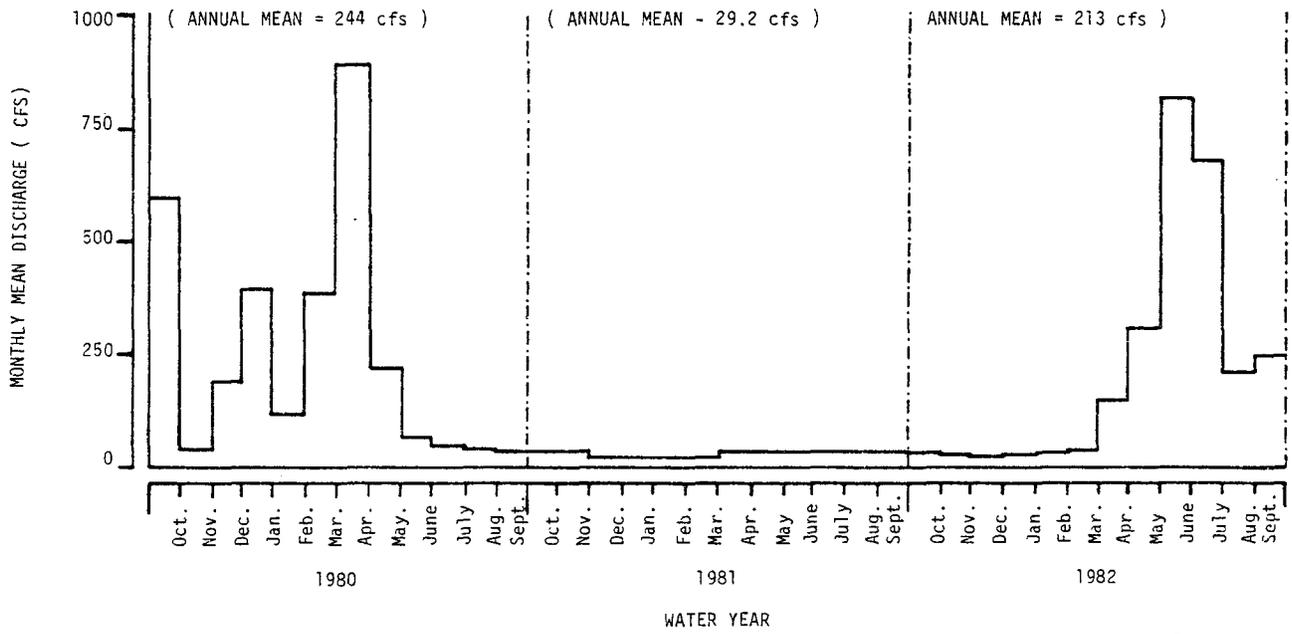


FIGURE 15. -- Streamflows, Oklawaha River at Moss Bluff

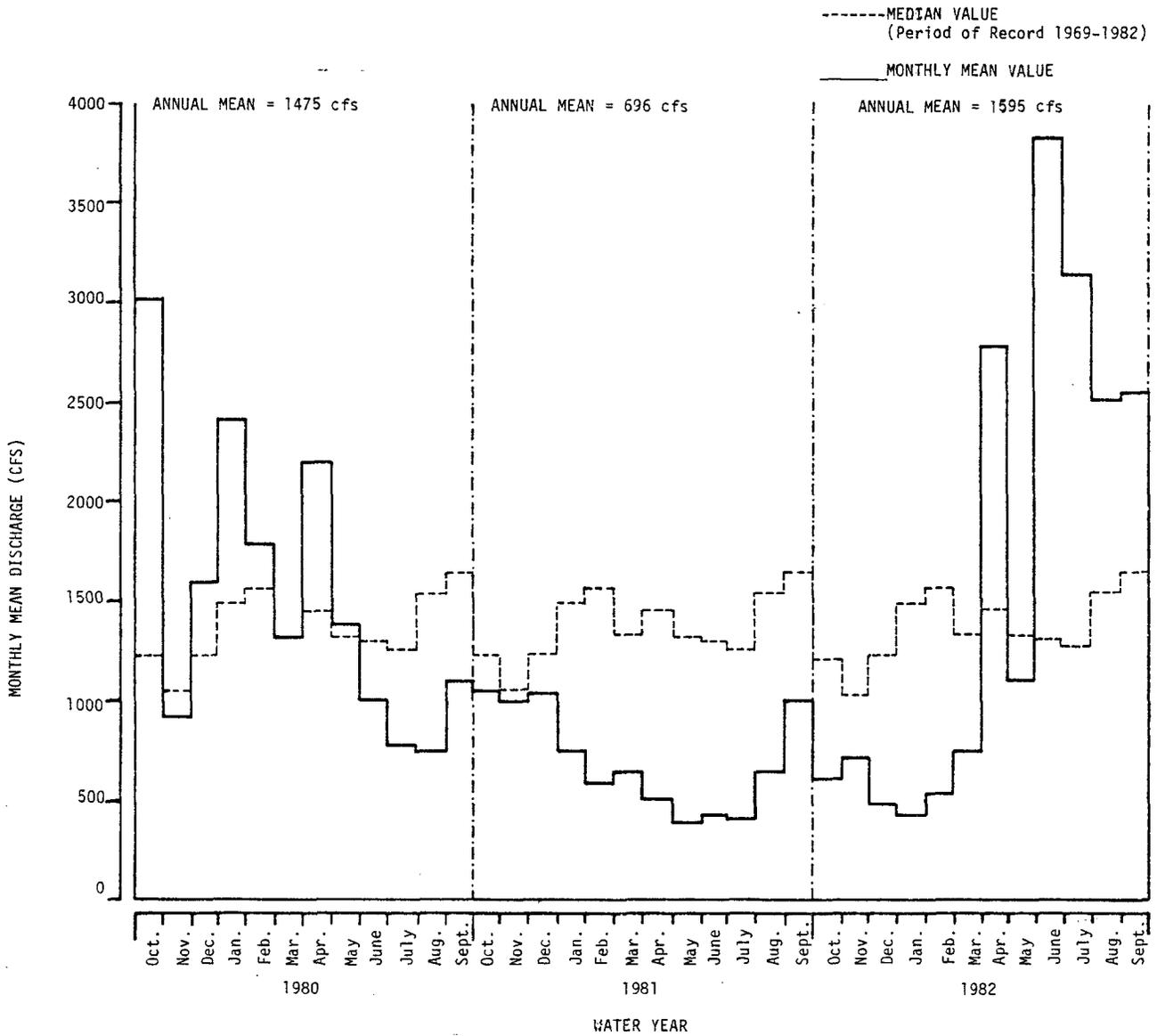


FIGURE 16. -- Streamflows, Oklawaha River at Rodman Dam, Near Orange Springs

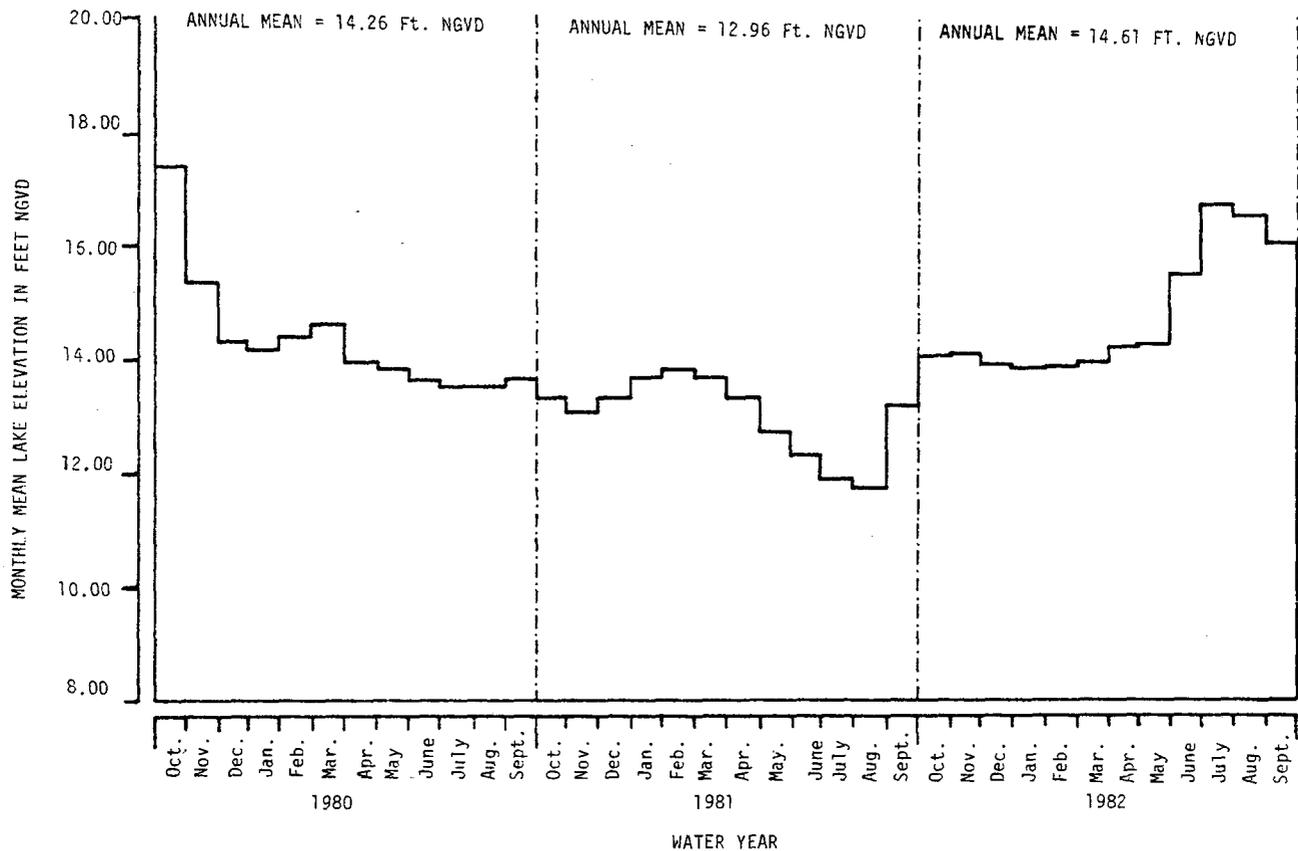


FIGURE 17 -- Elevation, Lake Washington Near Eau Gallie

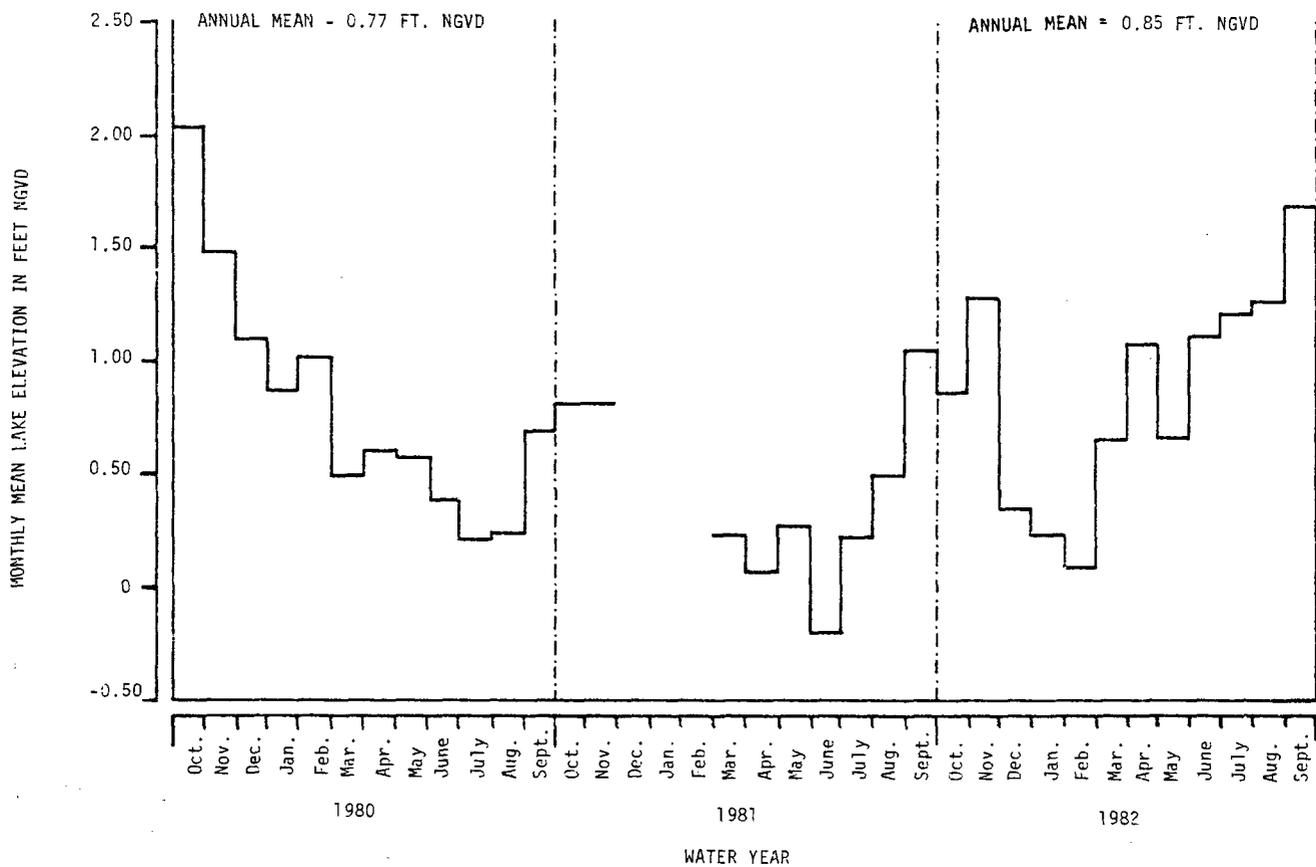


FIGURE 18. -- Elevation, Lake George Near Salt Springs

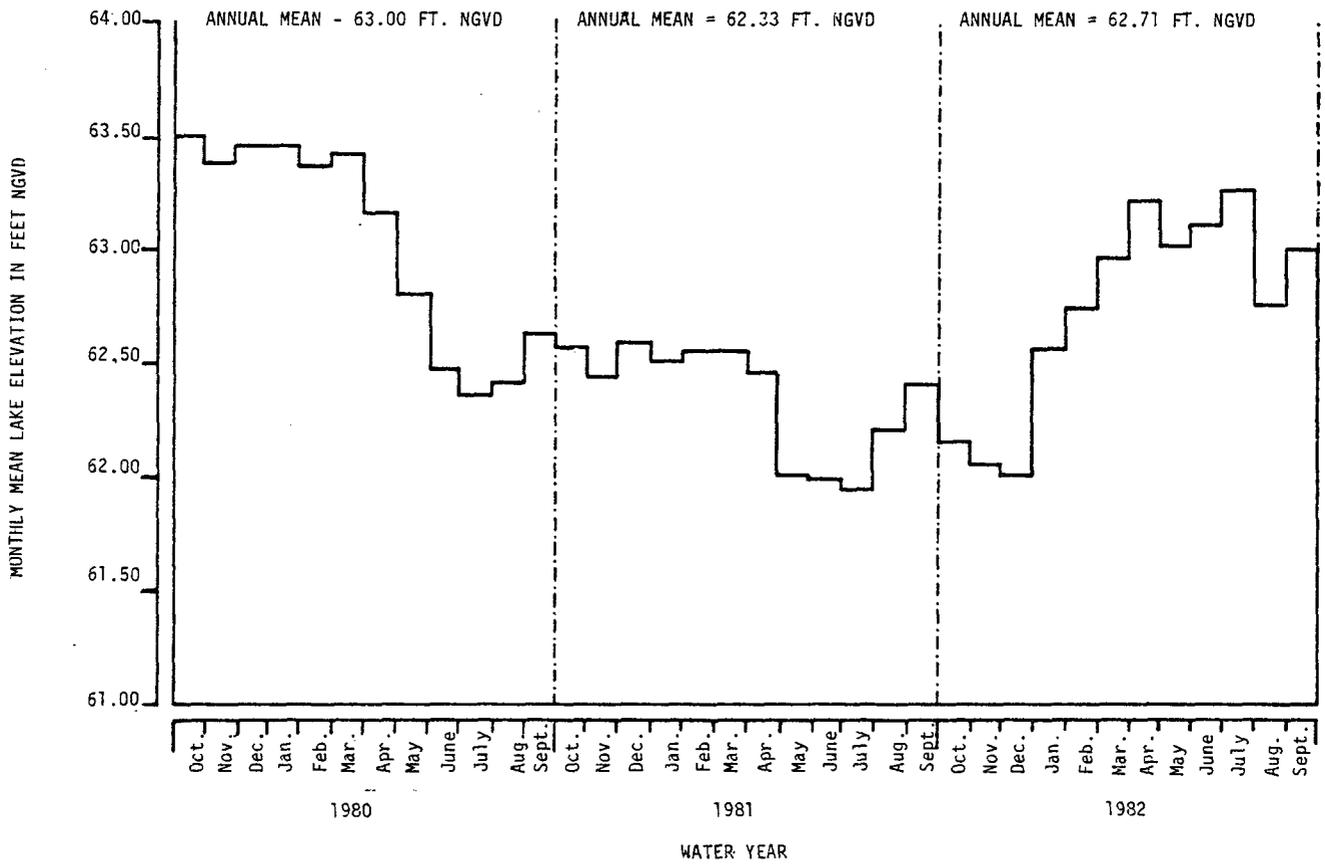


FIGURE 19. -- Elevation, Lake Eustis at Eustis

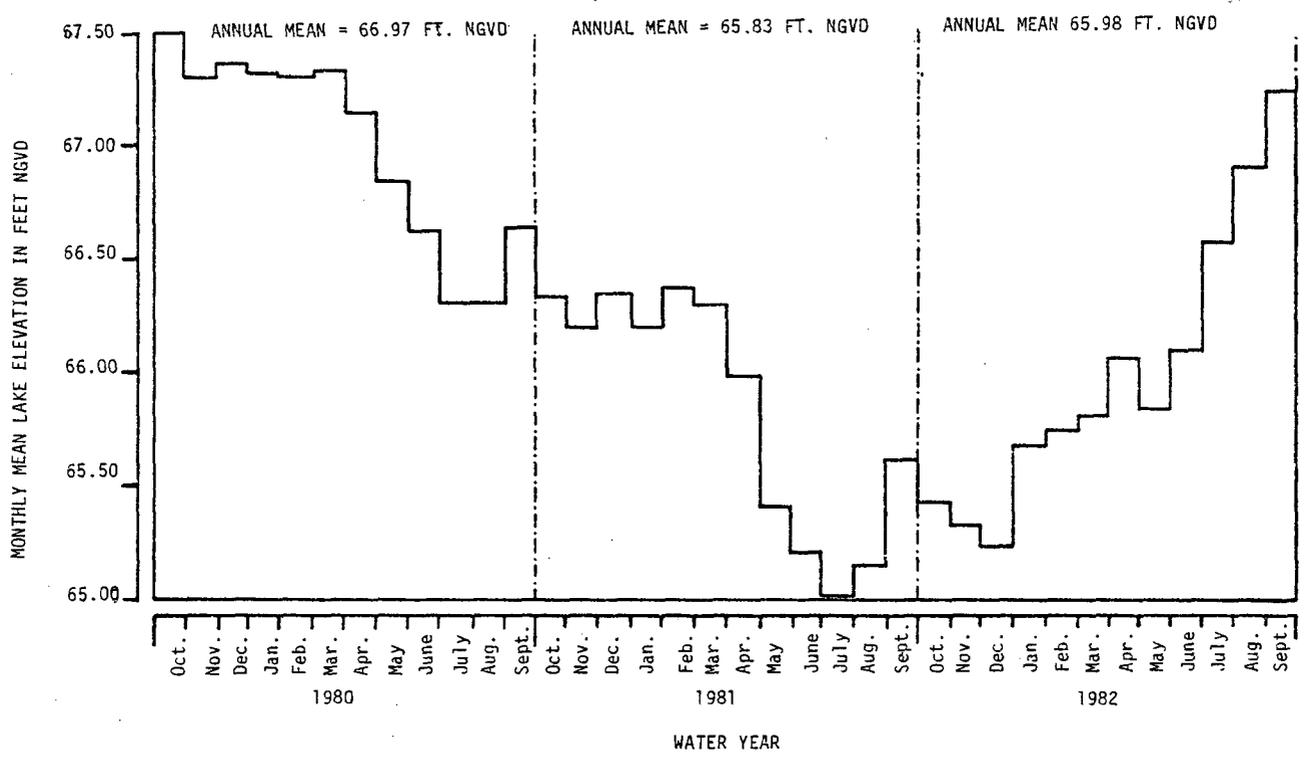


FIGURE 20. -- Elevation, Lake Apopka at Winter Garden

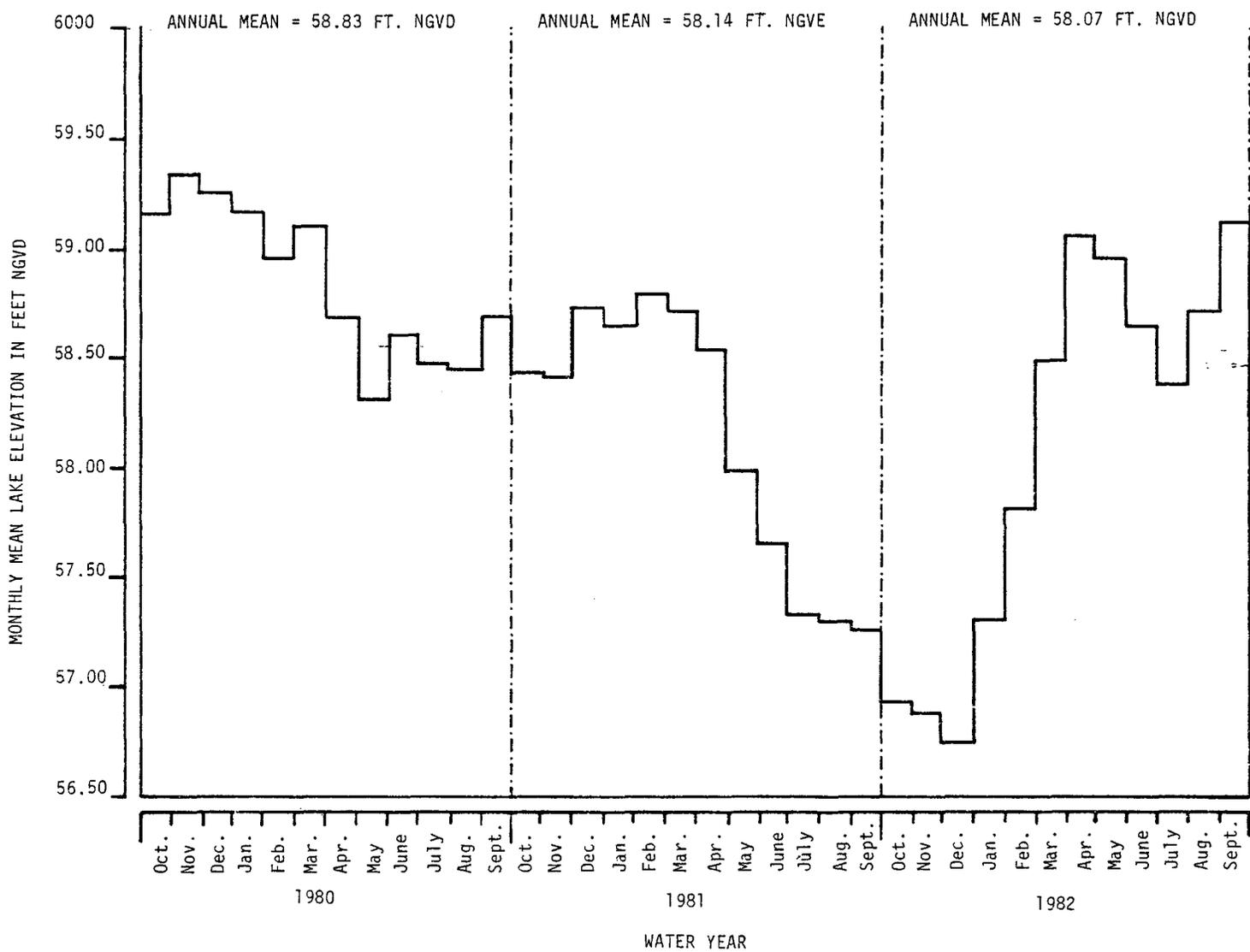


