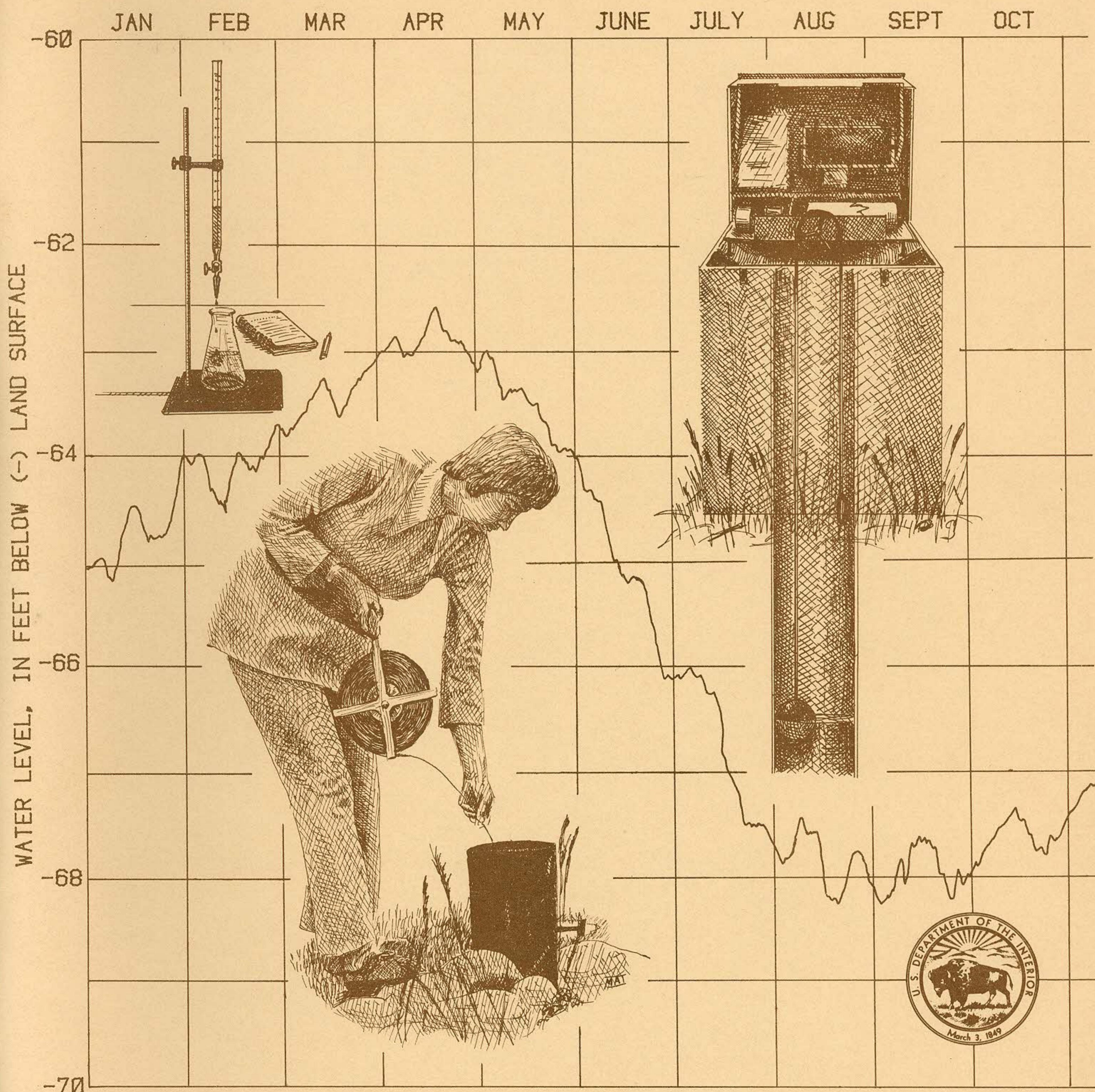


C.N. JOINER

GROUND-WATER LEVELS AND QUALITY DATA FOR GEORGIA, 1977



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GROUND-WATER LEVELS AND QUALITY DATA

FOR GEORGIA, 1977

Open-File Report 79-213

Prepared in cooperation with the
Georgia Department of Natural Resources
Geologic and Water Resources Division

Doraville, Georgia

October 1978

UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, Secretary

GEOLOGICAL SURVEY

H. William Menard, Director

Open-File Report 79-213

For additional information write to:

U.S. Geological Survey
Suite B
6481 Peachtree Industrial Boulevard
Doraville, Georgia 30360

PREFACE

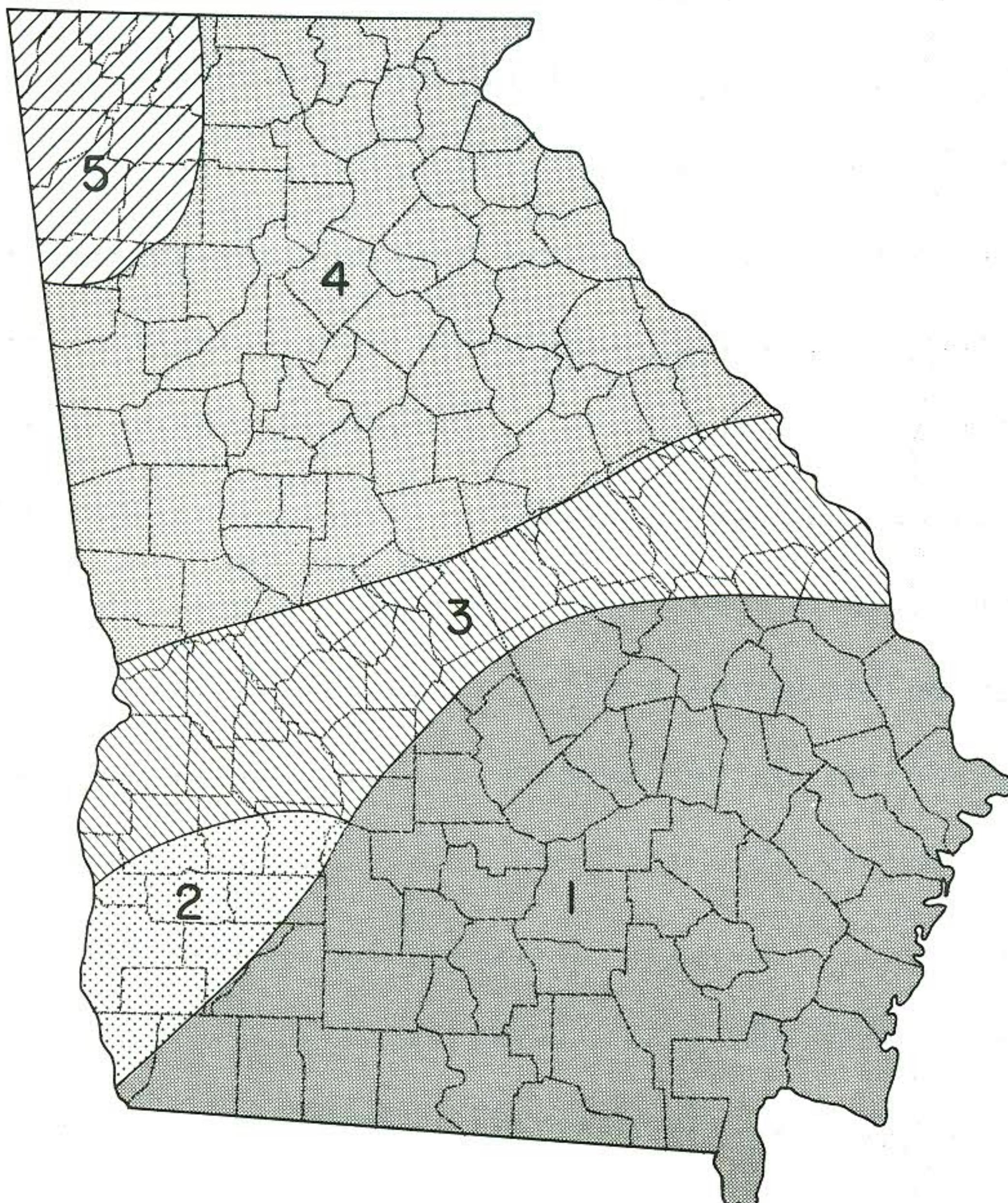
This report was prepared by personnel of the Georgia District of the Water Resources Division of the U.S. Geological Survey. It was done in cooperation with the State of Georgia; Chatham County; Glynn County; the cities of Brunswick and Valdosta; and the Albany Water, Gas and Light Commission.

