EFFECTS OF THE DROUGHT OF 1980-81 ON STREAMFLOW AND ON GROUND-WATER LEVELS IN GEORGIA

By Robert F. Carter

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 83-4158

Prepared in cooperation with the

GEORGIA DEPARTMENT OF NATURAL RESOURCES,
Division of Environmental Protection, and
SAVANNAH DISTRICT, CORPS OF
ENGINEERS, U.S. ARMY

Doraville, Georgia

1983

UNITED STATES DEPARTMENT OF THE INTERIOR

WILLIAM P. CLARK, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information
write to:

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

Copies of this report can
be purchased from:

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

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI units
	Length	
inches (in.)	2.54	millimeters (mm)
	0.0254	meters (m)
feet (ft)	0.3048	meters (m)
	Area	
square miles (mi)	1.590	square kilometers (km^2)
	Volume	
acre-feet (acre-ft)	1233	cubic meters (m^3)
	0.001233	cubic hectometers (hm^3)
	0.00001233	cubic kilometers (km^3)
	Flow	
cubic feet per second (ft /s)	2.832	liters per second (L/s)
	2.832	cubic decimeters per second (dm^3/s)
	0.02832	cubic meters per second (m^3/s)
million gallons per day	4.381	cubic decimeters per second (dm^3/s)
	0.04381	cubic meters per second (m^3/s)

National Geodetic Vertical Datum of 1929 (NGVD of 1929): A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level.

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ABSTRACT

The 1980-81 drought resulted in the lowest rates of streamflow since 1954 in most areas of Georgia, and the lowest since 1925 in some areas. Over most of the State, minimum average streamflows for periods of 1, 7, 30, 60, 90, and 183 consecutive days receded to low levels estimated to be reached at average intervals of 10 to 25 years. Flows in the Flint River from central to southwest Georgia receded to levels estimated to be reached at average intervals of 70 years. Pool levels at four major reservoirs receded to the lowest levels since the reservoirs were first filled.

Ground-water levels declined below the lowest levels previously observed in many observation wells. Nearly continuous declines were recorded in some wells for as much as 20 consecutive months, and levels remained below the previous minimum level of record for as much as 9 consecutive months.

INTRODUCTION

The periodic recurrence of serious droughts represents a major water resources problem not easily resolved by man's intervention. The drought of 1980-81 may be described as typical. It was unpredictable and, like most droughts, had adverse effects on large segments of the population and the economy.

Hydrologists index droughts through assessment of the percentage of normal streamflow and the status of ground-water levels. The drought of 1980-81 caused streamflow rates and ground-water levels to be the lowest of record in some areas of Georgia, and near record lows in other areas. The drought was notable not only for extreme lows of streamflow and ground-water levels, but also because of the exceptional length of time that these low-flow conditions and low ground-water levels persisted. Drought conditions began in the summer of 1980 in the south and middle parts of the State, extended to the north (except for the extreme northwest) by December 1980 and, when significant winter rains failed to materialize, the drought continued through 1981. Some reservoirs reached their lowest levels since first filling, causing recreation activities, power production, navigation, and related operations to be greatly reduced. Ground-water levels generally declined more steeply than usual during the summer of 1980 and with little or no recovery during the fall and winter, these declines extended into 1981. In the Coastal Plain, declines were especially steep in areas where ground-water levels are affected by pumping for irrigation.

The absolute minimum rate of flow of a stream determines the severity of water shortages for users who depend on "run-of-river" water supply and have little storage or reserve capacity. Many municipal and industrial water-supply systems and wastewater treatment systems are in this category.

An extended period of below normal runoff can cause problems even for users who maintain reserves of water for use in times of scarcity. Such a drought can adversely affect hydropower production, navigation and major irrigation projects as well as recreation resources, including wildlife. Damages to agriculture are likely to be more severe in a drought of long duration.

Purpose and Scope

Fundamental to the design and implementation of drought mitigation measures is a better understanding of the hydrology of droughts, including factual data collected during historical droughts. This report examines and discusses the severity, areal extent, and duration of the 1980-81 drought. This drought produced the lowest rates of streamflow since 1954 in most areas of the State and the lowest since 1925 in some areas. Estimates of the frequency of occurrence of 1980-81 streamflow are presented. Water levels that occurred in major reservoirs are listed and compared with previous minimum levels. The low ground-water levels that occurred are documented and compared with previous minimum levels. The report makes available in an easily accessible form much basic data for use by designers of water-development projects, as well as planners concerned with long-range water use.

Cooperation and Acknowledgments

The U.S. Geological Survey and State agencies of Georgia have had cooperative agreements for systematic collection of streamflow records since 1896. Agencies that assisted in collecting data through cooperative agreement with the Survey are:

Georgia Department of Natural Resources, Joe D. Tanner, Commissioner, through the Division of Environmental Protection, J. Leonard Ledbetter, Director.

Assistance in the form of funds and services was given by the Savannah District, Corps of Engineers, U.S. Army.

RAINFALL

Deficiency of rainfall is the basic cause of drought. The effect on streamflow varies, depending on amount and intensity of rainfall and soil moisture conditions. Very light rains merely wet the ground surface and soon evaporate. Steady rains replenish soil moisture, but do not produce much runoff until the soil becomes saturated. Intense rains of short duration may produce flashy runoff without great benefit to soil moisture or lasting benefits to the streams. During periods of deficient rainfall, soil moisture is abnormally low and much or all of the rain is absorbed by the ground, leaving little water to reach the streams. Evaporation and transpiration by plants may prevent much of the water in the ground from reaching the water table.

Exceptionally low streamflow is usually the result of prolonged periods of below-normal rainfall. Figure 1 shows departure of 1981 rainfall from normal at selected rain gages throughout the State. These rainfall data were obtained from the National Weather Service. A more revealing picture may be seen if monthly mean rainfall is compared with monthly mean runoff at a nearby stream-gaging site (fig. 2). These diagrams of average monthly and 1981 monthly rainfall and runoff show typical conditions in Georgia. The Dahlonega rainfall and Chestatee River runoff are typical of northern Georgia; Jonesboro rainfall and Flint River runoff near Culloden are typical of central Georgia; and Waycross rainfall and Satilla River runoff are typical of southeastern Georgia. These graphs for 1981 do not show the deficient rainfall for the preceding 6 months in 1980, but they illustrate the effect of long periods of deficient rainfall on runoff. The rainfall data are collected at a point and do not exactly represent the area contributing to runoff. Nevertheless, the rainfall data shown are typical of conditions in the drainage basins of the gaging stations.

STREAMFLOW

Continuous-Record Stations

Low-flow data for all continuous-record gaging stations operated in Georgia during 1980 and 1981 are compiled in table 1. Locations of these gaging stations are shown in figure 3. Precise location descriptions of the stations are in "Water Resources Data - Georgia - Water Year 1981, U.S. Geological Survey Water-Data Report GA-81-1."

Table 1 lists the minimum daily flow at each station prior to the 1981-82 climatic year which began April 1, 1981. The minimum average flows for periods of 1, 7, 30, 60, 90, 120, and 183 consecutive days during the 1981-82 climatic year, and the corresponding recurrence intervals, are listed. The recurrence interval is commonly used to express the relative severity of hydrologic events. For a given low-flow event, the recurrence interval is the average length of time, in years, between occurrences of a low flow less than the given event. Mathematically, the recurrence interval is the reciprocal of the probability of recurrence. For example, an event having a 20-percent chance of occurrence in any 1 year (a probability of 0.20) has a recurrence interval of 1/0.20, or 5 years; similarly, a 4-percent chance of occurrence is equivalent to a recurrence interval of 1/0.04, or 25 years. The concept of recurrence interval does not imply regularity of occurrence. An event of 25-year recurrence interval might be exceeded in two consecutive years or it might not be exceeded in a 50-year period.

Frequencies are shown for flow data which represent natural conditions and for regulated sites where the regulation pattern is well established and fairly uniform for the period of record used in the frequency analysis.

Methods of Analysis

Annual low flows for the period of record for continuous-record gaging stations were compiled for periods of 1, 7, 30, 60, 90, 120, and 183 consecutive days by means of a digital computer, using the climatic year as a

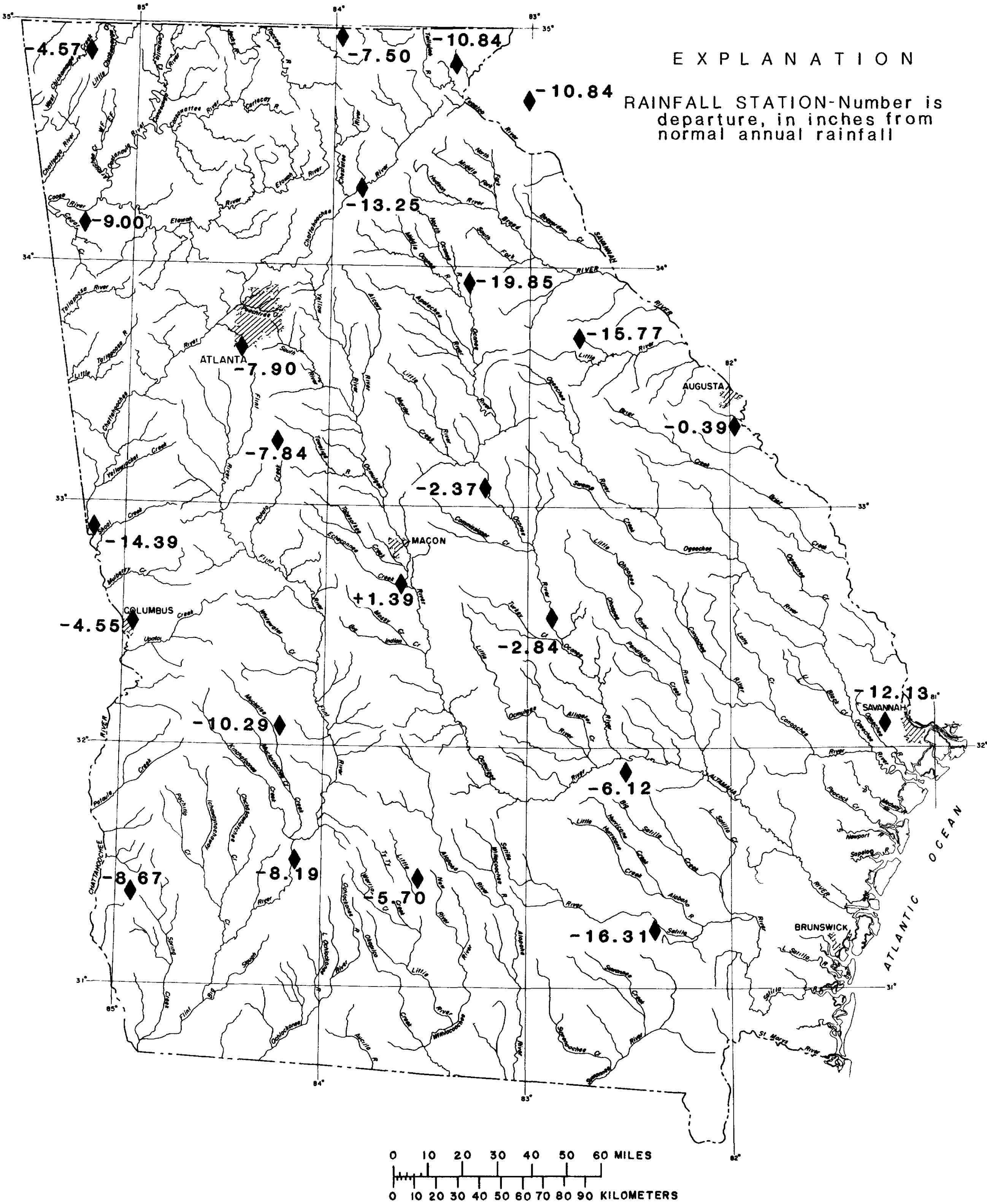

Figure 1.—Departure of 1981 rainfall from normal annual rainfall at selected rain gages in Georgia.

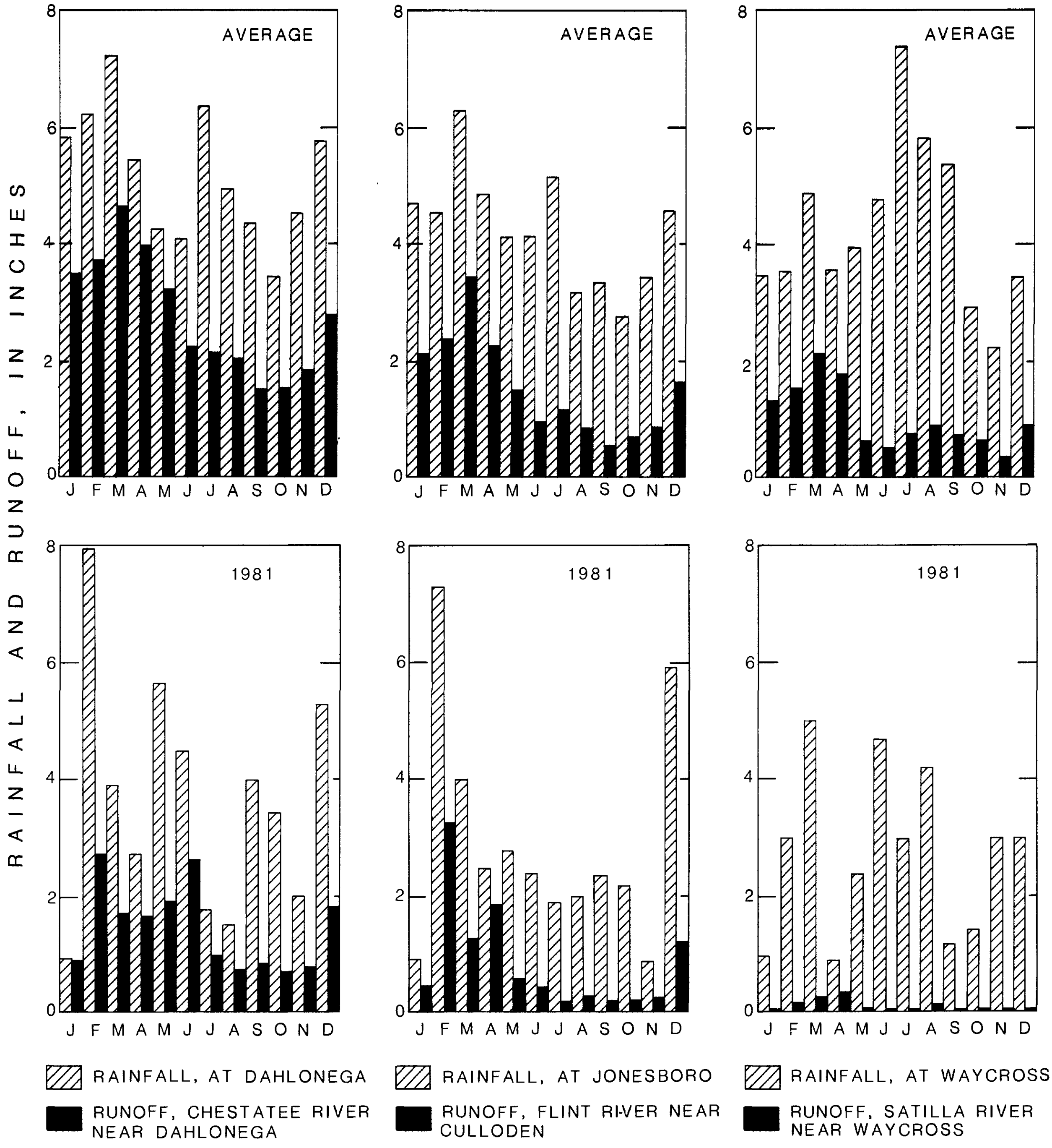

Figure 2.— Average monthly and 1981 monthly rainfall and runoff, in inches, at representative sites in northern, central, and southern Georgia.

