TECHNICAL PUBLICATION SJ 80-2

ANNUAL REPORT OF HYDROLOGIC CONDITIONS AND WATER RESOURCE ACTIVITIES - 1979 WATER YEAR

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Palatka, Florida

February 1980

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 1979 (October 1978 through September 1979). 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. Ground water, surface water, and precipitation data for the 1979 water year are presented and compared with historical data. In the second section, current projects, cooperative programs, and field station activities are discussed. 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 resource 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 1979 is shown in Figure 2. Rainfall within the District during the 1979 water year ranged from a high of 71.64 inches at Daytona Beach in Volusia County to a low of 54.45 at Glen St. Mary in Baker County. Average rainfall for the 1979 water year calculated using the isohyetal map (Figure 2) was 60.40 inches as compared to a District mean of 54.90 inches (based on Figure 1) for the period 1941-1970.

Percent departure from the normal rainfall for the 1979 water year is illustrated on Figure 3. Rainfall throughout most of the District ranged from zero to 10% above normal. The only area receiving below normal rainfall was the northwest corner of the District, including all of Baker County. Four areas, three of which are adjacent to the Atlantic Coast and the other predominantly south of the City of Clermont, Lake County, received from 10-25% above normal rainfall for the 1979 water year.

Figure 4 shows reported monthly rainfalls at five selected stations within the District for the 1979 water year as compared to the mean monthly rainfall values calculated for the period 1941-1970. Highest amounts of monthly precipitation were recorded during January, May, and September. However, September's precipitation was influenced by the high rainfalls

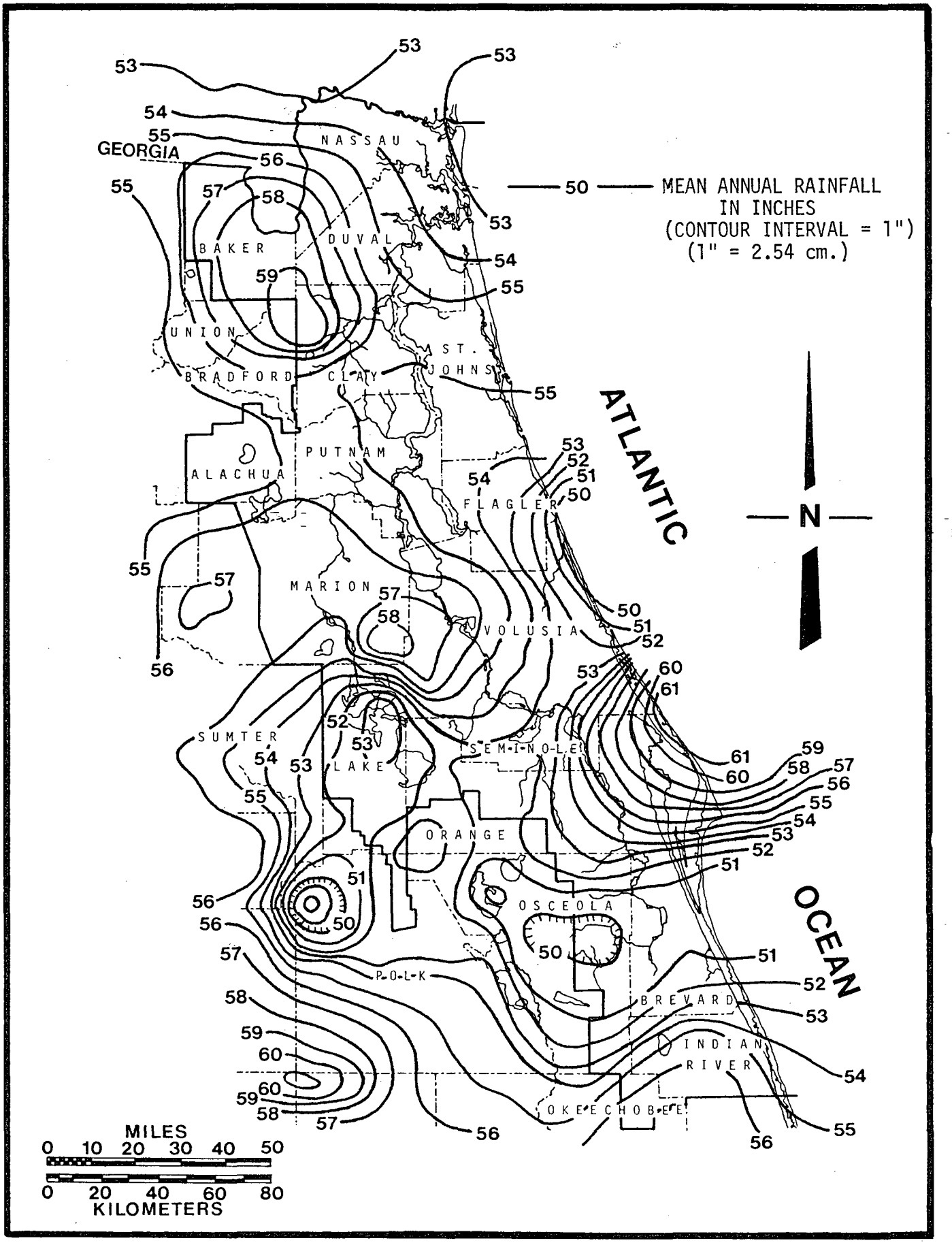

FIGURE 1. -- Mean Annual Rainfall in the SJRWMD, 1941-1970.

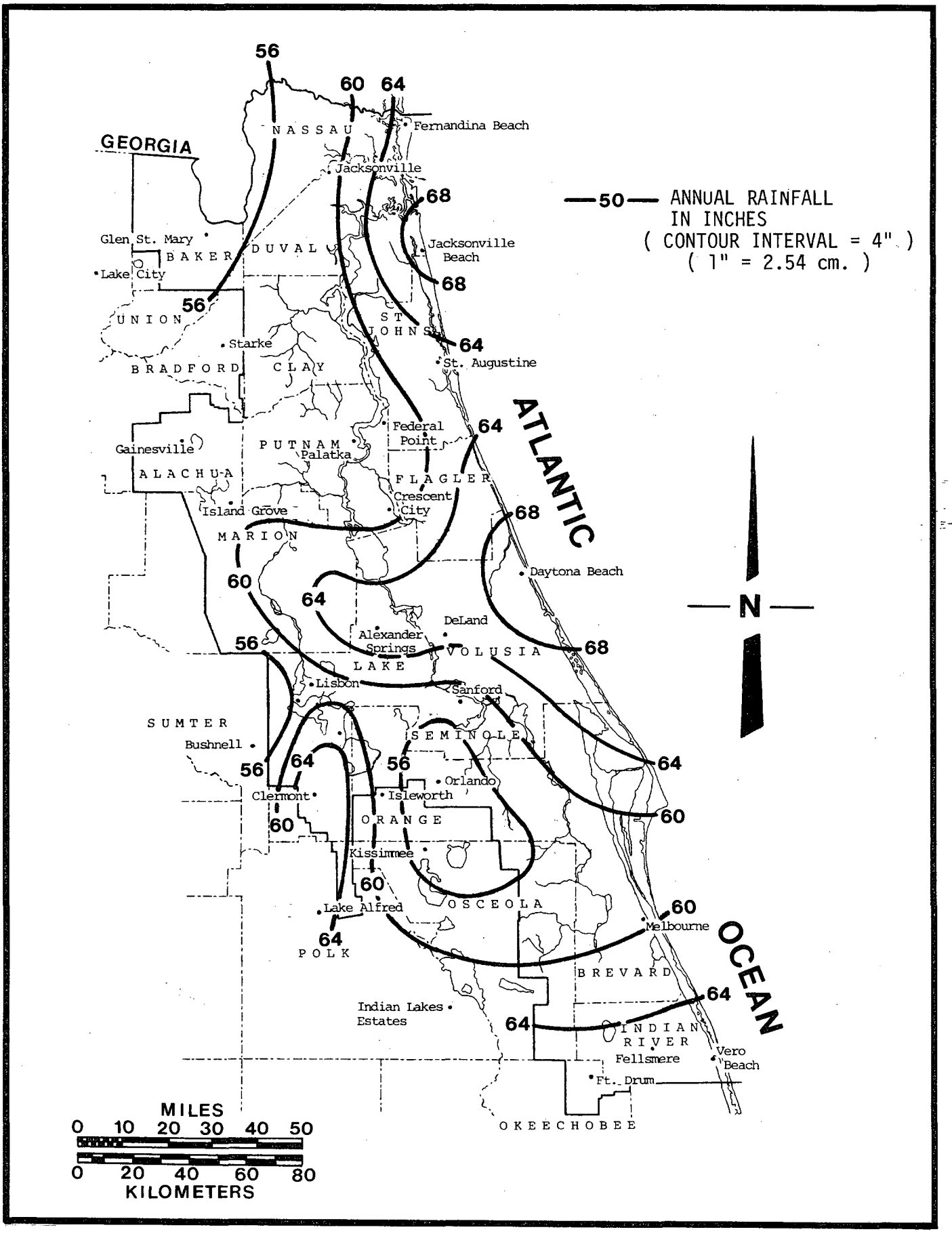

FIGURE 2. -- Rainfall in the SJRWMD, 1979 Water Year.

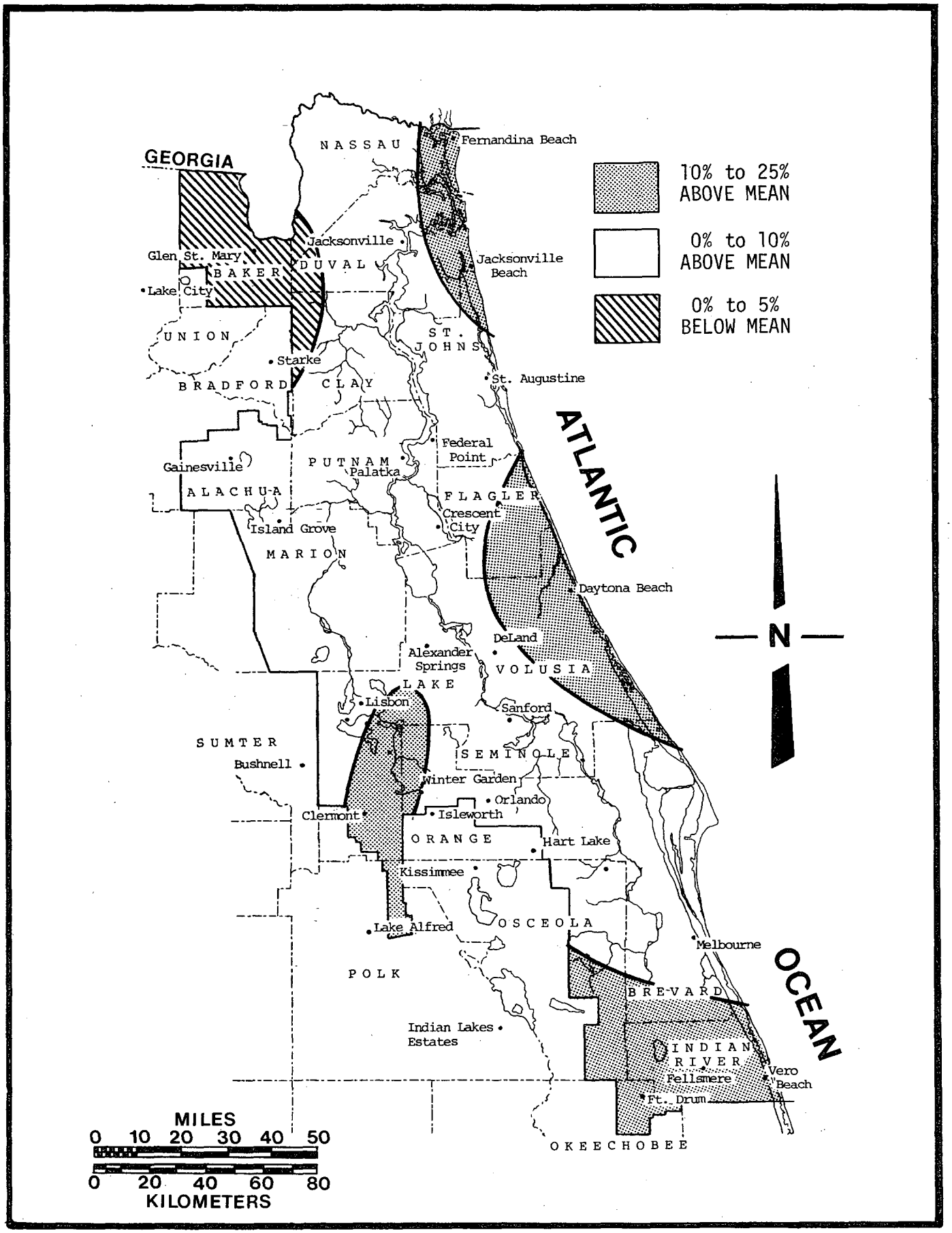

FIGURE 3. -- Percent Departure from Mean Annual Rainfall in the SJRWMD, 1979 Water Year.