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM (SI) UNITS

<u>Multiply inch-pound units</u>	<u>By</u>	<u>To obtain SI units</u>
Foot (ft)	0.3048	meter (m)
Gallon per minute (gal/min)	0.06309	liter per second (L/s)
Million gallon per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
	28.32	liter per second (L/s)
		Specific capacity
Gallon per minute per foot of drawdown [(gal/min)/ft]	0.207	liter per second per meter [(L/s)/m]
		Transmissivity
Foot squared per day (ft^2/s)	0.0929	meter squared per day (m^2/d)

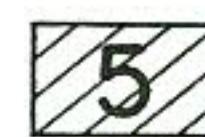
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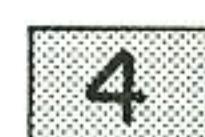


GROUND WATER RESERVOIRS

RESERVOIRS AND WELL YIELDS



Massive dolomite—yields 5–50 gpm,
maximum reported yield 1000 gpm.
Limestone, sandstone, mudstone,
chert—yields 1–20 gpm, maximum
reported yield 50–300 gpm



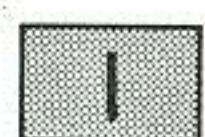
Principally granite, gneiss, and meta-
sediments—yields 1–25 gpm, maxi-
mum reported yield 400 gpm



Sand and gravel—yields 50–1200 gpm,
maximum reported yield 1800 gpm
(Cretaceous)



Sand and limestone—yields 250–600
gpm, maximum reported yield 1400
gpm (Clayton Limestone—lower
Tertiary)



Limestone and sand—yields 1000–5000
gpm, maximum reported yield 11,000
gpm (principal artesian aquifer)

1.0 INTRODUCTION

A New Format, Combining Text and Graphics in Two-Page Units

This report begins a publication format that will present annually both water-level and water-quality data. In this format the information is presented in two-page units: the left page includes text which summarizes the information for an area or subject and the right page consists of one or more illustrations. Daily mean water-level fluctuations and trends are shown in hydrographs for the previous year and fluctuations for the monthly mean water level the previous 10 years for selected observation wells in Georgia. The selected wells best illustrate the effects of changes in recharge and discharge in the various ground-water reservoirs in the State. A short narrative explains fluctuations and trends in each hydrograph.

Monitoring ground-water levels is essential to the understanding of storage changes and other changes in a ground-water reservoir. Fluctuations and long-term trends in water levels occur as a result of recharge to and discharge from the reservoir, or aquifer. Varying rates of recharge occur chiefly as a result of varying rates of precipitation, evapotranspiration, and surface-water infiltration into the ground-water reservoir. Discharge occurs as natural flow from the aquifer to streams and springs, direct ground-water evapotranspiration, and as manmade withdrawal from wells.

Ground-water levels have been monitored in Georgia for at least a hundred years. Most of the data gathered were used in areal reconnaissance studies, and published, usually as tables, with a few graphs of water-level trends.

These data had limited value, especially considering the often large amount of time between the data collection and publication of the data. With the advent of continuously monitoring recorders and computer processing of data, this information can now be presented to the user in an understandable and timely manner.

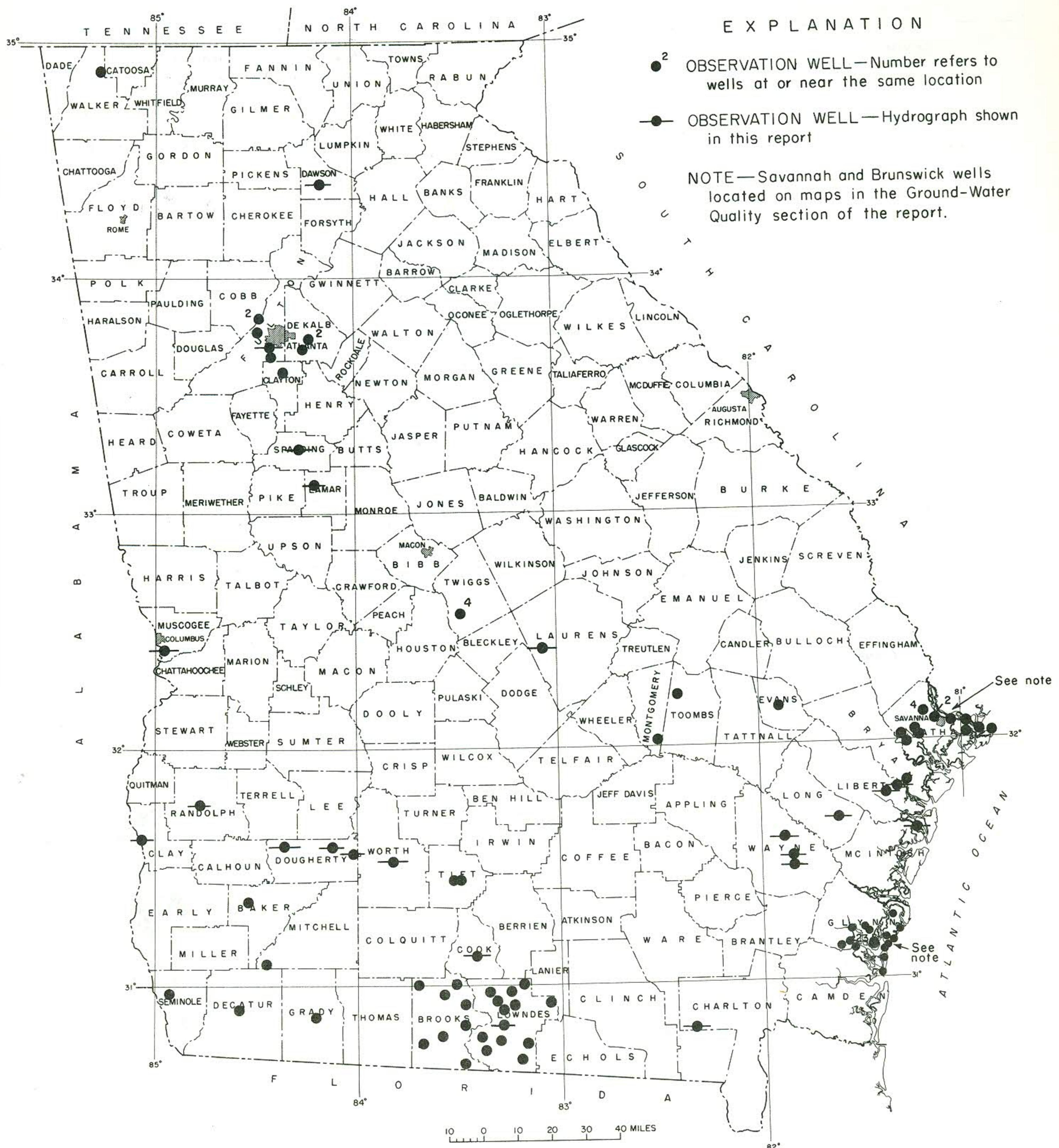
2.0 WATER-LEVEL MEASUREMENT PROGRAM, 1977