FIGURE 21. -- Elevation, Lake Griffin at Leesburg

WATER USE BY SOURCE

Agricultural irrigation (which includes Livestock water use) was the largest water use category for 1982 using 50% of the total fresh water (Figure 22). This category accounted for 42% of the ground water and 78% of the total fresh water used within the District. The second largest category was Public supply using 25% of the total fresh ground water and 4% of the total fresh surface water. Other categories where substantial amounts of ground water were used are Heat Pump/Air Conditioning with 14%, Industrial (which includes Institutional water use) 11%, and Domestic self supply 8%. Thermoelectric Power Generation accounted for less than 1% (0.4%) of the total ground water used in 1982. The two major fresh surface water use categories were Agricultural Irrigation (78.4%) and Industrial (15%) accounting for 93% of the total used in 1982. Public supply and Thermoelectric accounted for the remaining 7% of total fresh surface water.

WATER USE BY COUNTY

Indian River and Brevard counties were the largest fresh water using counties in 1982 (Table 2), accounting for 19% (270.7 MGD) and 18% (256.11) MGD), respectively. Orange (148.99 MGD), Lake (140.21 MGD) and Duval (132.12 MGD) counties are the next three largest fresh water using counties for 1982.

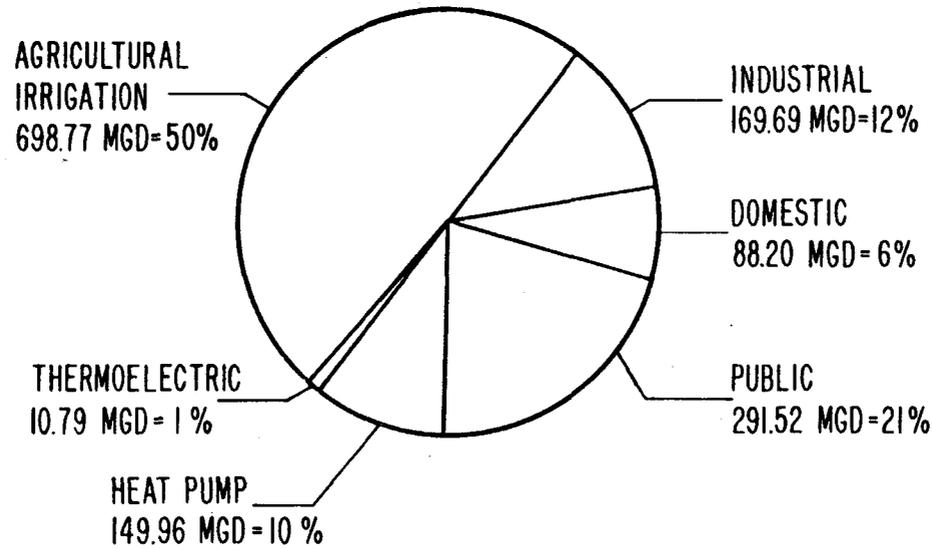
Brevard County, the largest ground water using county in 1982, accounted for 229.51 MGD. Other counties which withdrew over the 100 MGD of fresh ground water are Orange (144.37 MGD), Duval (129.86 MGD), Lake (118.39 MGD) and Indian River (108.26 MGD).

Indian River County was the largest surface water using county in 1982 accounting for 162.44 MGD. Other counties using substantial amounts of surface water were Putnam (38.70 MGD), Brevard (26.60 MGD) and Lake (21.82 MGD).

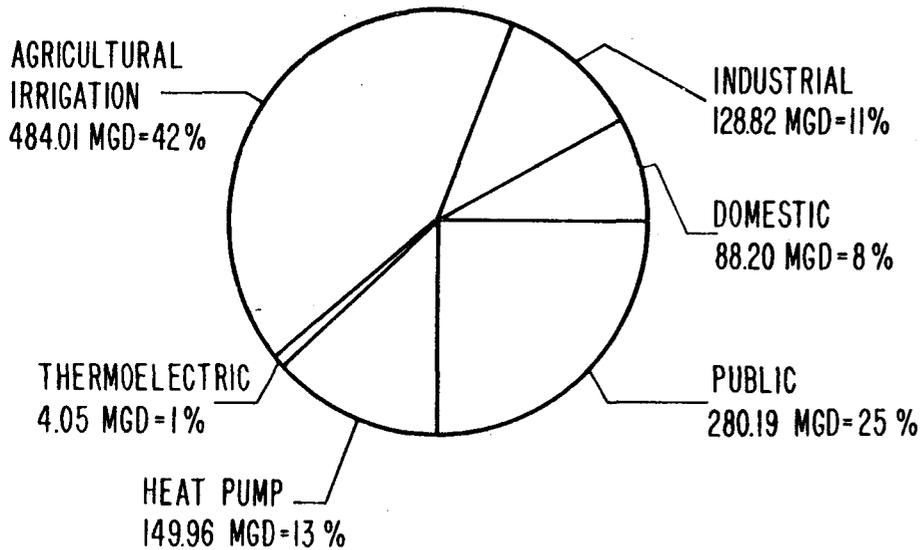
Table 2. 1982 WATER USE BY CATEGORY (MGD)