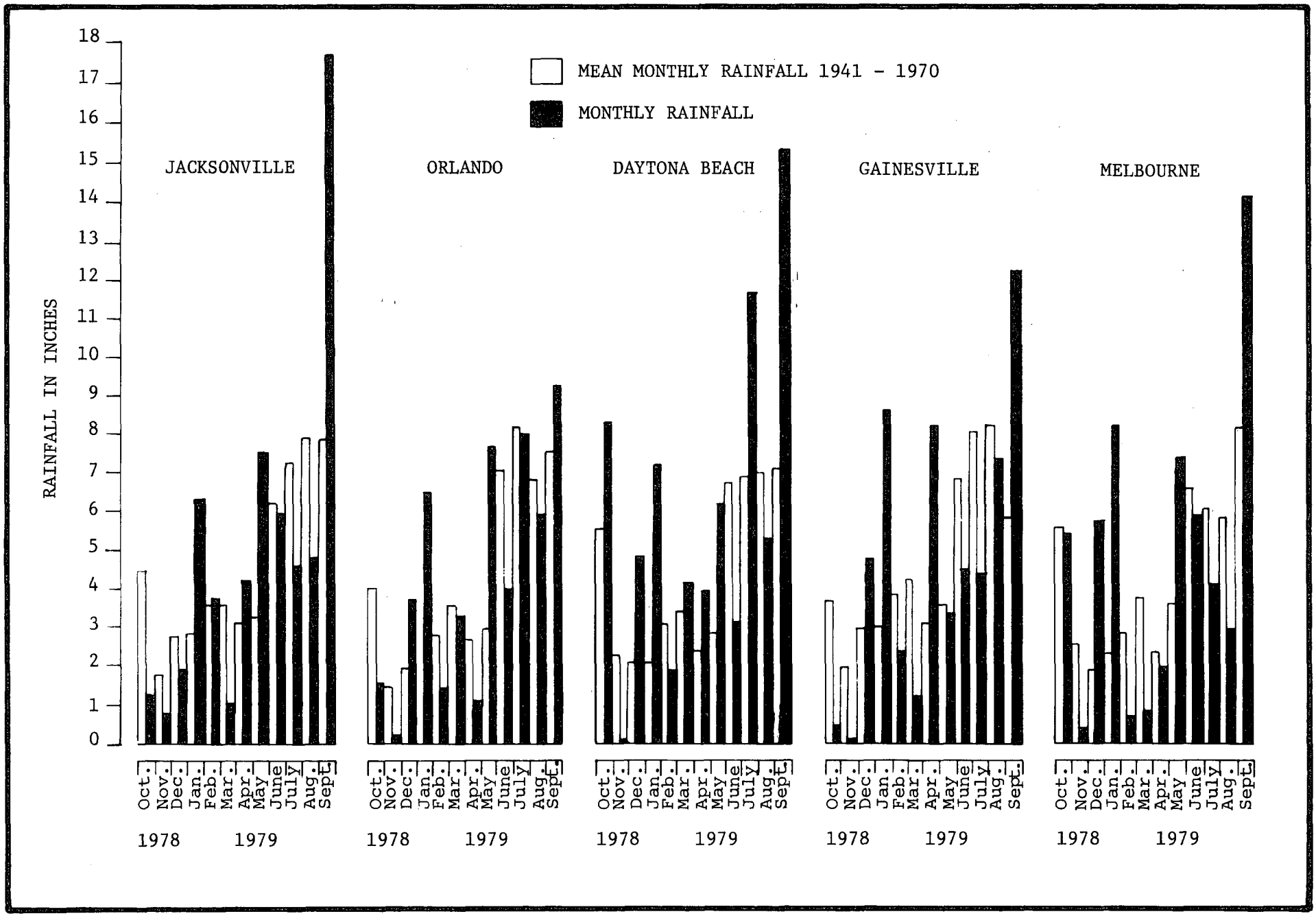

FIGURE 4. -- Mean Monthly Rainfall Compared with Recorded Monthly Rainfall at Selected Stations, 1979 Water Year.

associated with hurricanes David and Fredrick. Rainfall was generally below the normal for the months of June, July, and August in most portions of the District.

In summary, rainfall throughout almost the entire District during the 1979 water year was above the period of record normal rainfall, with the exception of the northwestern corner of the District. Average rainfall for the entire District was 60.40 inches, which was 5.50 inches above the District normal.

FLORIDAN AQUIFER

Water Levels

Figure 5 shows the potentiometric surface of the Floridan aquifer in the St. Johns River Water Management District for May 1979. Differences in water levels between July 1961 and May 1977 are shown in Figure 6. Over this 16-year period, there has been a general decline in the potentiometric surface throughout the District. Changes of less than ten feet are noted in the central and western portions, while changes of ten feet or slightly more are noted in the remainder. One notable exception is the Fernandina Beach area where the potentiometric surface has dropped approximately 100 feet due to heavy industrial pumpage.

Fluctuations in water levels of four wells with long periods of record are shown in Figure 7. The geographic locations of these wells within the District are shown in Figure 6.

Well No. V-1 is located in a relatively undeveloped area in south central Volusia County about 11 miles southeast of Deland on the flank of a potentiometric high. Comparison of water levels for the 1978 and 1979 water years

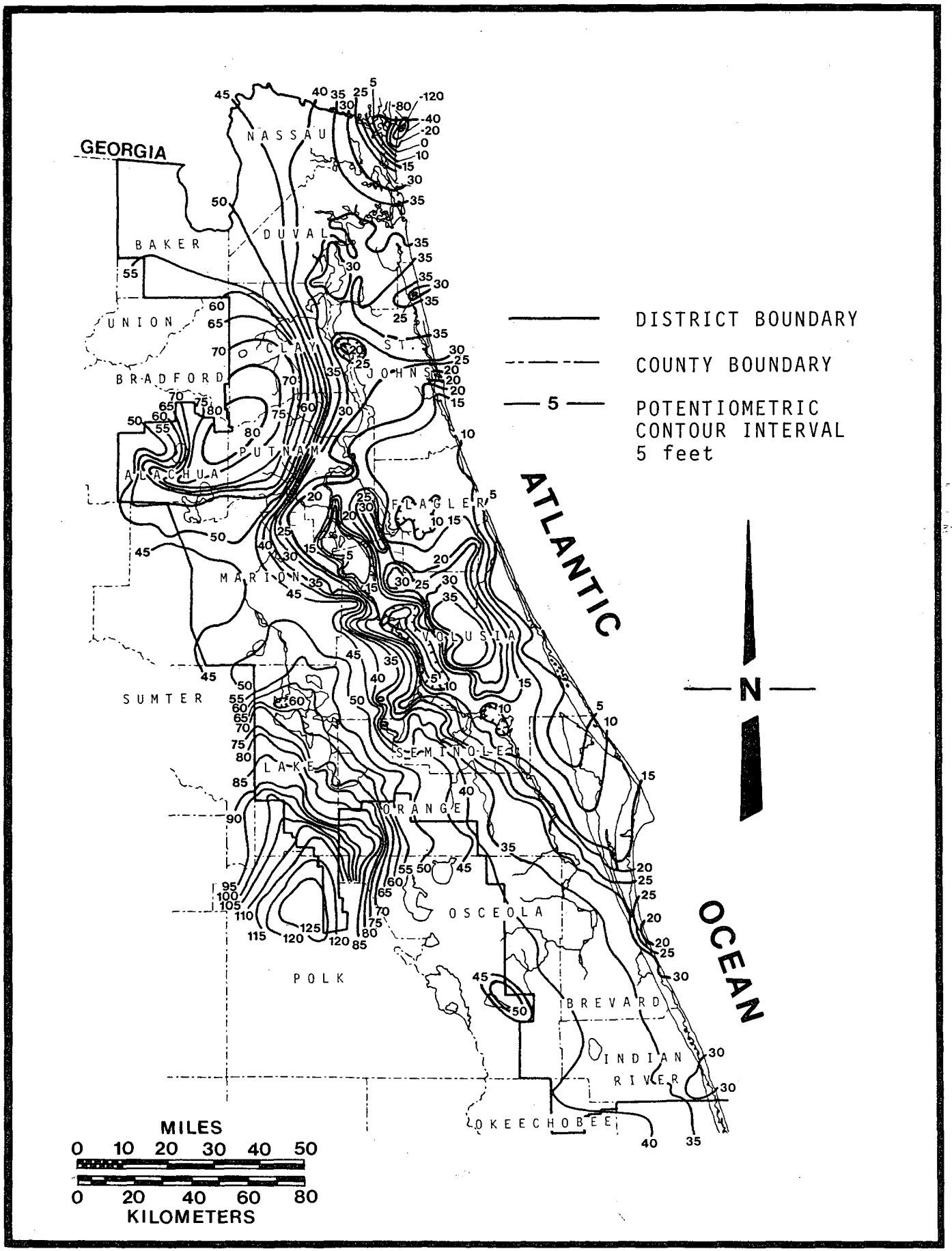

FIGURE 5. -- Potentiometric Surface of the Floridan Aquifer in the SJRWMD, May 1979.

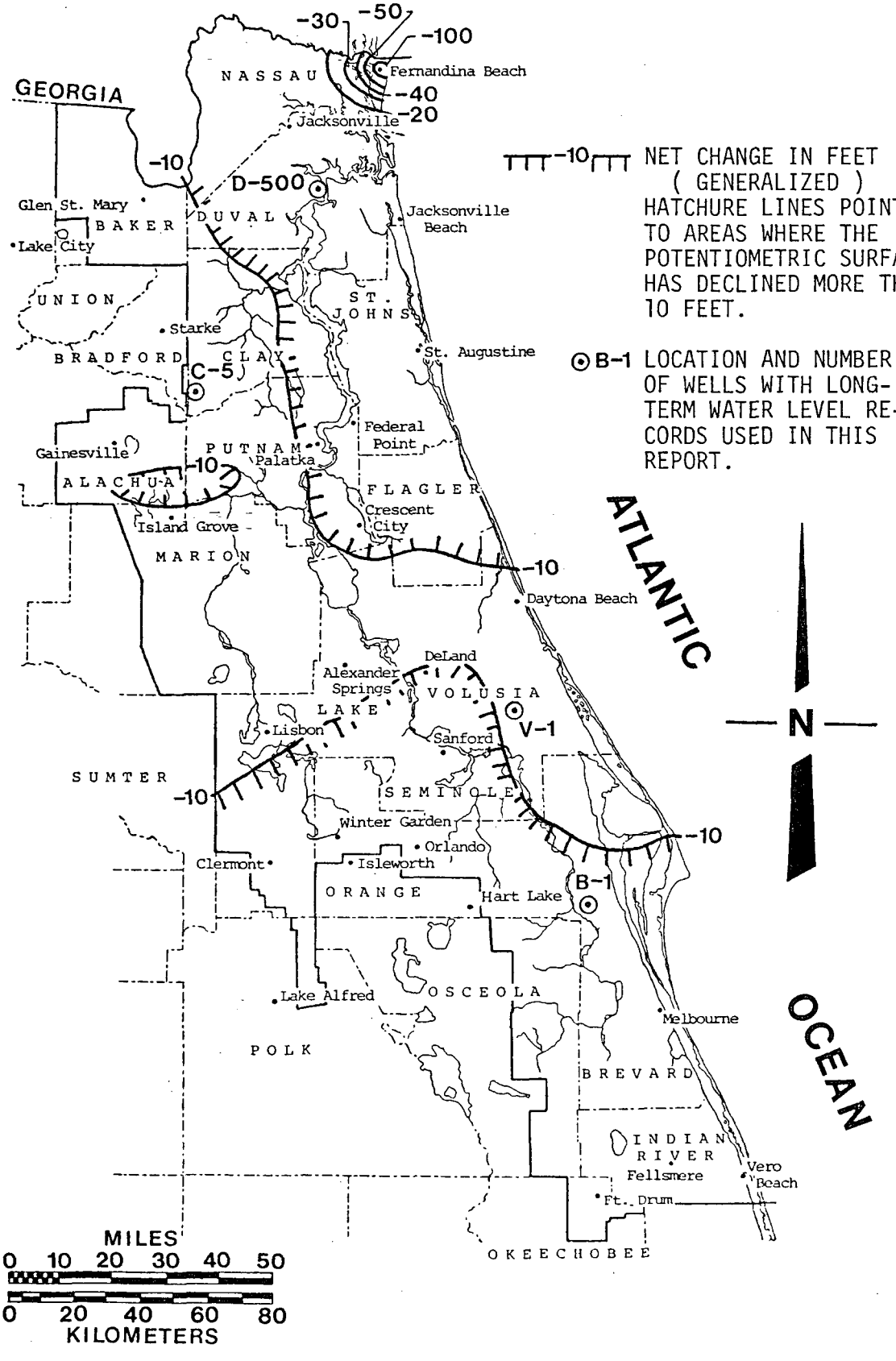

FIGURE 6. -- Net Change of Potentiometric Surface in the Floridan Aquifer Between July 1961 and May 1977.