More than 2,000 water-level measurements made in Georgia in 1977 provided the basic data for this report.

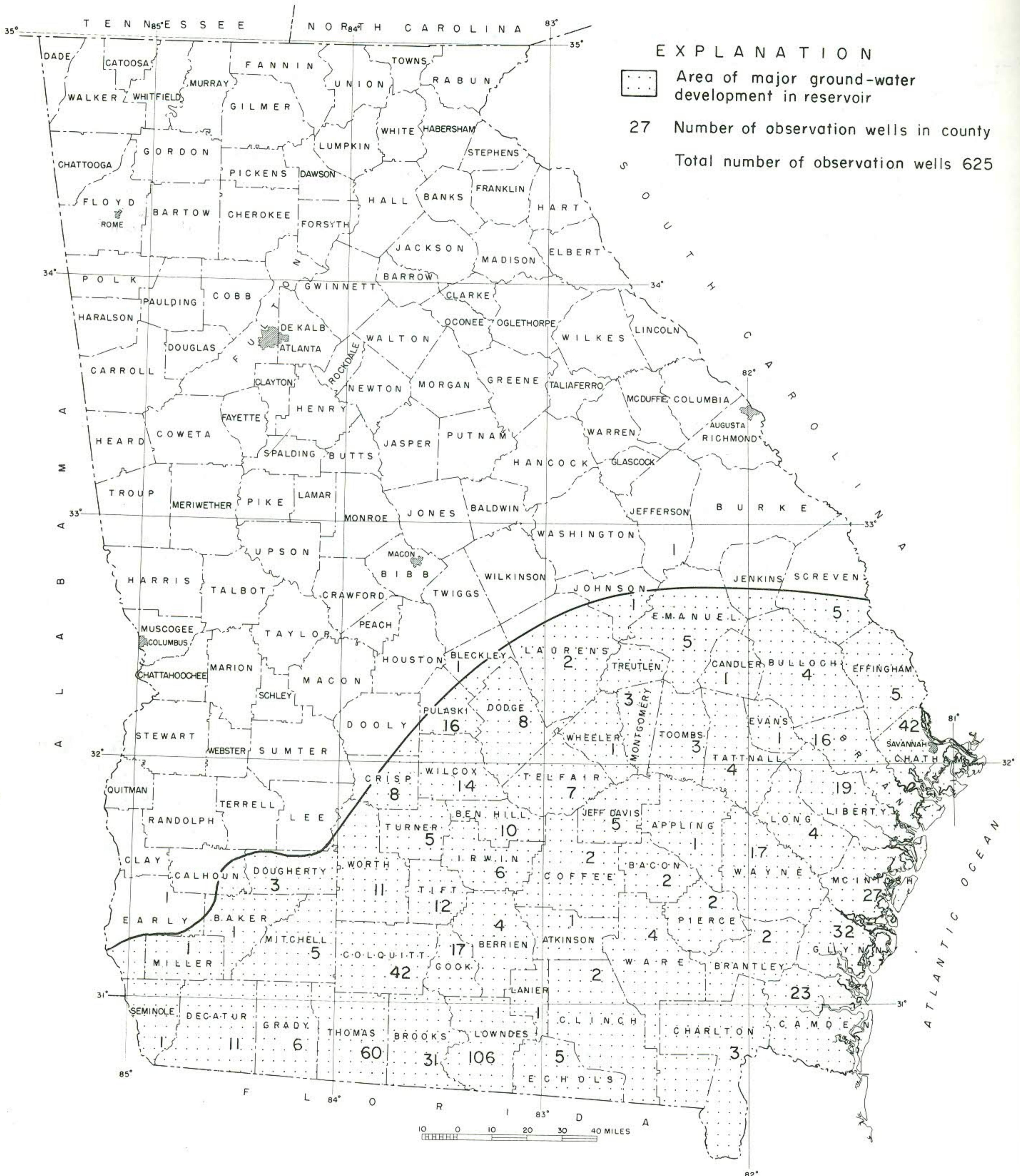
2.1 Locations of Observation Wells and Availability of Data

As part of the cooperative ground-water investigations undertaken by the U.S. Geological Survey and the State of Georgia, a statewide water-level measurement program to monitor long-term trends was inaugurated in 1938. This program initially consisted of an observation well network to provide long-term data on the amounts of ground water in storage in the coastal area. Other wells were added in areas where changes in water levels might forewarn of potential water-quality problems.

