TECHNICAL PUBLICATIONS SJ 81-4

ANNUAL REPORT OF HYDROLOGIC CONDITIONS 1980 WATER YEAR

By

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Palatka, Florida

November 1981

Project Number 2002314

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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 1980 (October 1979 through September 1980). 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, and 3. surface water data for the 1980 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 become 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 1980 is shown in Figure 2. Rainfall within the District during the 1980 water year ranged from a high of 47.33 inches at Sanford in Seminole County to a low of 32.81 at Melbourne in Brevard County. Average rainfall for the 1980 water year calculated using the isohyetal map (Figure 2) was 41.92 inches as compared to a District mean of 54.90 inches (based on Figure 1) for the period of 1941-1970.

The departure from the normal rainfall for the 1980 water year is illustrated on Figure 3. Rainfall was below normal through the entire District ranging from -8.00 inches at Federal Point in the central part of the District to -17.36 inches at Fernandina Beach in the north part of the District and -17.88 inches at Titusville in the southern part of the District.

In summary, rainfall throughout the entire District during the 1980 water year was below the period of record normal rainfall.

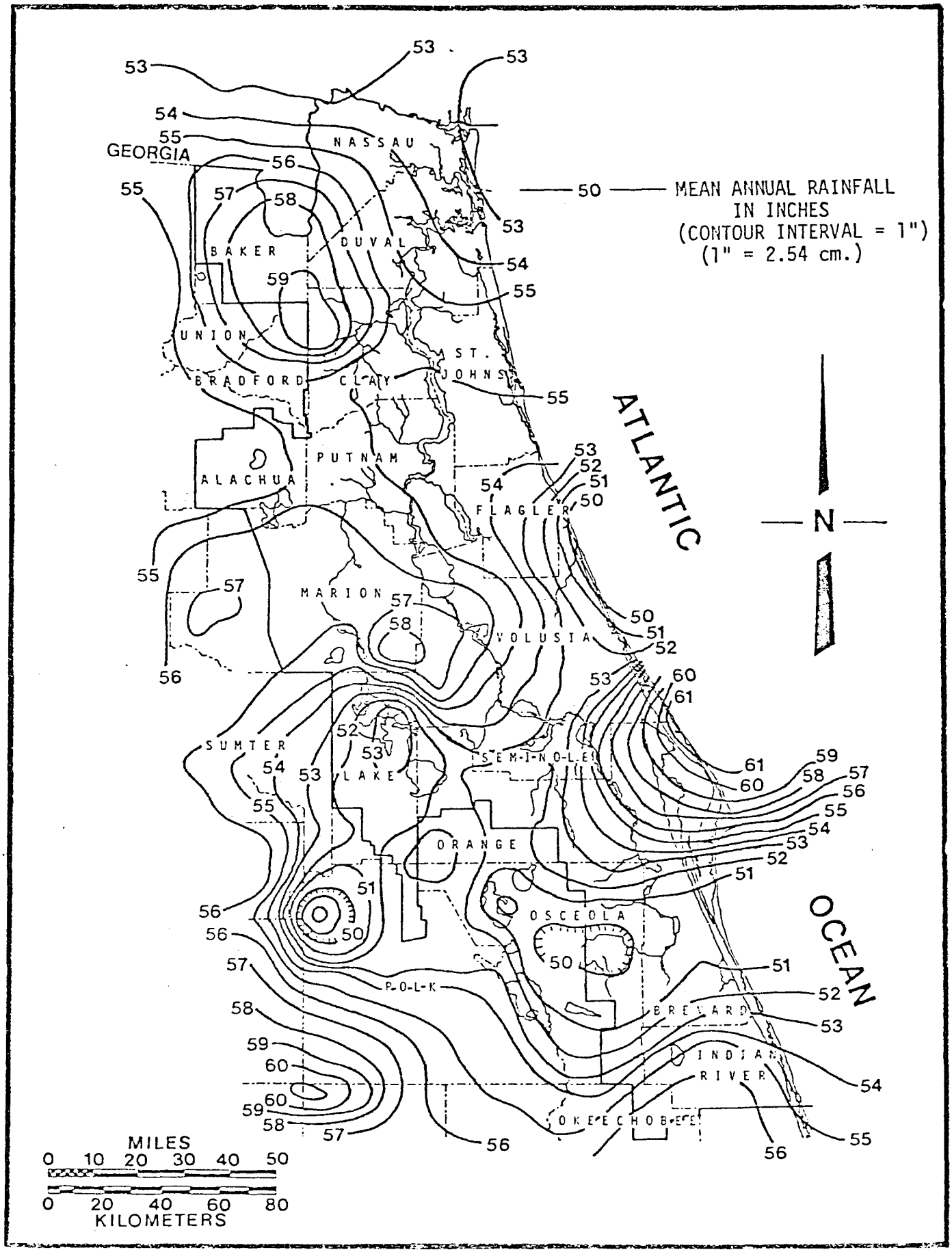

FIGURE 1. -- Mean Annual Rainfall in the SJRWMD, 1941-1970.

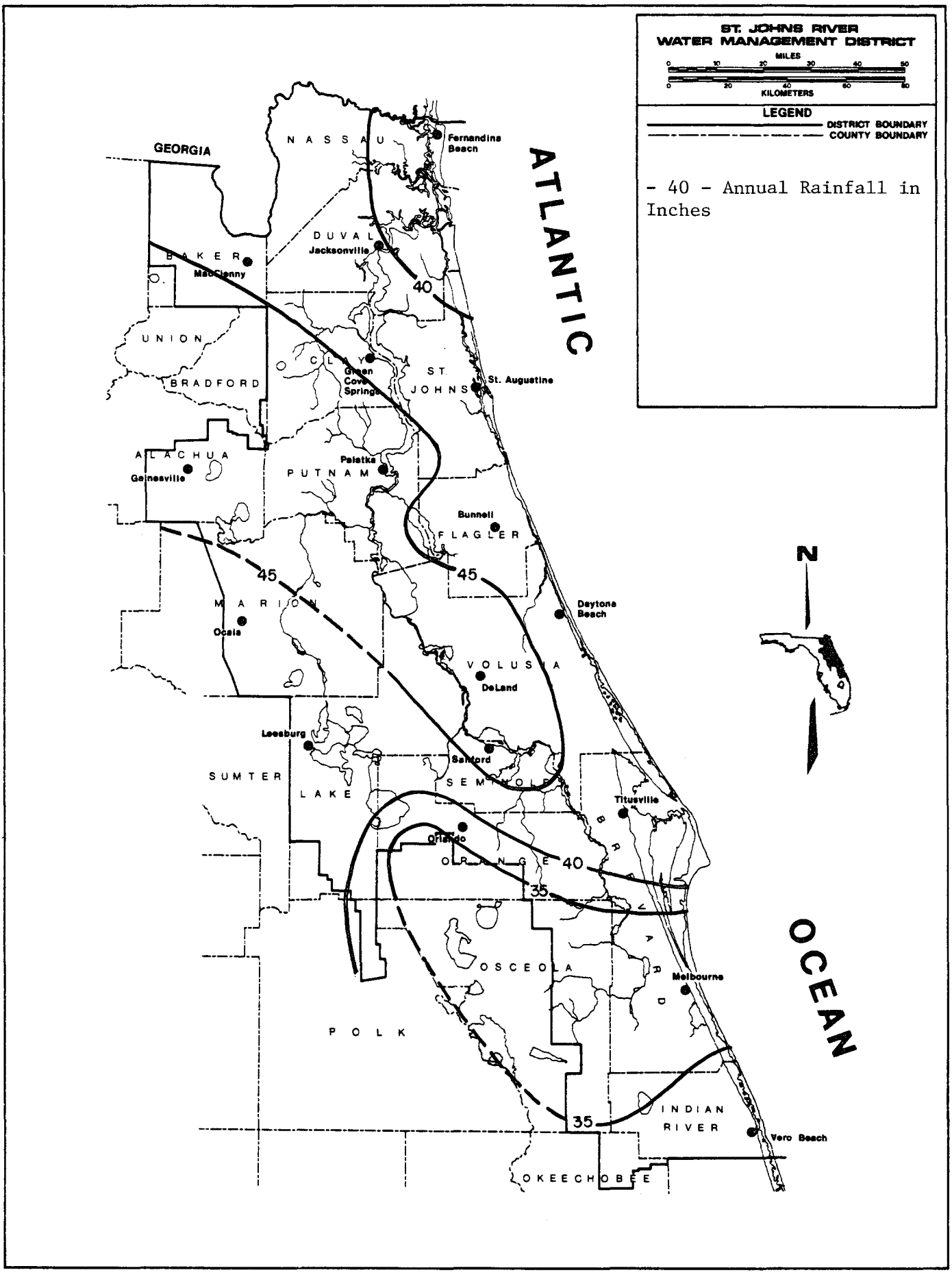

FIGURE 2. -- 1980 Rainfall in Inches (October 1979 - September 1980)

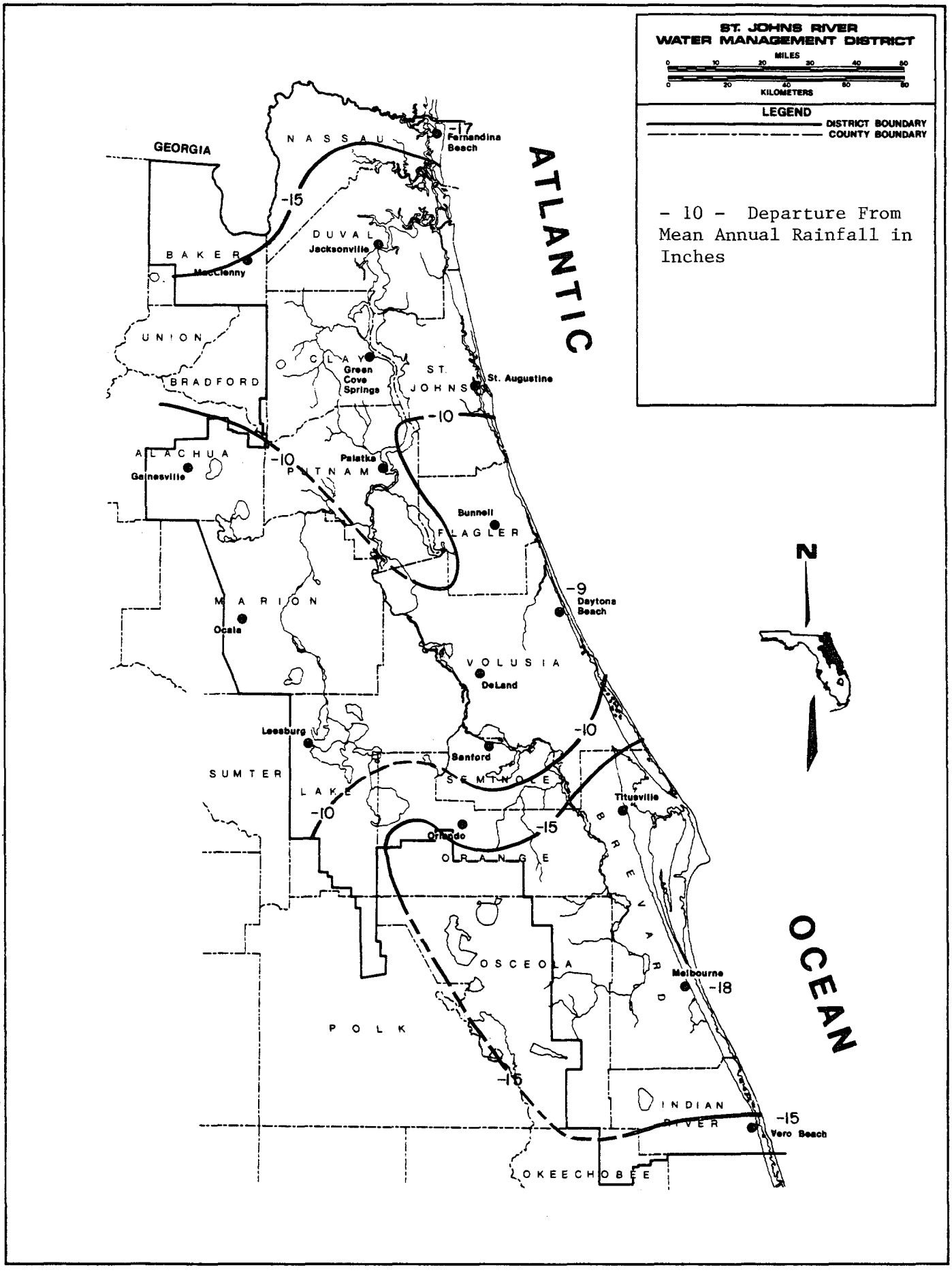

FIGURE 3. -- Departure from Mean Annual Rainfall for 1980 in Inches (Oct 79 - Sep 80)

Floridan Aquifer

The potentiometric surface of the Floridan aquifer in the St. Johns River Water Management District for May, 1980 is shown in Figure 4. Water level differences for the normal seasonal low and high, May, September 1980 respectively, are displayed in Figure 5. Changes range from increases of less than one foot to decreases of greater than seven feet.