	PUBLIC	DOMESTIC	INDUSTRIAL	AGRICULTURE IRRIGATION	THERMO ELECTRIC	HEAT PUMP	TOTAL
ALACHUA	16.47	1.66	1.34	12.56	0.72	-	32.75
Ground	16.47	1.66	1.34	11.08	0.72	-	31.27
Surface	-	-	-	1.48	-	-	1.48
BAKER	0.53	1.52	0.29	2.38	-	-	4.72
Ground	0.53	1.52	0.29	1.79	-	-	4.13
Surface	-	-	-	0.59	-	-	0.59
BRADFORD	-	0.22	-	-	-	-	0.22
Ground	-	0.22	-	-	-	-	0.22
Surface	-	-	-	-	-	-	0.00
BREVARD	18.20	4.05	0.15	91.96	0.24	141.51	256.11
Ground	6.87	4.05	0.15	76.69	0.24	141.51	229.51
Surface	11.33	-	-	15.27	-	-	26.60
CLAY	5.93	3.58	5.52	4.07	-	-	19.10
Ground	5.93	3.58	5.52	2.80	-	-	17.83
Surface	-	-	-	1.27	-	-	1.27
DUVAL	70.19	17.08	35.81	6.88	2.16	-	132.12
Ground	70.19	17.08	35.81	4.62	2.16	-	129.86
Surface	-	-	-	2.26	-	-	2.26
FLAGLER	1.45	0.48	0.05	6.02	-	-	8.00
Ground	1.45	0.48	0.05	5.85	-	-	7.83
Surface	-	-	-	0.17	-	-	0.17
INDIAN R.	7.51	11.77	0.23	250.91	0.28	-	270.70
Ground	7.51	11.77	0.23	88.47	0.28	-	108.26
Surface	-	-	-	162.44	-	-	162.44
LAKE	11.67	8.78	19.32	100.44	-	-	140.21
Ground	11.67	8.78	15.19	82.75	-	-	118.39
Surface	-	-	4.13	17.69	-	-	21.82
MARION	7.59	7.47	0.19	19.13	-	-	34.38
Ground	7.59	7.47	0.19	16.46	-	-	31.71
Surface	-	-	-	2.67	-	-	2.67
NASSAU	3.29	5.72	41.73	2.46	-	-	53.37
Ground	3.29	5.72	41.73	1.60	-	-	52.34
Surface	-	-	0.17	0.86	-	-	1.03
OKEECHOBEE	-	0.06	-	13.70	-	-	13.76
Ground	-	0.06	-	11.68	-	-	11.74
Surface	-	-	-	2.02	-	-	2.02
ORANGE	83.16	4.24	5.58	54.54	1.47	-	148.99
Ground	83.16	4.24	5.58	51.39	-	-	144.37
Surface	-	-	-	3.15	1.47	-	4.62
OSCEOLA	-	0.05	-	8.42	-	-	8.47
Ground	-	0.05	-	7.56	-	-	7.61
Surface	-	-	-	0.86	-	-	0.86
POLK	-	0.77	-	15.16	-	-	15.93
Ground	-	0.77	-	15.09	-	-	15.86
Surface	-	-	-	0.07	-	-	0.07
PUTNAM	3.45	7.40	55.59	22.29	0.73	2.29	91.75
Ground	3.45	7.40	19.02	20.58	0.31	2.29	53.05
Surface	-	-	36.57	1.71	0.42	-	38.70
SEMINOLE	25.16	5.63	3.37	27.34	-	-	61.50
Ground	25.16	5.63	3.37	26.94	-	-	61.10
Surface	-	-	-	0.40	-	-	0.40
ST. JOHNS	5.69	2.60	0.02	33.04	-	-	41.35
Ground	5.69	2.60	0.02	32.55	-	-	40.86
Surface	-	-	-	0.49	-	-	0.49
VOLUSIA	31.23	5.12	0.33	27.47	5.19	6.16	75.50
Ground	31.23	5.12	0.33	26.11	0.34	6.16	69.29
Surface	-	-	-	1.36	4.85	-	6.21
TOTALS	291.52	88.20	169.69	698.77	10.79	149.96	1408.93
Ground	280.19	88.20	128.82	484.01	4.05	149.96	1135.23
Surface	11.33	-	40.87	214.76	6.74	-	273.70

FRESH WATER USE (MGD)



FRESH GROUND WATER USE (MGD)



FRESH SURFACE WATER USE (MGD)

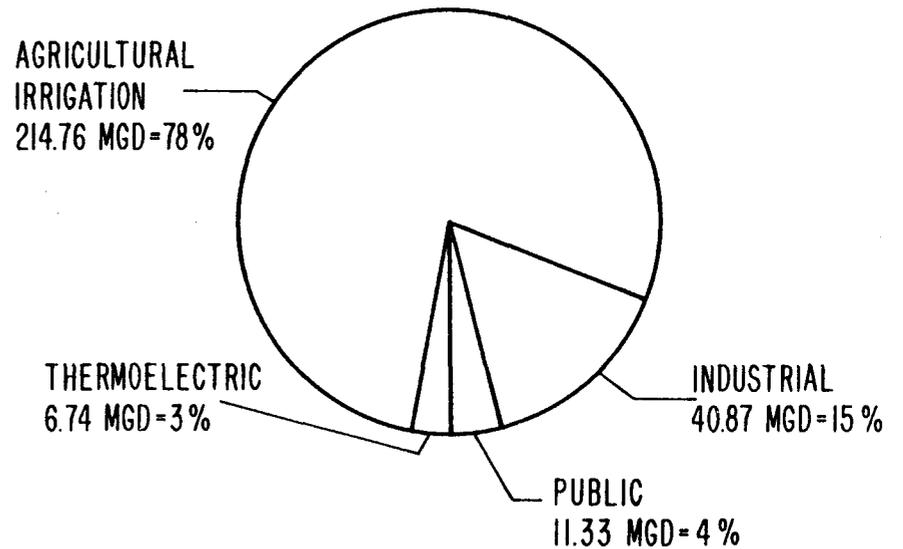


FIGURE 22. -- Total Fresh Water Use By Category

APPENDIX A

ANNUAL RAINFALL STATISTICS

The mean rainfall for 1951-1980 (the past three decades ending in 1980) is considered as normal for a given gaging station. However, other rainfall statistics, such as the median (value equaled or exceeded for 50% of time), middle or normal range (the range covered by the middle 50% of the annual rainfall values), maximum and minimum during the record period, the lowest mean annual rainfall (drought rainfall) for a specified period, etc., will be of interest for comparison with 1982 water year rainfall data.

For 25 long term NOAA (National Oceanic and Atmospheric Administration) stations located within and close to the District, the foregoing rainfall statistics including drought rainfall for 3-, 5-, and 10-year continuous periods are presented in Table A-1 for 1951-1980. In addition, Table A-2 considers all rainfall data available from 1931 through calendar year 1982 and presents similar statistics.