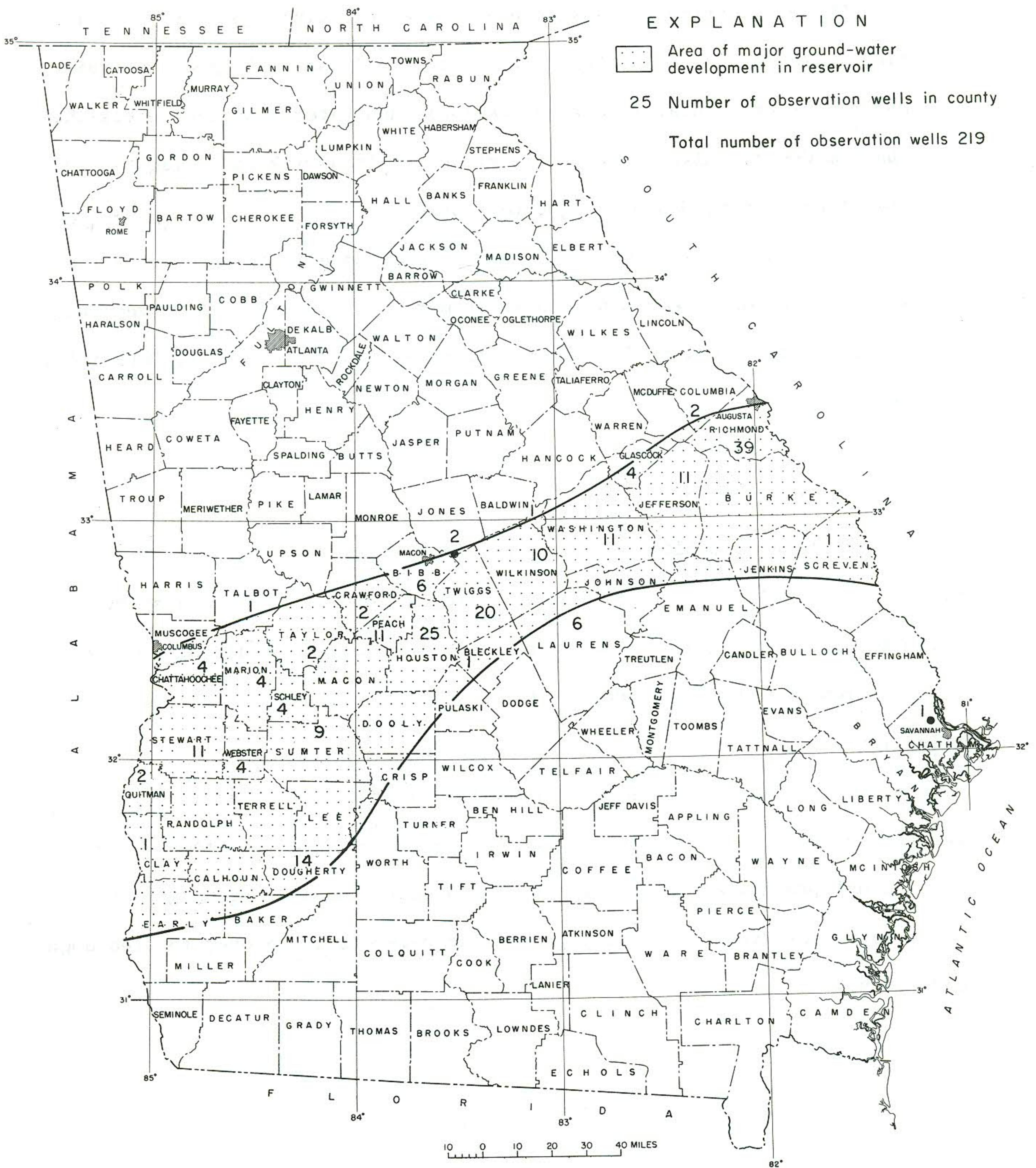
Additional networks became necessary to obtain detailed water-level data for a generalized appraisal of the State's ground-water resources. Two of these networks have been established to provide data for water-level maps for the principal artesian aquifer and the Cretaceous aquifer system. Water-level data are collected for each of these systems on an alternate-year basis so that a map for each system will be available every 2 years.



Location of observation wells showing long-term trends in water levels



Ground-water level network for reservoir I (principal artesian aquifer)



Ground-water level network for reservoir 3 (Cretaceous aquifer system).

The cooperation and assistance of the following agencies in collecting water-level data during 1977 is gratefully acknowledged: Georgia Department of Natural Resources, Geologic and Water Resources Division; Chatham County; Glynn County; the cities of Brunswick and Valdosta; and the Albany Water, Gas and Light Commission.

Records of all water-level measurements made in these observation wells may be obtained upon request from the U.S. Geological Survey, Water Resources Division, 6481 Peachtree Industrial Blvd., Suite B, Doraville, GA 30360.

3.0 CHANGES IN WATER LEVELS, 1977

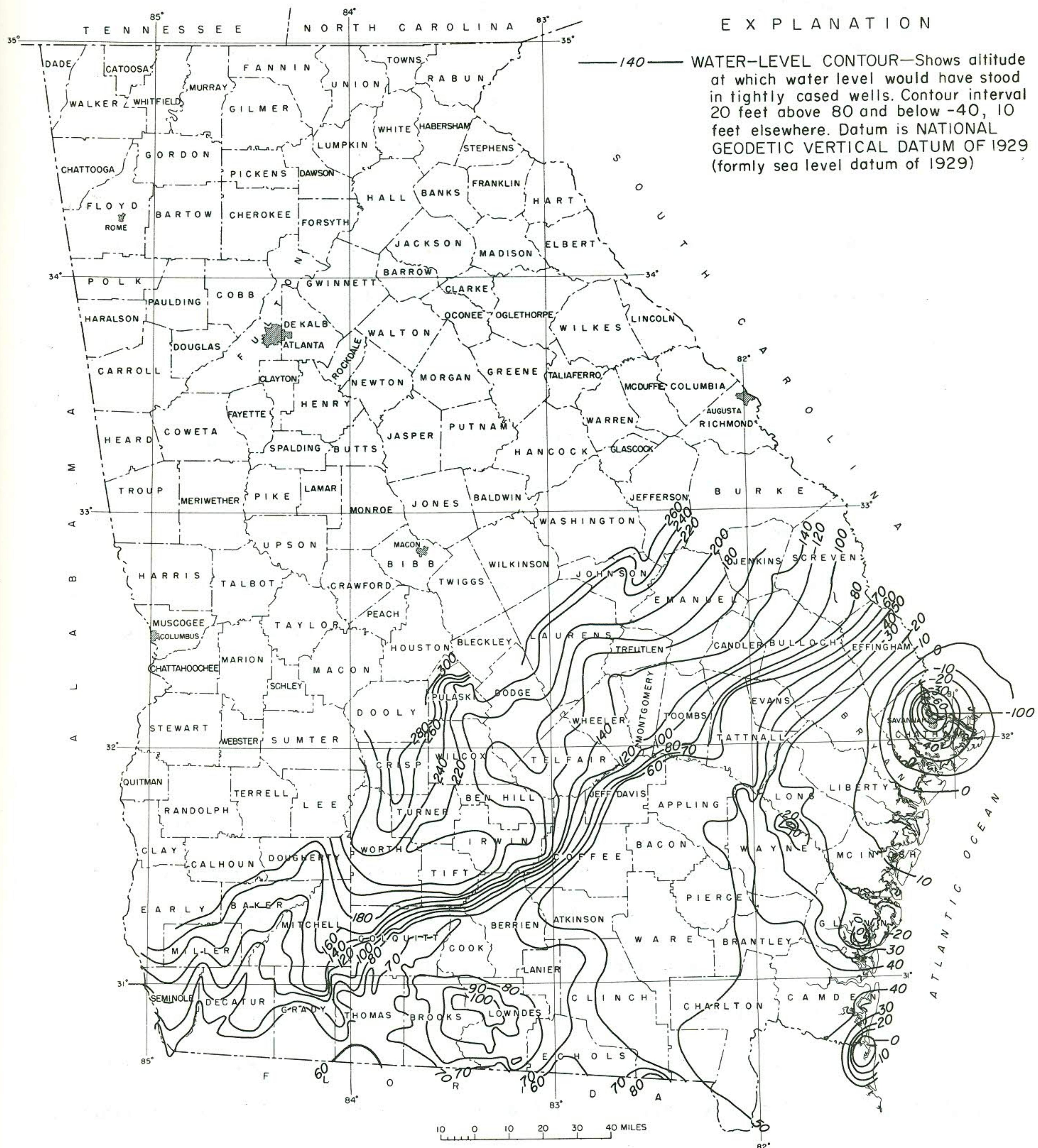
One of the most publicized droughts since 1954-55 occurred in Georgia in 1977. Low precipitation, chiefly in the growing season, created a severe agricultural drought. Ground-water levels declined as a result of the lack of recharge from precipitation and the increased withdrawal of ground water for irrigation.