Generally, the northern portion of the District water levels recorded in September declined in the approximate range of three feet below those levels recorded in May. Areas such as Green Cove Springs, Palm Valley, and St. Augustine recorded as much as a seven foot decline in the aquifer's water level during the four month period. The vicinity of Daytona Beach is the only other area which demonstrated a potentiometric surface decline of three feet lower or more in September than in May.

Figure 6 shows the location of four long term monitor wells along with a generalized net change in the Floridan aquifer potentiometric surface between July, 1961 and May, 1977. Figure 7 illustrates the long term hydrographs for these select wells.

Well B-1 is located northeast of Cocoa, Brevard County. Over the past five years this area has experienced medium-high development and increased water use. During the 1980 water year, well B-1 recorded a water level high of 28.12 feet MSL (mean sea level) in October. This level declined approximately 0.6 feet by February, 1980. The period of early March until mid-June the water level gradually decreased to a low of 24.40 feet MSL. The water level increased through the summer to 25.54 feet MSL in September, the end of the water year.

Expected lows and highs in the Floridan aquifer normally occur in May and September respectively. Well B-1 encountered its high within the first week of

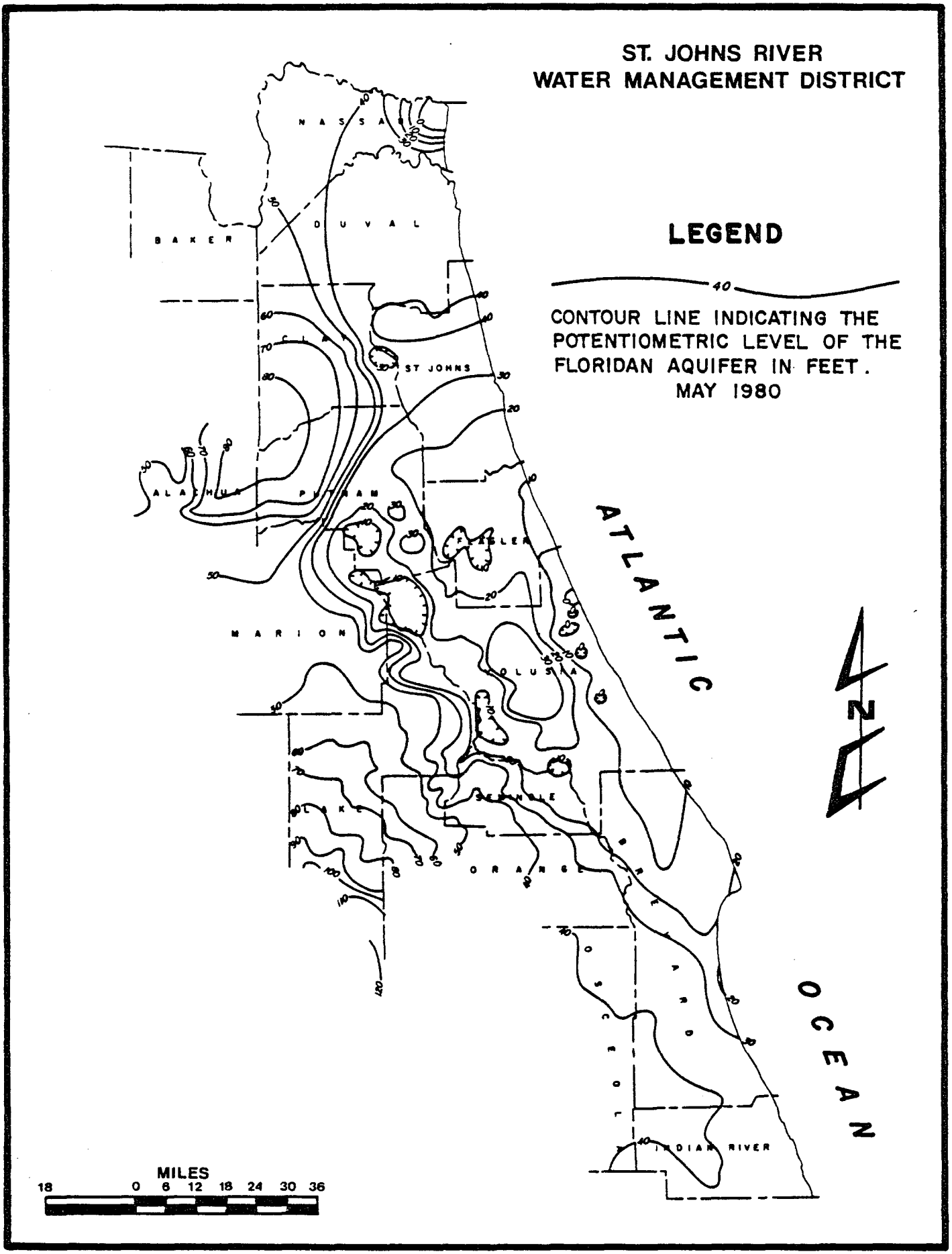

FIGURE 4. -- Potentiometric Surface of the Floridan Aquifer, May 1980

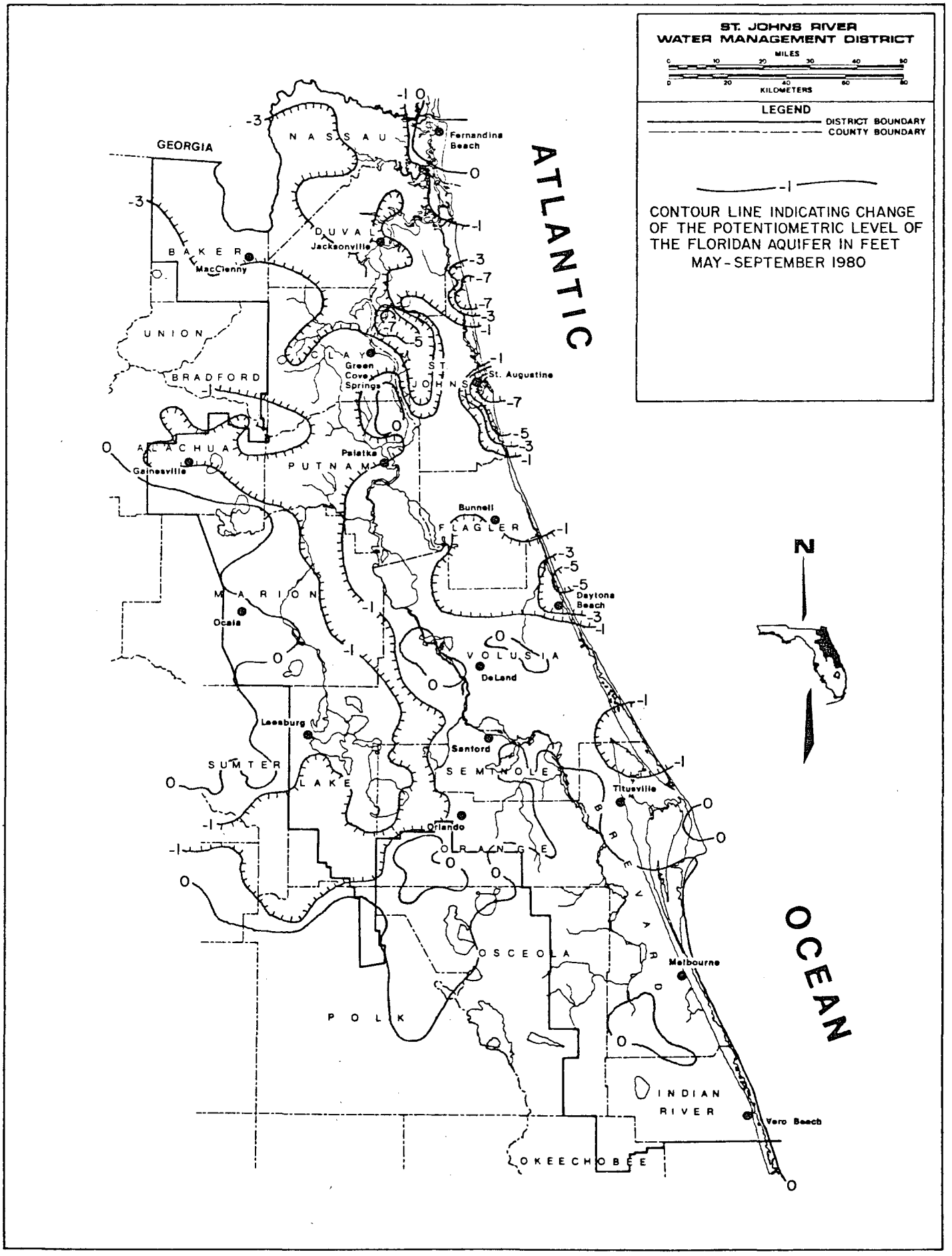

FIGURE 5. -- Potentiometric Level of the Floridan Aquifer May-September 1980

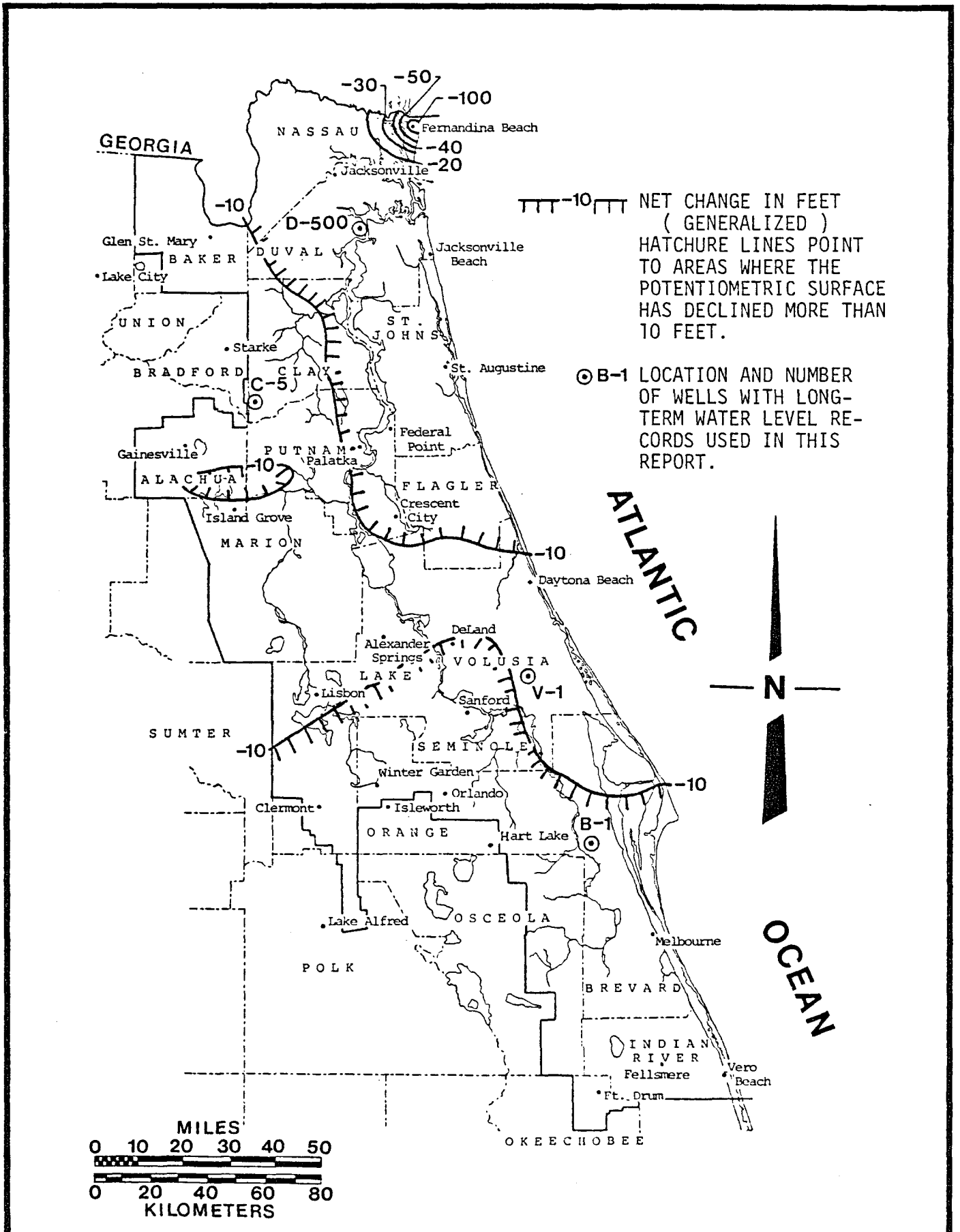

FIGURE 6. -- Net Change of Potentiometric Surface in the Floridan Aquifer Between July 1961 and May 1977.