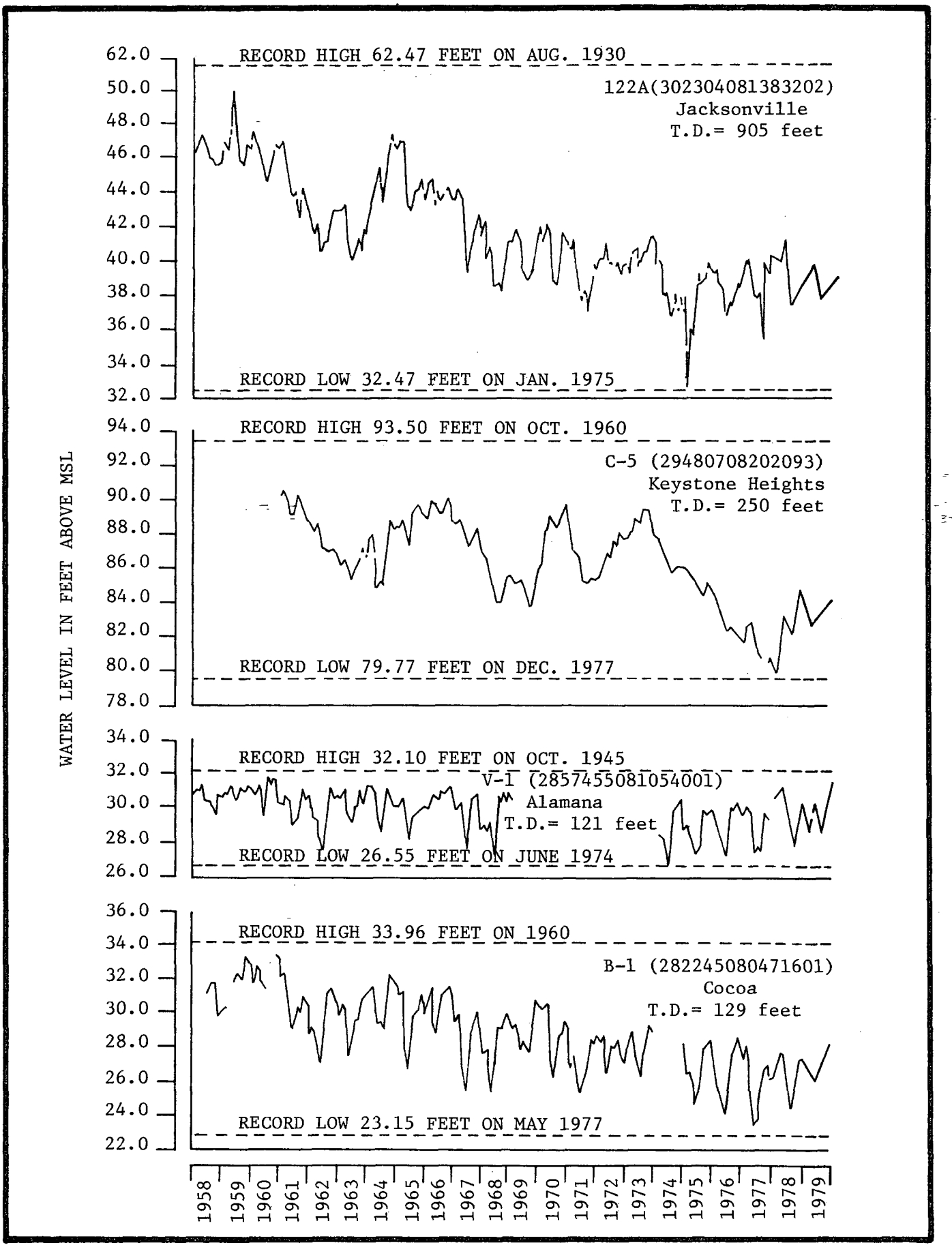

FIGURE 7. -- Hydrographs of Selected Wells in the SJRWMD.

shows that the maximum water level was 0.59 feet higher, and the minimum water level was 0.96 feet higher in the 1979 water year than the corresponding levels in the 1978 water year.

Well No. C-5 is located in a relatively undeveloped lakes region of Clay County about one mile northwest of Keystone Heights and is situated within a potentiometric high. Comparison of the water levels for the 1978 and 1979 water years shows that the maximum water level was 0.35 feet lower, and the minimum water level was 2.83 feet higher for the 1979 water year than the 1978 water year.

Because wells C-5 and V-1 are located near or on potentiometric highs (potential recharge areas) in areas where the Floridan aquifer is not unduly stressed by development, variation in water levels in these wells are indicative of differences between natural recharge to and discharge from the Floridan aquifer.

Well 122-A is located in an urban area of Jacksonville in Duval County. Comparison of water levels for the 1978 and 1979 water years shows that the maximum water level is 0.20 feet lower, and the minimum is 0.40 feet higher in the 1979 water year than in the 1978 water year.

Well No. B-1 is located near a developed urban area of Brevard County about four miles northwest of Cocoa. Comparison of water levels for the 1978 and 1979 water years shows that the maximum water level is 0.69 feet higher, and the low is 1.84 feet higher in the 1979 water year than in the 1978 water year. Variation in water levels in wells 122-A and B-1 are indicative of areas where urban, industrial, and agricultural development has placed a stress upon the Floridan aquifer through increasing the water use.

Water Quality

High chloride concentration in Floridan aquifer water is a major problem in some parts of the St. Johns River Water Management District. Figure 8 shows chloride concentration in ground water in the upper part of the Floridan aquifer for 1970 (modified from DNR, 1970). Data published by the Brevard County Planning Department indicate that water from the Floridan aquifer along a narrow band (too narrow to show up in Figure 8), extending from Cape Canaveral to Indialantic currently exhibits chloride concentrations in excess of 1,000 mg/l as a result of continued and increased pumping stress in that area. On the 1970 chloride map, this area is shown as having chloride concentrations between 251 and 1,000 mg/l. One additional area too small to show up as a pattern on the map in which chloride concentrations are of concern is the Ft. George Island area. A water sample collected from one well in the Ft. George Island area during 1979 exhibited a chloride concentration in excess of 200 mg/l. Figure 9 shows changes in chloride concentration with changes in water levels for a well on Ft. George Island (D-164) for the interval 1930 to 1979.

UNCONFINED AND SECONDARY ARTESIAN AQUIFER

The unconfined or shallow water table aquifer consists of surficial clastics; namely, sand, sandy clay, shell beds, or deposits consisting of a mixture of sand and shell. Areally, it is of variable thickness and exhibits variable water-yielding characteristics. The unconfined aquifer occupies a position between land surface and the top of the first major confining bed.

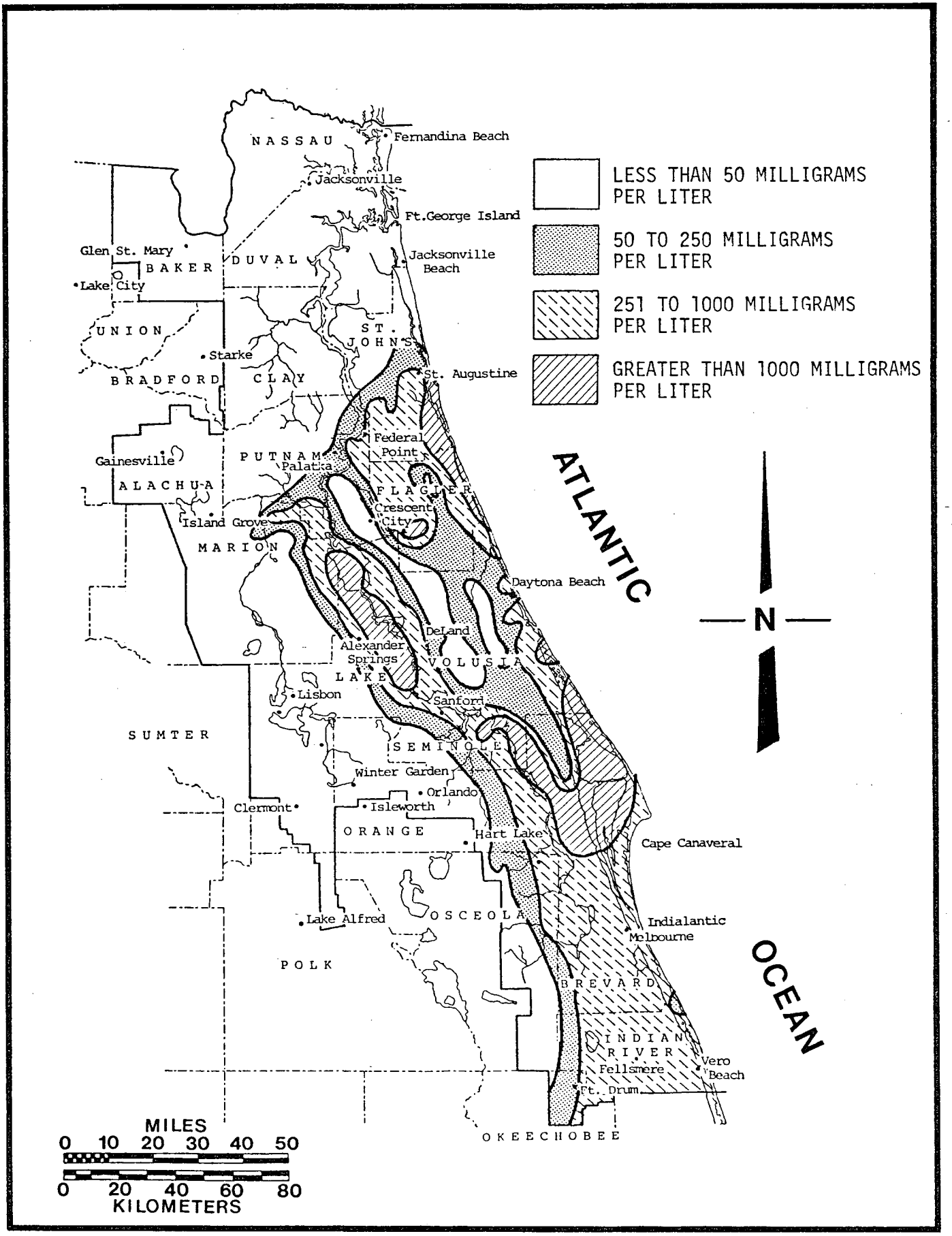

FIGURE 8. -- Chloride Concentration in the Floridan Aquifer in the St. Johns River Basin (Modified from DNR, 1970).

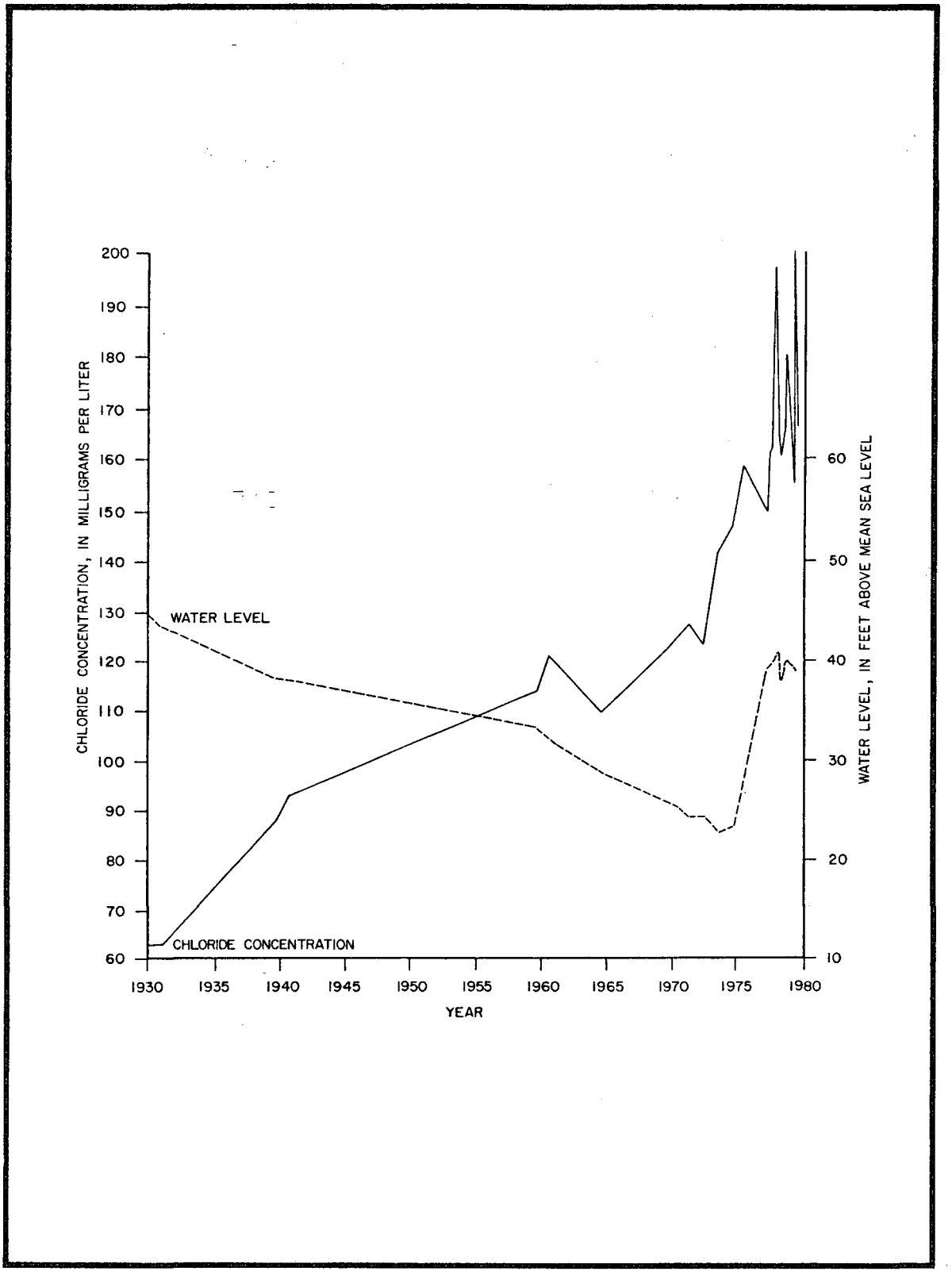

FIGURE 9. -- Water Level and Chloride Content Variations in Well D-164, Ft. George Island, Florida.