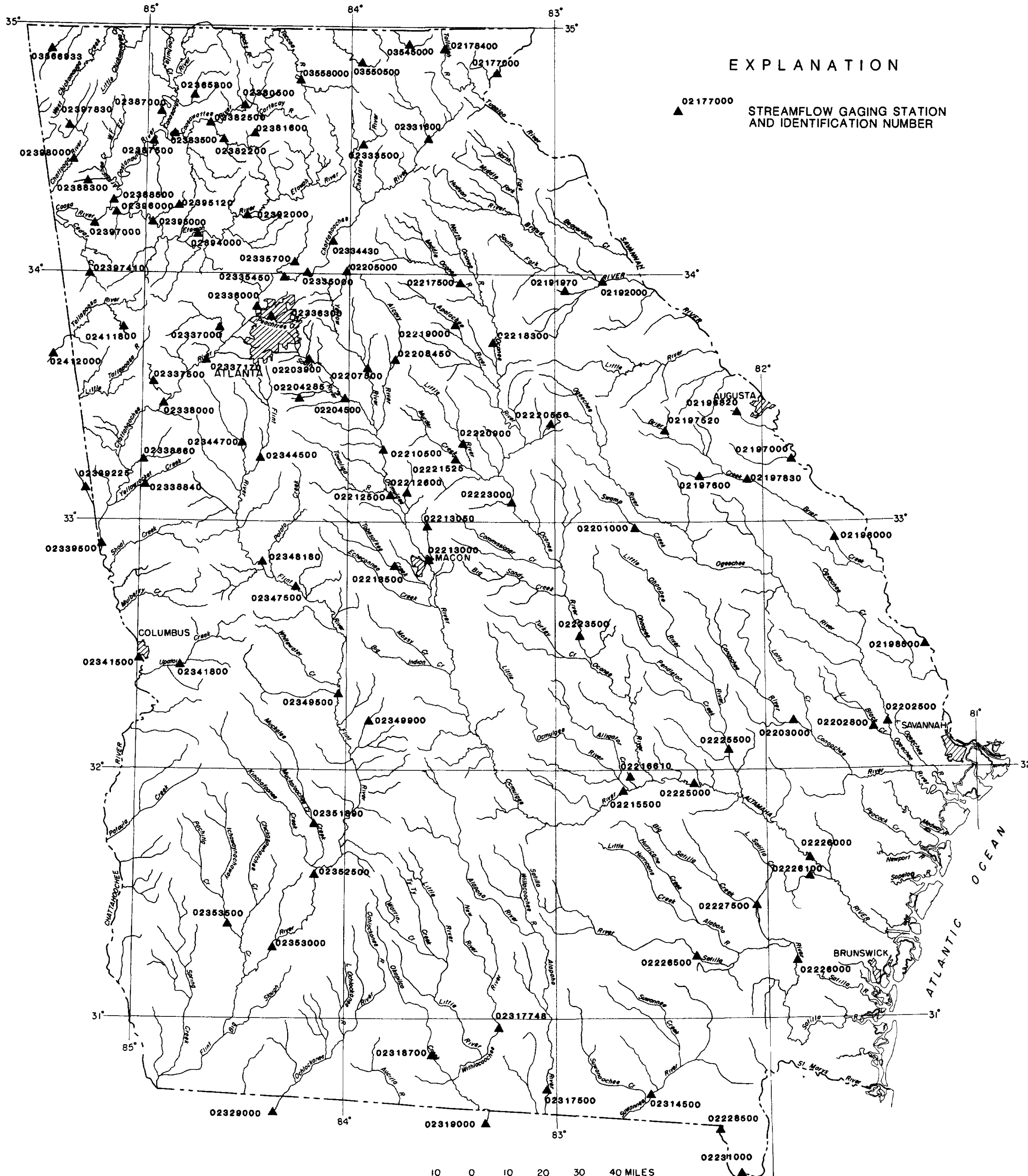

Figure 3.— Location of continuous-record gaging stations for which data are included in this report.

Table 1.— Minimum flows at continuous-record gaging stations during the drought of 1981, and estimated recurrence intervals
(R.I., recurrence interval; <, less than; >, more than)

Station number	Station name	Period of record	Drainage area (mi^2)	Average flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year: Flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year: Date	Minimum average flow for indicated number of consecutive days in 1981-82 climatic year and estimated recurrence interval: 1-day flow (ft^3/s)	Est. R.I. (years)	7-day flow (ft^3/s)	Est. R.I. (years)	30-day flow (ft^3/s)	Est. R.I. (years)	60-day flow (ft^3/s)	Est. R.I. (years)	90-day flow (ft^3/s)	Est. R.I. (years)	183-day flow (ft^3/s)	Est. R.I. (years)
02177000	Chattooga River near Clayton	May 1907 to June 1908, Oct. 1939 to Mar. 1982	207	660	88	Oct. 8,12, 1954	113	15	117	15	130	20	168	10	188	10	227	20
02178400	Tallulah River near Clayton	July 1964 to Mar. 1982	56.5	203	48	Nov. 6, 1978	38	20	39	20	42	20	50	20	54	20	68	20
02191970	Little Macks Creek near Lexington	Dec. 1974 to Mar. 1982	1.77	2.09	.19	Oct. 22, 1978	.13	—	.14	—	.17	—	.22	—	.28	—	.39	—
02192000	Broad River near Bell	Oct. 1926 to Sept. 1932, Aug. 1937 to Mar. 1982	1,430	1,809	110	Oct. 7, 1954	171	12	175	15	214	20	283	15	332	17	424	20
02196820	Butler Creek at Fort Gordon	Oct. 1968 to Mar. 1982	7.5	8.19	.10	June 29, July 21, 1969	.46	—	.58	—	.90	—	1.2	—	2.1	—	2.8	—
02197000	Savannah River at Augusta (flow regulated by Lake Burton, Mathis Reservoir, Hartwell Lake, and Clarks Hill Reservoir)	Oct. 1882 to Dec. 1891, Jan. 1896 to Dec. 1906, Jan. 1926 to Mar. 1982	7,508	10,200	[1] 1,040	Oct. 2, 1927	2,160	>20	3,610	>20	4,200	>20	4,660	>20	4,970	>20	5,340	>20
02197520	Brier Creek near Thomson (low flow affected by diversions and return flow from the city of Thomson)	July 1967 to Mar. 1982	55	480	.24	Sept. 24, 1968	.66	—	.73	—	.89	—	1.19	—	2.7	—	5.9	—
02197600	Brushy Creek near Wrens (low flow affected by irrigation withdrawal)	May 1958 to Mar. 1982	28	27.1	5.5	Aug. 30, Sept. 19, 1978	4.0	20	4.5	20	5.7	20	6.5	20	8.2	15	8.8	20
02197830	Brier Creek near Waynesboro	July 1969 to Mar. 1982	473	486	95	Oct. 7, 1970	79	—	82	—	93	—	113	—	144	—	181	—
02198000	Brier Creek at Millhaven	Oct. 1936 to Mar. 1982	646	662	64	Sept. 5-11, 1954	103	25	105	25	122	25	153	20	187	7	248	6
02198500	Savannah River near Clyo (flow regulated by Lake Burton, Mathis Reservoir, Hartwell Lake, and Clarks Hill Reservoir)	Oct. 1929 to Sept. 1933, Oct. 1937 to Mar. 1982	9,850	12,100	[2] 1,970	Sept. 27, 1931	4,420	3	4,840	3	5,030	3	5,320	4	5,510	5	5,980	10
02201000	Williamson Swamp Creek at Davisboro	May 1980 to Mar. 1982	109	—	17	Sept. 16, 1980	12	—	13	—	15	—	19	—	21	—	29	—
02202500	Ogeechee River near Eden	Apr. 1937 to Mar. 1982	2,650	2,358	131	Sept. 13, 1954	171	20	173	20	186	25	216	25	258	25	320	30
02202600	Black Creek near Blichton	Feb. 1980 to Sept. 1982	232	—	[3] 0	Aug. 19, 1954	.69	—	.76	—	1.40	—	1.70	—	2.0	—	4.4	—
02203000	Canoochee River near Claxton	May 1937 to Mar. 1982	555	464	.86	Oct. 25,26, 1954	1.7	5	3.0	4	4.2	4	4.4	5	8.7	6	34	7
02203900	South River at Flakes Mill Road, near Atlanta (low flow affected by operation of wastewater treatment plants upstream of gage)	Aug. 1979 to Mar. 1982	99	—	69	Sept. 27, 1980	61	—	66	—	77	—	90	—	98	—	106	—
02204285	Pates Creek near Flippen (low flow may be affected by upstream release of wastewater on land)	Aug. 1977 to Mar. 1982	11.9	—	1.50	Oct. 24, 1978	1.10	—	1.19	—	2.8	—	3.6	—	3.6	—	4.5	—

See footnotes at end of table.

Table 1.— Minimum flows at continuous-record gaging stations during the drought of 1981, and estimated recurrence intervals — Continued
(R.I., recurrence interval; <, less than; >, more than)

Station number	Station name	Period of record	Drainage area (mi^2)	Average flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year: Flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year: Date	1-day flow (ft^3/s)	Est. R.I. (years)	7-day flow (ft^3/s)	Est. R.I. (years)	30-day flow (ft^3/s)	Est. R.I. (years)	60-day flow (ft^3/s)	Est. R.I. (years)	90-day flow (ft^3/s)	Est. R.I. (years)	183-day flow (ft^3/s)	Est. R.I. (years)
							Minimum average flow for indicated number of consecutive days in 1981-82 climatic year and estimated recurrence interval											
02204500	South River near McDonough (low flow affected by operation of wastewater treatment plants upstream of gage)	Oct. 1939 to Sept. 1960, Oct. 1975 to Mar. 1982	456	576	54	Oct. 12, 1954	100	—	103	—	130	—	170	—	179	—	193	—
02205000	Wildcat Creek near Lawrenceville	Oct. 1953 to Mar. 1982	1.59	1.70	.01	Sept. 4,5; Oct. 2,5,7,9, 1954	0	30	0	30	0	30	.05	30	.09	30	.22	10
02207500	Yellow River near Covington	Sept. to Dec. 1897, May 1899 to Dec. 1901, July 1944 to Sept. 1960, Oct. 1975 to Mar. 1982	378	471	10	Oct. 7, 1954	32	4	34	5	47	7	60	10	72	15	96	12
02208450	Alcovy River above Covington (discharge affected by diversions by city of Covington)	Jan. 1972 to Mar. 1982	185	269	25	Sept. 17, 1972	5.5	—	7.9	—	12	—	23	—	26	—	40	—
02210500	Ocmulgee River near Jackson (flow regulated by Lloyd Shoals Reservoir)	May 1906 to Sept. 1915, Aug. 1939 to Sept. 1960, Oct. 1975 to Mar. 1982	1,420	1,726	[4] 18	Nov. 20, 1910	336	5	340	10	348	13	353	13	365	13	423	13
02212500	Ocmulgee River at Juliette (flow regulated by Lloyd Shoals Reservoir)	June 1916 to Sept. 1921, July 1974 to Mar. 1982	1,960	2,634	365	Nov. 4, 1978	363	—	374	—	391	—	418	—	439	—	491	—
02212600	Falling Creek near Juliette	July 1964 to Mar. 1982	72.2	66.5	.17	Sept. 29, 1972	.08	20	.10	20	.47	20	.88	20	2.4	20	4.4	20
02213000	Ocmulgee River at Macon (flow regulated by Lloyd Shoals Reservoir)	Jan. 1893 to Dec. 1911, Jan. 1912 to Dec. 1913, Oct. 1928 to Mar. 1982	2,240	2,724	128	Oct. 24, 1954	280	10	317	15	351	20	382	>20	401	>20	455	>20
02213050	Walnut Creek near Gray	Oct. 1961 to Mar. 1982	29	33.9	0	June, July, Aug. 1954	0	20	.02	20	.52	20	.76	20	.90	20	1.90	20
02213500	Tobesofkee Creek near Macon (flow regulated to some extent by Lake Tobesofkee)	Mar. 1937 to Mar. 1982	182	197	2.5	Oct. 9, 1954	17	5	17	5	18	7	19	10	19	10	23	20
02215500	Ocmulgee River at Lumber City (flow regulated by Lloyd Shoals Reservoir)	Oct. 1936 to Mar. 1982	5,180	5,596	808	Oct. 30,31, Nov. 1-3, 1954	951	30	966	30	1,030	25	1,120	30	1,150	30	1,260	30
02216610	Tillman Mill Creek near Lumber City	Oct. 1974 to Mar. 1982	2.71	2.09	0	Most years	0	—	0	—	0	—	0	—	0	—	0	—
02217500	Middle Oconee River near Athens	Oct. 1901 to Oct. 1902, Jan. 1929 to Mar. 1932, Apr. 1937 to Mar. 1982	398	526	26	Sept. 7, 1957	38	10	40	15	56	15	74	15	84	15	117	20
02218300	Oconee River near Penfield (some regulation at low flow from manipulation of Barnett Shoals Dam)	Aug. 1977 to Mar. 1982	940	--	223	Oct. 12, 1978	101	—	108	—	141	—	197	11	209	—	277	—

See footnotes at end of table.