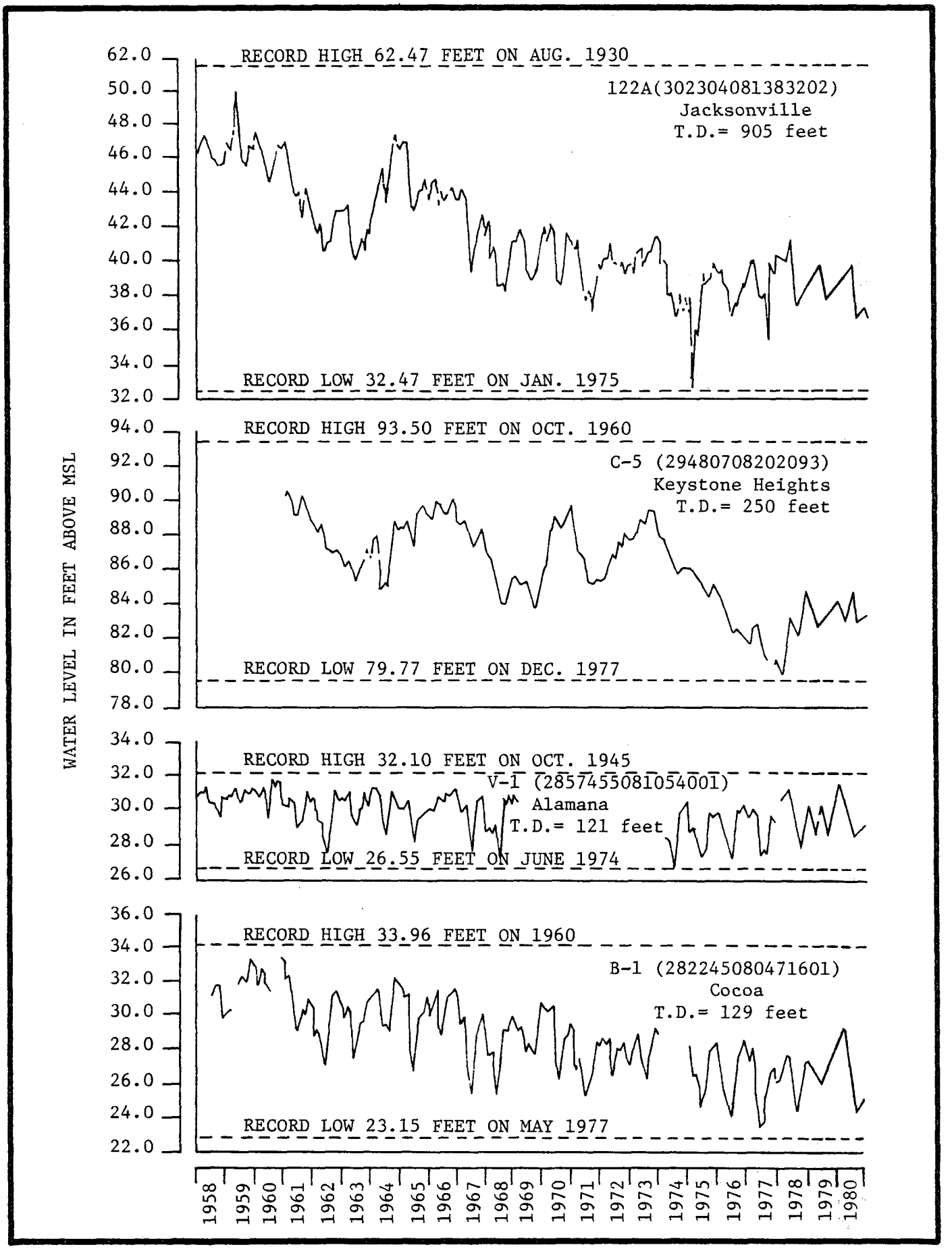

FIGURE 7. -- Hydrographs of Selected Wells in the SJRWMD.

October and its low in the middle of June, not deviating much from usual occurrences. However, the water level did decline 2.38 feet between the seasonal high of October 1979 and September 1980.

Well V-1, near Alamana, is located about 11 miles southeast of Deland on the eastern flank of the Deland Ridge. The potentiometric elevation measured at the well was at its highest level, 31.25 feet MSL, at the beginning of the 1980 water year. Levels steadily declined, with exception to sporadic increases (probably from rainfall), until it reached a low of 28.85 feet MSL in September 1980 end of the water year. The potentiometric surface at the well declined 1.35 feet between corresponding high water levels. The low water level occurred in mid-June suggesting a dry spring, or excessive withdrawal from the aquifer before summer rains.

Well C-5 is located in the vicinity of Keystone Heights, Clay County. This southeast portion of Clay County is known to be in an area of recharge to the Floridan aquifer. From October 1, 1979 through April 1, 1980, the water levels predominantly fluctuated between 83.75 and 84.75 feet MSL. The well's highest potentiometric elevation was observed at 85.97 feet MSL in April and a low of 83.40 feet MSL occurred in July. The water level reached 84.09 feet MSL on September 3, then dropped to 83.74 feet MSL by the end of the water year. C-5 did not reflect the expected high and low periods of May and September. The high water level occurred in early spring normally a time of declining water levels. This implies that summer rains of 1979 were less than usual. The variation in water level for the year was 1.67 feet.

Well D-122A is located in urban Jacksonville where the Trout River flows into the St. Johns River. Water levels of this well were recorded monthly unlike the previous three wells which levels were recorded daily.

The potentiometric elevation at the well rose from the beginning of the water year until late March - early April, 1980. The level then dropped until late July reaching its low, rising slightly in August, then falling off to near its yearly low of 36.67 feet MSL in September.

This well did not show the normal patterns of aquifer fluctuations as did well C-5.

These abnormal variations in aquifer water level trends can be attributed to:

1. The decrease in rainfall Florida has experienced over the past several years.
2. The additional stress by additional water withdrawals from the aquifer from increased development and industrilization.

In the future, the usual high and low potentiometric surface patterns typically expressed by the aquifer cannot be expected until rainfall activity increases.

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 25% below normal for the District during the 1980 water year. However, the District experienced heavy rainfall in September 1979 as a result of hurricane activity (Hurricane David traversed along the east coast early in September while Hurricane Frederic passed along the Gulf Coast in the later part of the month). Consequently, above normal streamflows and water elevations persisted in the early months of 1980 water year. Rainfall deficiency began in the later months of water year 1980, and finally developed into a severe drought. Streamflows and water elevations were below normal throughout the District in the later months of the water year. Locations of stream or lake gaging stations used in the preparation of this report are shown in Figure 8 .

Figures 9 through 15 present monthly streamflow data for water years 1978-1980 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.

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

Gaging Station	Mean Flow in cfs Water Year 1978	1979	1980
Etonia Creek at Bardin	115	107	105
Rice Creek near Springdale	79.8	61.8	36.8
Simms Creek near Bardin	56.6	72.8	47.0
South Fork Black Creek near Penney Farms	146	143	169
North Fork Black Creek near Middleburg	198	259	274
Ortega River at Jacksonville	28.1	46.6	28.2
Pablo Creek at Jacksonville	22.5	49.3	33.4

Mean annual water elevations/stream-flows for 1980 water year were higher in the St. Marys River, Oklawaha River Basin but lower in the St. Johns River Basin, with the exception of the Black Creek, compared 1979 water year. Figures 16 through 20 present monthly elevations for some principal lakes in the District.

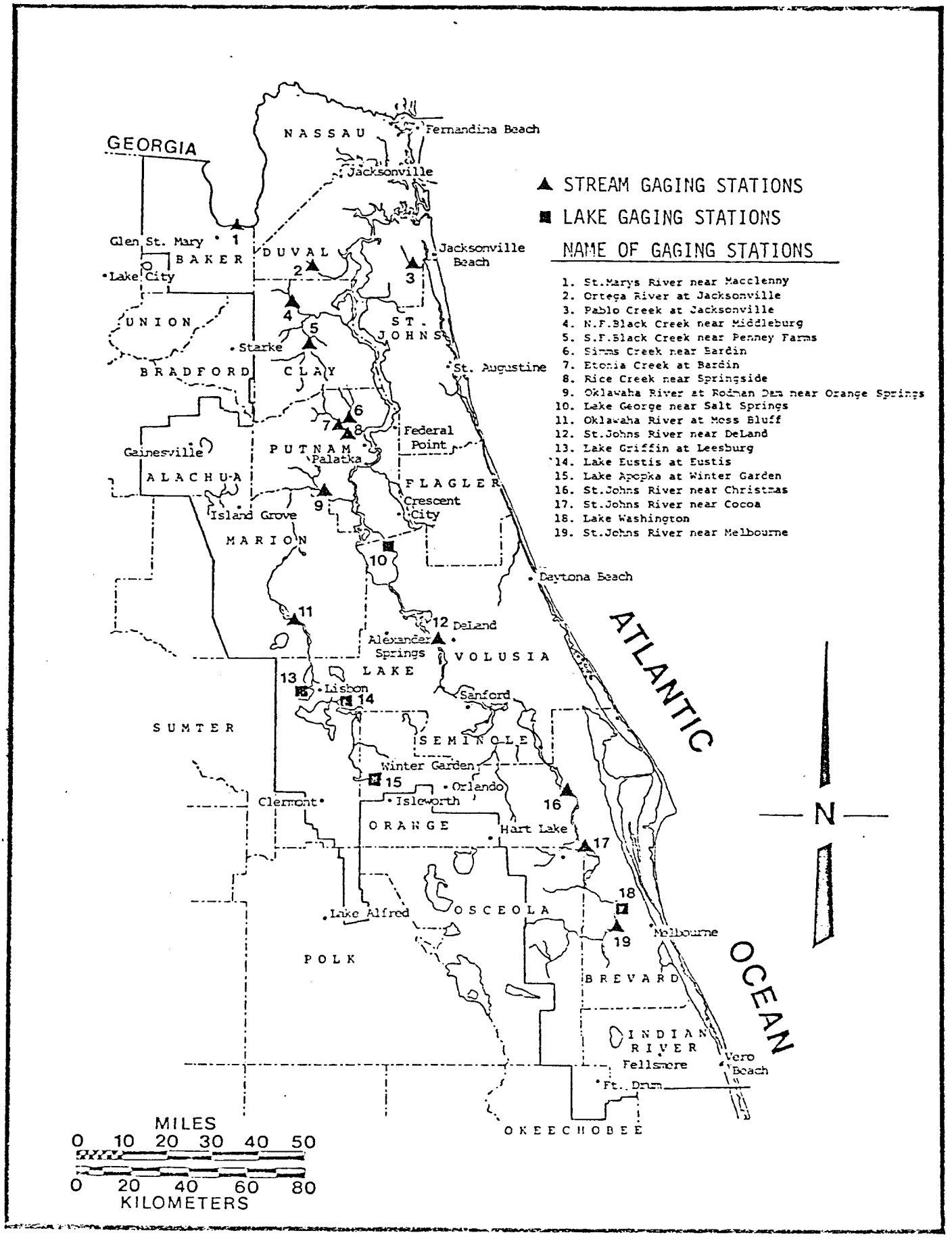

FIGURE 8 -- Location of Stream and Lake Gaging Stations Used in this Report.