The secondary artesian aquifer generally consists of thin, discontinuous lenses of shell, limestone, sand, or sand and gravel interbedded with clay. The secondary artesian aquifer, where present, generally occupies a position within the Hawthorn Formation or other confining beds and lies between the shallow water table aquifer and the top of the Floridan aquifer.

The shallow water table and the secondary artesian aquifers are most extensively developed for domestic and public supplies in the southeast part of the District where water from the Floridan aquifer has a chloride concentration in excess of National Secondary Drinking Water maximum contaminant levels (mcl = 250 mg/l).

Locally, water from the unconfined or secondary artesian aquifers may contain undesirable concentrations of chloride and/or iron. High concentrations of these two constituents account for most water quality problems in these aquifers. High chloride concentrations in the coastal unconfined or secondary artesian aquifers may be found in areas: (1) where overpumping of shallow wells has caused salt water intrusion, or (2) natural intrusion has occurred where these aquifers underlie areas of low topographic relief in close proximity to a saline water body.

Available data indicate that iron concentrations in waters from wells completed in the secondary artesian or water table aquifers range from 0 to 19 mg/l within the St. Johns River Water Management District. National Secondary Drinking Water maximum contaminant levels for iron concentration state that iron should not exceed 0.3 mg/l.

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 10% above normal for the District during the 1979 water year. However, a major portion of it (up to about 25% of the annual rainfall at some stations) occurred the month of September as a result of hurricane activity. Consequently, high streamflows and water elevations were recorded in the month of September, but the annual mean values remained lower than those of the 1978 water year when District-wide rainfall was near normal. Above average stream discharge due to the September rainfall continued into October of the 1980 water year. Locations of stream or lake gaging stations used in the preparation of this report are shown in Figure 10.

Figures 11 through 17 present monthly streamflow data for water years 1977-1979 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. Flows in the St. Johns River were above median for most months during the 1979 water year.

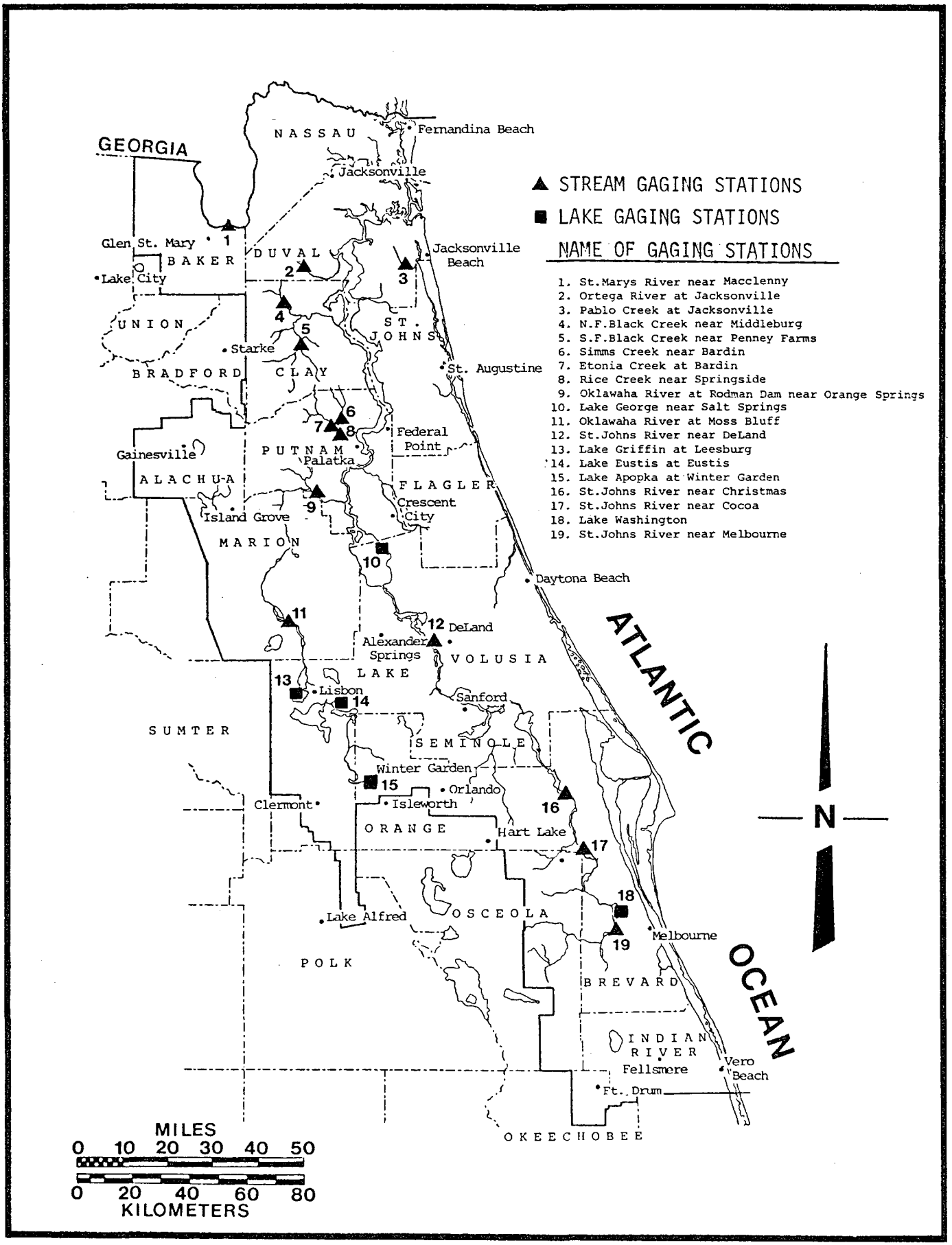

FIGURE 10. -- Location of Stream and Lake Gaging Stations Used in this Report.

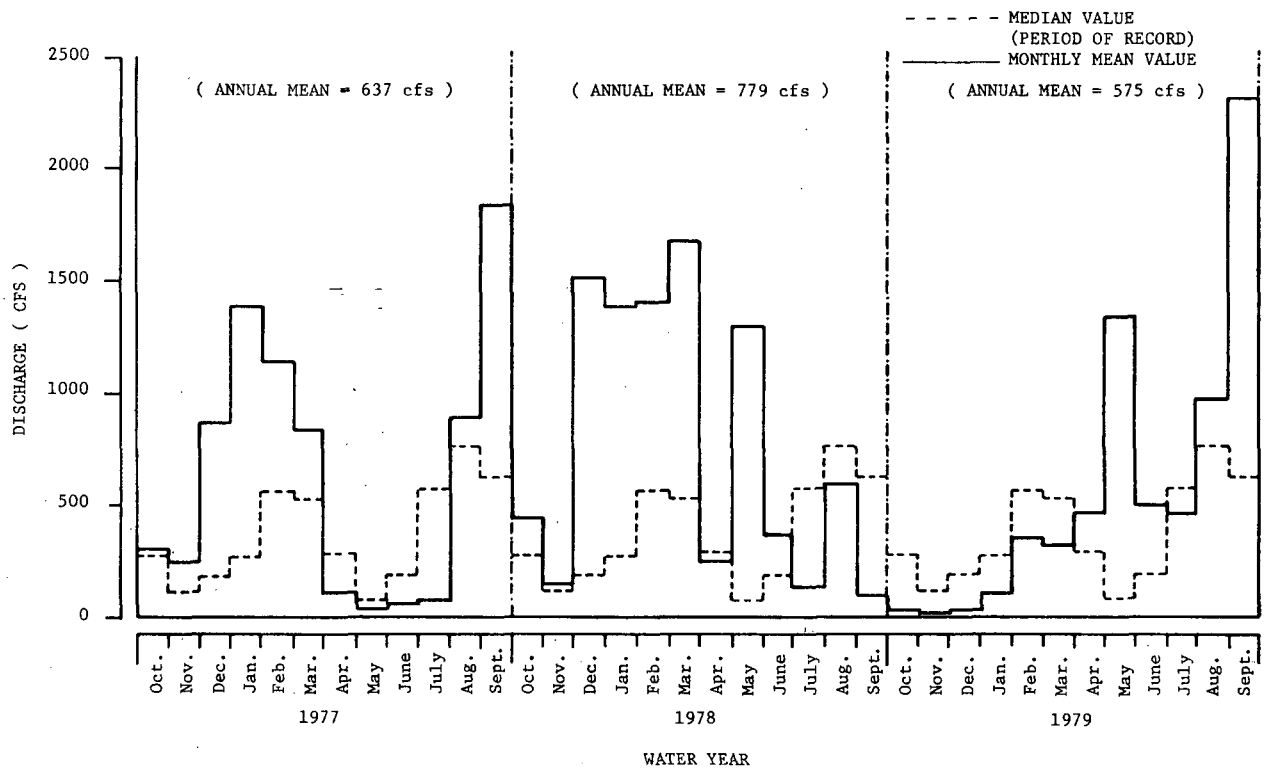

FIGURE 11. -- Streamflows, St. Marys River near Macclenny.