TABLE A-1. -- RAINFALL STATISTICS FOR 1951-1980 (PERIOD USED FOR CALCULATING NORMAL RAINFALL)

(ALL RAINFALL VALUES ARE ANNUAL VALUES IN INCHES)

STATION ----- (1)	NORMAL (2)	MEDIAN (3)	NORMAL RANGE (4)	MAXIMUM (5)	MINIMUM (6)	LOWEST MEAN ANNUAL RAINFALL (DROUGHT RAINFALL) FOR		
						3 YEARS (7)	5 YEARS (8)	10 YEARS (9)
BUSHNELL	51.28	49.76	43.90-58.21	77.11(1960)	35.60(1956)	38.00(1954-56)	45.16(1975-79)	47.80(1970-79)
CLERMONT	51.21	50.41	45.39-55.96	68.09(1959)	32.28(1961)	40.88(1961-63)	45.12(1961-65)	49.65(1954-63)
CRESCENT CITY	53.57	53.10	46.84-59.96	74.47(1964)	37.97(1954)	42.80(1954-56)	48.08(1954-58)	50.93(1954-63)
DAYTONA BEACH	46.81	46.35	37.36-53.94	69.02(1975)	31.36(1952)	36.90(1977-79)	39.83(1976-80)	46.03(1971-80)
DELAND	54.57	54.32	46.04-62.58	74.79(1953)	41.53(1974)	44.88(1954-56)	49.35(1961-65)	52.54(1962-71)
FEDERAL POINT	52.74	53.16	45.06-58.74	73.75(1964)	34.89(1954)	40.01(1954-56)	46.03(1952-56)	50.75(1954-63)
FELLSMERE	50.88	51.14	42.30-56.01	70.93(1959)	27.94(1967)	40.96(1974-76)	42.09(1974-78)	46.24(1969-78)
FERNANDINA BEACH	51.30	49.65	43.45-54.83	82.45(1969)	36.54(1980)	42.58(1954-56)	43.54(1954-58)	47.43(1954-63)
FT. PIERCE	52.56	52.09	46.04-58.50	70.19(1959)	38.30(1961)	43.37(1975-77)	46.77(1973-77)	48.97(1971-80)
GAINESVILLE	52.86	51.10	47.98-60.53	76.95(1964)	33.56(1977)	41.98(1954-56)	46.60(1974-78)	50.01(1954-63)
GLEN ST. MARY	56.56	57.07	47.48-63.06	84.95(1964)	34.35(1954)	41.61(1954-56)	45.90(1951-55)	53.75(1951-60)
ISLEWORTH	51.05	48.85	42.87-56.54	78.78(1953)	35.33(1954)	42.08(1954-56)	44.90(1976-80)	48.09(1971-80)
JACKSONVILLE	52.05	52.13	43.90-56.55	70.57(1973)	36.83(1954)	43.75(1954-56)	46.43(1974-78)	48.62(1954-63)
JACKSONVILLE BEACH	50.01	51.76	42.02-54.80	71.35(1979)	30.01(1954)	39.78(1954-56)	43.71(1954-58)	46.54(1954-63)
KISSIMEE	48.96	48.63	41.09-54.11	80.38(1960)	28.07(1961)	40.46(1970-72)	42.44(1970-74)	43.58(1971-80)
LAKE ALFRED	50.79	49.07	43.68-57.99	76.57(1959)	35.62(1961)	39.44(1954-56)	44.64(1961-65)	47.17(1969-78)
MELBOURNE	48.16	46.84	41.58-54.84	68.90(1960)	32.52(1965)	40.70(1970-72)	41.31(1970-74)	44.56(1971-80)
OCALA	53.92	51.88	46.06-60.31	71.15(1953)	39.30(1971)	44.04(1971-73)	46.41(1971-75)	50.38(1966-75)
ORLANDO	49.54	49.10	43.91-54.39	68.74(1960)	38.12(1977)	44.08(1975-77)	45.45(1976-80)	46.56(1971-80)
PALATKA	51.52	50.62	45.86-56.82	72.80(1964)	29.22(1954)	38.99(1954-56)	44.26(1952-56)	49.48(1952-61)
SANFORD	51.16	51.00	45.68-54.91	74.06(1953)	35.04(1962)	41.39(1961-63)	46.17(1961-65)	47.36(1961-70)
ST.AUGUSTINE	52.61	50.95	44.21-60.05	79.91(1953)	32.68(1956)	38.12(1954-56)	43.10(1974-78)	49.70(1971-80)
TITUSVILLE	56.67	54.28	48.14-65.63	81.74(1953)	40.15(1980)	45.62(1975-77)	47.50(1974-78)	49.56(1971-80)
VERO BEACH	51.33	50.69	43.97-61.53	68.31(1973)	32.70(1961)	42.68(1961-63)	44.44(1961-65)	48.57(1955-64)
WINTER HAVEN	48.85	48.94	42.60-52.73	73.28(1959)	32.51(1954)	34.45(1954-56)	41.90(1952-56)	46.35(1961-70)

EXPLANATION:-

NORMAL - MEAN FOR 1951-1980

MEDIAN - ANNUAL RAINFALL EQUALED OR EXCEEDED THIS VALUE FOR 50% OF YEARS

NORMAL RANGE - THE RANGE COVERED BY THE MIDDLE 50% OF THE 1951-1980 RAINFALL VALUES

MAXIMUM - HIGHEST RAINFALL DURING 1951-1980

MINIMUM - LOWEST RAINFALL DURING 1951-1980

COLUMN (7) - MEAN RAINFALL FOR 3-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL

COLUMN (8) - MEAN RAINFALL FOR 5-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL

COLUMN (9) - MEAN RAINFALL FOR 10-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL

TABLE A-2. -- RAINFALL STATISTICS FOR THE AVAILABLE PERIOD OF RECORD SINCE 1931

(ALL RAINFALL VALUES ARE ANNUAL VALUES IN INCHES)