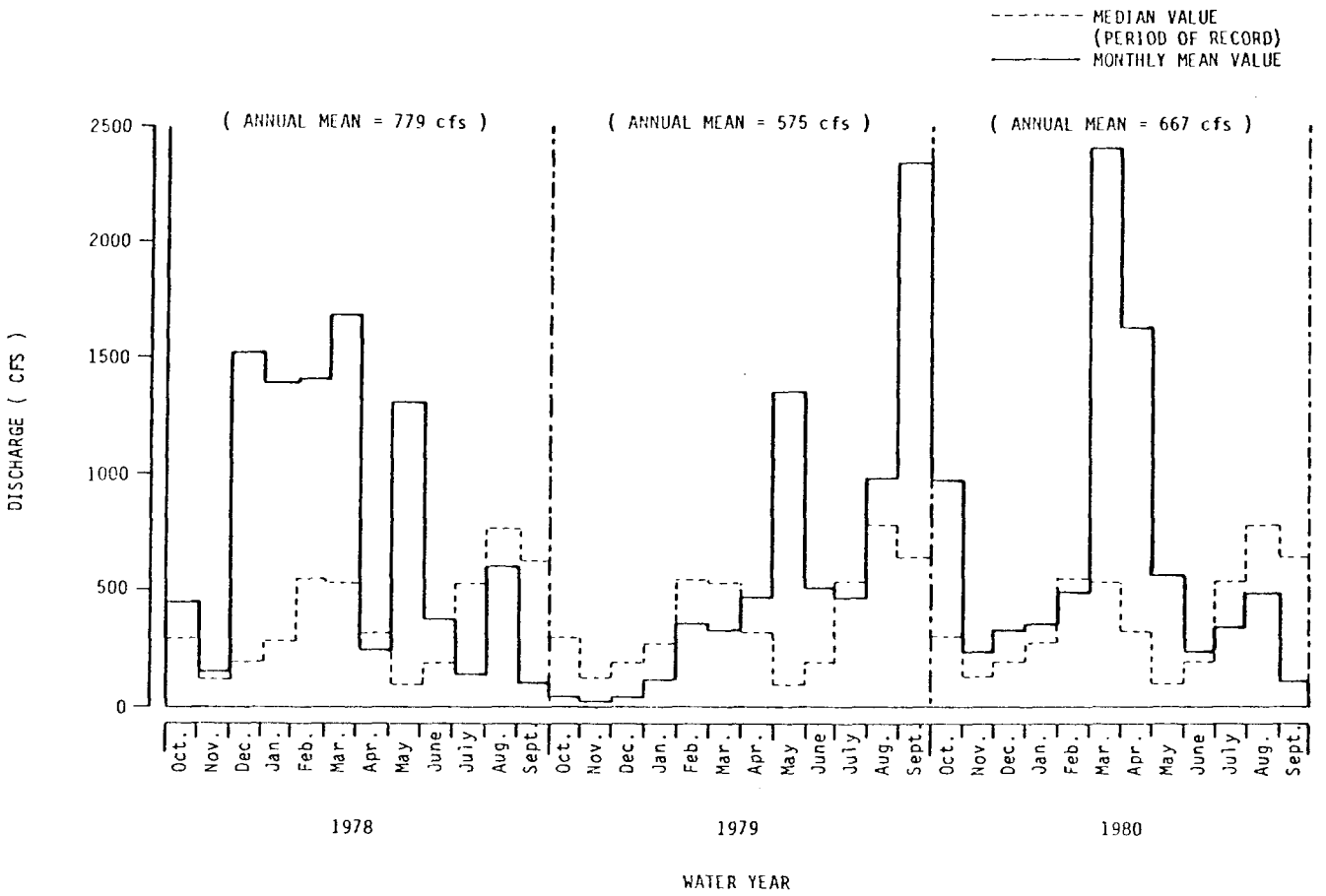

FIGURE 9. -- Streamflows, St. Marys River near Macclenny.

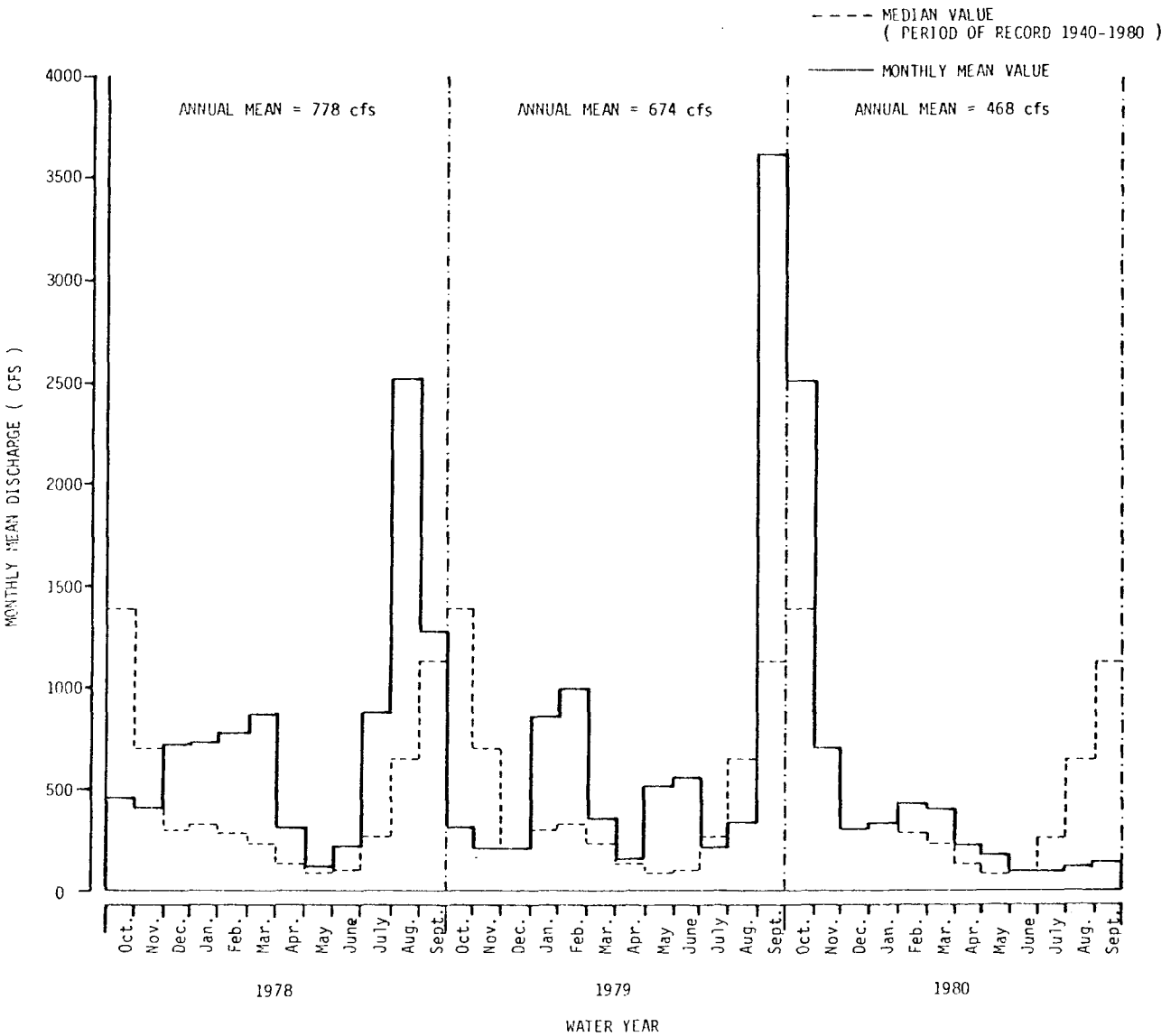

FIGURE 10. -- Streamflows, St. Johns River at Melbourne.

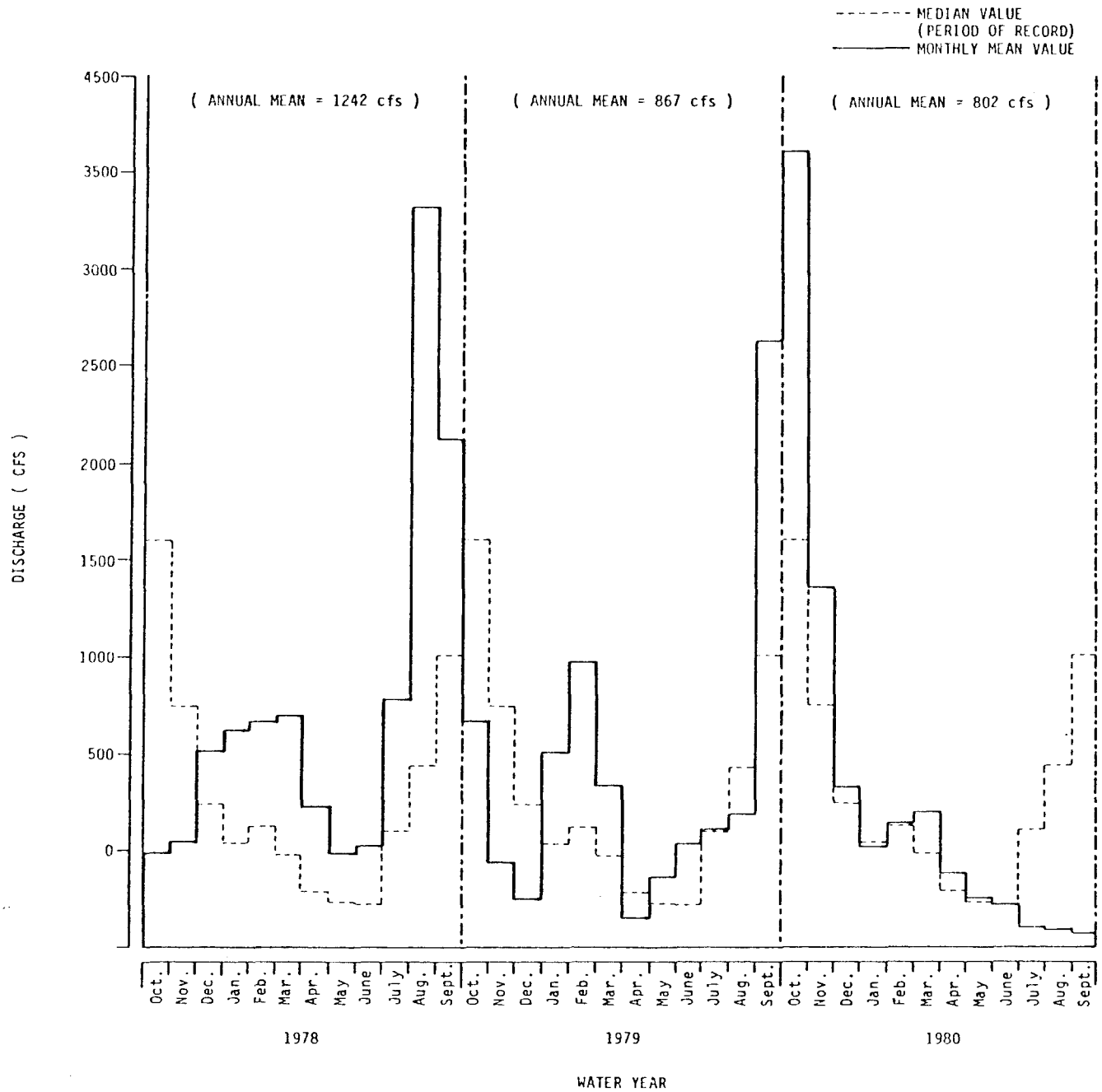

FIGURE 11. -- Streamflows, St. Johns River near Cocoa.