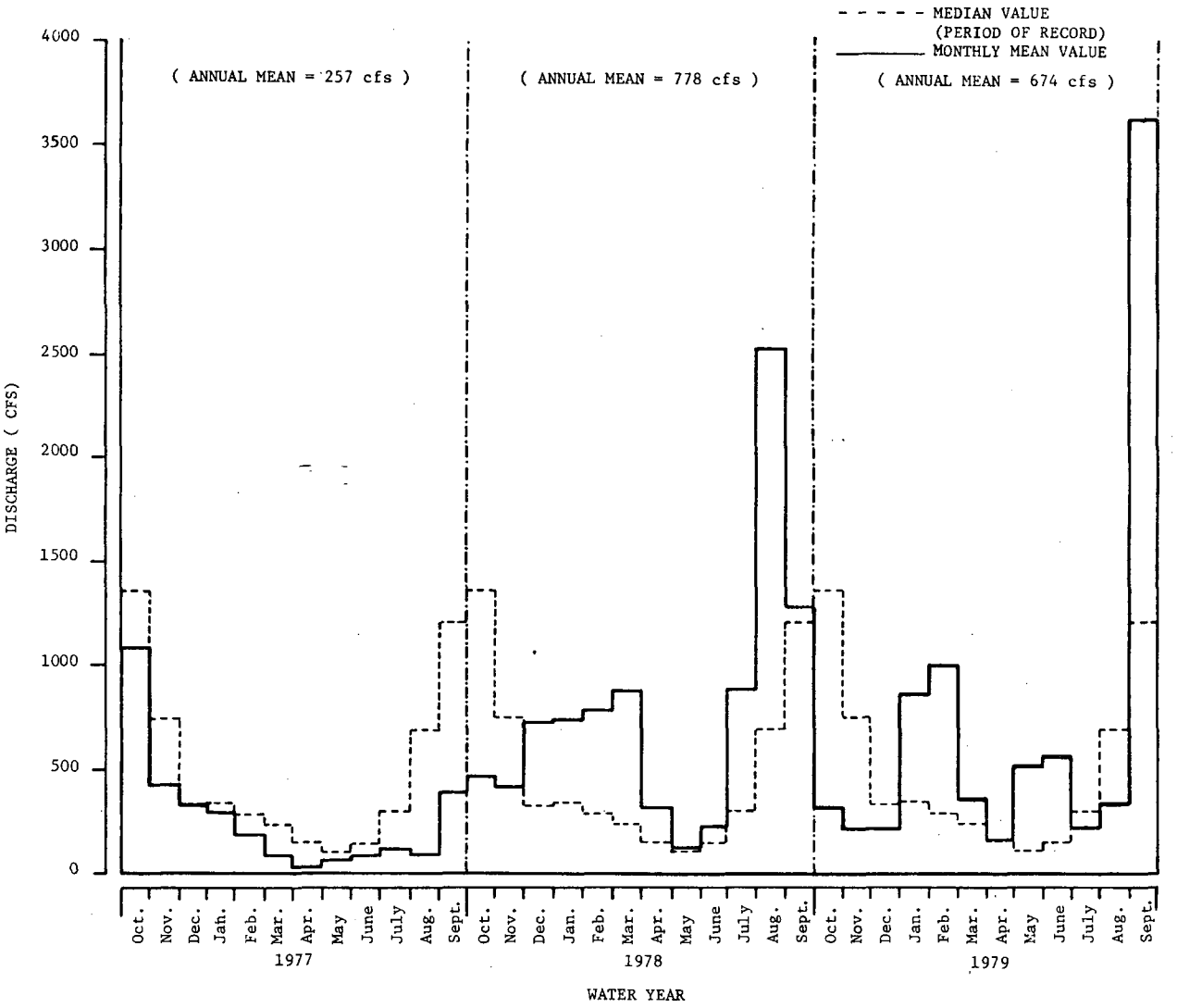

FIGURE 12. -- Streamflows, St. Johns River at Melbourne

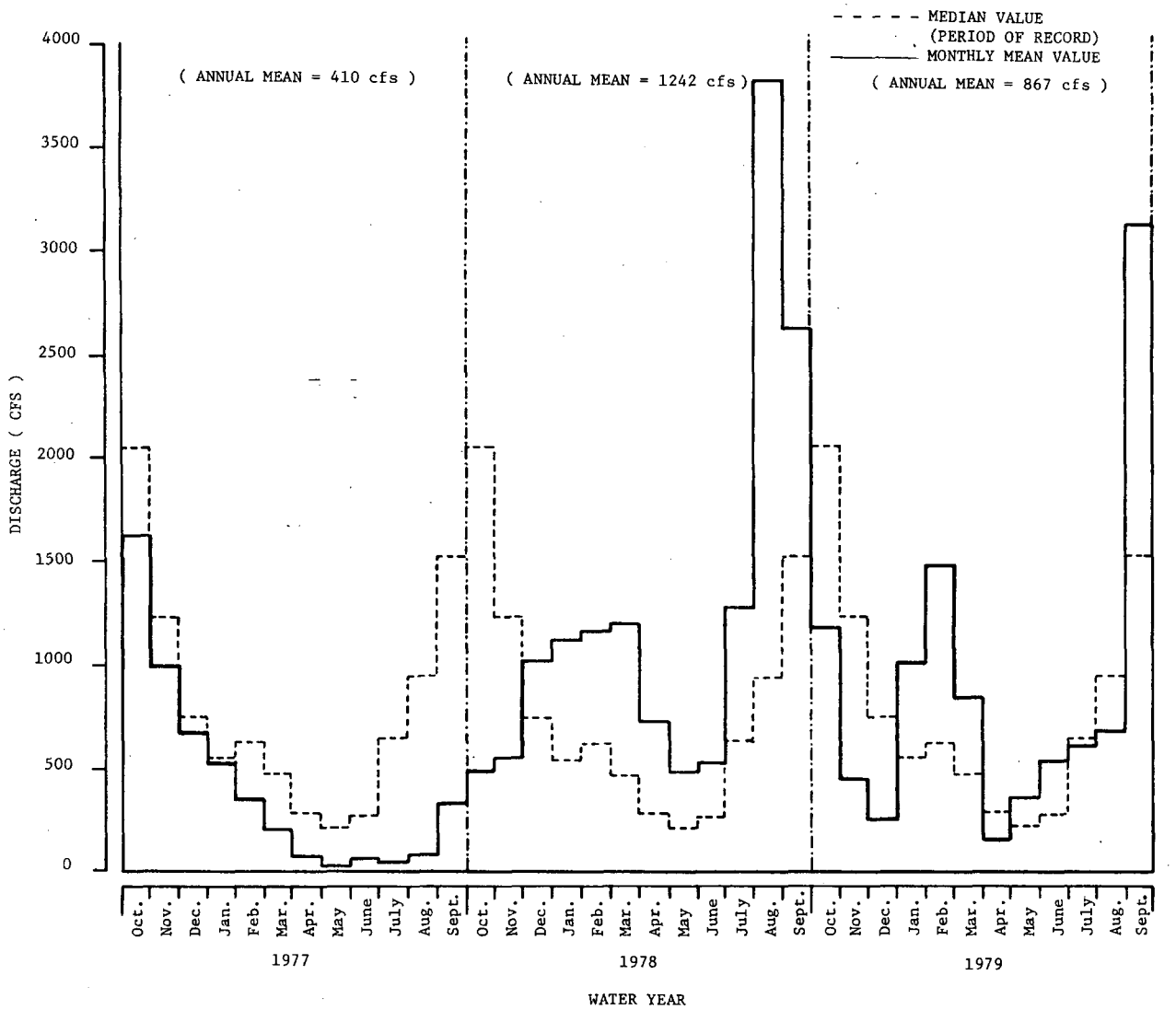

FIGURE 13. -- Streamflows, St. Johns River near Cocoa.

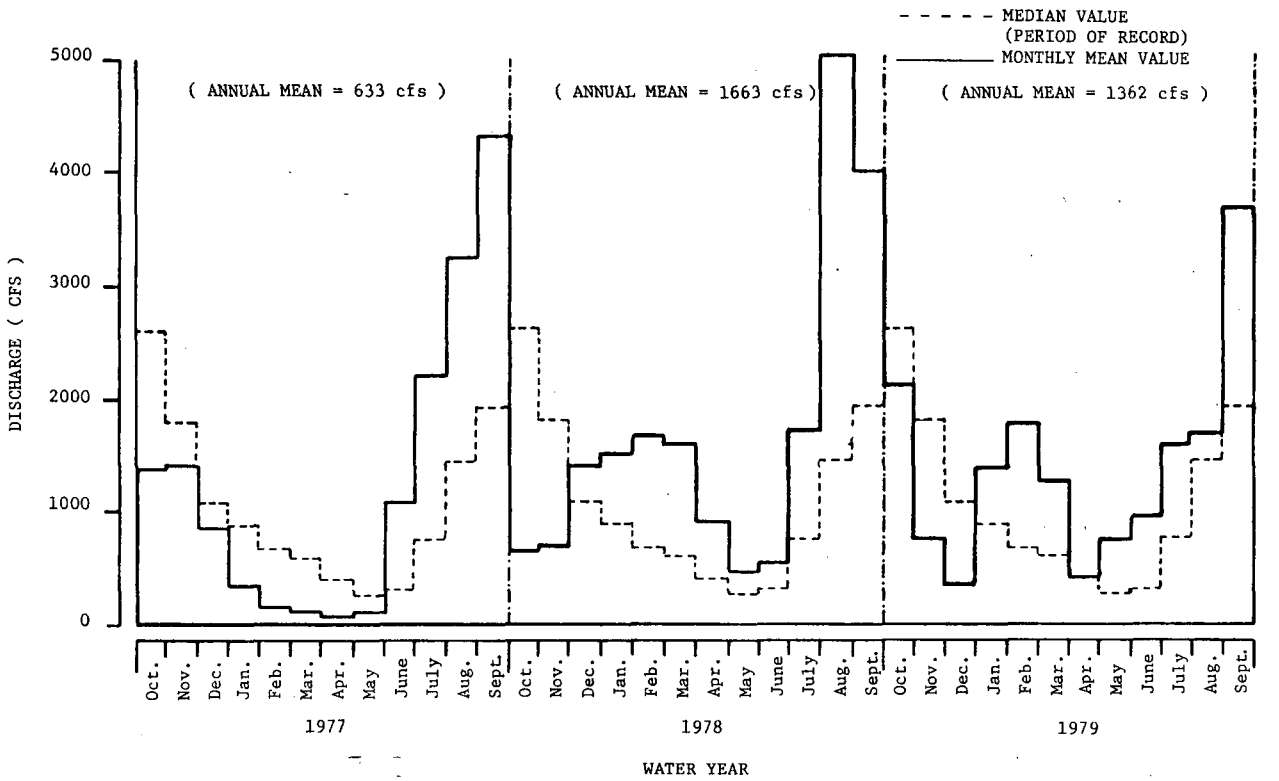

FIGURE 14. -- Streamflows, St. Johns River near Christmas.

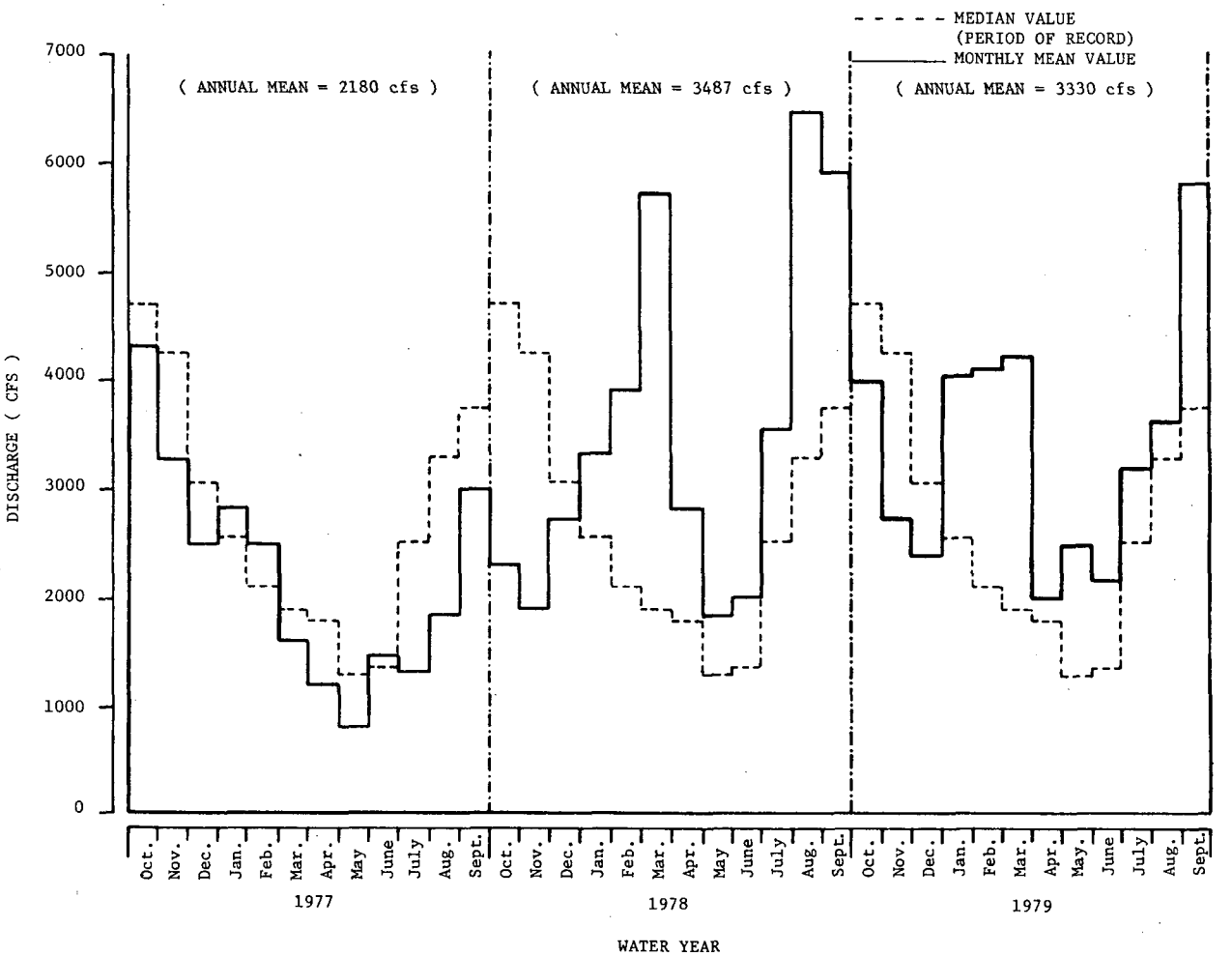

FIGURE 15. -- Streamflows, St. Johns River near Deland.

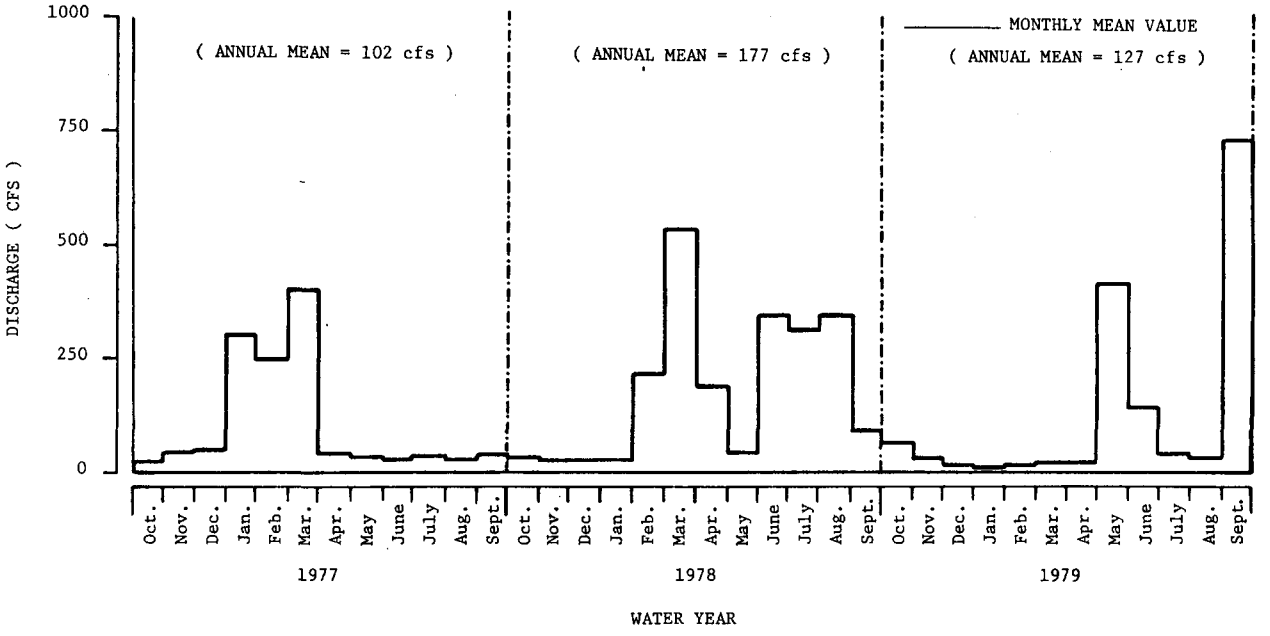

FIGURE 16. -- Streamflows, Oklawaha River at Moss Bluff.