Mean annual water levels were generally lower in 1977 than in at least the previous 2 to 3 years and in some areas were the lowest of record. However, normal precipitation in the autumn and winter of 1977 recharged the ground-water reservoirs, enabling ground-water levels to recover to predrought conditions.

EXPLANATION

—140—

WATER-LEVEL CONTOUR—Shows altitude at which water level would have stood in tightly cased wells. Contour interval 20 feet above 80 and below -40, 10 feet elsewhere. Datum is NATIONAL GEODETIC VERTICAL DATUM OF 1929 (formly sea level datum of 1929)



Water-level in reservoir I (principal artesian aquifer) in Georgia, January–May 1976.

3.1 Regional Principal Artesian Aquifer

The principal artesian aquifer is one of the most prolific ground-water reservoirs in the United States. Over 300 million gallons of water per day are pumped from the aquifer in Georgia, mostly for industrial use.

The aquifer underlies most of the Coastal Plain below the Fall Line and water is under artesian pressure except where the aquifer crops out at the surface. Thus, water levels are commonly above land surface in wells tapping the aquifer.

Water levels in wells tapping the principal artesian aquifer fluctuate seasonally in response to recharge from streamflow, and hence to precipitation and evapotranspiration near the areas of outcrop. Away from outcrop areas where the aquifer is deeply buried, seasonal fluctuations relating to recharge are less pronounced; ground-water withdrawal is the chief cause of water-level changes in these areas.

Record low water level established in August

A record low was established in August 1977 when the water level in USGS test well OK 8 declined to 68.34 feet below land surface. The largest fluctuation in a single year occurred in 1977 as the monthly mean water level declined from 63.8 feet in February to 68.2 feet in August.

Although the well is a great distance from the outcrop area of the principal artesian aquifer, seasonal fluctuations in the water level occur that roughly correspond to precipitation and evapotranspiration. This is probably due to the effects of vertical leakage from the Okefenokee Swamp to the aquifer.

CHARLTON COUNTY

3049430822137.01 Local number, 049 0001.

LOCATION.--Lat $30^{\circ}49'43''$, long $82^{\circ}21'37''$, Hydrologic Unit 03110201, end of Georgia Highway 117 east of Stephen K. Foster State Park.

Owner: U. S. Geological Survey, Test well OK 8.

AQUIFER.--Principal artesian aquifer.

WELL CHARACTERISTICS.--Drilled observation well, diameter 4 in., depth 647 ft, cased to 465 ft, open hole.

DATUM.--Altitude of land-surface datum is 116 ft.

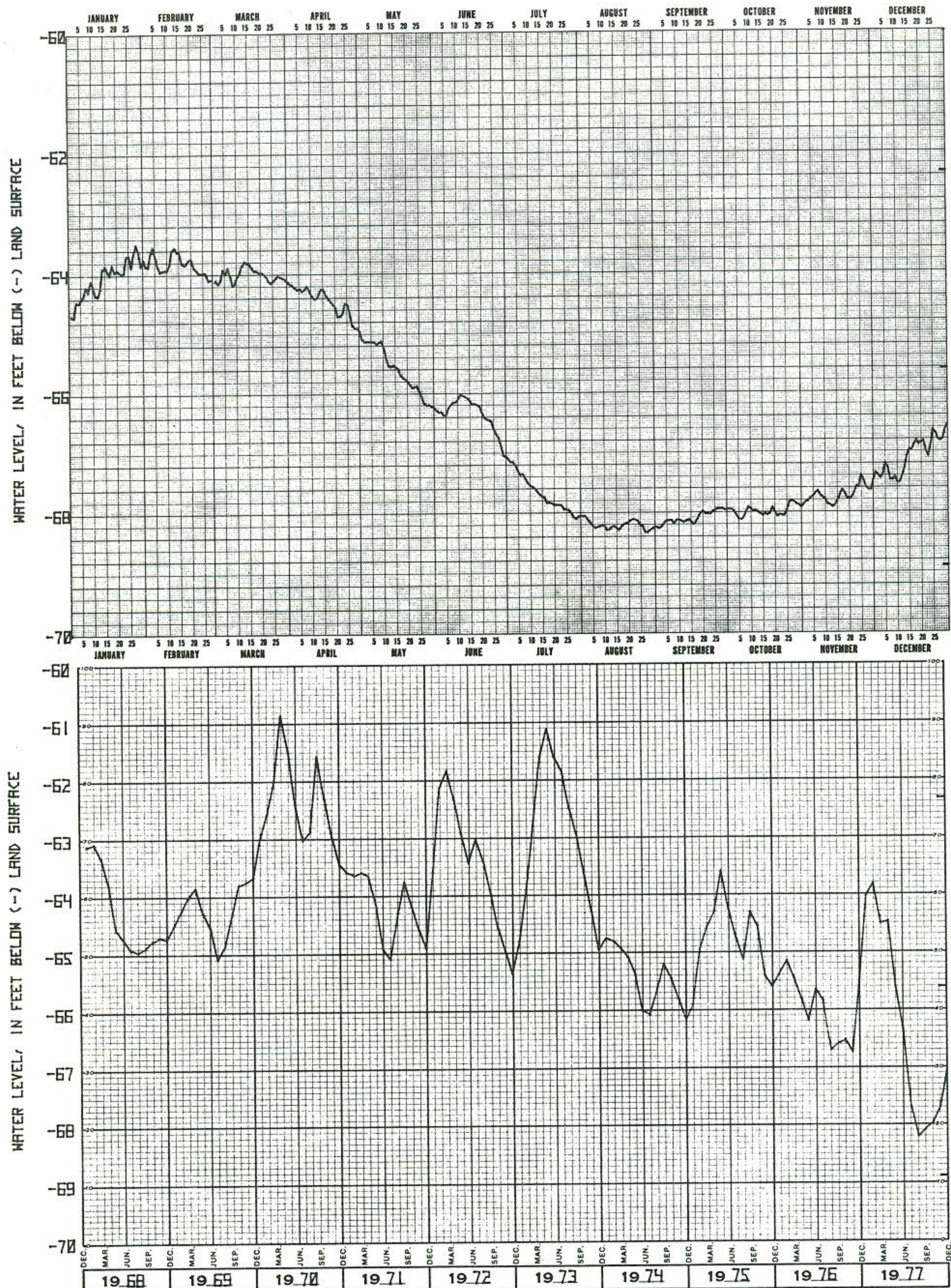
Measuring point: Floor of recorder shelter, 4.2 ft above land-surface datum.

REMARKS.--Well pumped and sounded June 15, 1976, to a depth of 484 ft, well open to aquifer below obstruction.

PERIOD OF RECORD.--May 1966 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 58.75 ft below land-surface datum, June 17, 1966; lowest, 68.34 ft below land-surface datum, August 28, 1977.

Water level, in feet below land surface, through calendar year 1977 daily mean values - monthly mean values.