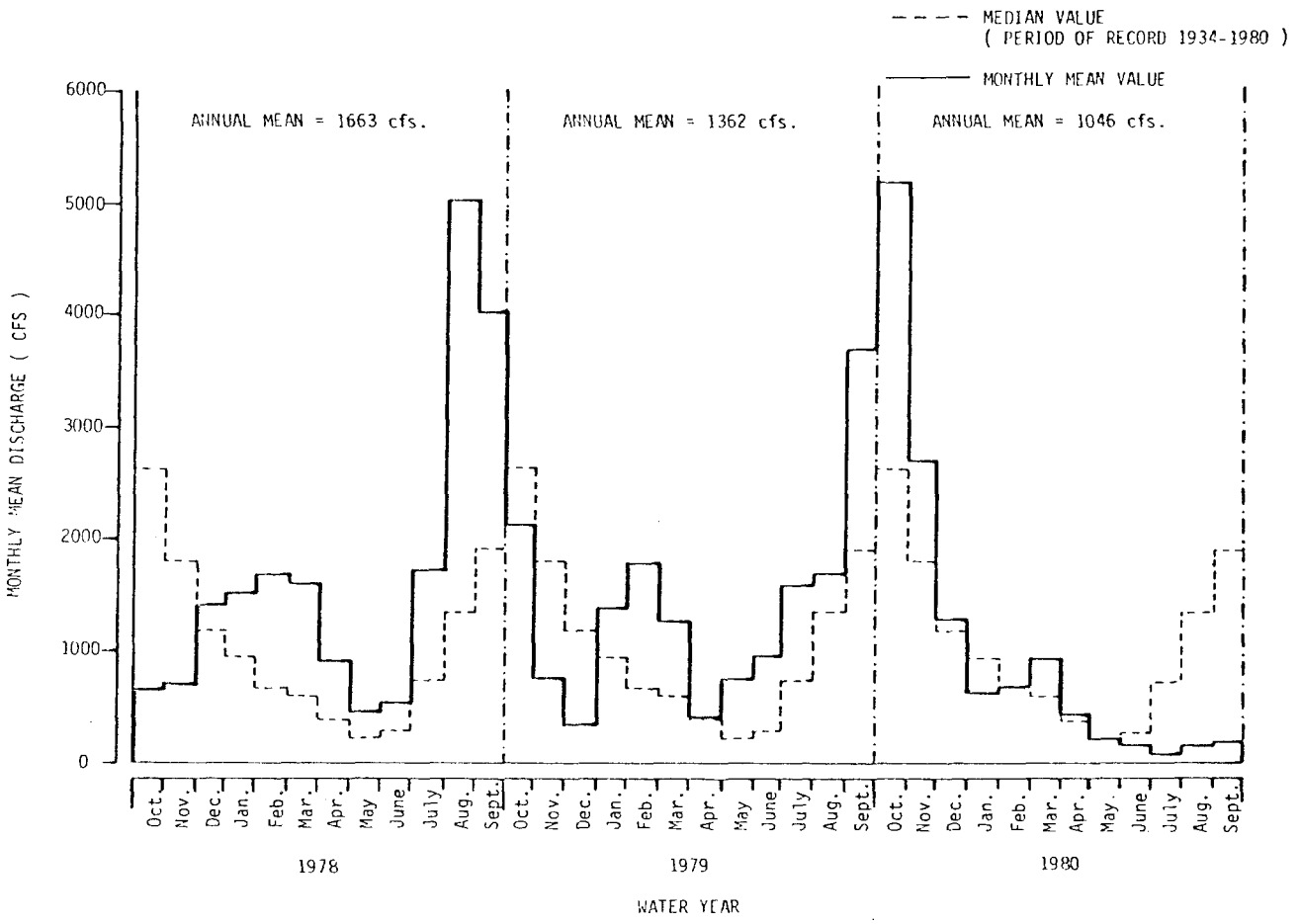

FIGURE 12. -- Streamflows, St. Johns River near Christmas.

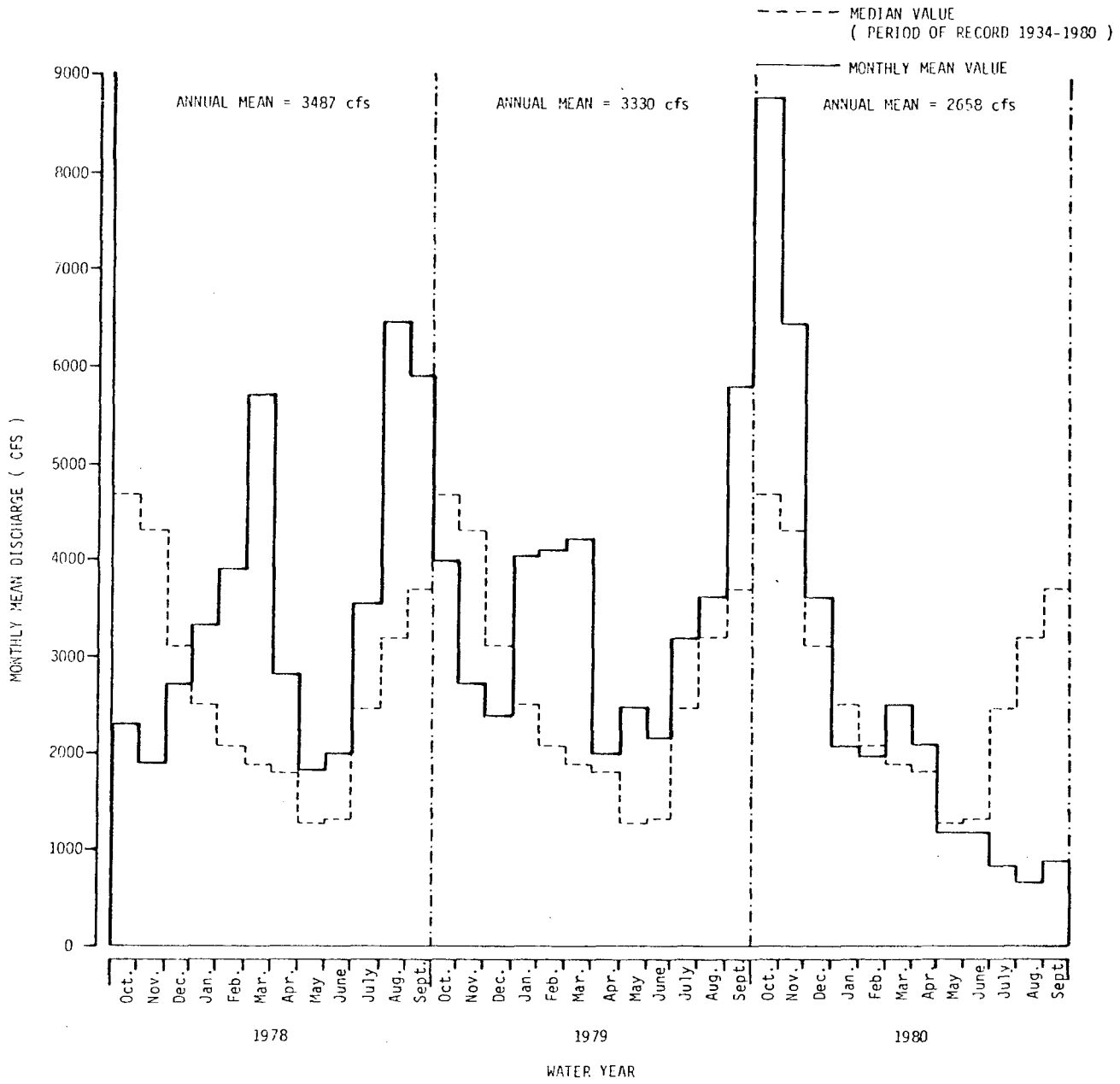

FIGURE 13. -- Streamflows, St. Johns River near Deland.

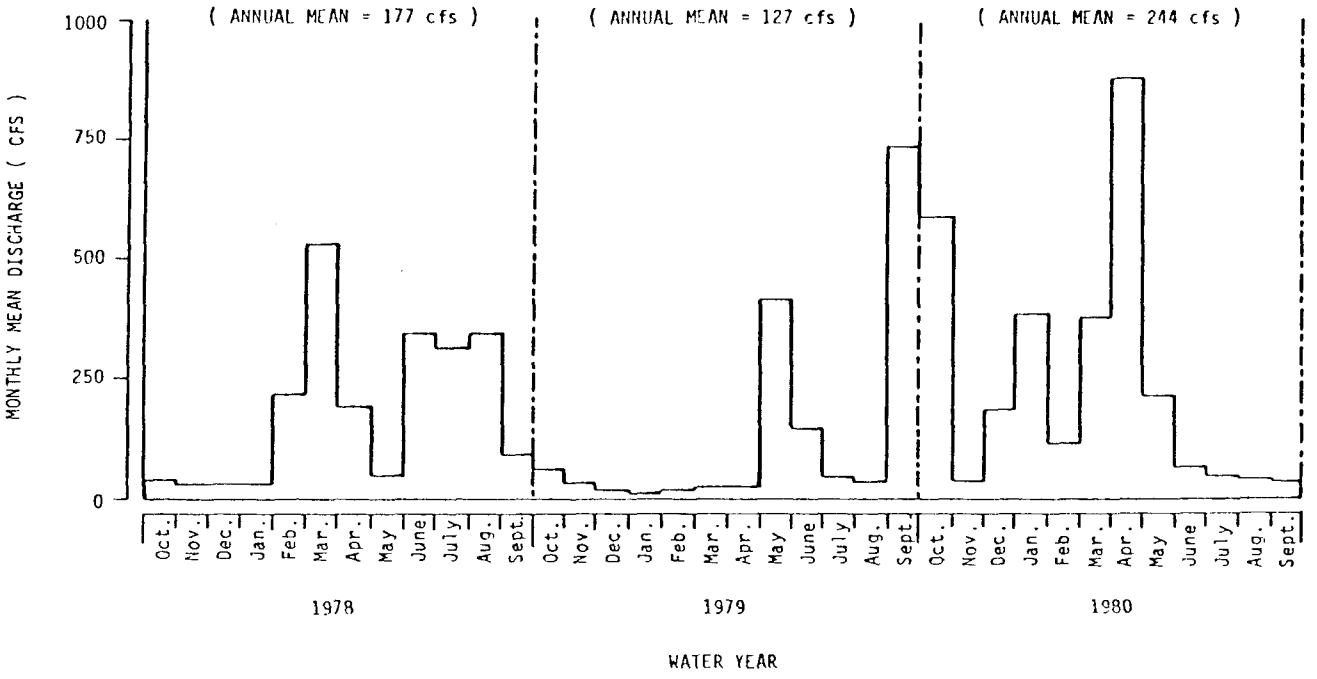

FIGURE 14. -- Streamflows, Oklawaha River at Moss Bluff.