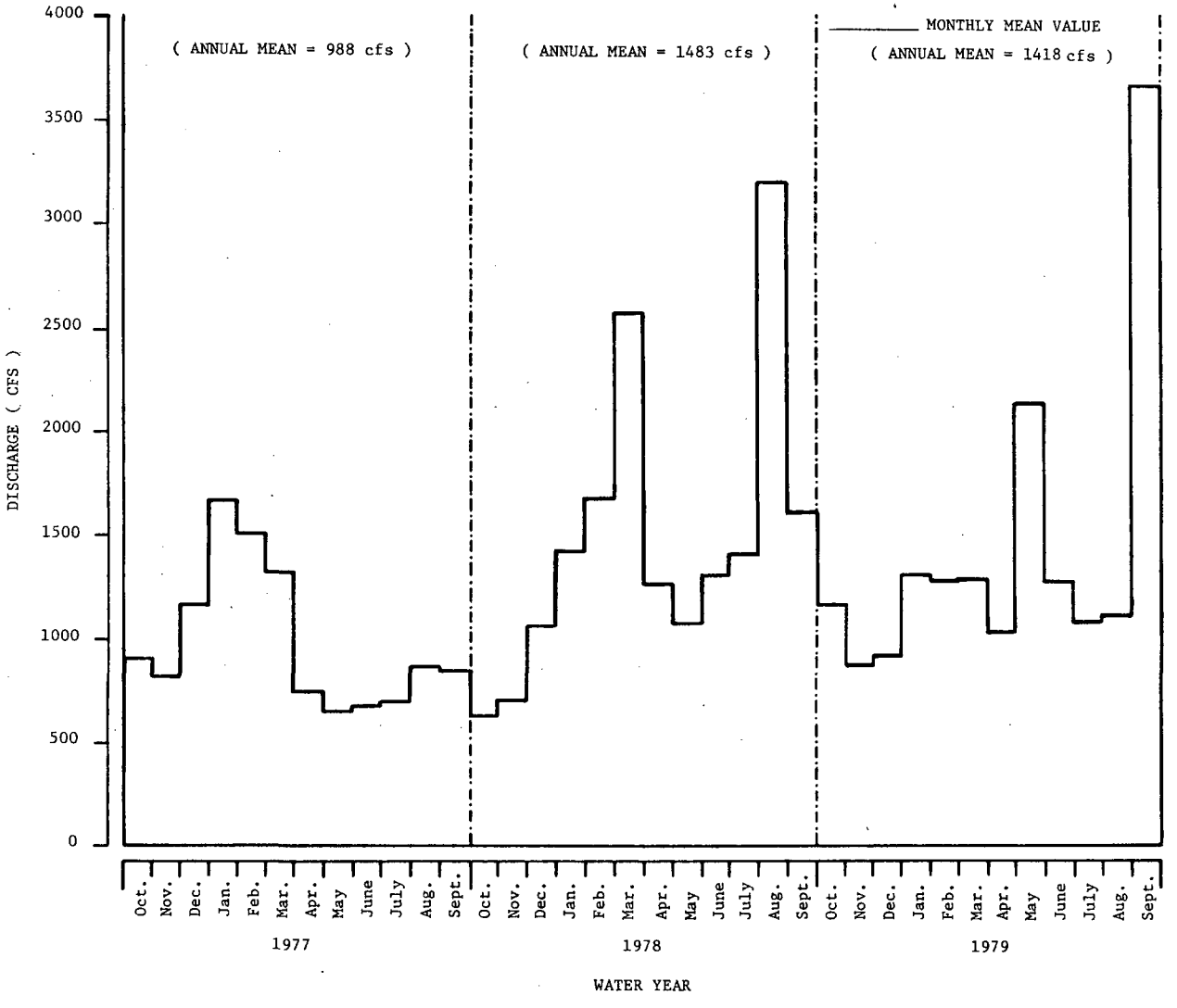

FIGURE 17. -- Streamflows, Oklawaha River at Rodman Dam, near Orange Springs.

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 1977	1978	1979
Etonia Creek at Bardin	85.4	115	107
Rice Creek near Springdale	43.6	79.8	61.8
Simms Creek near Bardin	31.9	56.6	72.8
South Fork Black Creek near Penney Farms	74.9	146	143
North Fork Black Creek near Middleburg	125	198	259
Ortega River at Jacksonville	21.5	28.1	46.6
Pablo Creek at Jacksonville	18.2	22.5	49.3

Lake elevations in the St. Johns River Basin were, for the most of the year slightly lower in Lake Washington (Figure 18) and slightly higher in Lake George (Figure 19) during 1979 water year than 1978 water year. The principal lakes in the Oklawaha River recorded slightly lower levels in the early part of the 1979 water year but recovered later on. Figures 20 through 22 show monthly elevations for Lakes Apopka, Eustis, and Griffin, respectively.

HIGH STAGE CONDITIONS DURING HURRICANES

Florida experienced three hurricanes (David, Fredrick, and Henri) during September-October 1979. Hurricane David which traversed along the east coast early in September and produced high stages in the St. Johns and the St. Marys River Basins, while hurricane Fredrick, which passed along the Gulf Coast of Florida in the later part of September, produced high stages in the Oklawaha River Basin. Hurricane Henri disintegrated into a minor storm by

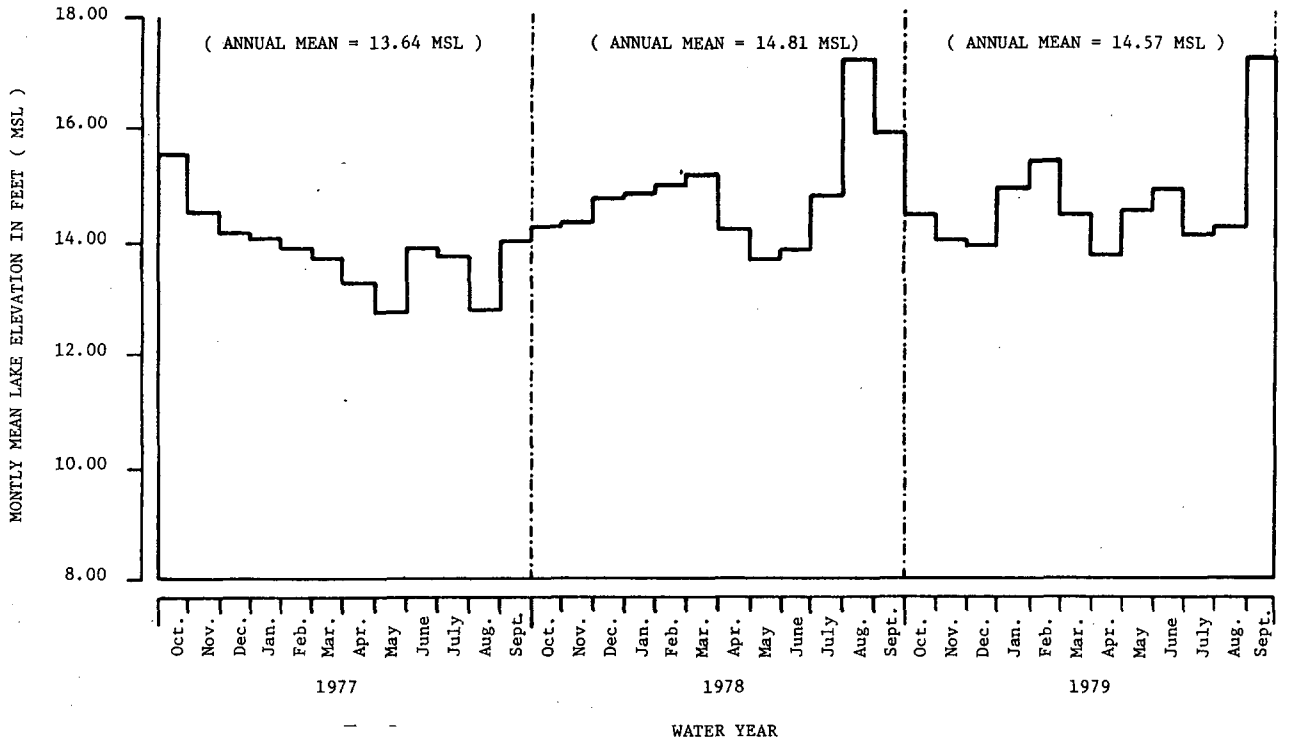

FIGURE 18. -- Elevation, Lake Washington near Eau Gallie.

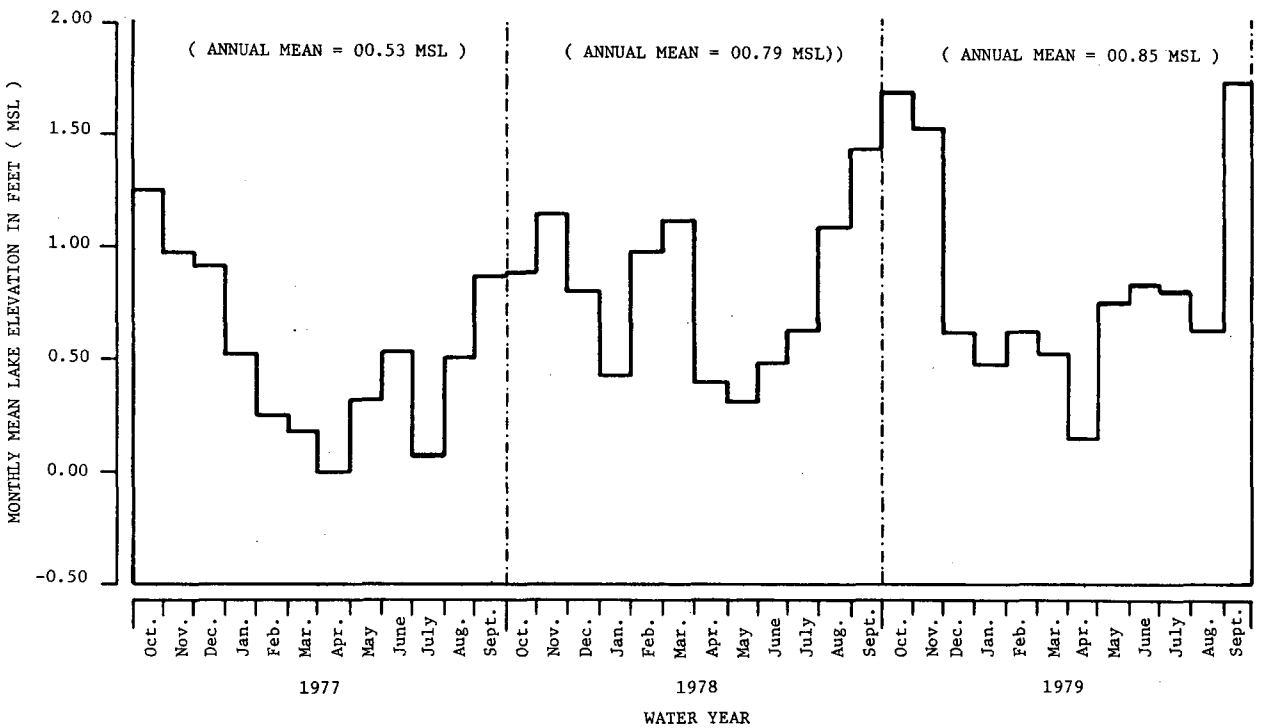

FIGURE 19. -- Elevation, Lake George near Salt Springs.

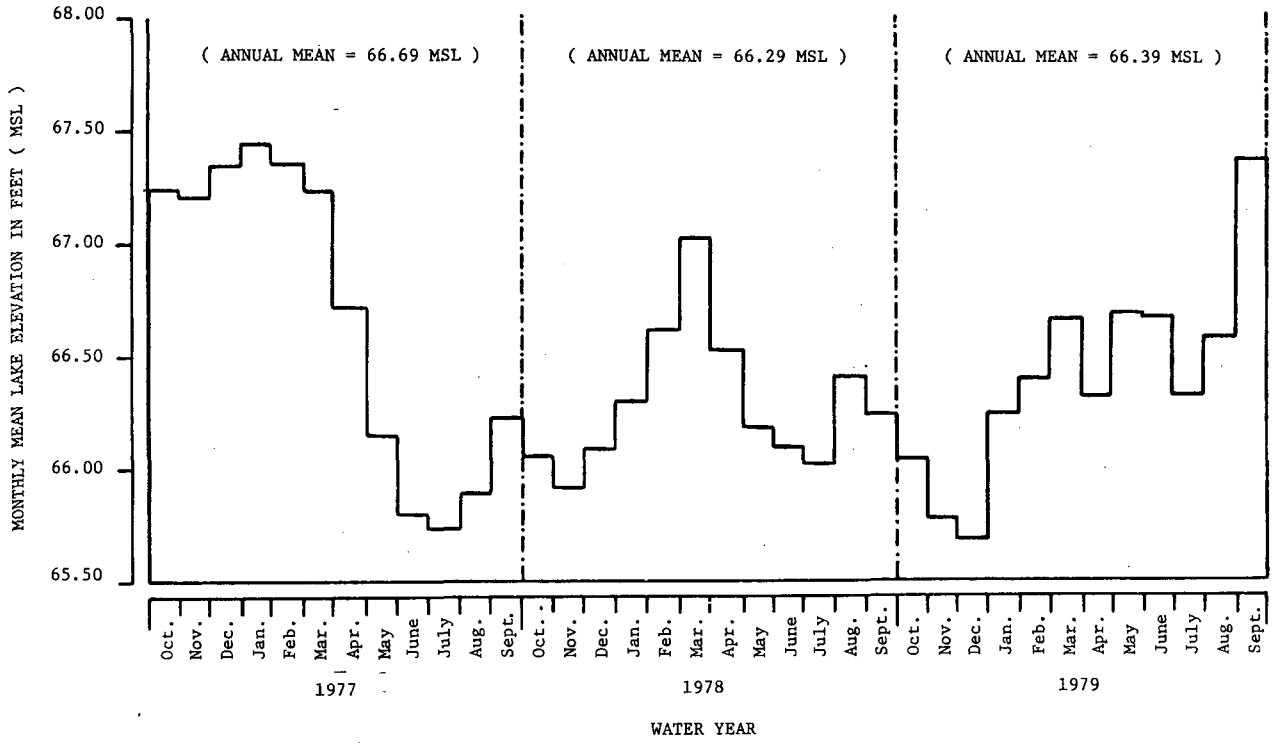

FIGURE 20. -- Elevation, Lake Apopka at Winter Garden.