STATION ----- (1)	MEAN ----- (2)	MEDIAN ----- (3)	MIDDLE RANGE ----- (4)	MAX ----- (5)	MIN ----- (6)	LOWEST MEAN ANNUAL RAINFALL (DROUGHT RAINFALL) FOR		
						3 YEARS (7)	5 YEARS (8)	10 YEARS (9)
RITHLO, 1959-1982	52.55	51.46	47.52-57.15	73.04	36.43	44.91(1979-81)	46.13(1977-81)	48.64(1972-81)
RUSHNELL, 1948-1981	51.71	51.16	44.02-58.21	77.11	35.60	38.00(1954-56)	45.16(1975-79)	47.63(1972-81)
CLERMONT, 1931-1982	50.86	51.04	46.59-54.84	68.09	32.28	40.88(1961-63)	45.12(1961-65)	48.42(1948-57)
CRESCENT CITY, 1931-1982	53.22	52.94	46.72-59.31	75.03	37.97	42.80(1954-56)	47.47(1935-39)	48.90(1948-57)
DAYTONA BEACH, 1937-1982	48.84	48.10	39.87-55.18	79.29	31.36	34.71(1950-52)	37.55(1977-81)	45.08(1950-59)
DELAND, 1931-1982	54.87	54.53	47.01-62.27	75.89	41.53	44.88(1954-56)	49.35(1961-65)	52.03(1948-57)
FELLSMERE, 1931-1982	54.24	54.64	49.35-60.79	78.83	27.94	40.96(1974-76)	42.09(1974-78)	45.76(1972-81)
FEDERAL POINT, 1931-1982	53.24	53.11	45.12-60.14	73.75	34.89	40.01(1954-56)	46.03(1952-56)	50.03(1931-40)
FERNANDINA BEACH, 1931-1982	50.71	49.65	41.77-55.14	82.45	22.79	41.44(1938-40)	43.54(1954-58)	44.94(1931-40)
FT. DRUM, 1956-1982	50.66	53.94	45.08-57.20	63.89	32.74	43.35(1965-67)	45.07(1964-68)	46.54(1961-70)
FT. PIERCE, 1931-1982	52.93	51.46	45.97-58.93	77.51	38.22	43.37(1975-77)	46.77(1973-77)	48.33(1972-81)
GAINESVILLE, 1931-1982	52.32	50.55	47.53-59.96	76.95	33.56	41.98(1954-56)	44.04(1977-81)	48.21(1973-82)
GLEN ST. MARY, 1931-1982	55.76	55.14	47.58-62.23	84.95	34.35	41.61(1954-56)	45.90(1951-55)	49.88(1934-43)
INDIAN LAKES EST, 1961-1980	51.87	50.26	46.64-59.74	68.33	30.25	42.63(1970-72)	48.32(1967-71)	50.08(1961-70)
ISLEWORTH, 1931-1982	52.02	50.68	45.31-57.57	78.78	35.33	42.08(1954-56)	44.90(1976-80)	47.83(1972-81)
JACKSONVILLE, 1941-1982	53.24	52.86	48.51-61.76	77.37	35.77	42.27(1980-82)	43.93(1977-81)	48.62(1954-63)
JACKSONVILLE BEACH, 1945-1982	50.94	52.37	42.60-57.01	71.35	30.01	39.78(1954-56)	43.71(1954-58)	46.54(1954-63)
KISSIMEE, 1931-1982	49.38	48.83	41.74-54.82	80.38	28.07	40.46(1970-72)	42.44(1970-74)	43.58(1971-80)
LAKE ALFRED, 1931-1982	50.93	50.02	43.52-57.84	76.57	35.62	39.44(1954-56)	44.64(1961-65)	47.17(1969-78)
LISBON, 1959-1982	47.48	46.39	41.57-51.85	67.58	33.11	38.95(1961-63)	43.39(1961-65)	44.93(1961-70)
MELBOURNE, 1941-1982	48.72	46.84	41.59-55.20	73.28	31.97	37.70(1980-82)	41.31(1970-74)	43.94(1973-82)
OCALA, 1931-1982	53.96	53.31	46.49-59.39	74.71	37.51	44.04(1971-73)	46.41(1971-75)	49.27(1931-40)
ORLANDO, 1941-1982	50.02	50.18	43.96-55.18	68.74	38.12	43.25(1942-44)	45.45(1976-80)	46.56(1971-80)
PALATKA, 1931-1982	52.46	51.60	46.64-57.65	74.61	29.22	38.99(1954-56)	44.26(1952-56)	46.87(1973-82)
SANFORD, 1931-1982	51.53	51.17	45.78-55.45	74.06	35.04	41.39(1961-63)	46.17(1961-65)	47.36(1961-70)
ST. AUGUSTINE, 1931-1982	52.43	50.95	44.24-59.23	79.91	32.68	38.12(1954-56)	43.10(1974-78)	46.99(1973-82)
STARKE, 1961-1982	53.33	54.30	49.91-57.30	63.28	40.10	46.24(1975-77)	48.66(1973-77)	51.43(1973-82)
TITUSVILLE, 1931-1982	55.44	53.90	47.89-64.71	81.74	35.18	44.30(1937-39)	47.12(1977-81)	48.05(1972-81)
VERO BEACH, 1949-1982	51.48	49.74	43.97-61.53	81.74	32.70	42.68(1961-63)	44.44(1961-65)	48.27(1949-58)
WINTER HAVEN, 1948-1982	49.90	49.48	43.48-55.65	73.28	32.51	34.45(1954-56)	41.90(1952-56)	46.35(1961-70)

EXPLANATION:-

MEAN - STATION MEAN FOR PERIOD SHOWN IN COLUMN (1)

MEDIAN - ANNUAL RAINFALL EQUALED OR EXCEEDED THIS VALUE FOR 50% OF YEARS

MIDDLE RANGE - RANGE COVERED BY THE MIDDLE 50% OF THE RAINFALL VALUES

MAX - HIGHEST RAINFALL DURING PERIOD SHOWN IN COLUMN (1)

MIN - LOWEST RAINFALL DURING PERIOD SHOWN IN COLUMN (1)

COLUMN (7) - MEAN RAINFALL FOR 3-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL

COLUMN (8) - MEAN RAINFALL FOR 5-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL

COLUMN (9) - MEAN RAINFALL FOR 10-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL

APPENDIX B

WATER RESOURCES DEPARTMENT TECHNICAL PUBLICATIONS

TECHNICAL REPORTS

<u>Month Approved By Governing Board</u>	<u>Technical Report Number</u>	<u>Title and Author(s)</u>
March 1979	No. 1	Geology of the Oklawaha Basin (Richard Johnson).
July 1979	No. 2	Saline Contamination of A Limestone Aquifer by Connate Intrusion in Agricultural Areas of St. Johns, Putnam and Flagler Counties, Northeast Florida (Doug Munch, Bruce Ripy and Richard Johnson).
April 1980	No. 3	Investigation of Ground Water Resources and Salt Water Intrusion in the Coastal Areas of Northeast Florida (Jim Frazee and Donnie McLaugherty).
November 1979	No. 4	Summary of the Hydrology of the Upper Etonia Creek Basin (Doug Munch, Dann Yobbi and George Chappell).
March 1980	No. 5	Hydrologic Investigation of the Potentio metric High Centered About the Crescent City Ridge, Putnam County, Florida (Fred Ross and Doug Munch).
November 1979	No. 6	Upper Oklawaha River Basin Water Management Study, Part I: Lake Griffin Region Study (C. Charles Tai and Donthamesetti V. Rao).
June 1980	No. 6A	Annual Water Use Survey-1978 (Elaine Scott).
July 1980	No. 7	Development of Environmental Constraints for the Proposed Jane Green Detention Areas (Carol Biagotti-Griggs and David Girardin).
November 1980	No. 8	Effects on the Floridan Aquifer of Ground Water Withdrawals for Fernery Freeze Protection, Southeast Putnam County, Florida (Fred Ross).
July 1981	No. 9	Structural Geologic Features and their Relationship to Salt Water Intrusion in West Volusia, North Seminole and Northeast Lake Counties (Richard Johnson).
November 1981	No. 10	Annual Water Use Survey - 1979 (Rich Marella).
August 1981	No. 11	Analysis of Residential Demand of Water in the St. Johns River Water Management District (Kathryn Lewis, Rich Marella and Roy Carriker).
January 1982	No. 12	Frequencies of High and Low Stages for Principal Lakes in the St. Johns River Water Management (Donthamsetti V. Rao).