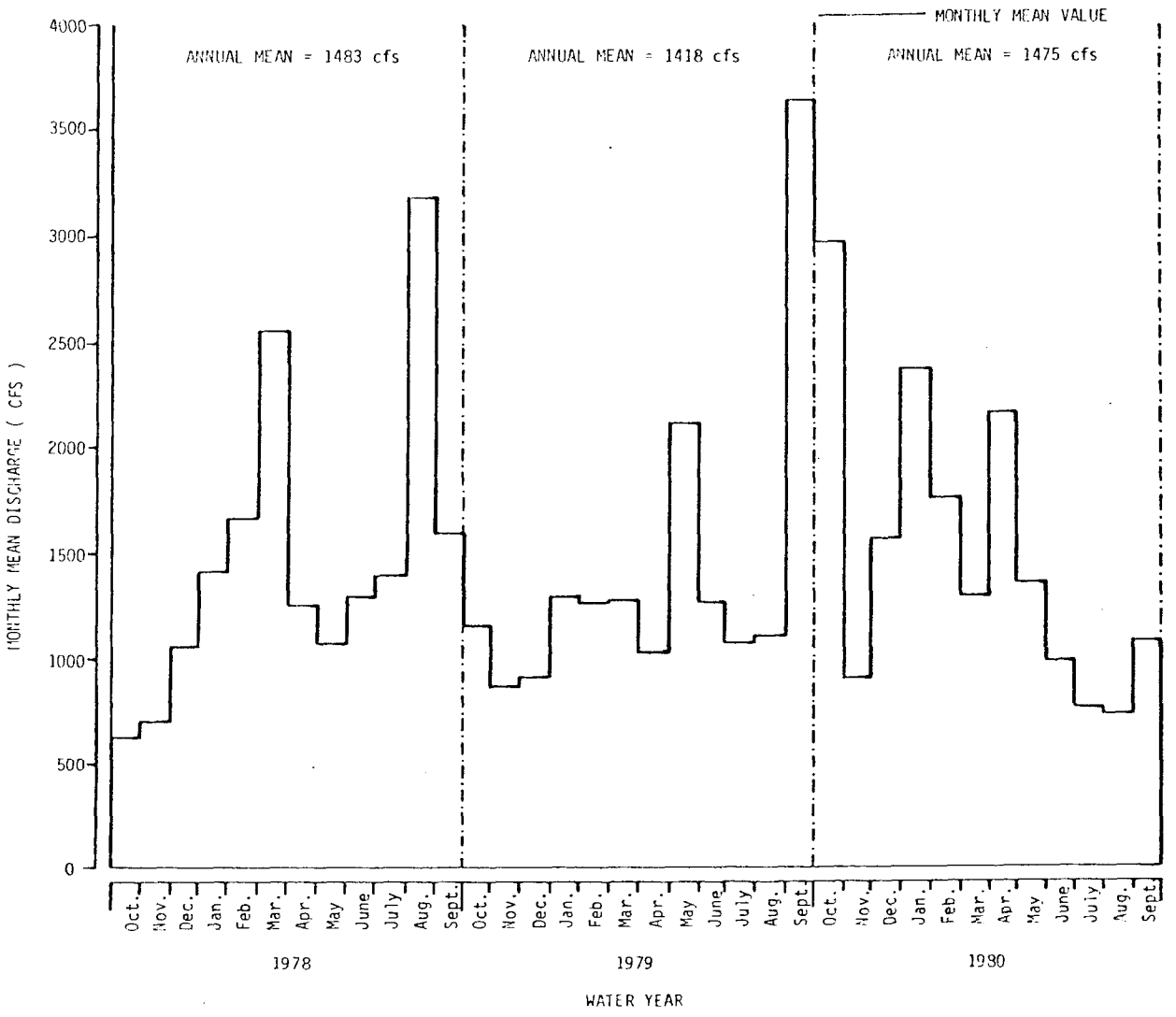

FIGURE 15. -- Streamflows, Oklawaha River at Rodman Dam, near Orange Springs

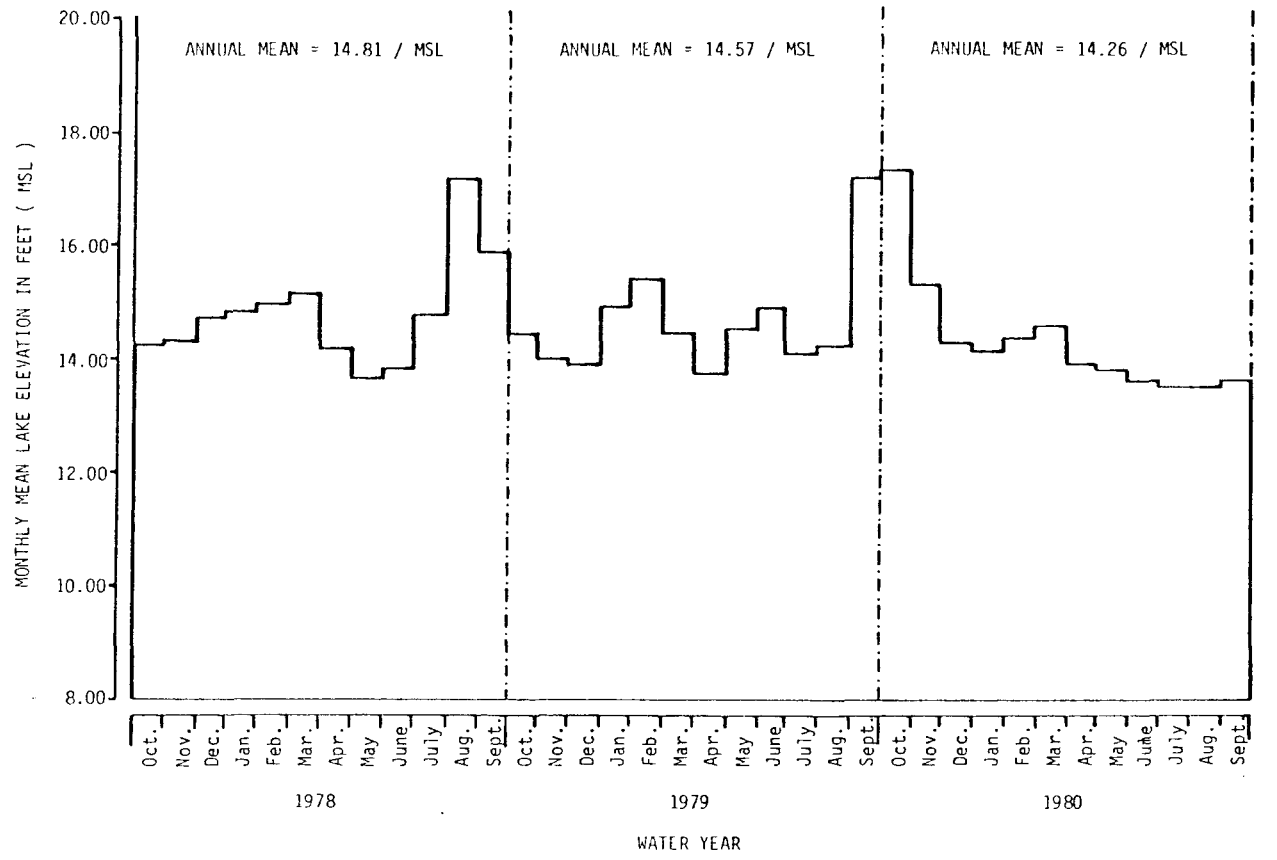

FIGURE 16. -- Elevation, Lake Washington near Eau Gallie.

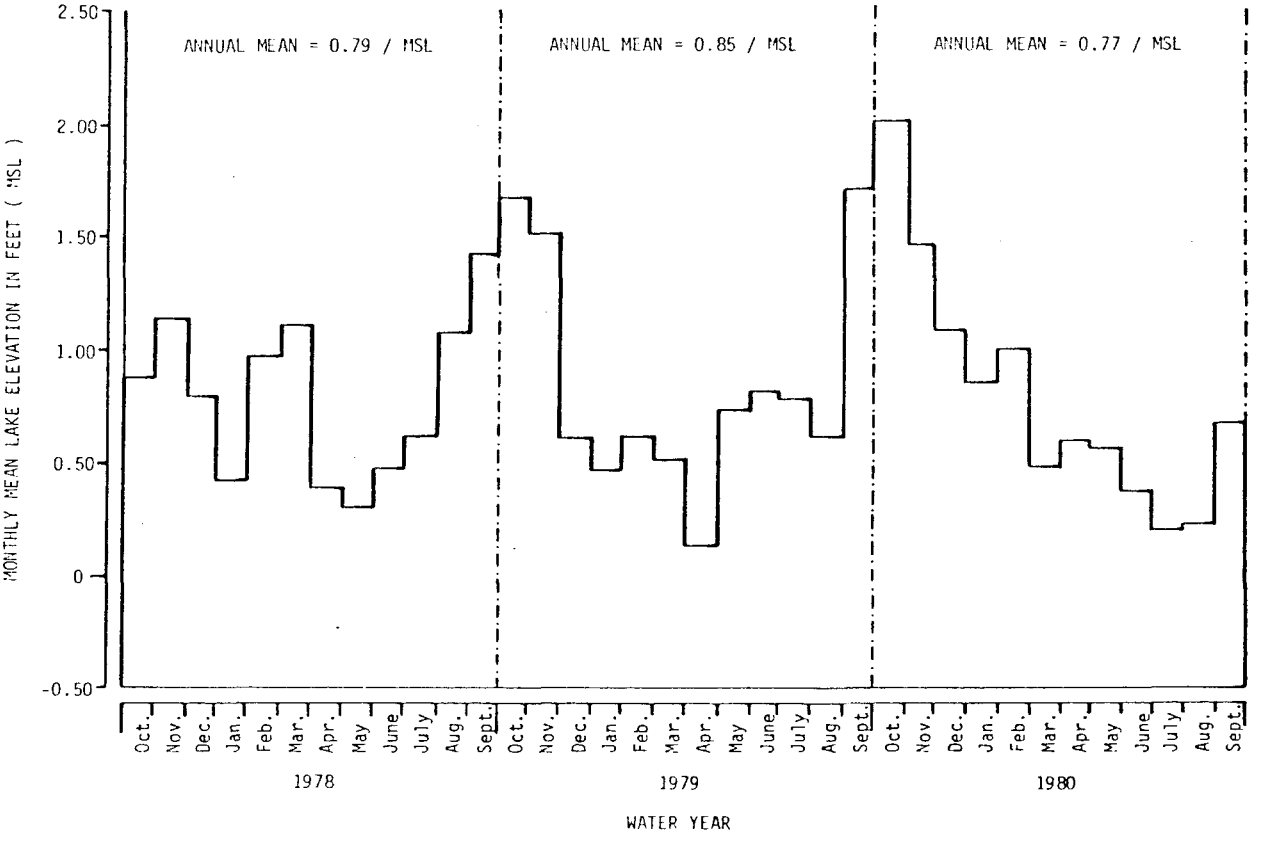

FIGURE 17. -- Elevation, Lake George near Salt Springs.

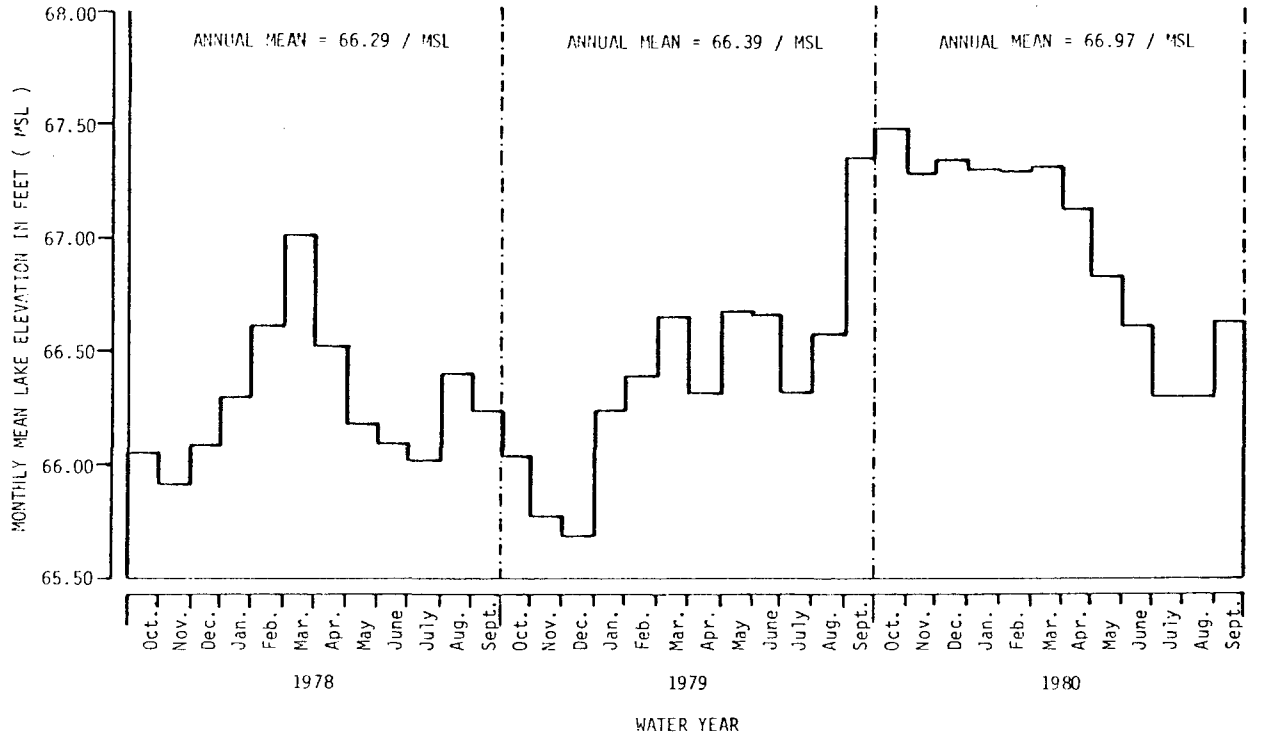

FIGURE 18. -- Elevation, Lake Apopka at Winter Garden.