Water-level fluctuations in test well OK 8

Water level shows long-term rise

Effects of the 1977 drought beginning in late spring lowered the mean monthly water level in the Dexter well to below 35 feet for the first time since 1973-74. The well is very near the area where the aquifer crops out and it responds chiefly to precipitation in the outcrop (recharge) area. The water level in the Dexter well declined from a high of about 24.2 feet in March to about 36.5 feet in July, a period of no precipitation. Notable rises in the water level around August 5 and 20 and November 5 correspond to precipitation.

The long-term trend in the Dexter well is an increase in water level, the greatest increase occurring during 1968-71, corresponding to an increase in precipitation.

LAURENS COUNTY

3226520830330.01 Local number, 175 0006.

LOCATION.--Lat $32^{\circ}26'52''$, long $83^{\circ}03'30''$, Hydrologic Unit 03070102, approximately 1.8 mi northeast of Dexter, Ga.

Owner: Danny Hogan.

AQUIFER.--Principal artesian aquifer.

WELL CHARACTERISTICS.--Drilled unused domestic well, diameter 4 in., depth 123 ft, cased to 89 ft, open hole.

DATUM.--Altitude of land-surface datum is 252 ft.

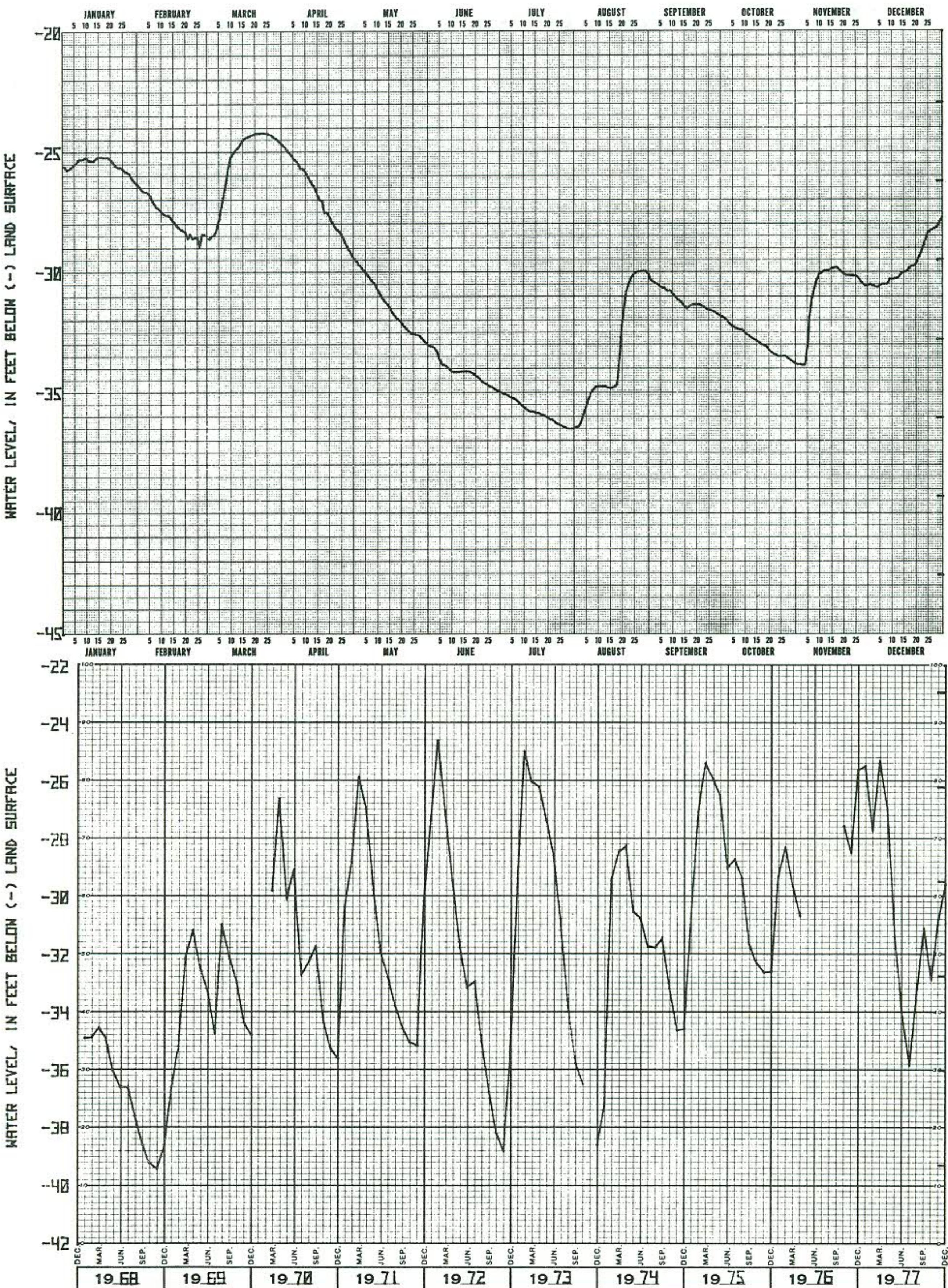
Measuring point: Floor of recorder shelter, 2.57 ft above land-surface datum.

REMARKS.--Borehole geophysical survey conducted November 1973.

PERIOD OF RECORD.--March 1964 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.11 ft below land-surface datum, February 14, 1972; lowest, 39.58 ft below land-surface datum, November 12, 1968.

Water level, in feet below land surface, through calendar year 1977 daily mean values - monthly mean values.



Water-level fluctuations in the Laurens County well

Water level reaches new low in December

Effects of the 1977 drought caused the water level in the Sylvester well to reach a record low of more than 194 feet below land surface in December 1977. Fluctuations in the water level were slight, however, and the maximum change during 1977 was a decline of about 2.2 feet from April to December. The annual mean water level in 1977 was only about 0.7 foot lower than in 1976.

The long-term decline was only about 0.5 foot, mostly occurring from May to December 1977.

WORTH COUNTY

3131460834916.01 Local number, 321 0009.

LOCATION.--Lat $31^{\circ}31'46''$, long $83^{\circ}49'16''$, Hydrologic Unit 03110204, near water tank, behind VFW on U. S. Highway 82 east, Sylvester, Ga.

Owner: City of Sylvester.

AQUIFER.--Principal artesian aquifer.

WELL CHARACTERISTICS.--Drilled unused municipal well, diameter 18 in., depth 450 ft, cased to 212 ft, open hole.

DATUM.--Altitude of land-surface datum is 433 ft.