Table 1.— Minimum flows at continuous-record gaging stations during the drought of 1981, and estimated recurrence intervals — Continued
(R.I., recurrence interval; < , less than; >, more than)

Station number	Station name	Period of record	Drainage area (mi^2)	Average flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year		Minimum average flow for indicated number of consecutive days in 1981-82 climatic year and estimated recurrence interval											
					Flow (ft^3/s)	Date	1-day flow (ft^3/s)	Est. R.I. (years)	7-day flow (ft^3/s)	Est. R.I. (years)	30-day flow (ft^3/s)	Est. R.I. (years)	60-day flow (ft^3/s)	Est. R.I. (years)	90-day flow (ft^3/s)	Est. R.I. (years)	183-day flow (ft^3/s)	Est. R.I. (years)
02219000	Apalachee River near Bostwick (some regulation at low flow from manipulation of High Shoals Dam)	June 1944 to Dec. 1949, Apr. 1977 to Mar. 1982	176	261	35	July 13, 1977	14	—	15	—	20	—	25	—	27	—	41	—
02220550	Whitten Creek near Sparta	June 1960 to Mar. 1982	15	15.9	.10	Sept. 16,17, 1980	0	25	0	25	.05	25	.12	25	.35	25	.90	25
02220900	Little River near Eatonton	Aug. 1977 to Mar. 1982	262	—	15	Oct. 11,12, 1978, Sept. 16, 1980	6.7	—	9.6	—	17	—	27	—	34	—	52	—
02221525	Murder Creek below Eatonton	Apr. 1977 to Mar. 1982	190	—	13	Sept. 10,15, 16, 1980	7.7	—	8.7	—	11	—	16	—	20	—	27	—
02223000	Oconee River at Milledgeville (flow regulated by Lake Oconee since January 1979 and by Sinclair Reservoir since November 1952)	Aug. 1903 to Mar. 1982	2,950	3,354	90	Several days Aug. and Sept. 1925; Aug. 3, 1955	274	3	308	7	335	20	346	40	372	>50	659	40
02223500	Oconee River at Dublin (flow regulated by Lake Oconee since January 1979 and by Sinclair Reservoir since November 1952)	Oct. 1897 to Mar. 1982	4,400	5,033	[5] 350	Sept. 11, 1951	445	8	463	10	534	14	571	25	638	25	804	25
02225000	Altamaha River near Baxley	Aug. 1949 to June 1951, Oct. 1970 to Mar. 1982	11,600	11,890	1,940	Nov. 3, 1978	1,680	—	1,750	—	1,820	—	1,980	—	2,090	—	2,350	—
02225500	Ohoopee River near Reidsville	Apr. 1903 to Dec. 1907, Apr. 1937 to Mar. 1982	1,110	984	19	Sept. 12,13, 1954	25	20	26	20	31	20	40	15	47	10	93	10
02226000	Altamaha River at Doctortown	Oct. 1931 to Mar. 1982	13,600	13,730	1,430	Oct. 27,28; Nov. 1, 1954	1,790	25	1,840	25	1,900	25	2,020	25	2,130	30	2,520	30
02226100	Penholoway Creek near Jesup	July 1958 to Mar. 1982	210	201	0	Most years	0	25	0	25	0	25	.12	25	.20	25	.55	25
02226500	Satilla River near Waycross	Mar. 1937 to Mar. 1982	1,200	1,014	6.2	Nov. 1-4, 1954	8.3	25	8.6	25	9.4	25	17	12	24	12	47	15
02227500	Little Satilla River near Offerman	Jan. 1951 to Mar. 1982	646	512	0	Oct. 10 to Nov. 14, 1954	.18	15	.23	15	.37	15	.66	10	1.5	10	4.2	10
02228000	Satilla River at Atkinson	Mar. 1930 to Mar. 1982	2,790	2,229	21	Nov. 2-5,7-13, 1954	27	20	28	20	34	20	53	15	68	12	116	15
02228500	North Prong St. Marys River at Moniac	Jan. 1921 to Dec. 1923, Jan. 1927 to June 1930, July 1932 to June 1934, Oct. 1950 to Mar. 1982	160	161	0	Some years	0	4	0	4	.01	4	.08	4	.59	4	7.6	4
02231000	St. Marys River near Macclenny, Fla.	Oct. 1926 to Mar. 1982	700	673	12	May 22, 1932	30	2	32	2	37	2	52	2	61	2	127	4
02314500	Suwannee River at Fargo (low flow at times affected by manipulation of water level at Mixons Ferry Dam)	Jan. 1927 to Dec. 1931, Apr. 1937 to Mar. 1982	1,260	1,080	0	At times, 1931, 1943, 1954	7.8	4	8.2	5	9.7	5	11	7	11	10	17	25

See footnotes at end of table.

Table 1.– Minimum flows at continuous-record gaging stations during the drought of 1981, and estimated recurrence intervals – Continued
(R.I., recurrence interval; <, less than; >, more than)

					Minimum daily flow prior to 1981-82 climatic year		Minimum average flow for indicated number of consecutive days in 1981-82 climatic year and estimated recurrence interval											
Station number	Station name	Period of record	Drainage area (mi2)	Aversge flow (ft^3/s)	Flow (ft^3/s)	Date	1-day flow (ft^3/s)	Est. R.I. (years)	7-day flow (ft^3/s)	Est. R.I. (years)	30-day flow (ft^3/s)	Est. R.I. (years)	60-day flow (ft^3/s)	Est. R.I. (years)	90-day flow (ft^3/s)	Est. R.I. (years)	183-day flow (ft^3/s)	Est. R.I. (years)
02317500	Alapaha River at Statenville	Jan. to June 1921, Oct. 1931 to Mar. 1982	1,400	1,031	17	Nov. 10-13, 1954	25	10	26	12	29	15	33	18	45	10	51	25
02317748	Withlacoochee River near Bemiss	Oct. 1976 to Mar. 1982	501	—	4.2	Oct. 25, 1978	2.8	—	3.0	—	3.6	—	7.3	—	14	—	21	—
02318700	Okapilco Creek at State Hwy. 33, near Quitman	Dec. 1979 to Mar. 1982	269	--	0	Sept. 6-8,9-28, 1980	0	—	0	—	0	—	.45	—	1.70	—	2.9	—
02319000	Withlacoochee River near Pinetta, Fla.	Jan. 1932 to Mar. 1982	2,120	1,680	73	Aug. 21, 1955	95	6	102	6	121	5	137	5	150	5	168	10
02329000	Ochlockonee River near Havana, Fla.	July 1926 to Mar. 1982	1,140	1,035	17	Oct. 23-28; Nov. 1, 1954	29	8	30	10	45	5	79	5	101	5	123	8
02331600	Chattahoochee River at Cornelia (some regulation at low flow from Habersham Mill powerplant)	Aug. 1957 to Mar. 1982	315	860	91	Sept. 7, 1957	120	—	162	10	187	15	225	15	244	15	289	15
02333500	Chestatee River near Dahlonega	June 1929 to Jan. 1932, Apr. 1940 to Mar. 1982	153	370	49	Oct. 4, 1931; Oct. 26, 1941	64	12	68	12	77	15	89	15	98	15	123	25
02334430	Chattahoochee River at Buford Dam, near Buford (flow regulated by Lake Sidney Lanier since January 1956)	June to Dec. 1901, Oct. 1941 to Mar. 1982	1,040	2,160	262	May 18, 1958	482	5	617	10	836	10	869	10	924	10	1,380	4
02335000	Chattahoochee River near Norcross (flow regulated by Lake Sidney Lanier since January 1956)	Oct. 1902 to Sept. 1946, Oct. 1956 to Mar. 1982	1,170	2,323	[6]132	Aug. 25, 1925	602	3	847	2	962	2	1,020	2	1,030	4	1,490	2
02335450	Chattahoochee River above Roswell (flow regulated by Lake Sidney Lanier since January 1956)	Oct. 1941 to May 1960, July 1976 to Mar. 1982	1,220	2,135	315	Aug. 11, 1957	515	--	818	—	974	—	1,010	—	1,020	—	1,470	—
02335700	Big Creek near Alpharetta	May 1960 to Mar. 1982	72	116	10	Oct. 6,7, 1970	6.0	25	7.0	25	9.0	25	12	25	14	25	19	25
02336000	Chattahoochee River at Atlanta (flow regulated by Lake Sidney Lanier since January 1956; diversions above station by Gwinnett, DeKalb, and Cobb Counties; return flows above station by Gwinnett and Cobb Counties)	Aug. 1928 to Dec. 1931, Oct. 1936 to Mar. 1982	1,450	2,613	296	Sept. 2, 1957	1,080	<2	1,110	2	1,180	2	1,300	2	1,290	3	1,630	2
02336300	Peachtree Creek at Atlanta	June 1958 to Mar. 1982	86.8	135	8.0	Aug. 10, 1959	6.0	25	6.2	25	15	10	21	10	30	15	35	25
02337000	Sweetwater Creek near Austell	May 1904 to Dec. 1905, Nov. to Dec. 1913, Mar. 1937 to Mar. 1982	246	333	2.1	Oct. 9, 1954	14	8	15	12	30	7	45	6	57	8	78	10
02337170	Chattahoochee River near Fairburn (flow regulated by Lake Sidney Lanier since January 1956; diversions and return flows above station by Gwinnett, DeKalb, and Cobb Counties, and by the city of Atlanta)	July 1965 to Mar. 1982	2,060	3,816	1,000	July 1, 1970	1,180	2	1,320	5	1,540	10	1,660	10	1,810	10	2,030	15

See footnotes at end of table.

Table 1.— Minimum flows at continuous-record gaging stations during the drought of 1981, and estimated recurrence intervals — Continued

(R.I., recurrence interval; <, less than; >, more than)

Station number	Station name	Period of record	Drainage area (mi^2)	Average flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year: Flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year: Date	Minimum average flow for indicated number of consecutive days in 1981-82 climatic year and estimated recurrence interval: 1-day flow (ft^3/s)	Est. R.I. (years)	7-day flow (ft^3/s)	Est. R.I. (years)	30-day flow (ft^3/s)	Est. R.I. (years)	60-day flow (ft^3/s)	Est. R.I. (years)	90-day flow (ft^3/s)	Est. R.I. (years)	183-day flow (ft^3/s)	Est. R.I. (years)
02337500	Snake Creek near Whitesburg	Sept. 1954 to Mar. 1982	37	58	2.4	Oct. 7, 1954	8.8	7	9.1	10	11	30	13	30	14	30	18	30
02338000	Chattahoochee River near Whitesburg (flow regulated by Lake Sidney Lanier since January 1954; diversions and return flows above station by Gwinnett, DeKalb, and Cobb Counties, and by the city of Atlanta)	Oct. 1938 to June 1954, Jan. 1965 to Mar. 1982	2,430	4,055	[7] 468	Oct. 26, 1941	1,320	2	1,580	2	1,870	2	2,330	2	2,330	2	2,460	2
02338660	New River near Corinth	Oct. 1978 to Mar. 1982	127	--	9.6	Sept. 17, 1980	1.5	—	1.9	—	5.4	—	12	—	13	—	26	—
02338840	Yellowjacket Creek at Hammett, near Hogansville	Oct. 1978 to Mar. 1982	91.0	--	9.2	Oct. 9,10,12,13, 16, 1978	2.8	—	3.0	--	5.2	—	12	—	12	—	16	—
02339225	Wehadkee Creek below Rock Mills, Ala.	Oct. 1978 to Mar. 1982	60.2	—	7.2	Oct. 13,14,18, 19, 1978	2.8	—	3.3	—	4.5	—	8.0	—	11	—	17	—
02339500	Chattahoochee River at West Point (flow regulated by Lake Sidney Lanier since January 1956 and by West Point Lake since October 1974)	July 1896 to Mar. 1982	3,550	5,645	[8] 224	Sept. 12, 1925	740	6	1,410	2	1,690	2	2,170	2	2,360	2	3,180	2
02341500	Chattahoochee River at Columbus (flow regulated by Lake Sidney Lanier since January 1956, West Point Lake since October 1974, and by Lake Harding since 1939)	Aug. 1929 to Mar. 1982	4,670	6,785	[9] 480	Oct. 31, 1931	1,160	2	1,570	2	2,060	3	2,600	3	2,810	3	3,700	3
02341800	Upatoi Creek near Columbus	Apr. 1968 to Mar. 1982	342	493	106	Oct. 6, 1970	100	15	104	15	116	15	133	15	139	15	148	15
02344500	Flint River near Griffin (flow affected by diversions upstream by city of Griffin and by operation of wastewater treatment plants near Atlanta)	Mar. 1937 to Mar. 1982	272	355	2.5	Oct. 20, 1954	16	--	21	—	37	—	52	—	63	—	72	—
02344700	Line Creek near Senoia (low flow affected by withdrawals and return flow by several municipalities)	Sept. 1964 to Mar. 1982	101	136	3.1	Oct. 14, 1978	2.0	20	2.3	20	5.2	15	9.2	15	12	15	16	20
02346180	Flint River near Thomaston	May 1966 to Mar. 1982	1,220	1,702	110	Oct. 2, 1970	77	—	83	—	144	--	206	--	208	—	269	--
02347500	Flint River near Culloden	July 1911 to May 1923, July 1928 to Dec. 1931, Mar. 1937 to Mar. 1982	1,850	2,405	96	Oct. 6, 1931	98	40	105	40	186	20	281	10	308	20	409	40
02349500	Flint River at Montezuma	Oct. 1904 to Dec. 1912, July 1930 to Mar. 1982	2,900	3,591	585	Oct. 26, 1941; Sept. 23, 1956	513	60	519	60	637	30	755	30	795	30	932	60
02349900	Turkey Creek at Byromville	June 1958 to Mar. 1982	45	48.7	.50	July 30, Oct. 16, 1968	2.2	8	2.6	10	3.0	15	3.7	15	4.1	15	4.8	15
02351890	Muckalee Creek at State Hwy. 195, near Leesburg	Dec. 1979 to Mar. 1982	362	--	38	Aug. 9, 1980	31	—	35	—	50	—	74	—	92	—	106	—

See footnotes at end of table.

Table 1.— Minimum flows at continuous-record gaging stations during the drought of 1981, and estimated recurrence intervals — Continued
[R.I., recurrence interval; <, less than; >, more than]

Station number	Station name	Period of record	Drainage area (mi^2)	Average flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year		Minimum average flow for indicated number of consecutive days in 1981-82 climatic year and estimated recurrence interval											
					Flow (ft^3/s)	Date	1-day flow (ft^3/s)	Est. R.I. (years)	7-day flow (ft^3/s)	Est. R.I. (years)	30-day flow (ft^3/s)	Est. R.I. (years)	60-day flow (ft^3/s)	Est. R.I. (years)	90-day flow (ft^3/s)	Est. R.I. (years)	183-day flow (ft^3/s)	Est. R.I. (years)
02352500	Flint River at Albany (flow regulated by powerplants at Flint River Reservoir since 1921 and at Warwick Reservoir since 1930)	Oct. 1901 to June 1921, Sept. 1929 to Mar. 1982	5,310	6,297	[10] 327	Aug. 24, 1930	878	—	888	—	967	70	1,180	70	1,200	70	1,490	70
02353000	Flint River at Newton (flow regulated by powerplants at Flint River Reservoir since 1921 and at Warwick Reservoir since 1930)	Apr. 1938 to Sept. 1950, Oct. 1956 to Mar. 1982	5,740	6,997	840	Oct. 20, 1940	1,230	—	1,250	—	1,330	70	1,540	70	1,570	70	1,850	70
02353500	Ichawaynochaway Creek at Milford (flow affected by irrigation withdrawals)	Aug. 1905 to Dec. 1907, Oct. 1939 to Mar. 1982	620	792	117	Sept. 16, 1968	50	—	68	—	129	—	181	—	204	—	227	—
02380500	Coosawattee River near Ellijay	Oct. 1938 to Dec. 1949, June 1963 to Mar. 1982	236	522	104	Oct. 26, 1941	119	10	120	15	131	15	154	8	165	8	206	15
02381600	Fausett Creek near Talking Rock	Oct. 1974 to Mar. 1982	9.99	19.7	4.5	Oct. 4-7,11,12, 1978	2.9	—	3.0	—	3.4	—	4.2	—	4.3	—	5.6	—
02382200	Talking Rock Creek near Hinton	Nov. 1973 to Mar. 1982	119	213	35	Oct. 7,12, 1978	26	—	27	—	31	—	38	—	39	—	50	—
02382500	Coosawattee River at Carters (flow regulated by Carters Lake and Carters re-regulation dam since November 1974)	Aug. 1896 to Dec. 1908, Oct. 1918 to Sept. 1923, Oct. 1961 to Aug. 1972, Oct. 1974 to Mar. 1982	521	1,236	[11] 122	Nov. 15, 1974	227	4	260	7	270	7	336	7	395	7	417	17
02383500	Coosawattee River near Pine Chapel (flow regulated by Carters Lake and Carters re-regulation dam since November 1974)	Oct. 1938 to Mar. 1982	831	1,494	188	Sept. 11, 1976	279	4	333	4	358	4	411	4	447	4	498	20
02385800	Holly Creek near Chatsworth (low flow affected by withdrawals and return flow by city of Chatsworth)	June 1960 to Mar. 1982	64.0	121	1.50	Sept. 14,16,17, 1980	4.8	2	7.0	2	10	2	18	2	23	2	39	2
02387000	Conasauga River at Tilton (flow affected by withdrawals and return flow by city of Dalton)	June 1937 to Mar. 1982	687	1,215	50	Oct. 29, 1978	62	—	82	—	116	—	196	—	226	—	360	—
02387500	Oostanaula River at Resaca (flow regulated by Carters Lake and Carters re-regulation dam since November 1974)	Oct. 1892 to Mar. 1982	1,600	2,811	[12] 180	Sept. 7,8, 1925	481	2	546	2	706	2	781	2	815	2	998	3
02388300	Heath Creek near Rome	May 1968 to Mar. 1982	14.7	26.9	1.20	Aug. 30 to Sept. 6, 1977; Oct. 5-7,11,13-21, 1978	2.0	<2	2.1	<2	2.3	<2	2.8	<2	3.2	<2	4.6	2
02388500	Oostanaula River at Rome (flow regulated by Carters Lake and Carters re-regulation dam since November 1974)	Oct. 1939 to Mar. 1982	2,120	3,635	[13] 408	Oct. 25, 1954	583	2	589	3	734	3	781	3	819	4	1,060	4
02392000	Etowah River at Canton	Oct. 1936 to Mar. 1982	613	1,247	178	Sept. 29,30, 1954	195	25	199	25	219	25	265	25	282	25	347	50

See footnotes at end of table.