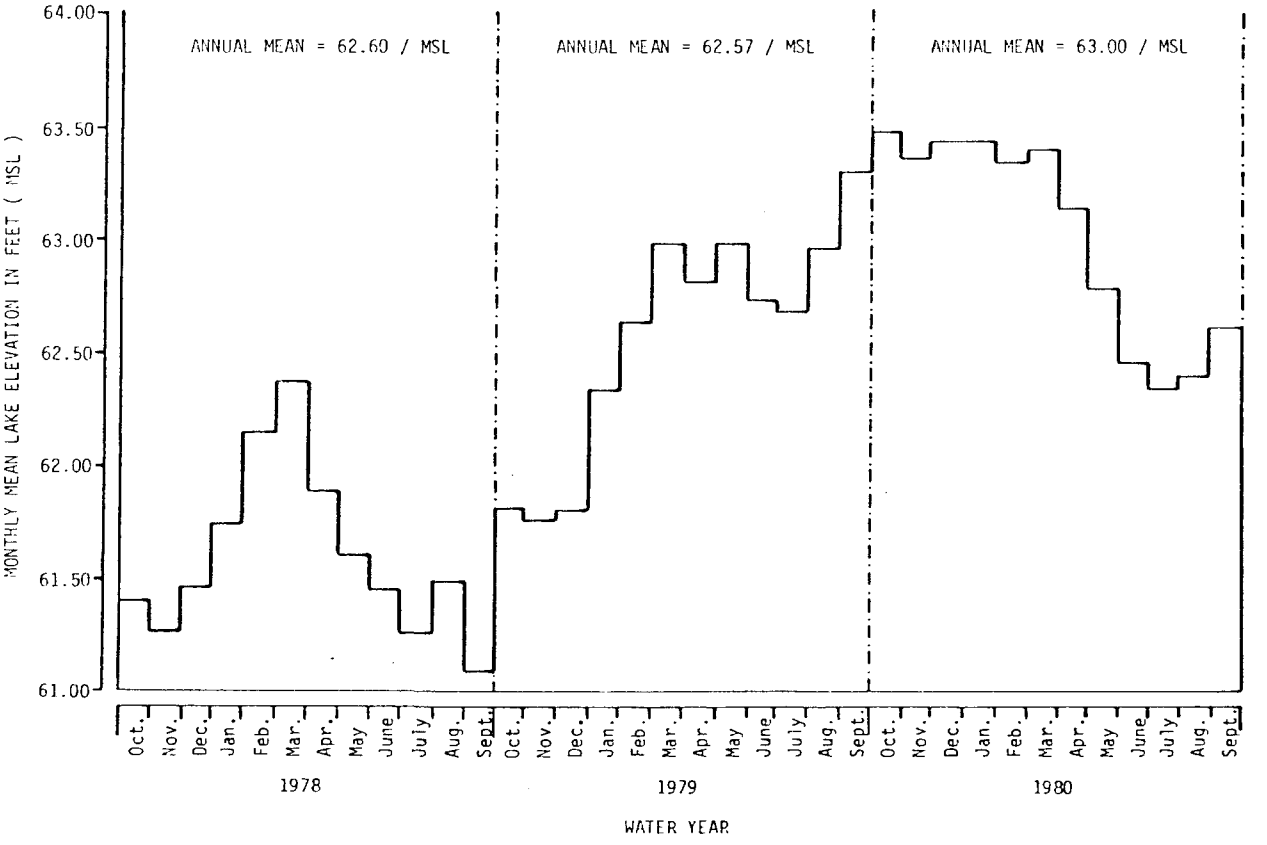

FIGURE 19. -- Elevation, Lake Eustis at Eustis.

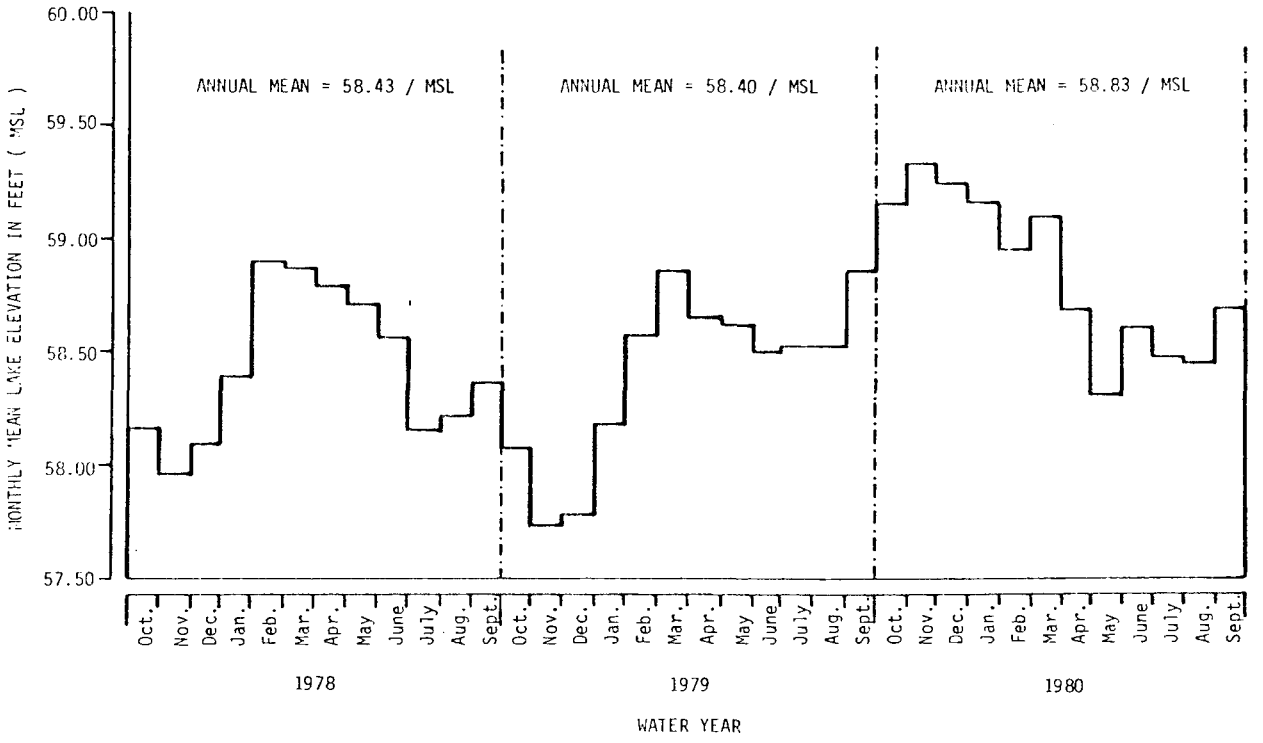

FIGURE 20. -- Elevation, Lake Griffin at Leesburg.

WATER USE

Total water use by categories for 1979 is shown in Table 2. Agricultural Irrigation is the largest water use category for 1979 using 48% of the ground water and 52% of the total fresh water (Figure 21). The second largest category is public supply using 18% of the ground water and 14% of the total fresh water. Other categories using substantial amounts of ground water are Heat Pump/Air Conditioning with 14%. Industrial 10% and domestic self-supplied 8%. The remaining three categories, Institutional, Livestock, Thermo-electric Power Generation, accounted for less than 2% of the total ground water used for 1979.

The two major fresh-water surface using categories are Agricultural irrigation and Thermo-electric Power Generation accounting for 91% of the total used in 1979. Industrial, Public Supply and Livestock accounted for the remaining 9% of total fresh surface water.

The 1979 per capita use, which is calculated by dividing the total water used in both public and domestic categories by the population, equals 170.84 GPCD District-wide.

TABLE 2.-- TOTAL WATER USE

ST.JOHNS RIVER WATER MANAGEMENT DISTRICT

1979

	WATER WITHDRAWN (MGD)						
	FRESH			SALINE			
WATER USE CATEGORY	GROUND	SURFACE	TOTAL	GROUND	SURFACE	TOTAL	TOTAL
PUBLIC	245.39	11.88	257.27	0.08	0.0	0.08	257.35
DOMESTIC (1)	109.67	0.0	109.67	0.0	0.0	0.0	109.67
INSTITUTIONAL (1)	9.51	0.0	9.51	0.0	0.0	0.0	9.51
INDUSTRIAL (1)	140.25	23.14	163.39	0.0	62.71	62.71	226.10
IRRIGATION	660.44	306.57	967.01	0.0	0.0	0.0	967.01
LIVESTOCK	7.04	8.13	15.17	0.0	0.0	0.0	15.17
THERMOELECTRIC POWER GENERATION	4.71	149.33	154.04	0.0	2562.96	2562.96	2717.0
HEAT PUMP-A/C (2) LAWN IRRIGATION	185.45	0.0	185.45	0.0	0.0	0.0	185.45
TOTAL	1362.46	499.05	1861.51	0.08	2625.67	2625.75	4487.26

TOTAL POPULATION (2,149,974) PER CAPITA USE (GPCD) 170.84 (3)

1. SELF-SUPPLIED ONLY.

2. DATA FOR THIS CATEGORY WAS ONLY COLLECTED IN TWO COUNTIES, BREVARD AND VOLUSIA. THE TOTAL IS THAT OF THOSE TWO COUNTIES.

3. GPCD IS BASED ON DISTRICT PUBLIC AND DOMESTIC WATER USE.

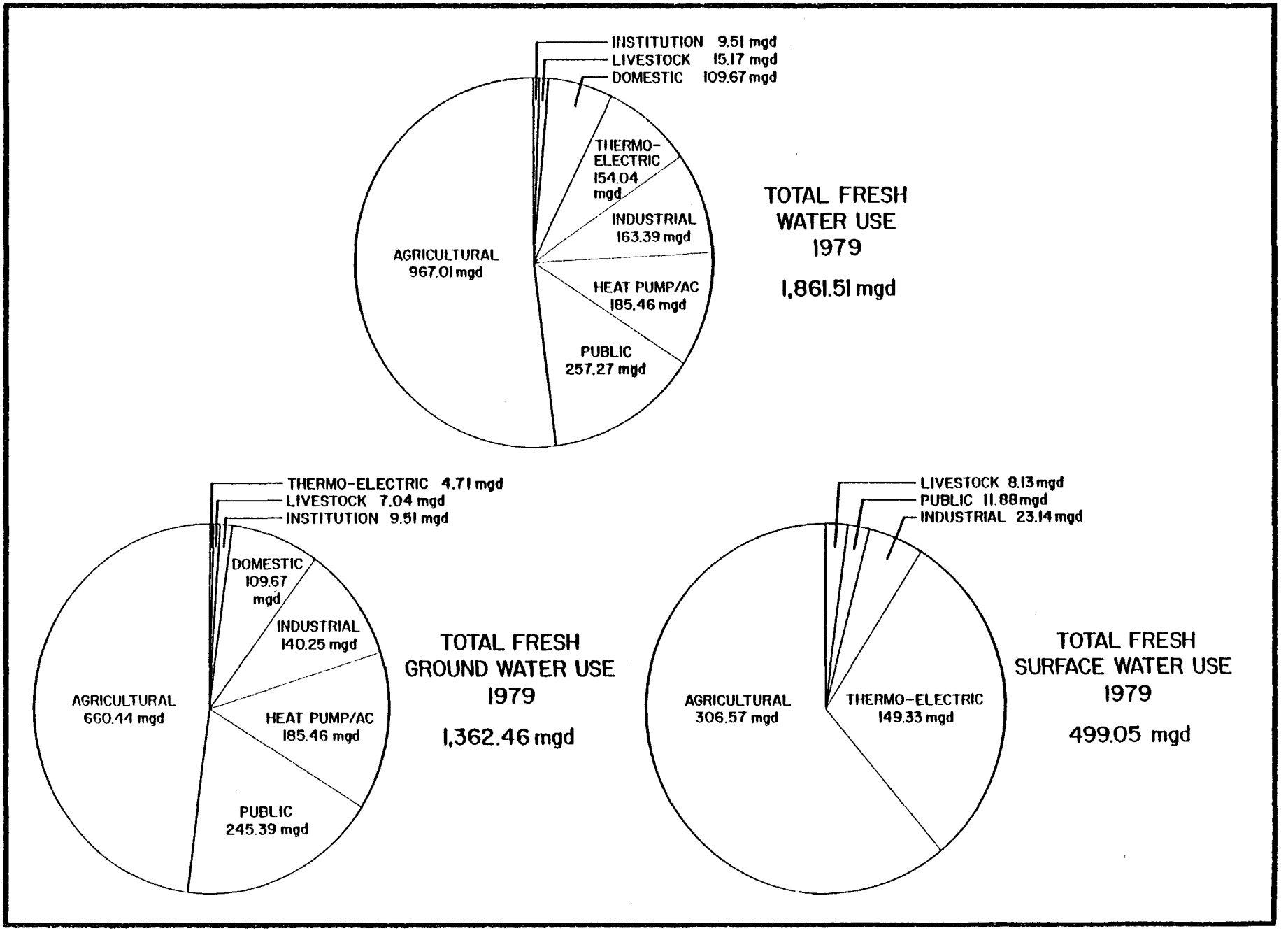

FIGURE 21. -- Water Use Within The St. Johns River Water Management District - 1979

APPENDIX A

RAINFALL STATISTICS FOR 1941-1970

The mean rainfall for 1941-1970 is considered as normal for a given gaging station. However, other rainfall statistics, such as the median, normal range, and the lowest mean annual rainfall (LMAR) for a specified period will be of interest for comparison with 1978 water year rainfall data.