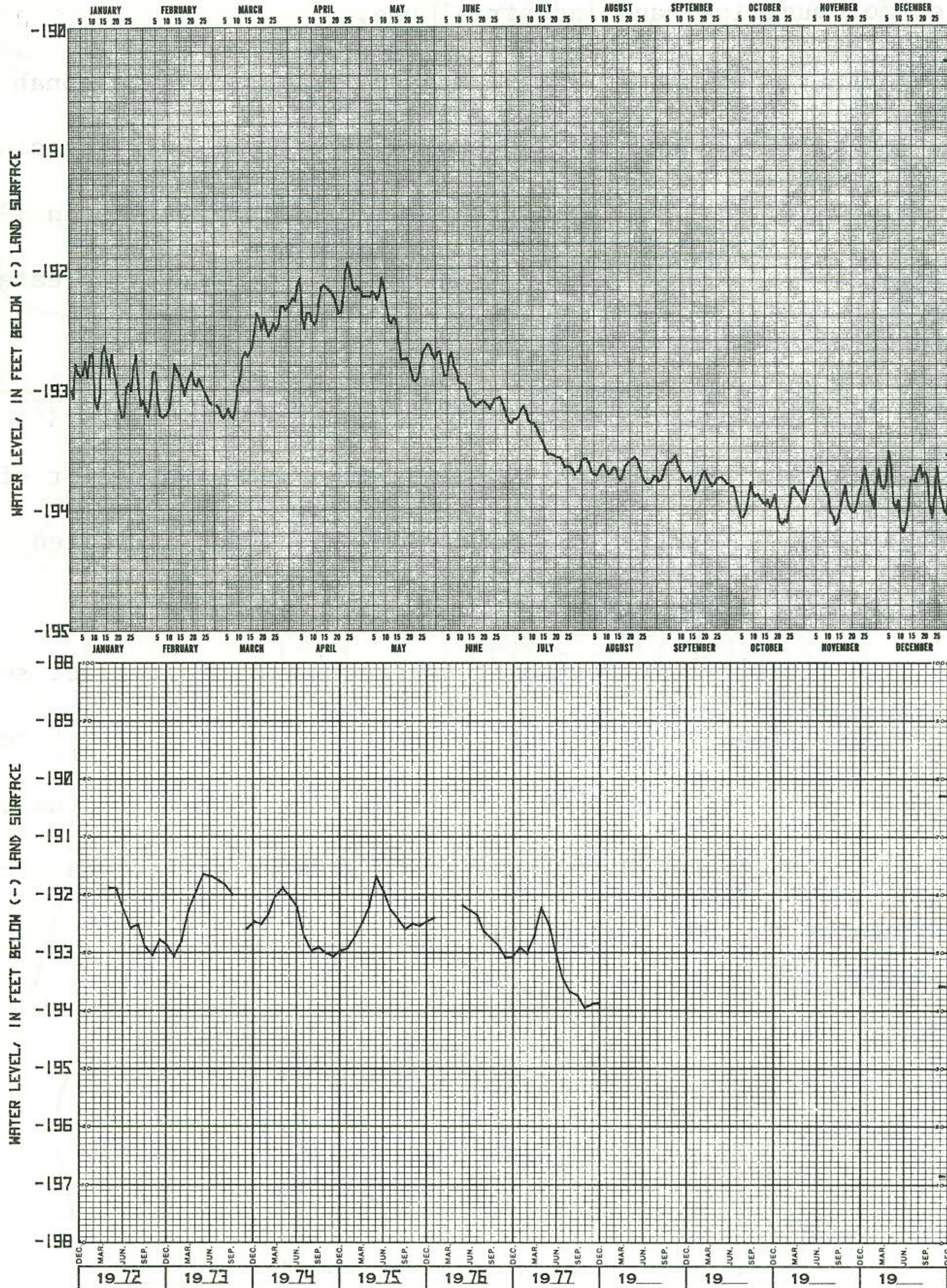
Measuring point: Floor of recorder shelter, 2.90 ft above land-surface datum.

REMARKS.--Well pumped and sounded June 1976. Borehole geophysical survey conducted June 5, 1975.

PERIOD OF RECORD.--May 1972 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 191.50 ft below land-surface datum, May 17, 1973; lowest, 194.22 ft below land-surface datum, December 10, 1977.

Water level, in feet below land surface, through calendar year 1977 daily mean values - monthly mean values.



Water-level fluctuations in the Sylvester observation well

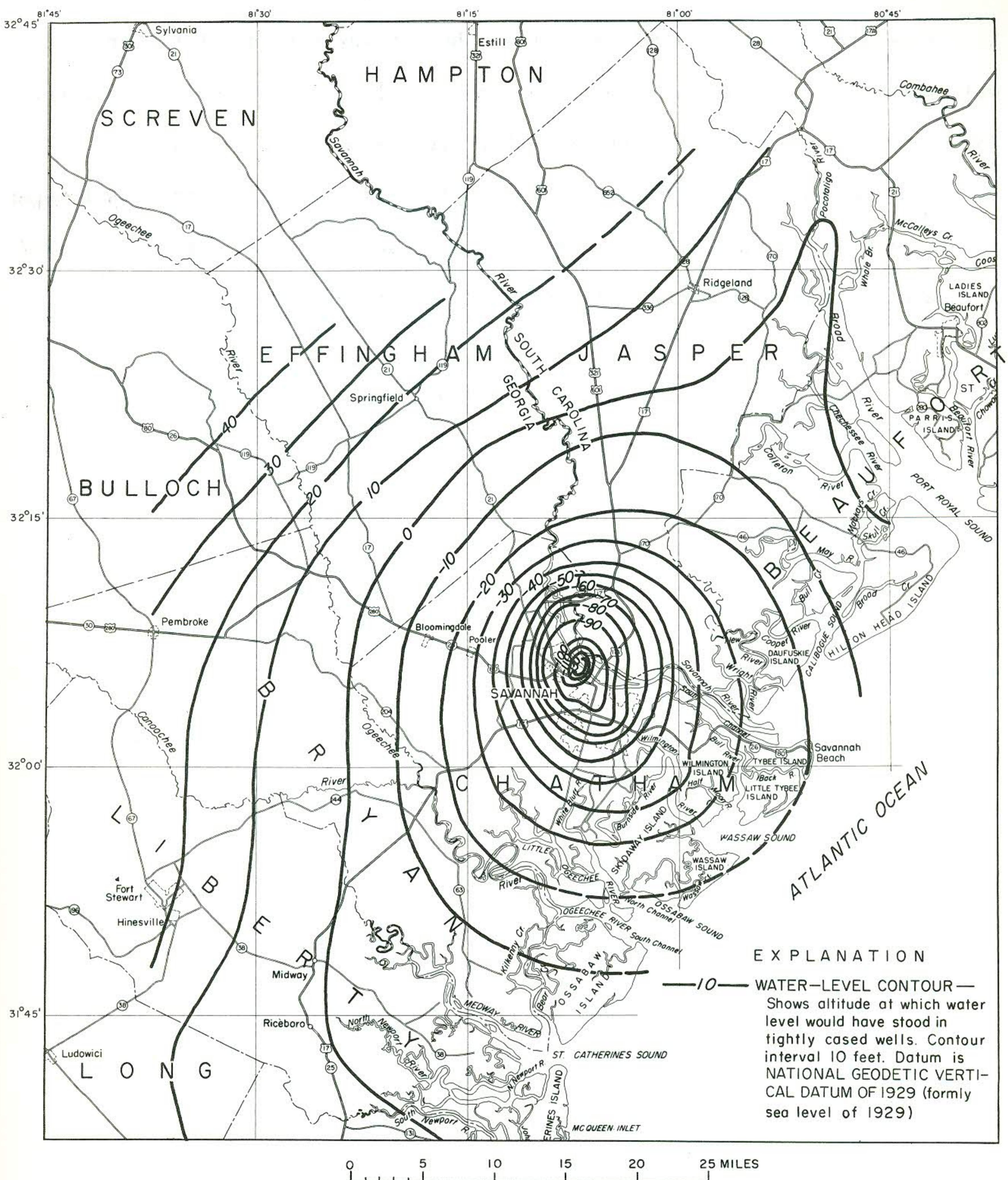
3.1a Savannah Area

Water levels in the Savannah area continued to decline and by 1977 had reached the lowest level in the period of record. The long-term decline in water levels can be attributed to the ever increasing large withdrawal of ground water for municipal and industrial use.