Table 1.– Minimum flows at continuous-record gaging stations during the drought of 1981, and estimated recurrence intervals – Continued
(R.I., recurrence interval; <, less than; >, more than)

Station number	Station name	Period of record	Drainage area (mi^2)	Average flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year: Flow (ft^3/s)	Minimum daily flow prior to 1981-82 climatic year: Date	1-day flow (ft^3/s)	Est. R.I. (years)	7-day flow (ft^3/s)	Est. R.I. (years)	30-day flow (ft^3/s)	Est. R.I. (years)	60-day flow (ft^3/s)	Est. R.I. (years)	90-day flow (ft^3/s)	Est. R.I. (years)	183-day flow (ft^3/s)	Est. R.I. (years)
							Minimum average flow for indicated number of consecutive days in 1981-82 climatic year and estimated recurrence interval											
02394000	Etowah River at Allatoona Dam, above Cartersville (flow regulated by Allatoona Reservoir since December 1949)	Sept. 1938 to Mar. 1982	1,120	1,912	152	Oct. 15, 1966	275	<2	366	3	592	3	750	3	767	4	1,020	4
02395000	Etowah River near Kingston (flow regulated by Allatoona Reservoir since December 1949)	July 1928 to Dec. 1931, Oct. 1936 to Mar. 1982	1,630	2,582	[14] 268	Oct. 19, 1931	483	3	680	3	831	4	1,000	4	1,070	4	1,310	4
02395120	Two Run Creek near Kingston	May 1980 to Mar. 1982	33.1	—	—	—	7.2	—	7.6	—	8.4	—	9.3	—	10	—	12	—
02396000	Etowah River at Rome (flow regulated by Allatoona Reservoir since December 1949)	July to Dec. 1903, Aug. 1904 to June 1921, Oct. 1938 to Mar. 1982	1,820	2,971	[15] 360	Oct. 10, 1904	615	2	797	3	927	4	1,090	3	1,150	4	1,410	5
02397000	Coosa River near Rome (flow regulated by Allatoona Reservoir since 1949 and by Carters Lake and Carters reregulation dam since November 1974)	Oct. 1896 to Dec. 1903, June 1928 to Dec. 1931, Mar. 1937 to Dec. 1958, Oct. 1962 to Mar. 1982	4,040	6,737	[16] 870	Oct. 18-22, 1931	1,120	4	1,260	6	1,630	4	1,800	4	2,100	4	2,530	5
02397410	Cedar Creek at Cedartown	Apr. 1981 to Mar. 1982	66.9	—	—	—	13	—	13	—	15	—	17	—	17	—	21	—
02397830	Harrisburg Creek near Hawkins	Oct. 1979 to Mar. 1982	13.3	—	0	Most years	0	—	0	—	0	—	0	—	.25	—	3.5	—
02398000	Chattooga River at Summerville	Mar. 1937 to Mar. 1982	192	359	38	Oct. 17, 1937; Nov. 9, 1939	69	2	72	3	74	4	78	2	95	2	126	2
02411800	Little River near Buchanan	June 1959 to Mar. 1982	20.2	34.1	1.60	Oct. 6, 1970	2.9	4	3.1	4	5.1	4	6.6	3	7.9	4	10	6
02412000	Tallapoosa River near Heflin, Ala.	Apr. 1953 to Mar. 1982	444	706	13	Oct. 9,10,13,14, 20-22, 1954	42	10	45	10	75	6	—	—	—	—	—	—
03545000	Hiawassee River at Presley	Oct. 1941 to Mar. 1982	45.5	139	23	Sept. 29, Oct. 5, 6,8,10-13, 1954; Sept. 7, 1957	27	12	28	18	30	25	33	20	37	20	45	25
03550500	Nottely River near Blairsville (occasional regulation by Lake Trahlyta in Vogel State Park)	Jan. 1942 to Mar 1982	74.8	188	28	Oct. 6, 1947	31	15	32	15	35	15	40	20	44	20	58	20
03558000	Toccoa River near Dial	Oct. 1912 to Mar. 1982	177	498	60	Sept. 6, 1925	114	15	115	18	123	18	142	12	158	10	195	10
03568933	Lookout Creek near New England	Aug. 1979 to Mar. 1982	149	—	23	Aug. 28,29, Sept. 8,9, 1980	16	—	16	—	17	—	19	—	25	—	41	—

1 Minimum daily flow since regulation began at Clarks Hill Reservoir, 2,280 ft^3/s, Sept. 17, 1952.
2 Minimum daily flow since regulation began at Clarks Hill Reservoir, 3,610 ft^3/s, Sept. 20, 1952.
3 Observed before period of operation of continuous gage.
4 Flow affected by filling of Lloyd Shoals Reservoir. Minimum daily flow since reservoir was filled, 69 ft^3/s, Nov. 25, 26, 1954.
5 Flow affected by filling of Sinclair Reservoir. Minimum and daily flow since reservoir was filled, 351 ft^3/s, Oct. 19, 1954.
6 Minimum daily flow since regulation began, 351 ft^3/s, Sept. 1, 1957.
7 Minimum daily flow since regulation began, 1,170 ft^3/s, Sept. 15, 1969.
8 Minimum daily flow since present regulation began, 539 ft^3/s, Jan. 2, 1977.
9 Minimum daily flow since present regulation began, 860 ft^3/s, Sept. 14, 1975.
10 Flow affected by work on reservoir upstream.
11 Flow affected by filling of Carters Lake. Minimum daily flow since lake was filled, 195 ft^3/s, July 20, 1975.
12 Minimum daily flow since regulation began, 354 ft^3/s, Oct. 30, 1978.
13 Minimum daily flow since regulation began, 463 ft^3/s, Oct. 17, 1978.
14 Minimum daily flow since regulation began, 363 ft^3/s, Oct. 14, 1956.
15 Minimum daily flow since regulation began, 400 ft^3/s, Dec. 7, 1954.
16 Minimum daily flow since present regulation began, 1,120 ft^3/s, Oct. 9, 1978.

basis. Many of the gaging stations used were previously analyzed through climatic year 1974 (Carter and Putnam, 1978).

Flows were arrayed by computer in order of magnitude and assigned order numbers beginning with the smallest flow as number 1. The recurrence interval (RI) of each value in the array was computed by the formula

$$RI = \frac{N+1}{M},$$

where N = the number of years of record, and
M = the order number.

This is the plotting position formula currently in use by the U.S. Geological Survey. The formula is simple to compute and gives results acceptably in conformance with some of the latest theories regarding distribution of drought flows.

The frequency data computed as described above were plotted on log-Extremal Type III (Weibull) plotting paper and flow-frequency curves were defined by graphical curve fitting. The graphical method facilitated use of judgment in fitting mean curves to data derived from short periods of record. For example, the lowest flow in a data set derived from 10 years of record would have a computed plotting position of 11-years recurrence interval. The lowest flow in a data set derived from 30 years of record on a nearby stream would have a computed plotting position of 31 years, even if it occurred in the same climatic year as that of the 10 year data set. In this instance, the lowest flow in the set with 10 values would probably plot as an outlier. This effect is illustrated in figure 4 by a frequency curve based on 10 years of record at one gaging station compared with a frequency curve based on 30 years of record at a nearby gaging station. The minimum flow during a severe drought (1954) at the station with 10 years of record is an outlier and does not line up well with other data on the graph for that station, but the minimum flow during 1954 at the station with 30 years of record does line up fairly well with other data for that station.

In fitting a graphical curve to a set of data for a gaging station with the short record, one can use knowledge that, at nearby gaging stations, the low flow in 1954 had a much longer recurrence interval than 11 years. Therefore, it is reasonable to give little weight to the 1954 low-flow data point in drawing a frequency curve.

Frequency estimates for 1980-81 low flows based on graphical curves are listed in table 1.

Partial-Record Gaging Stations

At partial-record gaging stations only occasional flow measurements are made, usually one a year, during periods of base flow. Results of these measurements can be related to concurrent flows at nearby continuous-record "index" gaging stations provided sufficient measurements are available to establish a satisfactory flow relation. Flow measurements obtained during severe drought are desirable if the flow relation is to be extended to include extreme low-flow events. Flow measurements were made at 83 low-flow partial-record stations during 1981 and the results of these measurements are listed in table 2. Locations of these sites are shown in figure 5.

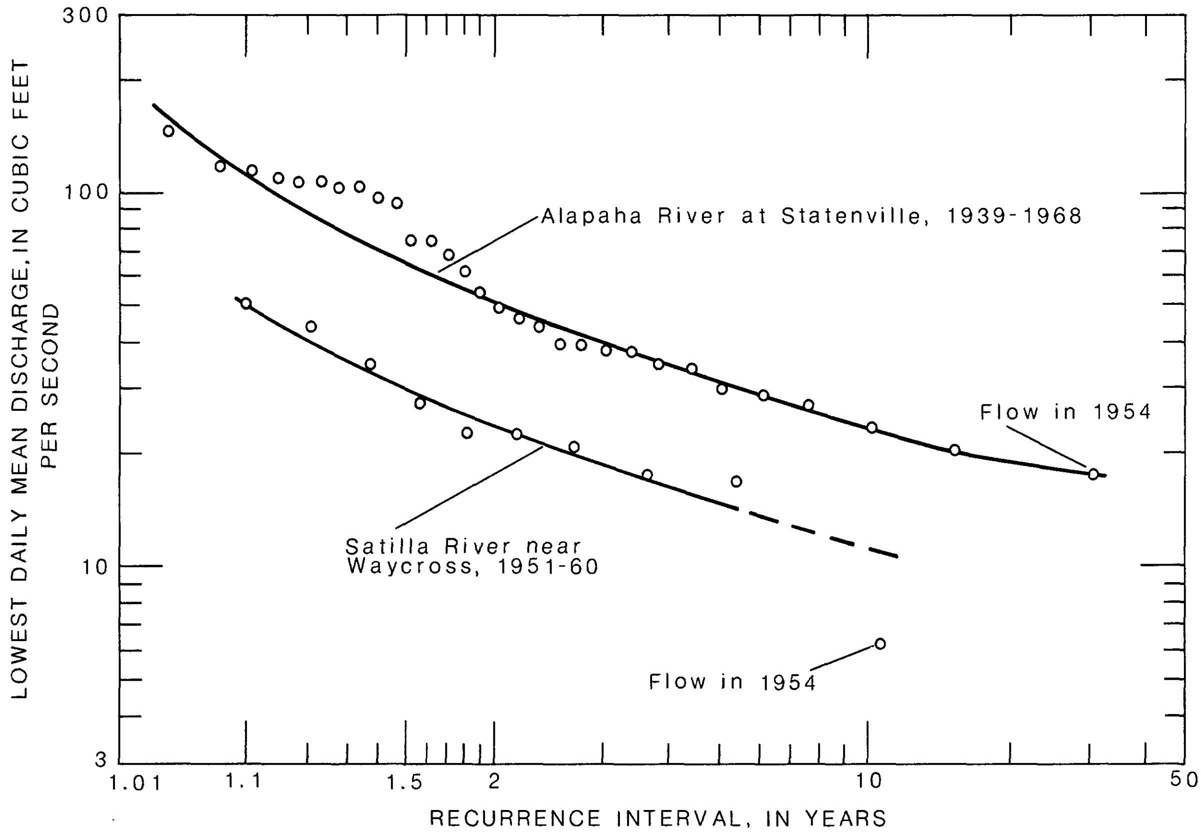

Figure 4.— Frequency curve of annual minimum daily flows for Satilla River near Waycross (02226500) for 1951-60 compared with the curve for Alapaha River at Statenville (02317500) for 1939-68.

Table 2 shows the number, name, and location of measuring sites, drainage area, period of record, and the 1981 date and measured discharge. Measurements made in previous years, as listed under period of record, have been published previously. Continuous-record gaging stations were operated previously at some of the sites listed in table 2.

Measurements were made at relatively few low-flow partial-record stations in the Coastal Plain during 1981, and relatively few such stations are operated there. This is because in much of the area, a great many of the small tributary streams, especially those draining less than 200 mi^2, are intermittent during the late summer and fall. Much of this area is underlain by limestone, clay, and sand of Miocene to Pleistocene age that contribute little or no flow to small and medium-sized streams during rainless periods. Only the very large streams are incised deeply enough into underlying aquifers to receive appreciable ground-water outflow during dry periods (Carter and Putnam, 1978).

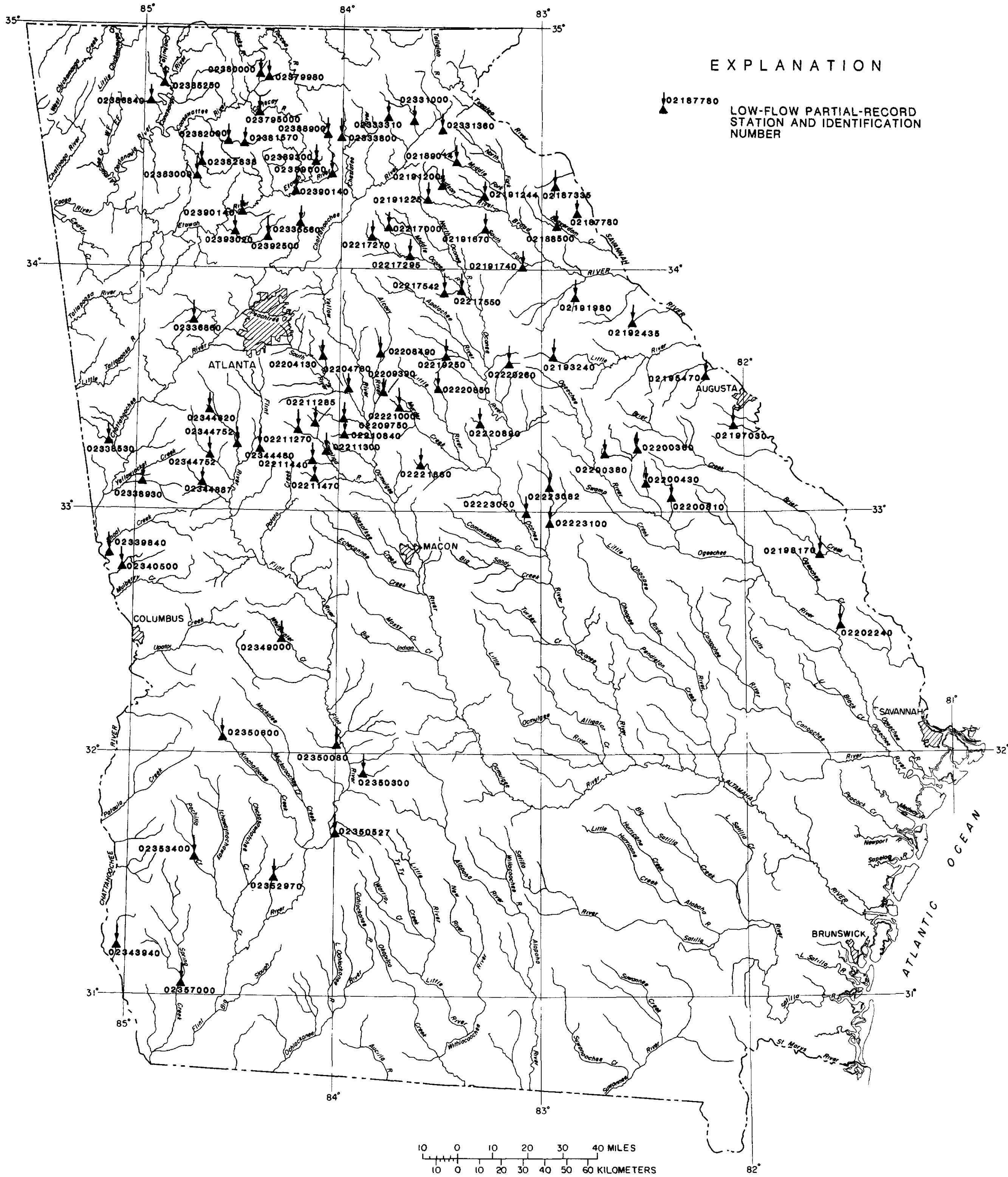

Figure 5.— Location of low-flow partial-record gaging stations at which measurements were made during 1981.