For 19 long term NOAA stations located within and close to the District, the rainfall statistics mean, median, normal range, maximum, minimum, and the LMAR for 3, 5, and 10 years were evaluated for the period 1941-70 by a computer program. These results are presented in Tables A-1 to A-3. Definitions for the above statistics are presented in the tables.

TABLE A-1. -- RAINFALL STATISTICS INCLUDING THE LOWEST MEAN ANNUAL RAINFALL FOR 3 YEARS FOR 1941-70(THE PERIOD USED FOR CALCULATING NORMAL RAINFALL)

(ALL RAINFALL VALUES ARE IN INCHES/YEAR)

STATION	MEAN	MEDIAN	NORMAL RANGE	MAX	MIN	LOWEST MEAN	PERIOD
FELLSMERE	55.86	55.52	50.22-62.49	78.83	27.94	41.77	1965-67
LAKE ALFRED	52.87	53.95	47.96-58.71	76.57	35.62	39.44	1954-56
MELBOURNE	50.79	50.56	44.50-57.76	73.28	32.52	41.61	1954-56
GAINESVILLE	54.60	55.33	47.75-61.14	76.95	35.24	41.98	1954-56
TITUSVILLE	59.20	61.21	49.22-66.03	81.74	41.88	48.95	1954-56
SANFORD	53.32	53.09	47.62-57.89	74.06	35.04	41.39	1961-63
ST.AUGUSTINE	55.22	55.27	46.94-62.64	79.91	32.68	38.12	1954-56
PALATKA	54.84	55.76	48.47-60.75	74.61	29.22	38.99	1954-56
ORLANDO	51.21	50.64	43.96-55.95	68.74	39.61	43.25	1942-44
GLEN ST. MARY	58.74	60.63	47.48-65.66	84.95	34.35	41.61	1954-56
JACKSONVILLE	54.47	54.00	49.00-62.53	77.37	36.83	43.75	1954-56
FERNANDINA BEACH	52.89	50.59	44.81-55.04	82.45	39.83	42.58	1954-56
DELAND	54.87	54.98	47.67-63.99	74.79	41.54	44.88	1954-56
DAYTONA BEACH	50.20	49.84	42.40-58.17	79.29	31.36	34.71	1954-56
CRESCENT CITY	54.67	53.37	46.75-62.43	75.03	37.97	42.80	1954-56
CLERMONT	51.41	51.67	47.11-55.15	68.09	32.28	40.88	1961-63
FEDERAL POINT	54.50	54.97	49.03-60.48	73.75	34.89	40.01	1954-56
HART LAKE	52.27	52.66	43.92-58.68	76.66	32.61	41.20	1961-63
ISLEWORTH	53.14	50.68	45.14-60.82	78.78	35.33	42.08	1954-56

NOTES:-
MEAN - ARITHMETIC AVERAGE OF ANNUAL RAINFALL VALUES FOR THE PERIOD OF RECORD
MEDIAN - RAINFALL WHICH WAS EQUALED OR EXCEEDED FOR 50% OF YEARS DURING THE PERIOD OF RECORD
NORMAL RANGE - RAINFALL WAS GREATER THAN THIS RANGE FOR 25% OF YEARS AND LESS THAN THIS RANGE FOR 25% OF YEARS DURING THE PERIOD OF RECORD
MAX - THE HIGHEST RECORDED ANNUAL RAINFALL FOR THE PERIOD OF RECORD
MIN - THE LOWEST RECORDED ANNUAL RAINFALL FOR THE PERIOD OF RECORD
LOWEST MEAN - MEAN ANNUAL RAINFALL FOR ANY 3-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL
PERIOD - CALENDAR YEARS FOR WHICH THE LOWEST MEAN RAINFALL OCCURRED

TABLE A-2. -- RAINFALL STATISTICS INCLUDING THE LOWEST MEAN ANNUAL RAINFALL FOR 5 YEARS FOR 1941-70(THE PERIOD USED FOR CALCULATING NORMAL RAINFALL)

(ALL RAINFALL VALUES ARE IN INCHES/YEAR)

STATION	MEAN	MEDIAN	NORMAL RANGE	MAX	MIN	LOWEST MEAN	PERIOD
FELLSMERE	55.86	55.52	50.22-62.49	78.83	27.94	43.47	1963-67
LAKE ALFRED	52.87	53.95	47.96-58.71	76.57	35.62	44.64	1961-65
MELBOURNE	50.79	50.56	44.50-57.76	73.28	32.52	45.59	1961-65
GAINESVILLE	54.60	55.33	47.75-61.14	76.95	35.24	47.95	1952-56
TITUSVILLE	59.20	61.21	49.22-66.03	81.74	41.88	53.18	1954-58
SANFORD	53.32	53.09	47.62-57.89	74.06	35.04	46.17	1961-65
ST.AUGUSTINE	55.22	55.27	46.94-62.64	79.91	32.68	46.51	1954-58
PALATKA	54.84	55.76	48.47-60.75	74.61	29.22	44.26	1952-56
ORLANDO	51.21	50.64	43.96-55.95	68.74	39.61	47.17	1942-46
GLEN ST. MARY	58.74	60.63	47.48-65.66	84.95	34.35	45.90	1951-55
JACKSONVILLE	54.47	54.00	49.00-62.53	77.37	36.83	47.35	1954-58
FERNANDINA BEACH	52.89	50.59	44.81-55.04	82.45	39.83	43.54	1954-58
DELAND	54.87	54.98	47.67-63.99	74.79	41.54	49.35	1961-65
DAYTONA BEACH	50.20	49.84	42.40-58.17	79.29	31.36	39.15	1954-58
CRESCENT CITY	54.67	53.37	46.75-62.43	75.03	37.97	48.08	1954-58
CLERMONT	51.41	51.67	47.11-55.15	68.09	32.28	45.12	1961-65
FEDERAL POINT	54.50	54.97	49.03-60.48	73.75	34.89	46.03	1952-56
HART LAKE	52.27	52.66	43.92-58.68	76.66	32.61	43.26	1961-65
ISLEWORTH	53.14	50.68	45.14-60.82	78.78	35.33	46.85	1948-52

NOTES:-
MEAN - ARITHMETIC AVERAGE OF ANNUAL RAINFALL VALUES FOR THE PERIOD OF RECORD
MEDIAN - RAINFALL WHICH WAS EQUALED OR EXCEEDED FOR 50% OF YEARS DURING THE PERIOD OF RECORD
NORMAL RANGE - RAINFALL WAS GREATER THAN THIS RANGE FOR 25% OF YEARS AND LESS THAN THIS RANGE FOR 25% OF YEARS DURING THE PERIOD OF RECORD
MAX - THE HIGHEST RECORDED ANNUAL RAINFALL FOR THE PERIOD OF RECORD
MIN - THE LOWEST RECORDED ANNUAL RAINFALL FOR THE PERIOD OF RECORD
LOWEST MEAN - MEAN ANNUAL RAINFALL FOR ANY 5-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL
PERIOD - CALENDAR YEARS FOR WHICH THE LOWEST MEAN RAINFALL OCCURRED

TABLE A-3. -- RAINFALL STATISTICS INCLUDING THE LOWEST MEAN ANNUAL RAINFALL FOR 10 YEARS FOR 1941-70(THE PERIOD USED FOR CALCULATING NORMAL RAINFALL)

(ALL RAINFALL VALUES ARE IN INCHES/YEAR)

STATION	MEAN	MEDIAN	NORMAL RANGE	MAX	MIN	LOWEST MEAN	PERIOD
FELLSMERE	55.86	55.52	50.22-62.49	78.83	27.94	46.53	1961-70
LAKE ALFRED	52.87	53.95	47.96-58.71	76.57	35.62	48.86	1961-70
MELBOURNE	50.79	50.56	44.50-57.76	73.28	32.52	48.09	1949-58
GAINESVILLE	54.60	55.33	47.75-61.14	76.95	35.24	50.01	1954-63
TITUSVILLE	59.20	61.21	49.22-66.03	81.74	41.88	57.12	1942-51
SANFORD	53.32	53.09	47.62-57.89	74.06	35.04	47.36	1961-70
ST.AUGUSTINE	55.22	55.27	46.94-62.64	79.91	32.68	51.30	1950-59
PALATKA	54.84	55.76	48.47-60.75	74.61	29.22	49.48	1952-61
ORLANDO	51.21	50.64	43.96-55.95	68.74	39.61	48.67	1961-70
GLEN ST. MARY	58.74	60.63	47.48-65.66	84.95	34.35	52.31	1949-58
JACKSONVILLE	54.47	54.00	49.00-62.53	77.37	36.83	48.62	1954-63
FERNANDINA BEACH	52.89	50.59	44.81-55.04	82.45	39.83	47.43	1954-63
DELAND	54.87	54.98	47.67-63.99	74.79	41.54	52.03	1948-57
DAYTONA BEACH	50.20	49.84	42.40-58.17	79.29	31.36	45.08	1954-63
CRESCENT CITY	54.67	53.37	46.75-62.43	75.03	37.97	48.90	1948-57
CLERMONT	51.41	51.67	47.11-55.15	68.09	32.28	48.42	1948-57
FEDERAL POINT	54.50	54.97	49.03-60.48	73.75	34.89	50.13	1950-59
HART LAKE	52.27	52.66	43.92-58.68	76.66	32.61	47.24	1961-70
ISLEWORTH	53.14	50.68	45.14-60.82	78.78	35.33	49.78	1949-58

NOTES:-
MEAN - ARITHMETIC AVERAGE OF ANNUAL RAINFALL VALUES FOR THE PERIOD OF RECORD
MEDIAN - RAINFALL WHICH WAS EQUALED OR EXCEEDED FOR 50% OF YEARS DURING THE PERIOD OF RECORD
NORMAL RANGE - RAINFALL WAS GREATER THAN THIS RANGE FOR 25% OF YEARS AND LESS THAN THIS RANGE FOR 25% OF YEARS DURING THE PERIOD OF RECORD
MAX - THE HIGHEST RECORDED ANNUAL RAINFALL FOR THE PERIOD OF RECORD
MIN - THE LOWEST RECORDED ANNUAL RAINFALL FOR THE PERIOD OF RECORD
LOWEST MEAN - MEAN ANNUAL RAINFALL FOR ANY 10-YEAR CONTINUOUS PERIOD HAVING THE LOWEST RAINFALL
PERIOD - CALENDAR YEARS FOR WHICH THE LOWEST MEAN RAINFALL OCCURRED