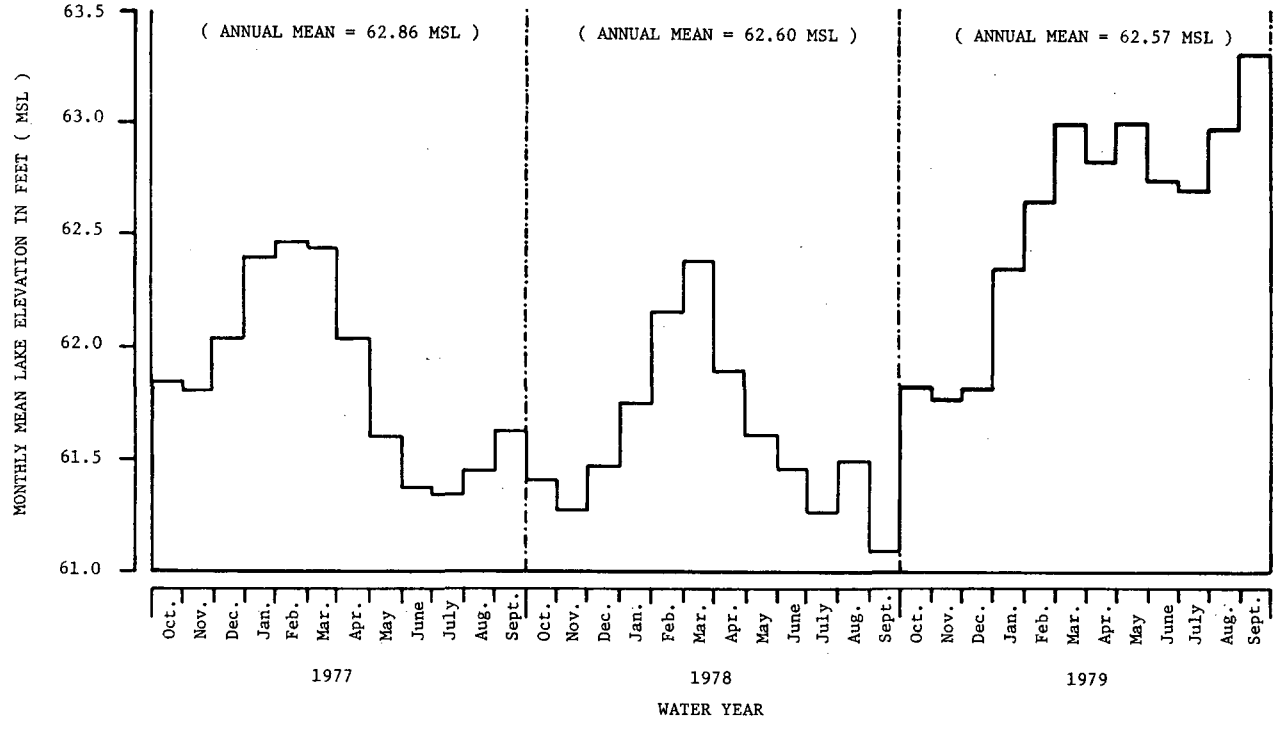

FIGURE 21. -- Elevation, Lake Eustis at Eustis

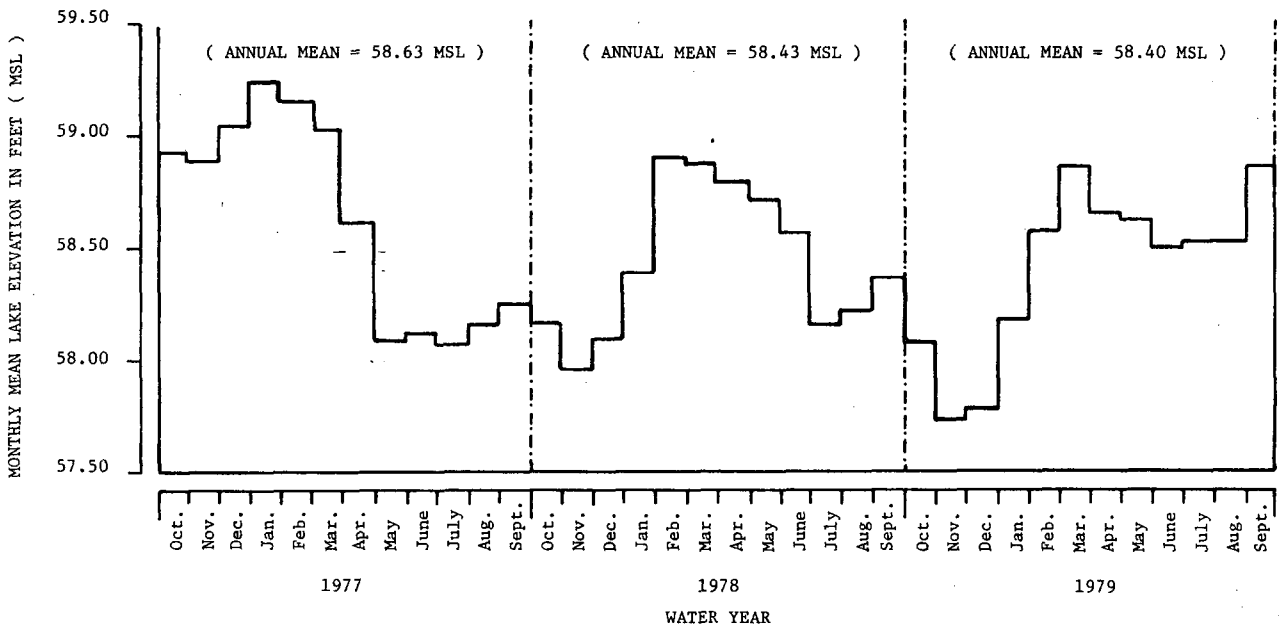

FIGURE 22. -- Elevation, Lake Griffin at Leesburg.

the time it reached Florida's Keys. In the month of September most rainfall stations in the District received precipitation ranging from two to three times the normal for the month.

To illustrate the extent of stage rises produced as a result of hurricane activity, the stages which prevailed on September 1, 1979 can be compared to the peak stages reached following the hurricanes (Table 2). While the lake levels in the Oklawaha River Basin increased approximately 1 foot, the St. Johns River rose about 2 to 4 feet and some smaller creeks such as the north fork of Black Creek rose as much as 15 feet higher than the existing stage on September 1.

TABLE 2 -- Comparison of Stages on September 1, 1979 with Peak Stages Produced by the Hurricanes of September 1979.

	Gaging Station	Gage Height/Elevation, ft. Appx. Stage On Sept. 1st	Peak Stage
1.	Blue Cypress Lake	24.30	26.01
2.	St. Johns River near Melbourne (at U.S. 192)	15.42	18.87
3.	Lake Washington	14.37	18.34
4.	Lake George	0.71	2.76
5.	Lake Apopka	66.89	67.84
6.	Lake Dora	63.04	64.28
7.	Lake Eustis	63.04	63.76
8.	Lake Griffin	58.58	59.66
9.	S. F. Black Creek near Penney Farms	1.40	12.13
10.	N. F. Black Creek near Middleburg	1.81	17.10
11.	Pablo Creek at Jacksonville	4.38	7.28
12.	Oretega River at Jacksonville	24.95	36.04
13.	St. Marys River near Macclenny	4.58	14.51

STATUS OF WATER RESOURCES INVESTIGATION AND ACTIVITIES

DEPARTMENT INVESTIGATIONS

Structural Geologic Features and Their Relationship to Salt Water Intrusion in West Volusia, North Seminole and Northeast Lake Counties, Florida

Geophysical logging techniques were used to investigate the geologic structure of the area of Florida between Lakes George and Monroe (Northeast Lake, North Seminole and West Volusia Counties) along the St. Johns River in order to determine the possible existence and location of any faulting and its relationship to salt water intrusion. The Avon Park Limestone, Ocala Limestone, Hawthorn Formation and surficial materials were investigated by use of geophysical logs, logs of test wells, cores and Florida Bureau of Geology lithologic computer printouts. Data collected during the study could not confirm the existence of other previously proposed faults in the area. Preliminary data indicate that a fault may be present between Altoona, Northeast Lake County, and Lake Dias, West Volusia County, running perpendicular to the St. Johns River.

The source of salt water contamination is probably not related to the proposed faults parallel to the St. Johns River but appears to be a function of well depth. This report is in draft and will be completed mid 1980.

Geology of the Oklawaha River Basin

Geophysical logging techniques and driller's logs from 50 wells were used to investigate the geology of the Oklawaha River Basin (portions of Lake,

Marion, Orange and Polk Counties, Florida). A hard, low porosity zone of carbonates contained within the Avon Park Limestone was traced into the Basin from surrounding counties and its existence under the entire Basin was established. In the study area the Avon Park Limestone is a carbonaceous limestone divisible into three zones (1) a lower zone with high porosity, (2) a middle zone with very low porosity, and (3) an upper zone with high porosity. The Ocala Limestone within the study area consists of relatively pure limestone and is generally high in porosity. The Hawthorn Formation can be divided into a lower unit of phosphatic carbonates interbedded with clay and an upper unit of phosphatic clay and sand. Four local structural elements were located by the use of structure contour maps of the tops of the Avon Park, Ocala and Hawthorn Formations. This report was published in March, 1979.

Upper Oklawaha River Basin Water Management Study

Part I: Lake Griffin Region Study

Water level fluctuations in Lake Griffin are regulated within a narrow elevation range of 58.00 to 59.50 feet msl for navigation as well as flood control purpose. The objective of this study was to determine the expected elevations in Lake Griffin as a result of major storm events. The procedure followed was: (1) determine the runoff generated in the lake basin for 4-day storms of return periods ranging from 2 to 100 years, (2) route the storm hydrograph through a variety of stage-discharge conditions, and (3) evaluate the peak stage, peak outflow and stage-discharge hydrographs for each condition covered.

Results generated by this study will serve as an operation manual at the Moss Bluff structure. This manual will help to determine the gate opening

required at Moss Bluff for releasing flows downstream, limiting the peak stage in Lake Griffin to a desirable elevation on the basis of 24-hour rainfall and the flows released upstream at Burrell structure. The report was published in January, 1980.

Monitoring Network

In order to supplement and update the District data base, a hydrologic monitoring network is operated and maintained. Ground water levels, lake stages, and rainfalls are monitored at selected locations throughout the District. This program is in a preliminary stage. The scope of the monitoring network is being modified or expanded according to the changing data needs of the District.

District Observation Well Network (DOWN Program)

In some areas of the District, very little hydrologic information is available on one or more of the aquifers present. To provide data for sound water management decisions in these areas, the DOWN Program was instituted during the 1979 water year. Permanent observation wells are drilled and instrumented for the collection of water level and water quality data. At some locations, pumping tests will be run to determine aquifer characteristics. Upon completion, these observation wells are included in the District monitoring network.

The Hydrologic Investigation of the Potentiometric High Centered About the Crescent City Ridge, Putnam County, Florida

An investigation of the potentiometric high centered about the Crescent City Ridge in southeast Putnam County, Florida was conducted for the 1978

water year (October 1977 through September 1978). The elevation and shape of the underlying limestones, ample precipitation, and the ability of the surficial sand deposits to hold water for eventual recharge to the Floridan aquifer, contribute to the formation of the potentiometric high.

Ground water flows down gradient from the center of the potentiometric high to the east and west, with discharge occurring in Crescent Lake and the St. Johns River. Potentiometric levels range from nearly 40 feet above msl along the ridge to approximately 10 feet above mean sea level at the ridge margins. A pumping test of the Floridan aquifer produced an average value of 126,000 gal/day/ft for transmissivity and 3.5×10^{-4} for the storage coefficient.

Water quality sampling showed that the Floridan aquifer contains water of excellent quality with chloride concentrations of less than 25 mg/l. However, water in the Floridan aquifer near the St. Johns River was found to be of much poorer quality, indicating that the western margin of the ridge is influenced by ground water discharge from outside the area or from deeper within the aquifer.

A water balance for the area was determined for the 1978 water year and recharge to the Crescent City Ridge was estimated to be approximately 30 million gallons per day. This report is in final draft form and will be published in early 1980.

Investigation of Ground Water Resources and Salt Water Intrusion in the Coastal Areas of Northeast Florida

Ground water resources and salt water intrusion in the coastal areas of northeastern Florida were evaluated. Aquifer characteristics were

determined for the three systems occurring in the study area, namely, the Floridan, secondary artesian, and shallow aquifers. Water levels and water quality were periodically measured for each aquifer. Available potable water resources in the Floridan aquifer were estimated using safe yield approximations.

Trilinear plotting, Stiff patterns, and factor analysis were used to interpret water quality data which aided in establishing the origin and distribution of chemical constituents found in waters of the various aquifers. Cross sections and a fence diagram were also used to illustrate the location of the 250 and 1,000 mg/l chloride interfaces.

Within the project limits, five "areas of vital concern" were delineated. These areas specifically address the problems associated with high water use and recognize the potential for water quality deterioration in the shallow, secondary, and artesian aquifers. This report will be published in February, 1980.