The present rate of withdrawal of ground water in the Savannah area seems to exceed the rate of recharge to the ground-water reservoir, causing a long-term decline in water levels. Lower than normal precipitation in 1977 further depressed water levels by decreasing recharge and by creating greater demands for water throughout the summer and early autumn.

Mean annual water levels ranged from 2 to 9 feet lower in 1977 than in 1976. Largest declines were experienced in wells near the center of pumpage in the Savannah area. Water levels in these wells also fluctuated more, responding to periodic changes in pumpage.

Yearly water-level fluctuations in the Savannah area reflect seasonal variations in precipitation and evapotranspiration as they affect recharge to the ground-water reservoir. Marked deviations from normal fluctuations indicate effects of ground-water withdrawal, with greater deviations occurring in water levels nearer the point of withdrawal.



Water level in reservoir I (principal artesian aquifer), Savannah area, December 1977.

New water-level low in July

A record low water level was established in the National Park Service well when the level declined below 33 feet in July 1977. Greater withdrawal for municipal and industrial use together with reduced recharge in the Savannah area due to low precipitation in mid-1977 created a mean annual water level 2 feet lower than in 1976. A decline of about 7 feet from 1968 to 1977 indicates a long-term downward trend in the water level.

CHATHAM COUNTY

3202020805412 Local number, 051 0073.

LOCATION.--Lat $32^{\circ} 02' 02''$, long $80^{\circ} 54' 12''$, Hydrologic Unit 03060204, Cockspur Island, near pilot house.

Owner: U. S. Department of the Interior, National Park Service.

AQUIFER.--Principal artesian aquifer.

WELL CHARACTERISTICS.--Drilled observation well, diameter 8 in., depth 348 ft, cased to 110 ft, open hole.

DATUM.--Altitude of land-surface datum is 8.0 ft.

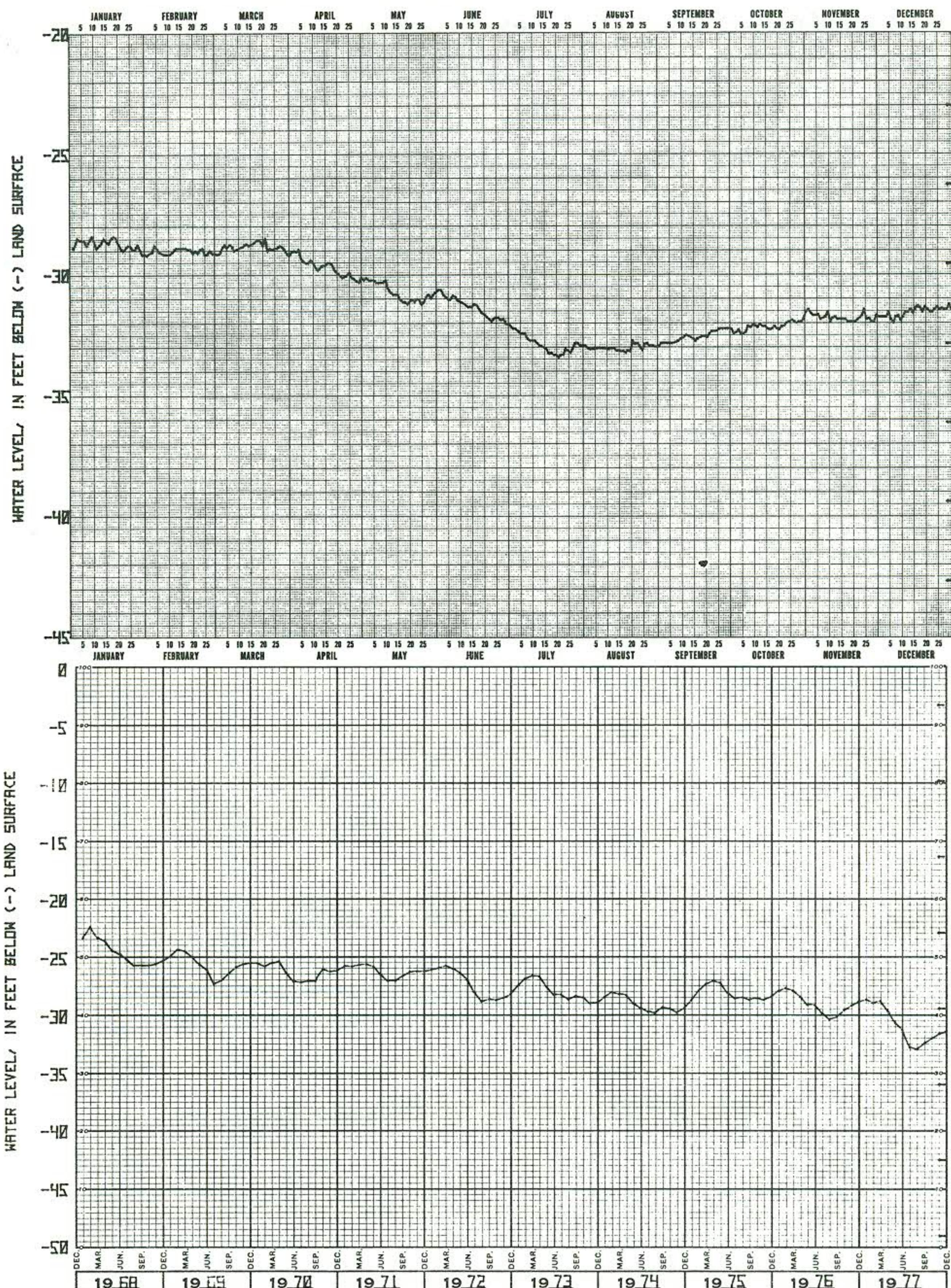
Measuring point: Floor of recorder shelter, 3.62 ft above land-surface datum.

REMARKS.--Borehole geophysical survey conducted June 16, 1961.

PERIOD OF RECORD.--February 1956 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.0 ft below land-surface datum, March 5, 1956; lowest, 33.40 ft below land-surface datum, July 21, 1977.

Water level, in feet below land surface, through calendar year 1977 daily mean values - monthly mean values.



Water-level fluctuations in the National Park Service well

Water level reaches new low in July

The water level in the Morrison well dropped below 46 feet in July 1977, almost 4 feet lower than the previous low experienced in August 1976. The annual mean water level in 1977 was about 4 feet lower than in 1976.

A marked decline in the water level began in 1976, and is related to increased pumpage in the Savannah area. This decline adds to that experienced in the previous 8 years. The decline in the annual mean water level from 1968 to 1977 was about 11 feet.