**Starred reports are in progress and have not yet been approved by our Governing Board.

TECHNICAL REPORTS CONTINUED

February 1982	No. 13	Vegetation Community Structure of the Proposed Jane Green Detention Area (Carol Biagotti-Griggs).
April 1982	No. 14	Annual Water Use Survey - 1980 (Rich Marella).
March 1982	No. 15	Upper St. Johns River Hydrologic Model (USJM) Users Manual (C. Charles Tai and Kato Suphunvorrnanop).
May 1983	No. 16	A Study of Crown Flood Irrigation Methods (David Clapp and Hal Wilkening, III).
January 1983	No. 17	Water Quality Monitoring Annual Report (Carol J. Fall).
May 1983	No. 18	The Role of Fire on Land-Use Management (Greeneville (Sonny) Hall).
	No. 19	**Howell Branch Basin Surface Water Management Study (Kato Suphunvorrnanop).
July 1983	No. 20	Hydrologic and Engineering Study for Extreme Drawdown of Lake Griffin (Wayne Ingram).
	No. 21	**Hydrologic Reconnaissance of Marion County (Kevin Rohrer).
June 1983	No. 22	Econlockhatchee River System: Level I Report (Larry Gerry).
	No. 23	**Stratigraphic Analysis of Geophysical Logs in Water Wells in Peninsular Florida (Richard Johnson).
	No. 24	**Burrell Dam Safety Evaluation (Ricardo V. Vieira).
	No. 25	**Annual Water Use Survey - 1981 (Rich Marella).
	No. 26	**Distribution and Structure of Floodplain Plant Communities in the Upper Basin of the St. Johns River, Florida (Ed Lowe).

WATER RESOURCES DEPARTMENT TECHNICAL PUBLICATIONS

INFORMATION CIRCULARS

<u>Date Approved By Governing Board</u>	<u>Information Circular Number</u>	<u>Title and Author(s)</u>
March 1978	No. 1	Annual Report of Hydrologic Conditions and Water Resource Activities - 1977 Water Year (Alfred Canepa, Donthamsetti V. Rao and Dann K. Yobbi).
August 1978	No. 2	Improvement of Water Quality Through A Cooperative Well Plugging Program (Doug Munch).
March 1979	No. 3	Annual Report of Hydrologic Conditions and Water Resource Activities - 1978 Water Year (Alfred Canepa, Frank Fenzel and Donthamsetti V. Rao).
January 1980	No. 4	Salt Water Intrusion in Coastal Aquifers: A Bibliography (George P. Szell).
February 1980	No. 5	Annual Report of Hydrologic Conditions and Water Resource Activities - 1979 Water Year (Doug Munch, Frank Fenzel and Donthamsetti V. Rao).
November 1981	No. 6	Annual Report of Hydrologic Conditions - 1980 Water Year (Doug Munch, Donthamsetti V. Rao, Alan Aikens and Rich Marella).
October 1982	No. 7	Annual Report of Hydrologic Conditions - 1981 Water Year (Doug Munch, Donthamsetti V. Rao, Alan Aikens and Rich Marella).
March 1983	No. 8	St. Johns River Water Management District Current Population and Projections - 1980 (Rich Marella and Bruce Ford).
	No. 9	**Annual Report of Hydrologic Conditions - 1982 Water Year (Doug Munch, Donthamsetti V. Rao, and Rich Marella).

WATER RESOURCES DEPARTMENT TECHNICAL PUBLICATIONS

TECHNICAL MEMORANDUMS

<u>Month Approved By Governing Board</u>	<u>Technical Memorandum Number</u>	<u>Title and Author(s)</u>
May 1979	No. 1	Test Drilling Report of Northeast Volusia County (Doug Munch).
July 1979	No. 2	Supplemental Data for Report of Saline Contamination of A Limestone Aquifer by Connate Intrusion in Agricultural Areas of St. Johns, Putnam and Flagler Counties, Northeast Florida (Doug Munch, Bruce Ripy, and Richard Johnson).
August 1980	No. 3	Log Pearson Type 3 Distribution: Tables of Quantiles (Donthamsetti V. Rao).
July 1980	No. 4	Results of Test Drilling and Materials Investigation of Borrow Areas (Fred Ross).
February 1982	No. 5	Investigation of Fern Water Use in Southeast Putnam County, Florida (Phil Leary).
	No. 6	**Effect of Sand Mining Operations on Johns Lake Upper Palatlahaha River Basin (George Szell).
	No. 7	**Procedure for Determining 24-hour and 96-hour Synthetic Storms (Donthamsetti V. Rao).
	No. 8	**Palatlahaha Hydrologic Model (Wayne Ingram).
	No. 9	**Data for the Safety Evaluation of Burrell Dam (Ricardo Vieira).
	No. 10	**Burrell Spillway Discharge Evaluation (Ricardo Vieira).
	No. 11	**The Water Quality of the Middle St. Johns River: Southern Reach (Joel Steward).

WATER RESOURCES DEPARTMENT TECHNICAL PUBLICATIONS

MAP SERIES

<u>Month Adopted By Governing Board</u>	<u>Map Series Number</u>	<u>Title and Author(s)</u>
July 1983	83-1	Ground Water Withdrawals from the Floridan Aquifer in Duval County - 1980; August 1983 (Rich Marella).
November 1983	83-2	1981 Water Use (Rich Marella).

OTHER DISTRICT SUPPORTED TECHNICAL PAPERS
(Reprints Available)

The following papers have either been published in technical journals or presented at the National Speciality Conferences.

1. "Upper St. Johns River Water Management Model," presented at the August 9-11, 1978 ASCE Hydraulics Division Speciality Conference on Verification of Mathematical and Physical Models in Hydraulic Engineering, held at College Park, Maryland, by C. C. Tai.
2. "Log Pearson Type 3 Distribution: A Generalized Evaluation," Journal of the Hydraulics Division, ASCE, May 1980, by D. V. Rao.
3. "Log Pearson Type 3 Distribution: Method of Mixed Moments," Journal of the Hydraulics Division, ASCE, June 1980, by D. V. Rao.
4. "Agricultural Reservoir Design and Operation," presented at the June 2-5, 1980 ASCE Symposium on Surface Water Impoundments, held at Minneapolis, Minnesota, by C. C. Tai.
5. "Storm Water Management for a Shallow Lake in the Upper Reaches of a River," presented at the June 2-5, 1980 ASCE Symposium on Surface Water Impoundments," held at Minneapolis, Minnesota, by D. V. Rao and C. C. Tai.
6. "Three Parameter Probability Distributions," Journal of the Hydraulics Division, ASCE, March 1981, by D. V. Rao.
7. "Return Period for Mean Annual Hydrologic Event," Journal of the Hydraulics Division, ASCE, March 1981, by D. V. Rao.
8. "Predicting Precipitation Events: Gumbel vs Log Pearson," presented at the Fourth Conference on Hydrometeorology, October 7-9, 1981, Reno, Nevada, by D. V. Rao.
9. "Upper St. Johns River Water Management Plan Using Off-Line Reservoir Design Concept," presented at the July 20-23, 1982, ASCE Irrigation and Drainage Division Specialty Conference 'Environmentally Sound Water and Soil Management,' held at Orlando, Florida, by C. C. Tai and D. V. Rao.
10. "Hydrologic Change Due To Floodplain Impoundment and Encroachment by Agricultural Activities," presented at the July 20-23, 1982, ASCE Irrigation and Drainage Division Speciality Conference 'Environmentally Sound Water and Soil Management,' held at Orlando, Florida, by C. C. Tai and D. V. Rao.

11. "Water Supply Potential of the Upper St. Johns River," presented at the March 14-16, 1983 ASCE Water Resources Planning and Management Division Speciality Conference, Water Supply- The Management Challenge," held at Tampa, Florida, by C. C. Tai and D. V. Rao.
12. "Three Parameter Probability Distribution of Best Hydrologic Bounds," published in 'Frontiers of Hydraulic Engineering,' proceedings of the ASCE Hydraulics Division Conference, held at Massachusetts Institute of Technology, August 9-12, 1983, by D. V. Rao.
- 13 "Estimating Log Pearson Parameters by Mixed Moments," Journal of Hydraulic Engineering, ASCE, August 1983, by D. V. Rao