Table 2.—Discharge measurements made at low-flow partial-record gaging stations during calendar year 1981

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Savannah River Basin				
02187335	Cedar Creek near Hartwell, Ga.	Lat 34°20'06", long 82°56'26", Hart County, Hydrologic Unit 03060103, at State Highway 172, 1 mile south of Hartwell.	2.27	1979-81	9-1-81	0.52
02187780	Coldwater Creek near Ruckersville, Ga.	Lat 34°12'52", long 82°48'07", Elbert County, Hydrologic Unit 03060103, at State Highway 368, 3.5 miles north of Ruckersville.	67.5	1943, 1953, 1955, 1979, 1981	9-1-81	12
02188500	Beaverdam Creek at Dewy Rose, Ga. (Prior to 1975, published as South Beaverdam Creek.)	Lat 34°10'52", long 82°56'38", Elbert County, Hydrologic Unit 03060103, at county road, 1 mile northeast of Dewy Rose.	35.8	1943-77†, 1979-81	9-1-81	4.6
02189014	Middle Fork Broad River near Homer, Ga.	Lat 34°26'20", long 83°25'38", Banks County, Hydrologic Unit 03060104, at State Highway 184, 6.5 miles north of Homer.	45.8	1955, 1979-81	9-1-81	14
02191200	Hudson River at Homer, Ga.	Lat 34°20'30", long 83°29'10", Banks County, Hydrologic Unit 03060104, at State Highway 15, at Homer.	61.1	1959-79†, 1980-81	9-1-81	19
02191225	Hickory Level Creek near Maysville, Ga.	Lat 34°17'27", long 83°31'50", Banks County, Hydrologic Unit 03060104, at State Highway 98, 3 miles north of Maysville.	11.3	1943, 1953, 1955, 1979-81	9-1-81	3.8
02191244	Nails Creek near Carnesville, Ga.	Lat 34°16'32", long 83°16'33", Franklin County, Hydrologic Unit 03060104, at State Highway 106, 7 miles south of Carnesville.	47.2	1979-81	9-1-81	15
02191670	South Fork Broad River at Ila, Ga.	Lat 34°09'55", long 83°17'52", Madison County, Hydrologic Unit 03060104, at State Highway 106, at Ila.	17.0	1953, 1955, 1979-81	9-1-81	1.9
02191740	Big Clouds Creek near Carlton, Ga.	Lat 34°01'14", long 83°04'10", Oglethorpe County, Hydrologic Unit 03060104, at county road, 1 mile southwest of Carlton.	47.3	1943, 1953, 1955-56, 1979-81	9-1-81	4.2
02191980	Clark Creek near Tignall, Ga.	Lat 33°53'50", long 82°48'45", Wilkes County, Hydrologic Unit 03060104, at county road, 6 miles northwest of Tignall.	42.6	1943, 1953, 1955, 1979-81	9-1-81	1.2
02192435	Soap Creek near Lincolnton, Ga.	Lat 33°48'57", long 82°29'44", Lincoln County, Hydrologic Unit 03060103, at county road, 2 miles northwest of Lincolnton.	16.7	1974, 1979-81	9-2-81	.37
02193240	South Fork Little River near Crawfordville, Ga.	Lat 33°37'15", long 82°55'10", Taliaferro County, Hydrologic Unit 03060105, at State Highway 22, 4 miles north of Crawfordville.	45.7	1951-53, 1979-80, 1982	10-23-81	1.0
02194570	Uchee Creek near Evans, Ga.	Lat 33°34'02", long 82°11'01", Columbia County, Hydrologic Unit 03060106, at State Highway 104, 4 miles northwest of Evans.	58.3	1953, 1955, 1979-81	9-2-81	1.3

† Operated as a continuous-record gaging station.

Table 2.—Discharge measurements made at low-flow partial-record gaging stations during calendar year 1981—Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Savannah River Basin--Continued				
02197030	Spirit Creek near Hephzibah, Ga.	Lat 33°20'55", long 82°04'35", Richmond County, Hydrologic Unit 03060106, at Windsor Spring Road, 3 miles north of Hephzibah.	50.3	1943, 1955, 1980, 1982	10-22-81	3.23
02198170	Beaverdam Creek near Sylvania, Ga.	Lat 32°49'15", long 81°37'24", Screven County, Hydrologic Unit 03060108, at State Highway 24, 5 miles north of Sylvania.	116	1979-80, 1982	10-22-81	.58
		Ogeechee River Basin				
02200360	Beechtree Creek near Gibson, Ga.	Lat 33°14'40", long 82°34'25", Glascock County, Hydrologic Unit 03060201, at county road, 1 mile east of Gibson.	7.21	1979-80, 1982	10-23-81	.81
02200380	Joes Creek near Mitchell, Ga.	Lat 33°14'17", long 82°40'22", Glascock County, Hydrologic Unit 03060201, at county road, 2 miles east of Mitchell.	9.26	1979-80, 1982	10-23-81	.42
02200430	Duhart Creek near Louisville, Ga.	Lat 33°06'32", long 82°29'29", Jefferson County, Hydrologic Unit 03060201, at county road, 5 miles northwest of Louisville.	31.0	1979-80, 1982	10-21-81	14
02200810	Big Creek near Louisville, Ga.	Lat 33°02'55", long 82°21'30", Jefferson County, Hydrologic Unit 03060201, at county road, 4 miles northeast of Louisville.	56.9	1943-44, 1953, 1955, 1979-80, 1982	10-21-81	17
02202240	Ogeechee Creek at Oliver, Ga.	Lat 32°31'28", long 81°32'23", Screven County, Hydrologic Unit 03060202, at State Highway 17, at Oliver.	141	1954, 1979, 1982	10-22-81	.07
		Altamaha River Basin				
02204130	Honey Creek near Conyers, Ga.	Lat 33°34'47", long 84°03'51", Rockdale County, Hydrologic Unit 03070103, at State Highway 212, 6 miles southwest of Conyers.	26.0	1979-80, 1982	10-21-81	3.8
02204780	Snapping Shoals Creek near Porterdale, Ga.	Lat 33°29'25", long 83°57'19", Newton County, Hydrologic Unit 03070103, at State Highway 81, 8 miles south of Porterdale.	39.2	1979-80, 1982	10-21-81	6.6
02208490	Cornish Creek near Covington, Ga.	Lat 33°38'30", long 83°47'55", Newton County, Hydrologic Unit 03070103, at county road, 5 miles northeast of Covington.	28.3	1979-80, 1982	10-21-81	2.7
02209390	Bear Creek near Stewart, Ga.	Lat 33°26'45", long 83°48'46", Newton County, Hydrologic Unit 03070103, at county road, 3 miles northeast of Stewart.	27.0	1974, 1979-80, 1982	10-21-81	2.9
02209750	Tussahaw Creek near Jackson, Ga.	Lat 33°22'43", long 83°57'49", Butts County, Hydrologic Unit 03070103, at county road, 6 miles north of Jackson.	59.2	1955, 1974, 1977, 1979-80, 1982	10-22-81	5.3
02210640	Yellow Water Creek near Jackson, Ga.	Lat 33°18'42", long 83°59'00", Butts County, Hydrologic Unit 03070103, at State Highway 42, 1 mile northwest of Jackson.	5.25	1965, 1979-80, 1982	10-22-81	.50

Table 2.—Discharge measurements made at low-flow partial-record gaging stations during calendar year 1981—Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Altamaha River Basin--Continued				
02211270	Troublesome Creek near Griffin, Ga.	Lat 33°18'33", long 84°11'22", Spalding County, Hydrologic Unit 03070103, at State Highway 155, 7 miles northeast of Griffin.	16.9	1954, 1977, 1979-80, 1982	10-22-81	2.4
02211285	Indian Creek near Locust Grove, Ga.	Lat 33°21'02", long 84°08'28", Henry County, Hydrologic Unit 03070103, at county road, 1 mile west of Locust Grove.	15.2	1951, 1953-54, 1977, 1979-80, 1982	10-22-81	.82
02211300	Towaliga River near Jackson, Ga.	Lat 33°15'50", long 84°04'17", Butts County, Hydrologic Unit 03070103, at State Highway 16, 6.5 miles west of Jackson.	a105	1960-71†, 1973, 1977, 1979-80, 1982	10-22-81	1.8
02211440	Buck Creek near Orchard Hill, Ga.	Lat 33°12'21", long 84°07'46", Spalding County, Hydrologic Unit 03070103, at county road, 5 miles east of Orchard Hill.	16.7	1977, 1979-80, 1982	10-22-81	.86
02211470	Edie Creek near Milner, Ga.	Lat 33°08'39", long 84°08'45", Lamar County, Hydrologic Unit 03070103, at county road, 4 miles northeast of Milner.	7.70	1951, 1953-54, 1979-80, 1982	10-22-81	.20
02217000	Allen Creek at Talmo, Ga.	Lat 34°11'34", long 83°43'11", Jackson County, Hydrologic Unit 03070101, at U.S. Highway 129, at Talmo.	17.3	1951-71†, 1979-81	9-31-81	5.1
02217270	Mulberry River near Flowery Branch, Ga.	Lat 34°07'46", long 83°49'52", Hall County, Hydrologic Unit 03070101, at State Highway 211, 10 miles west of Flowery Branch.	43.2	1953, 1955, 1979-81	9-3-81	7.3
02217295	Mulberry River near Hoschton, Ga.	Lat 34°03'18", long 83°43'03", Jackson-Barrow County line, Hydrologic Unit 03070101, at State Highway 53, 3 miles southeast of Hoschton.	117	1951, 1955, 1979-81	9-3-81	28
02217542	Barber Creek near Eastville, Ga.	Lat 33°53'32", long 83°30'13", Oconee County, Hydrologic Unit 03070101, at county road, 1 mile north of Eastville.	26.5	1979-80, 1982	10-21-81	4.3
02217550	McNutt Creek near Watkinsville, Ga.	Lat 33°54'34", long 83°24'03", Oconee-Clarke County line, Hydrologic Unit 03070101, at U.S. Highway 441, 3 miles north of Watkinsville.	54.1	1975, 1979-80, 1982	10-21-81	6.7
02219250	Hard Labor Creek near Madison, Ga.	Lat 33°38'15", long 83°29'24", Morgan County, Hydrologic Unit 03070101, at State Highway 83, 4 miles north of Madison.	76.0	1967, 1979-80, 1982	10-22-81	9.1
02220260	Richland Creek near Greensboro, Ga.	Lat 33°36'33", long 83°09'44", Greene County, Hydrologic Unit 03070101, at county road, 2 miles north of Greensboro.	12.4	1956, 1979-80, 1982	10-22-81	0.11
02220690	Crooked Creek near Eatonton, Ga.	Lat 33°19'20", long 83°16'32", Putnam County, Hydrologic Unit 03070101, at county road, 7 miles east of Eatonton.	25.8	1974, 1979-80, 1981	10-23-81	.95

† Operated as a continuous-record gaging station.
a Approximately.

Table 2.—Discharge measurements made at low-flow partial-record gaging stations during calendar year 1981—Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Altamaha River Basin--Continued				
02220850	Big Indian Creek near Madison, Ga.	Lat 33°31'32", long 83°31'28", Morgan County, Hydrologic Unit 03070101, at State Highway 83, 6 miles southwest of Madison.	30.2	1943, 1951-54, 1979-80, 1982	10-22-81	3.1
02221000	Murder Creek near Monticello, Ga.	Lat 33°24'56", long 83°39'43", Jasper County, Hydrologic Unit 03070101, at State Highway 229, 8 miles north of Monticello.	a24	1952-71†, 1972, 1979-80, 1982	10-22-81	2.2
02221660	Cedar Creek near Monticello, Ga.	Lat 33°12'42", long 83°36'05", Jasper County, Hydrologic Unit 03070101, at county road, 9 miles southeast of Monticello.	20.1	1979-80, 1982	10-22-81	.57
02223050	Town Creek near Milledgeville, Ga.	Lat 32°59'30", long 83°04'25", Baldwin County, Hydrologic Unit 03070102, at State Highway 24, 11 miles southeast of Milledgeville.	58.9	1943, 1955, 1979-80, 1982	10-21-81	5.2
02223082	Buffalo Creek near Linton, Ga.	Lat 33°06'27", long 82°57'34", Hancock-Washington County line, Hydrologic Unit 03070102, at county road, 1 mile east of Linton.	92.9	1943-44, 1951, 1955, 1979-80, 1982	10-21-81	1.2
02223100	Buffalo Creek near Sandersville, Ga.	Lat 32°57'43", long 82°57'35", Washington County, Hydrologic Unit 03070102, at State Highway 24, 10 miles west of Sandersville.	248	1959-68, 1970 1972, 1975, 1979-80, 1982	10-21-81	15
		Apalachicola River Basin				
02331000	Chattahoochee River near Leaf, Ga.	Lat 34°34'37", long 83°38'09", Habersham County, Hydrologic Unit 03130001, at State Highway 115, 1.5 miles east of Leaf.	150	1940-71†, 1979-82	9-3-81, 10-18-82, 10-22-82	111 107 102
02331360	Hazel Creek near Clarksville, Ga.	Lat 34°35'09", long 83°31'07", Habersham County, Hydrologic Unit 03130001, at county road, 1 mile south of Clarksville.	16.8	1955, 1979-81, 1982	9-3-81 10-23-81	5.6 6.0
02333310	Tesnatee Creek near Cleveland, Ga.	Lat 34°35'44", long 83°46'41", White County, Hydrologic Unit 03130001, at U.S. Highway 129, 1 mile north of Cleveland.	9.89	1953, 1955, 1979-81, 1982	9-3-81 10-22-81	4.2 4.8
02333800	Cane Creek at Dahlonega, Ga.	Lat 34°31'44", long 84°00'25", Lumpkin County, Hydrologic Unit 03130001, at U.S. Highway 19, at Dahlonega.	21.9	1951, 1953, 1955, 1979-82	9-3-81 10-22-81	11 9.8
02335560	Bentley Creek near Cumming, Ga.	Lat 34°10'43", long 84°13'16", Forsyth County, Hydrologic Unit 03130001, at State Highway 371, 5 miles southwest of Cumming.	8.56	1955, 1980-82	9-3-81 10-21-81	2.0 1.8
02336860	Gothards Creek near Douglasville, Ga.	Lat 33°47'16", long 84°45'01", Paulding County, Hydrologic Unit 03130002, at State Highway 92, 4 miles north of Douglasville.	13.0	1953-54, 1979-80, 1982	10-22-81	.56

† Operated as a continuous-record gaging station.
a Approximately.