Streamflow Frequency Analysis

The task of establishing low flows and flood flows for the District's Water Resource Management Plan and for use in developing permit criteria has led to an investigation of methods used to forecast long term hydrologic events. In order to determine the most applicable statistical method for calculating low flows and flood flows within the District from existing data, a comprehensive study of commonly used 2-parameter and 3-parameter probability distribution was performed. Some new concepts and innovative methods have evolved as a result of this research. For a wider dissemination of this new knowledge as well as for inviting the opinion/criticism of the general pro-

fession on these new methods, it has been decided to publish the work as a series of papers in the Journal of the Hydraulics Division, ASCE. Two of the papers in this series entitled, 1. Log Pearson Type 3 Distribution: A Generalized Evaluation, and 2. Log Pearson Type 3 Distribution: The Method of Mixed Moments (written by Dr. D. V. Rao) are scheduled for publication in the summer of 1980.

Upper St. Johns River Basin Study (SJHM)

The Upper St. Johns River Basin hydrologic model (SJHM) was completed and calibrated. This model was used to predict the hydrologic response of the basin under existing conditions during various storm events. With the entire basin divided into seven planning units and sixty sub-basins, the model will be able to simulate any proposed alternative water management plan. This model will be refined to evaluate or to plan alternative designs for flood stage reduction and for maintenance of stage fluctuations which reflect natural conditions. The SJHM can also be used to develop a regulation schedule consistent with sound water management. Designs will be developed with consideration given to structural and non-structural approaches which produce the desired hydrological conditions.

A comprehensive study of the existing basins' hydrologic system was included in the Phase I report of the Upper St. Johns River Surface Water Management Plan. Both historical data and simulated results obtained using the SJHM were included in the plan.

Investigation of Flood Irrigation Practices

The Department has become involved in a study with the Resource Planning Department to evaluate the current practice of flood irrigation in citrus groves. The project was specifically designed for the purposes of: documenting the irrigation procedure, quantifying irrigation water requirements during normal and extreme rainfall conditions, determining irrigation application efficiency and gathering any other pertinent information.

A complete climatological data monitoring station was installed at the study area; located in Indian River County. Eight stream gaging stations were installed in the irrigation canals and will be used to determine quantities of irrigation water used during each irrigation cycle.

Ground water and soil moisture monitoring equipment were also installed in cooperation with the University of Florida, Institute of Food and Agricultural Sciences (IFAS). It is expected the study will continue for two citrus growing seasons to obtain the necessary data. A final report will be prepared.

Adoption of Several Computer Models for Application to St. Johns River Water Management District

Several generalized hydrologic computer models are in vogue throughout the country. These include HEC programs of Army Corps of Engineers, TR-20 of Geological Survey, SWMM of EPA and several others developed by Universities and Governmental Agencies. Whenever applicable, the use of such programs saves time in computer programming efforts. However, since the District's computer capabilities are limited, certain modifications are required to be made in the program statements before they can be used. So far, three major programs,

namely, HEC-1, HEC-2, and TR-20 have been acquired and have been modified for use on the District's computer. HEC-2 was used in the Upper St. Johns River Basin and other minor studies. HEC-1 and TR-20 will be used in modelling the St. Marys and Econlockhatchee River Basins during the next fiscal year.

Special Hydrologic and Engineering Investigations

Several investigations were conducted, and reports were prepared to address particular problems due to special circumstances. Two investigations completed this fiscal year are described as follows:

1. Middle St. Johns River Flood Stage Analysis - this study utilizes historical data coupled with statistical methods to determine flood stages of different return intervals (in years). This study was necessitated by a number of questions which resulted from the recent high water levels produced by heavy rainfall.
2. Tosahatchee Restoration - The Engineering Division designed and coordinated implementation activities of Phase I Tosahatchee restoration project. This project is a coordinated effort with the Department of Natural Resources to restore the natural water course of Taylor Creek. By accomplishing this task, the flood plain system of the St. Johns River, near the Tosahatchee Game Preserve will be properly utilized.

Upper St. Johns River Basin Project

The Upper St. Johns River Project includes in part seven counties of east central Florida extending from south of Lake Harney in Volusia County

south to State Road 68 in St. Lucie County. The east and west boundaries reflect hydrological conditions based on the St. Johns River Basin.

Alterations to this area by both urban and agricultural interest have resulted in detrimental impacts on the physical, chemical and biological characteristics of the area.

Involvement in this project has been to identify the chemical and biological characteristics of the study area. Through this process, the impact of land use changes on the ecosystem are identified. Identification of these impacts will allow for a more efficient evaluation of future management alternatives and provide insight as to how the system may be improved. Additional Department involvement in this project is discussed under Upper St. Johns River Basin Study (SJHM).

Water Quality Laboratory

The laboratory has been designed to meet the current needs of all the departments within the District by providing project support in the form of water quality analysis. Projects which utilized the laboratory include; Saltwater Intrusion Study, Hydrologic Investigation of the Crescent City Area and A.S.C.S. Well Plugging Project. Based on current project demands, the following analyses are available: hardness, alkalinity, solids (dissolved and suspended), nutrients (except nitrogen), and physical parameters (i.e. conductivity and temperature). Laboratory capabilities will be expanded to include nitrogen analysis upon arrival of the auto analyzer.

298 Drainage District/Interbasin Diversion Study

This project is an initial step toward monitoring the activities of the 298 Drainage Districts and ensuring the consistency of their plans with "The Water Resources Act of 1972."

The interbasin diversion study was designed as a subproject of the 298 Drainage District Survey since many districts utilize interbasin diversion. Interbasin diversion refers to the diverting of surface water from one basin to another. The purpose of this study is to gather information on the amount and effect of interbasin diversion from the St. Johns River. Preliminary flow measurements and water quality samplings were done during this year as the study began in October 1979. The sampling was done to monitor the effect of large discharges into the Indian River as a result of the high water conditions which were caused by hurricanes David and Fredrick.

Jane Green Study

This project was designed to identify the potential impacts associated with upland detention of floodwaters. In developing a regulation schedule for the proposed Jane Green Detention Area located in the Upper St. Johns River Basin, a detailed survey of the system's flora and fauna was conducted. Species composition of the macrophytic community was identified along a series of transects. A detailed survey of land surface elevations associated with the floodplain community was completed to facilitate a prediction of impacts associated with various water depths. The Jane Green report is scheduled to be released in middle 1980.

Aquatic Weed Control

Herbicide spraying for control of nuisance plants was reduced this year as compared to the FY 1977-78. The decrease in spraying was partly due to a moratorium on 2-4,D applications during June and July. Local officials' concern over herbicide levels in Lake Washington, Melbourne's public water supply, was the basis for the moratorium. Investigation of this concern by the District revealed no detectable concentrations in the water.

Apparently due to less than optimum environmental conditions, the growth and spread of water hyacinths was reduced this year inspite of a less intensive spraying program. However, subjugation of hyacinths allowed for water lettuce to proliferate. Additional concern was caused by the District's proposal to use a new herbicide (Diquat) that would kill both hyacinth and water lettuce. A test spraying of Diquat demonstrated pesticide levels dropped rapidly after application. The District took additional safeguards by contributing to the purchase of testing equipment for Melbourne which allows them to monitor 2-4,D and Diquat levels.

COOPERATIVE ACTIVITIES

Agricultural Stabilization and Conservation Services/Soil Conservation Service

The cooperative program with these agencies involves the partial plugging of agricultural artesian wells to reduce saline contamination resulting from upconing of saline water in a single aquifer or from the exchange of saline water between aquifers. The District provides technical assistance by geophysically logging wells and writing well plugging specifications, while the other agencies provide services such as funding for well plugging.

This program has proven to be very successful, and a paper entitled "Improvement of Water Quality Through a Cooperative Well Plugging Program" was prepared and released as Water Resources Department Information Circular No. 2. The paper is available to all interested parties.

Florida Bureau of Geology

The Bureau of Geology continued to develop geologic logs from core borings in their inventory, along with geologic cross-sections, and top of rock and structure contour maps for selected areas in the District. These tasks were accomplished through District funding of the part-time services of a Florida State University geology graduate student working under the supervision of the Bureau.

Currently, a map illustrating the top of the Eocene Limestone is in final phases of drafting and will be available in mid 1980.

U. S. Geological Survey

The cooperative program with the U. S. Geological Survey for the 1979 water year consisted of three parts: network data collection, semi-annual potentiometric mapping, and technical assistance. Network data collection included the monitoring of 38 surface water stations, 20 lake stations, and 42 ground water sites in the Greater St. Johns River Basin. In the Oklawaha River Basin, network data collection included 13 surface water gaging stations, 17 lake stations, and 12 ground water sites. Data were collected in May and September for compilation of District potentiometric maps. Data for these maps were collected from more than 670 ground water monitoring sites. Finally, technical assistance provided by the USGS included special data information

requests, technical report review, and technical seminars concerning advances in water resource evaluation techniques.

Test Drilling Report of Northwest Volusia County

In a continuing effort to collect hydrological data necessary for proper water resource management, the Water Resources Department of the St. Johns River Water Management District entered into a cooperative agreement to test drill and construct five observation wells for the U. S. Geological Survey in the vicinity of Pierson, Florida. The information collected from the construction along with the ability to observe artesian water levels of the Floridan aquifer on a continuing basis aids the USGS and the District in assessing the hydrologic impact of the large withdrawals of ground water used for the protection of ornamental ferns during the below freezing temperatures. The information mentioned above is available in Technical Memorandum No. 1, Test Drilling Report of Northwest Volusia County.

FIELD STATION ACTIVITIES

The Field Services Division of the Water Resources Department is located in Melbourne. This division is responsible for the maintenance and operation of District water control structures, navigation structures and appurtenant works in the Upper St. Johns River Basin and the Oklawaha Basin. Division activities include structure operation, data collection, aquatic weed control, and maintenance and repair of grounds, buildings, structures, rights-of-way and equipment.

As part of the levee maintenance program, approximately 6,500 acres were mowed. A total of 2,520 cubic yards of shoal material were removed at C-54. In excess of 51,650 cubic yards of fill were moved and placed on the levee system to repair damage done by erosion. Structure riprap was sprayed and cleaned of brush and small trees. Fence repair along District property boundaries totaled 45 miles. A hydraulic cyclinder vital to the operation of structure S-96 was replaced. All work which was scheduled for the Tosahatchee Game Preserve area was completed, restoring the natural flow of Taylor Creek Floodway.

In the Oklawaha River Basin, major improvements to the residence building at the Burrell structure were completed. At the Apopka-Beauclair structure, the boat house was repaired and a new cement floor poured. This building was improved for the purpose of needed storage space. Boat lockages for the 1979 water year totaled 518 for Apopka-Beauclair, 6,441 for Burrell and 1,793 for the Moss Bluff Structure.

Aquatic weed control within the St. Johns River totaled 155.5 acres treated with 152 gallons of Weedar-64. Aquatic control was also performed in Canal 54, and a hyacinth barrier at the north end of Lake Washington was maintained. Oklawaha River basin aquatic weed control program totaled 31.75 acres treated with Diquat, and maintenance to the hyacinth barrier at the north end of Lake Apopka was performed.

REFERENCES

Brevard County Planning Department, 1979. Area-wide waste treatment management plan, draft final report.

Florida Department of Natural Resources, 1970. Chloride concentration in water from the upper part of the Floridan aquifer: Florida Department of Natural Resources, Bureau of Geology Map Ser. 12 (revised).

U. S. Weather Bureau, 1977 and 1978. Climatological data, Florida, October 1977-September 1978: U. S. Department of Commerce, National Climatic Center, Ashville, North Carolina.

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.

APPENDIX B

The following Water Resources Department publications are available through the Public Information Office of the St. Johns River Water Management District.

INFORMATION CIRCULARS

Information Circular No. 1 - Annual Report of Hydrologic Conditions and Water Resources Activities--1977 Water Year-March 1978.

Information Circular No. 2 - Improvement of Water Quality Through A Cooperative Well Plugging Program - August 1978.

Information Circular No. 3 - Annual Report of Hydrologic Conditions and Water Resource Activities--1978 Water Year - March 1979.

Information Circular No. 4 - Salt Water Intrusion in Coastal Aquifers: A Bibliography - February 1980.

Information Circular No. 5 - Annual Report of Hydrologic Conditions and Water Resource Activities--1979 Water Year - February 1980.

TECHNICAL REPORTS

Technical Report No. 1 - Geology of the Oklawaha Basin - March 1979.

Technical Report No. 2 - Saline Contamination of A Limestone Aquifer By Connate Intrusion in Agricultural Areas of St. Johns, Putnam, and Flagler Counties, Northeast Florida - July 1979.

Technical Report No. 3 - Investigation of Ground Water Resources and Salt Water Intrusion in the Coastal Areas of Northeast Florida - February 1980

Technical Report No. 4 - Summary of the Hydrology of the Upper Etonia Creek Basin - November 1979.

Technical Report No. 5 - Hydrologic Investigation of the Potentiometric High Centered About the Crescent City Ridge, Putnam County, Florida - 1980

Technical Report No. 6 - Upper Oklawaha River Basin Water Management Study, Part I: Lake Griffin Region Study - November 1977.

Technical Report No. 7 - Structural Features and Their Relationship to Salt Water Intrusion in West Volusia, North Seminole, and Northeast Lake Counties, Florida - 1980

TECHNICAL MEMORANDUM

Technical Memorandum No. 1 - Test Drilling Report of Northwest Volusia County - May 1979

Technical Memorandum 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 - July 1979.