Table 2.—Discharge measurements made at low-flow partial-record gaging stations during calendar year 1981—Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Apalachicola River Basin--Continued				
02338530	Hillabahatchee Creek near Franklin, Ga.	Lat 33°16'50", long 85°07'10", Heard County, Hydrologic Unit 03130002, at State Highway 34, 1 mile west of Franklin.	77.3	1951, 1953, 1979-80, 1982	10-21-81	20
02338930	Beech Creek near LaGrange, Ga.	Lat 33°05'32", long 84°59'02", Troup County, Hydrologic Unit 03130002, at county road, 3 miles north of LaGrange.	52.9	1952, 1955, 1979-80, 1982	10-22-81	8.1
02339840	Flat Shoal Creek near West Point, Ga.	Lat 32°50'12", long 85°06'57", Harris County, Hydrologic Unit 03130002, at State Highway 103, 3 miles southeast of West Point.	211	1974, 1979-80, 1982	10-22-81	31
02340500	Mountain Oak Creek near Hamilton, Ga.	Lat 32°44'28", long 85°04'08", Harris County, Hydrologic Unit 03130002, at State Highway 103, 11 miles west of Hamilton.	61.7	1944-71†, 1979-80, 1982	10-22-81	53
02343940	Sowhatchee Creek at Cedar Springs, Ga.	Lat 31°10'40", long 85°02'37", Early County, Hydrologic Unit 03130004, at State Highway 273, at Cedar Springs.	64.2	1979-81	1-6-81	15
02344480	Shoal Creek near Griffin, Ga.	Lat 33°15'33", long 84°23'18", Spalding County, Hydrologic Unit 03130005, at county road, 4.5 miles west of Griffin.	20.5	1953-55, 1977, 1979-80, 1982	10-21-81	3.2
02344620	Shoal Creek near Sharpsburg, Ga.	Lat 33°23'21", long 84°37'24", Coweta County, Hydrologic Unit 03130005, at State Highway 54, 4 miles north of Sharpsburg.	24.1	1943, 1953-54, 1979-80, 1982	10-22-81	1.4
02344752	Line Creek above Haralson, Ga.	Lat 33°15'23", long 84°29'50", Coweta-Spalding County line, Hydrologic Unit 03130005, at State Highway 16, 3 miles east of Senoia.	216	1951, 1977, 1979-80, 1982	10-21-81	12
02344887	Red Oak Creek near Greenville, Ga.	Lat 33°06'13", long 84°39'59", Meriwether County, Hydrologic Unit 03130005, at State Highway 362, 5 miles northeast of Greenville.	41.4	1979-80, 1982	10-21-81	7.1
02349000	Whitewater Creek below Rambulette Creek, near Butler, Ga.	Lat 32°28'02", long 84°15'59", Taylor County, on left bank 500 ft downstream from mouth of Rambulette Creek, 6.5 miles south of Butler, and 8 miles upstream from Cedar Creek.	93.4	1952-71†	11-2-72 8-12-80 10-2-81	140 134 103
02350080	Lime Creek near Cobb, Ga.	Lat 32°02'06", long 83°59'33", Sumter County, Hydrologic Unit 03130006, at county road, 5 miles north of Cobb.	61.8	1954, 1957, 1974, 1979, 1981	1-5-81	16
02350300	Cedar Creek near Cordele, Ga.	Lat 31°54'47", long 83°51'12", Crisp County, Hydrologic Unit 03130006, at State Highway 257, 5 miles south of Cordele.	34.0	1954, 1961, 1965-68, 1973, 1979-81	1-5-81	3.1
02350527	Mill Creek near Albany, Ga.	Lat 31°40'04", long 83°59'48", Worth County, Hydrologic Unit 03130006, at State Highway 257, 10 miles northeast of Albany.	44.0	1979-81	1-6-81 7-30-81	14 15

† Operated as a continuous-record gaging station.

Table 2.—Discharge measurements made at low-flow partial-record gaging stations during calendar year 1981—Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Apalachicola River Basin--Continued				
02350600	Kinchafoonee Creek at Preston, Ga.	Lat 32°03'13", long 84°32'53", Webster County, near right bank at downstream side of bridge on State Highway 41, 1 mile southwest of Preston, and 1 mile upstream from Harrel Mill Creek.	197	1952-77† 1982	11-19-78 7-3-79 8-29-79 10-2-81	76.2 82.4 86.8 29.9
02352970	Cooleewahee Creek near Albany, Ga.	Lat 31°30'13", long 84°17'28", Dougherty County, Hydrologic Unit 03130008, at State Highway 62, 8 miles west of Albany.	60.1	1955, 1979-81	1-6-81	.44
02353400	Pachitla Creek near Edison, Ga.	Lat 31°33'17", long 84°40'43", Calhoun County, Hydrologic Unit 03130009, at State Highway 37, 3.6 miles east of Edison.	188	1951, 1954, 1959-71†, 1973-74, 1979-81	1-5-81	131
02357000	Spring Creek near Iron City, Ga.	Lat 31°02'23", long 84°44'18", Decatur County, Hydrologic Unit 03130010, at county bridge, 5.5 miles northeast of Iron City.	a485	1938-71†, 1977-78†, 1981	10-13-80 1-6-81 5-14-81 7-13-81 7-27-81 8-13-81 9-18-81	31 38 50 5.3 9.1 27 44
		Mobile River Basin				
02379500	Cartecay River near Ellijay, Ga.	Lat 34°40'53", long 84°27'20", Gilmer County, Hydrologic Unit 03150102, at State Highway 52, 2 miles southeast of Ellijay.	134	1937-76†, 1979-80, 1982	10-21-81	82
02379980	Rock Creek at Cherry Log, Ga.	Lat 34°46'46", long 84°23'32", Gilmer County, Hydrologic Unit 03150102, at State Highway 5, at Cherry Log.	10.7	1951, 1955, 1979-80, 1982	10-21-81	5.4
02380000	Ellijay River at Ellijay, Ga.	Lat 34°41'06", long 84°28'40", Gilmer County, Hydrologic Unit 03150102, at State Highway 5, at Ellijay.	87.7	1954-69†, 1982	10-21-81	46
02381570	Talking Rock Creek at Talking Rock, Ga.	Lat 34°30'40", long 84°30'31", Pickens County, Hydrologic Unit 03150102, at county road, at Talking Rock.	16.6	1955, 1979-80, 1982	10-22-81	4.1
02382000	Scarecorn Creek at Hinton, Ga.	Lat 34°28'04", long 84°35'30", Pickens County, Hydrologic Unit 03150102, at State Highway 53, 0.2 mile southwest of Hinton.	21.3	1939-42†, 1959-74†, 1980-82	9-2-81, 10-22-81	5.2 2.9
02382838	Salacoa Creek at Fairmount, Ga.	Lat 34°25'07", long 84°41'55", Gordon County, Hydrologic Unit 03150102, at U.S. Highway 411, 1 mile south of Fairmount.	44.1	1980-82	9-2-81 10-22-81	2.9 1.3
02383000	Rock Creek near Fairmount, Ga.	Lat 34°21'32", long 84°46'46", Bartow County, Hydrologic Unit 03150102, at State Highway 140, 7 miles southwest of Fairmount.	6.17	1952-74†, 1979-82	9-2-81 10-22-81	1.2 .56
02385250	Coahulla Creek near Dalton, Ga.	Lat 34°46'46", long 84°53'47", Whitfield County, Hydrologic Unit 03150101, at U.S. Highway 76, 3 miles east of Dalton.	119	1979-80, 1982	10-23-81	27

† Operated as a continuous-record gaging station.
a Approximately.

Table 2.—Discharge measurements made at low-flow partial-record gaging stations during calendar year 1981—Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Mobile River Basin--Continued				
02386840	Swamp Creek near Dalton, Ga.	Lat 34°40'24", long 84°58'57", Whitfield County, Hydrologic Unit 03150101, at U.S. Highway 41, 5 miles south of Dalton.	12.3	1959, 1966, 1979-80, 1982	10-22-81	1.2
02388900	Etowah River near Dahlonega, Ga.	Lat 34°30'53", long 84°03'37", Lumpkin County, Hydrologic Unit 03150104, at State Highway 9, 4 miles west of Dahlonega.	69.7	1951, 1953, 1955, 1959, 1979-82	9-3-81 10-22-81	53 52
02389000	Etowah River near Dawsonville, Ga.	Lat 34°22'57", long 84°03'21", Dawson County, Hydrologic Unit 03150104, near State Highway 53, 4 miles southeast of Dawsonville.	107	1940-76†, 1979-82	10-21-81	74
02389300	Shoal Creek near Dawsonville, Ga.	Lat 34°25'25", long 84°08'40", Dawson County, Hydrologic Unit 03150104, near State Highway 53, 1 mile west of Dawsonville.	21.7	1958-74†, 1979-82	10-21-81	11
02390140	Settingdown Creek near Ball Ground, Ga.	Lat 34°17'35", long 84°15'49", Cherokee County, Hydrologic Unit 03150104, at State Highway 369, 8 miles southeast of Ball Ground.	49.3	1955, 1959, 1980-81	9-3-81 10-21-81	11 11
02392500	Little River near Roswell, Ga.	Lat 34°07'09", long 84°23'18", Fulton County, Hydrologic Unit 03150104, at State Highway 140, 7 miles north of Roswell.	60.0	1947-76†, 1979-82	9-3-81 10-21-81	13 11
02393020	Noonday Creek near Woodstock, Ga.	Lat 34°06'25", long 84°32'50", Cherokee County, Hydrologic Unit 03150104, 1.7 miles west of Woodstock.	47.9	1974, 1980-82	9-3-81 10-21-81	19 10

† Operated as a continuous-record gaging station.

Generalized Areas of Similar Recurrence Intervals

To show the relative severity of deficient streamflows during the 1980-81 drought on an areal basis, the recurrence intervals of minimum average flows for selected periods of 1, 7, 30, 90, and 183 days, as listed in table 1, were plotted on maps. Only flow data not subject to significant regulation or other modification were used. Generalized areas were delineated in which the severity of the drought was indicated to be fairly uniform. The results, based on recurrence intervals for selected periods from 1 to 183 consecutive days, are shown in figures 6 through 10, respectively.

Areal delineation based on frequency estimates for minimum daily flows in 1981 (fig. 6) indicates that such flows are to be expected at average intervals of 15-25 years over most of the State. The drought was much less severe in the northwest, in an area near Augusta, and in the extreme southeast. Also, the drought, by this measure, was more moderate in a number of southern counties near the Florida State line.

Flows in the lower Flint River, from the vicinity of the gaging station, "Flint River near Culloden" and downstream, were generally much more below normal than were streams elsewhere in the State. For this reason, this part of the Flint River and four continuous-record gaging stations are shown on figures 6-10. The estimated recurrence intervals of low flows at these specific gaging stations are shown in figures 6-10 because they are more severe and do not fit the generalized pattern of drought severity based on other gaging stations. Exceptions are that 1-day and 7-day low-flow frequencies for gaging stations "Flint River at Albany" and "Flint River at Newton" are not shown in figures 6 and 7, because these flows are affected by regulation at hydropower plants and differ greatly from natural rates of flow. For longer periods of consecutive days, 30 days or more, the flow modification due to hydropower operations is not significant.

At the gaging station "Flint River near Culloden," the low flow in 1981 was generally more severe having a longer recurrence interval than for other streams in this part of the State. Downstream from the Fall Line, the Flint River flows through an area where local streams receive ground-water contributions from aquifers which normally sustain their flows throughout the year and even during drought periods. Large streams which cross the Fall Line normally gain substantial flow from tributaries in the region. This effect is pronounced on the Flint River. During the summer of 1981, however, the Flint River had unusually low flow above the Fall Line and received less than normal contribution from tributaries below the Fall Line. This resulted in the lowest recorded flow at the gaging station, "Flint River at Montezuma," in 59 years of record even though daily mean flows during some previous periods were diminished by regulation in the flow from a tributary stream. The regulation was caused by a hydropower plant that no longer exists. The minimum 7-day mean flow at the Montezuma gage in 1981 (519 ft^3/s) was only 84 percent of the previous minimum 7-day flow (618 ft^3/s), which occurred in 1941. The minimum 7-day flow is not affected by regulation. Shortages of water in the Montezuma area received widespread publicity.

The map showing regionalized recurrence intervals for minimum average flow for 7 consecutive days (fig. 7) depicts a pattern nearly identical to that for minimum daily flow (fig. 6). The map showing recurrence intervals

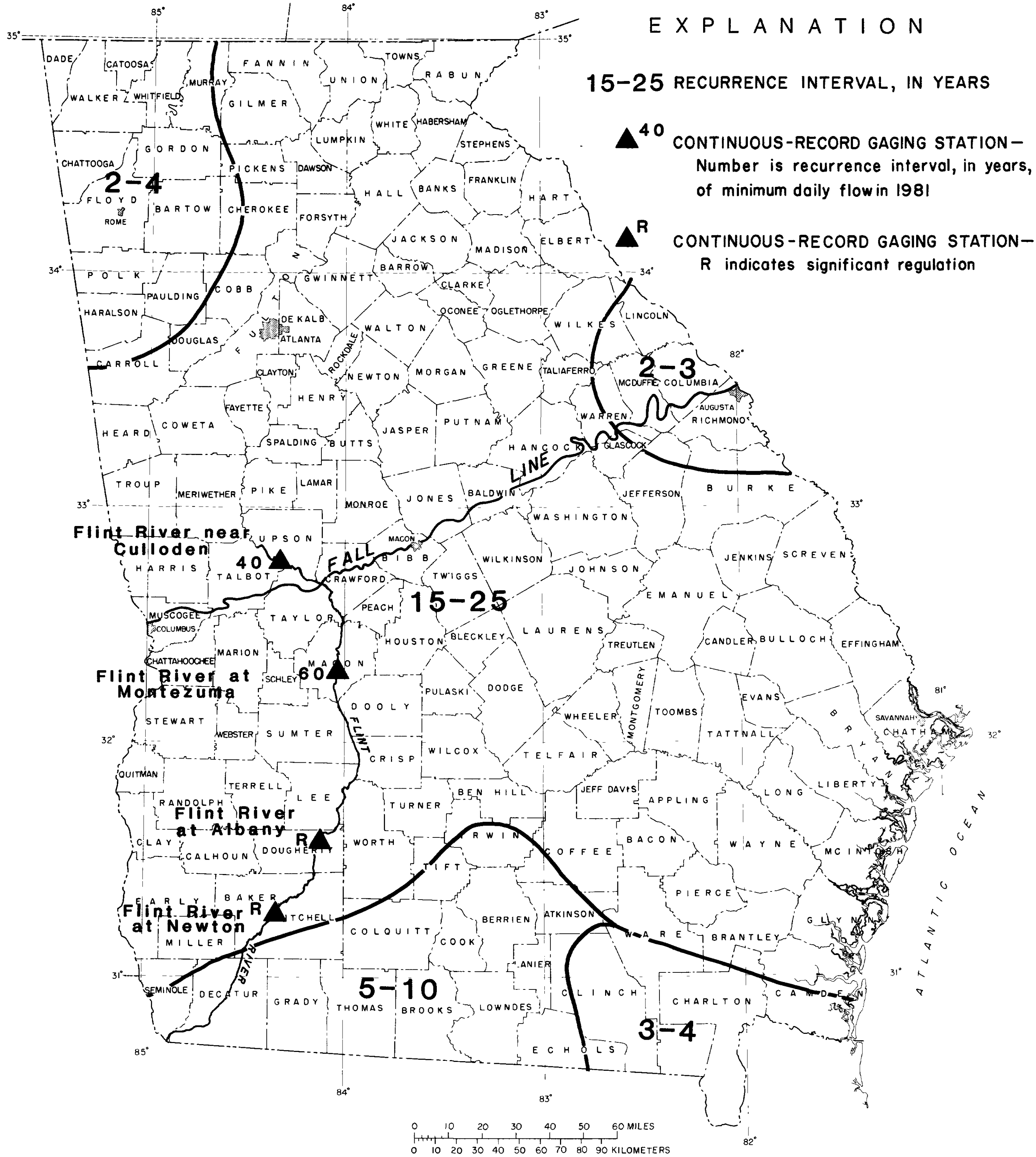

Figure 6.— Generalized areas of similar recurrence intervals of minimum daily flows during the 1981-82 climatic year, and estimated recurrence intervals of minimum daily flows at selected gaging stations on the Flint River.

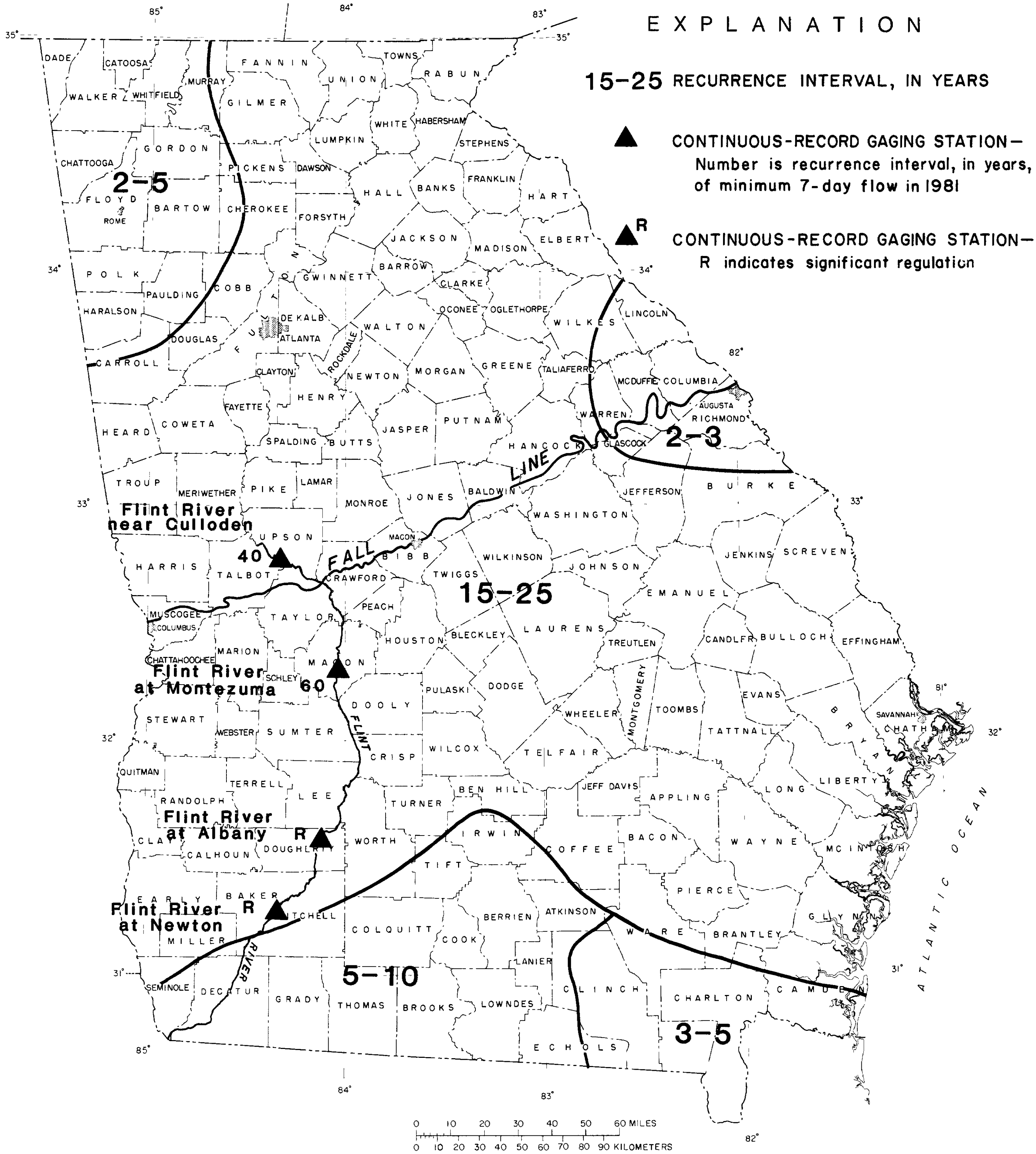

Figure 7.— Generalized areas of similar recurrence intervals of minimum flows for 7 consecutive days during the 1981-82 climatic year, and estimated recurrence intervals of minimum 7-day flows at selected gaging stations on the Flint River.

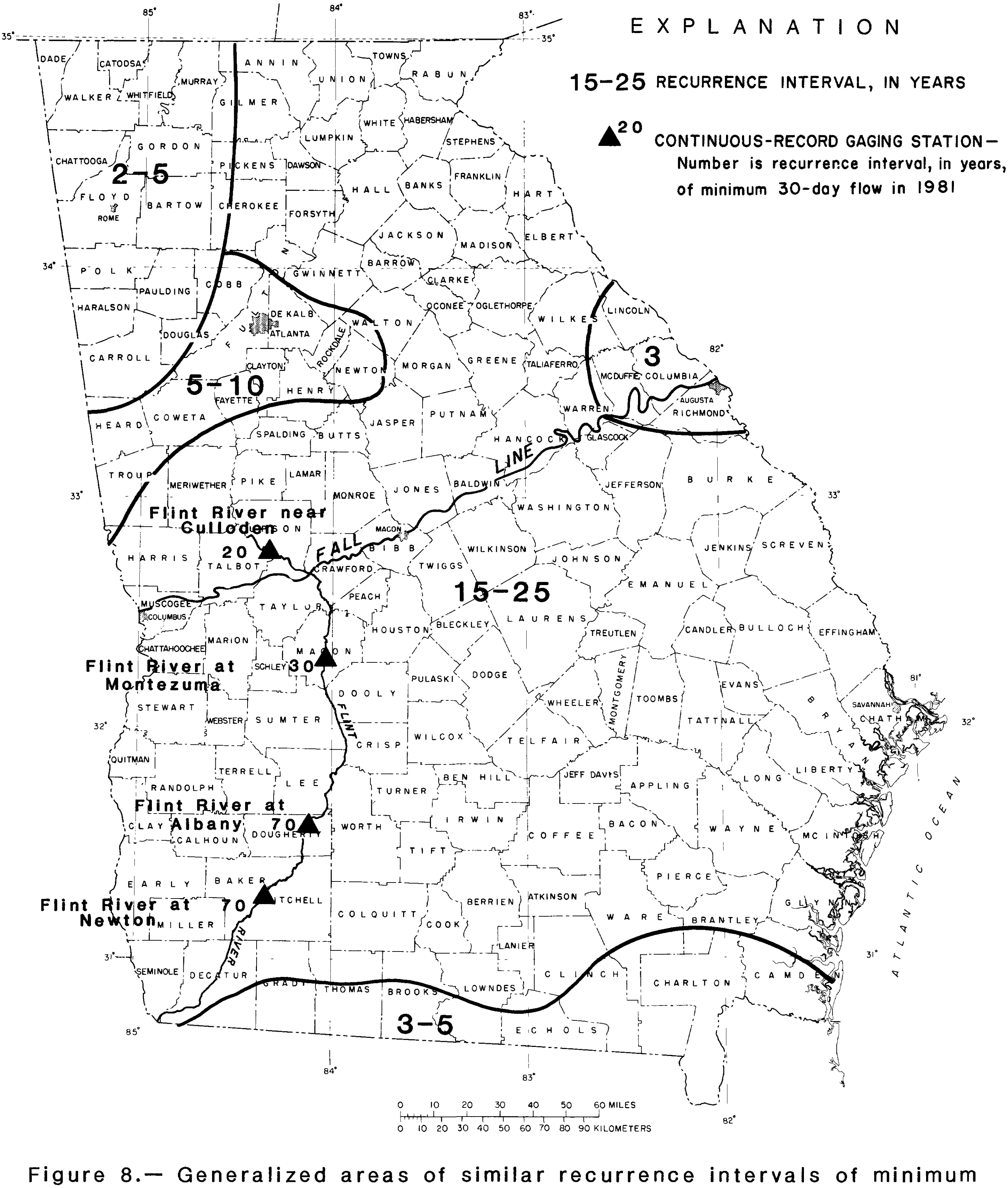

Figure 8.— Generalized areas of similar recurrence intervals of minimum flows for 30 consecutive days during the 1981-82 climatic year, and estimated recurrence intervals of minimum 30-day flows at selected gaging stations on the Flint River.

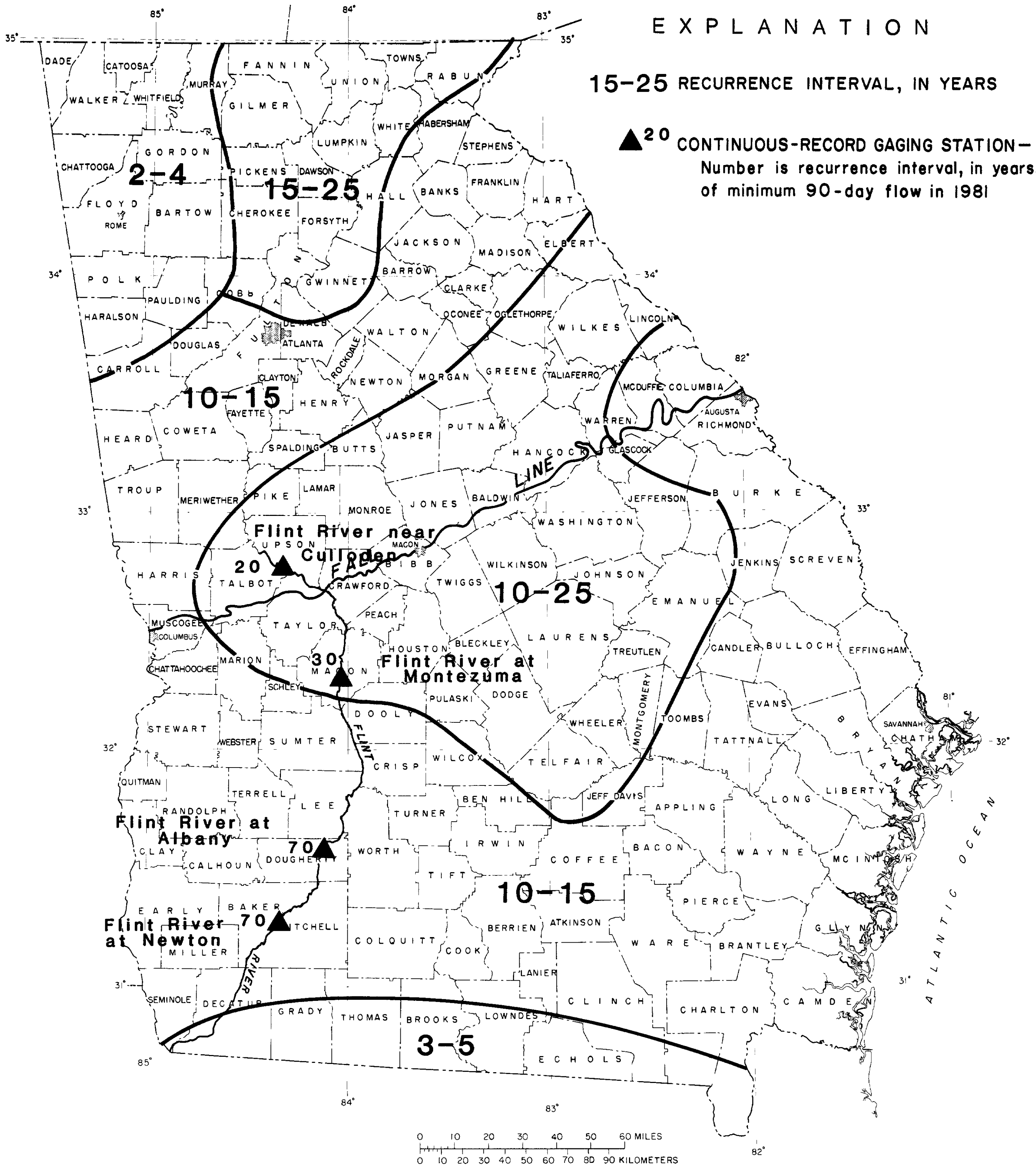

Figure 9.— Generalized areas of similar recurrence intervals of minimum flows for 90 consecutive days during the 1981-82 climatic year, and estimated recurrence intervals of minimum 90-day flows at selected gaging stations on the Flint River.

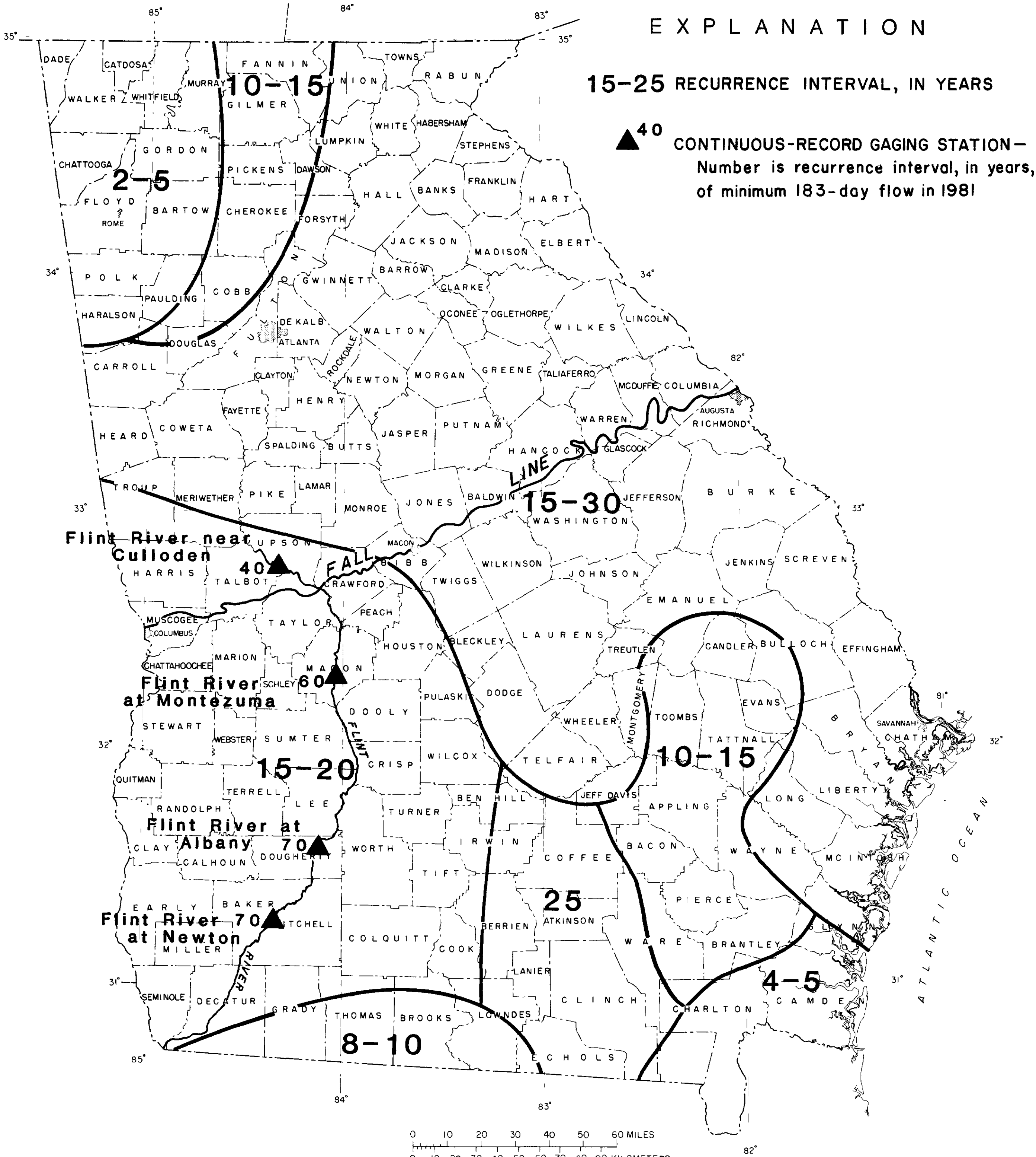

Figure 10.— Generalized areas of similar recurrence intervals of minimum flows for 183 consecutive days during the 1981-82 climatic year, and estimated recurrence intervals of minimum 183-day flows at selected gaging stations on the Flint River.

for average flows for 30 consecutive days (fig. 8) is similar to the map for minimum daily flows, except that in an area which includes Atlanta and extends southwesterly to the Alabama State line, the generalized recurrence interval was 5-10 years instead of 15-25 years. In southern counties near the Florida State line, the generalized recurrence interval was only 3-5 years instead of 5-10 years. As shown in figure 8, flow of the Flint River at gaging stations at Albany and Newton was the lowest observed in a long period of record (70 years estimated recurrence interval).

The map showing recurrence intervals for average flows for 90 consecutive days (fig. 9) differs from the previously described patterns. In a large irregularly shaped area extending from well north of the Fall Line southward to cover most of the Coastal Plain, the generalized recurrence interval was 10-15 years. This is somewhat less severe than was indicated for the same area by the minimum average flows for shorter periods of consecutive days.

The map showing recurrence intervals for average flows for 183 consecutive days (fig. 10) depicts a complex pattern of areas to which various generalized recurrence intervals apply.

Stream Hydrographs

The persistence of low flows during the drought is illustrated by streamflow hydrographs for selected gaging stations in several areas of the State. The locations of these gaging stations are shown in figure 11.

Figure 12 shows daily mean flows for the gaging station "Alapaha River at Statenville" and also shows normal flow and the previous low flow of record for each day. Flow receded below normal during June 1980 and, except for a few days in November 1980, remained below normal until December 1981. Several new record low flows were established for individual days, notwithstanding 50 years of flow record at this station. Especially notable were very low flows for the season during the winter months of early 1981.

Figure 13 shows daily mean flows for the gaging station "Flint River near Culloden" in the central part of the State compared with normal flows and previous low flow of record for each day. At this site, the Flint River receded below normal in July 1980, and was below normal for most of the time until December 1981.

Figure 14 shows daily mean flows for the gaging station "Etowah River at Canton" in the north. The Etowah River did not recede significantly below normal flow at this site until December 1980, but remained substantially below normal through December 1981, establishing many new record low daily flows for the 45 years of record.

RESERVOIRS

The long duration of deficient rainfall and low streamflows in 1980-81 had a cumulative effect on water levels in storage reservoirs, leading to exceptionally low lake levels and adverse effects on users of the lakes as well as on downstream users of water. Rates of flow downstream from the

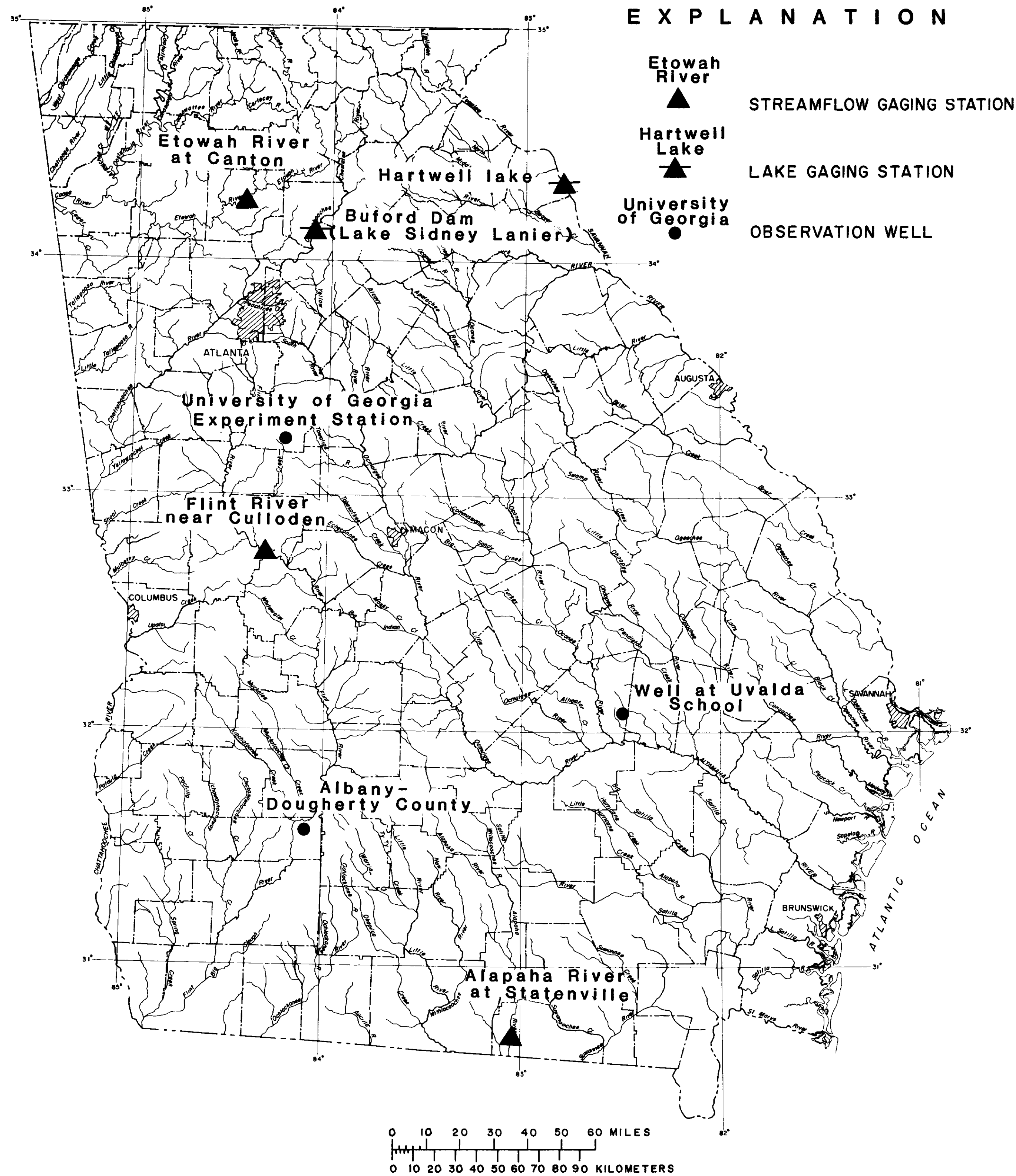

Figure 11.— Location of stream-gaging stations, reservoirs, and observation wells for which flow or stage hydrographs are presented in this report.

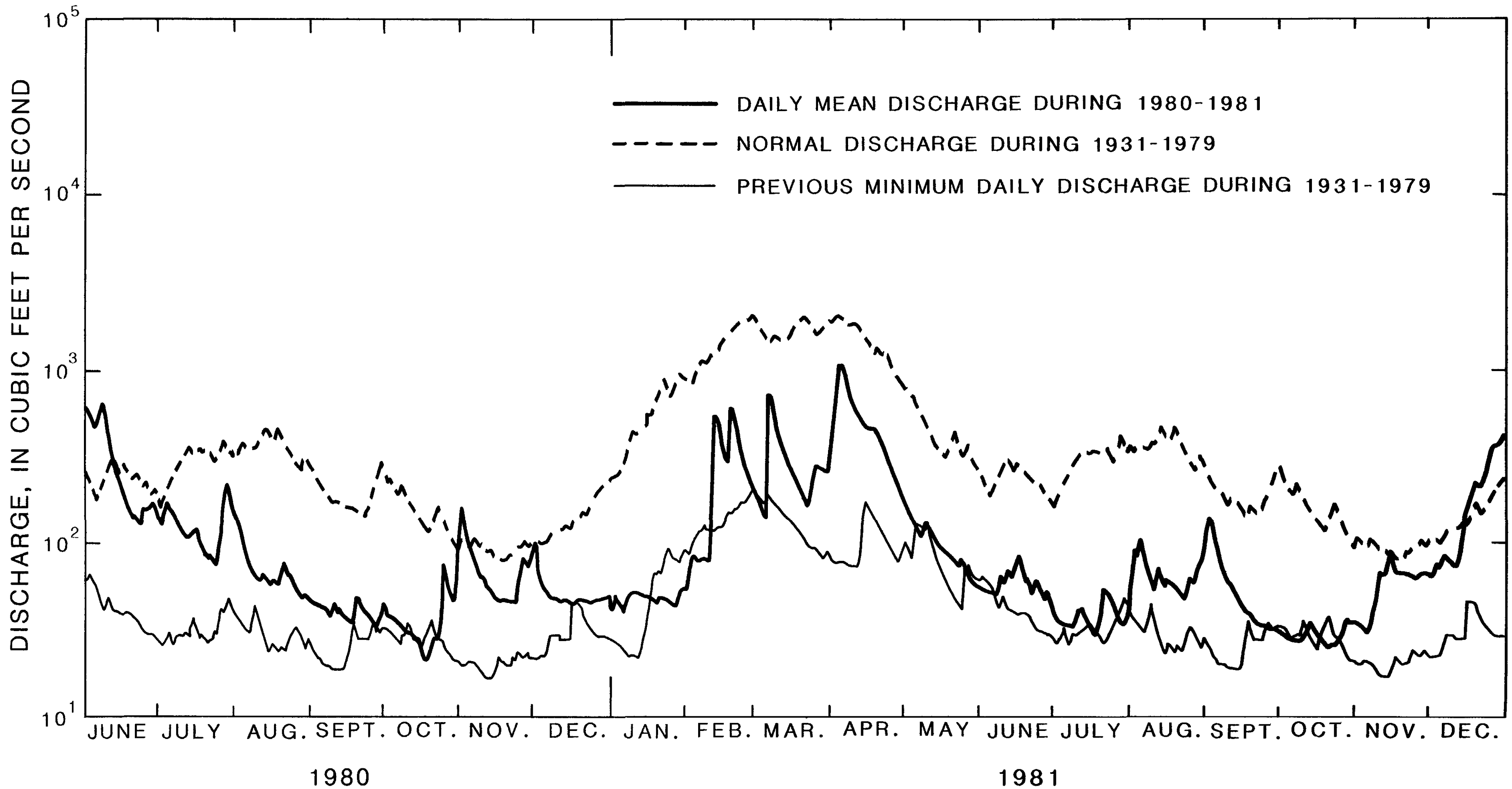

Figure 12.— Daily mean flows at Alapaha River at Statenville (02317500), June 1980 - December 1981.

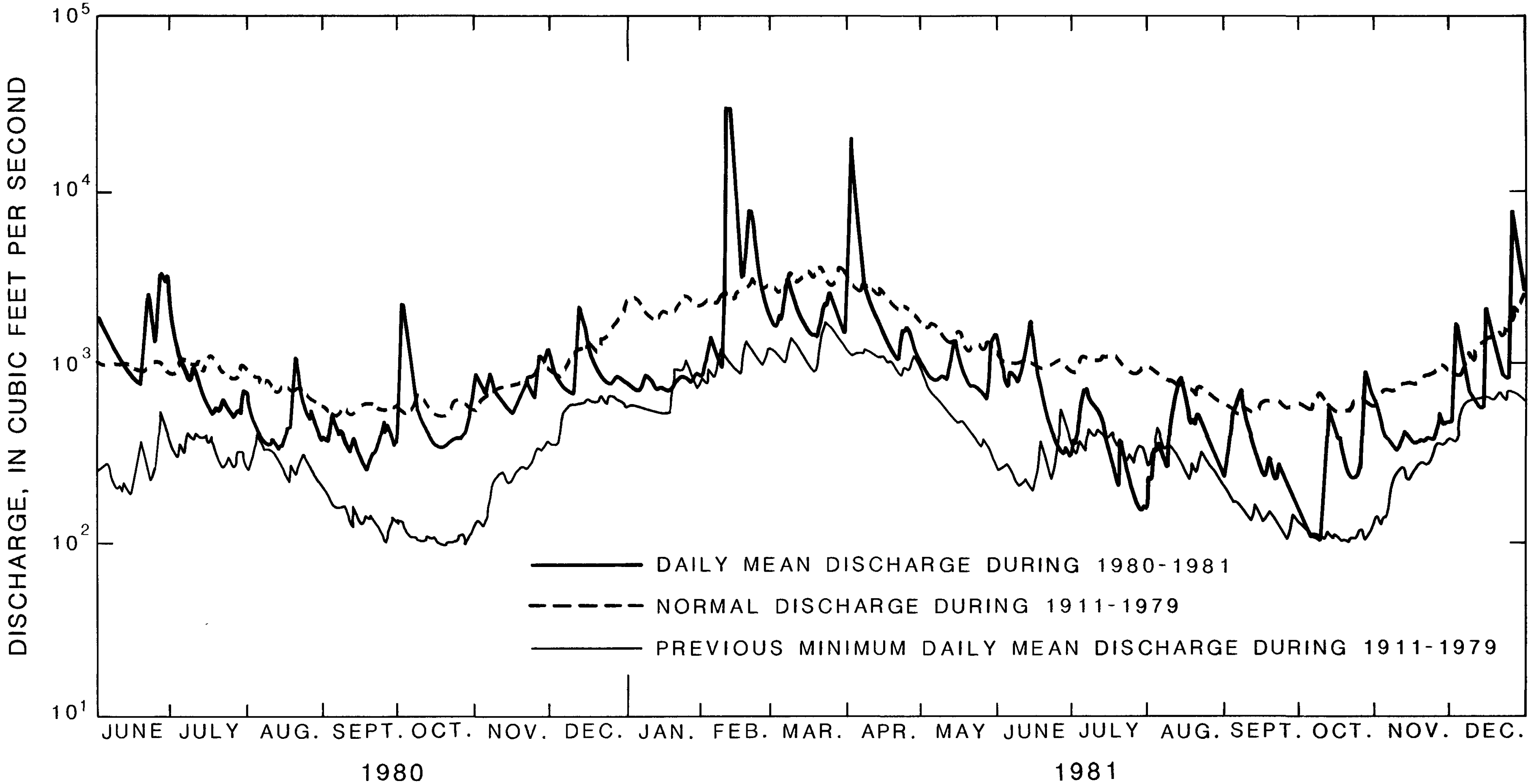

Figure 13.— Daily mean flows at Flint River near Culloden (02347500), June 1980-December 1981.

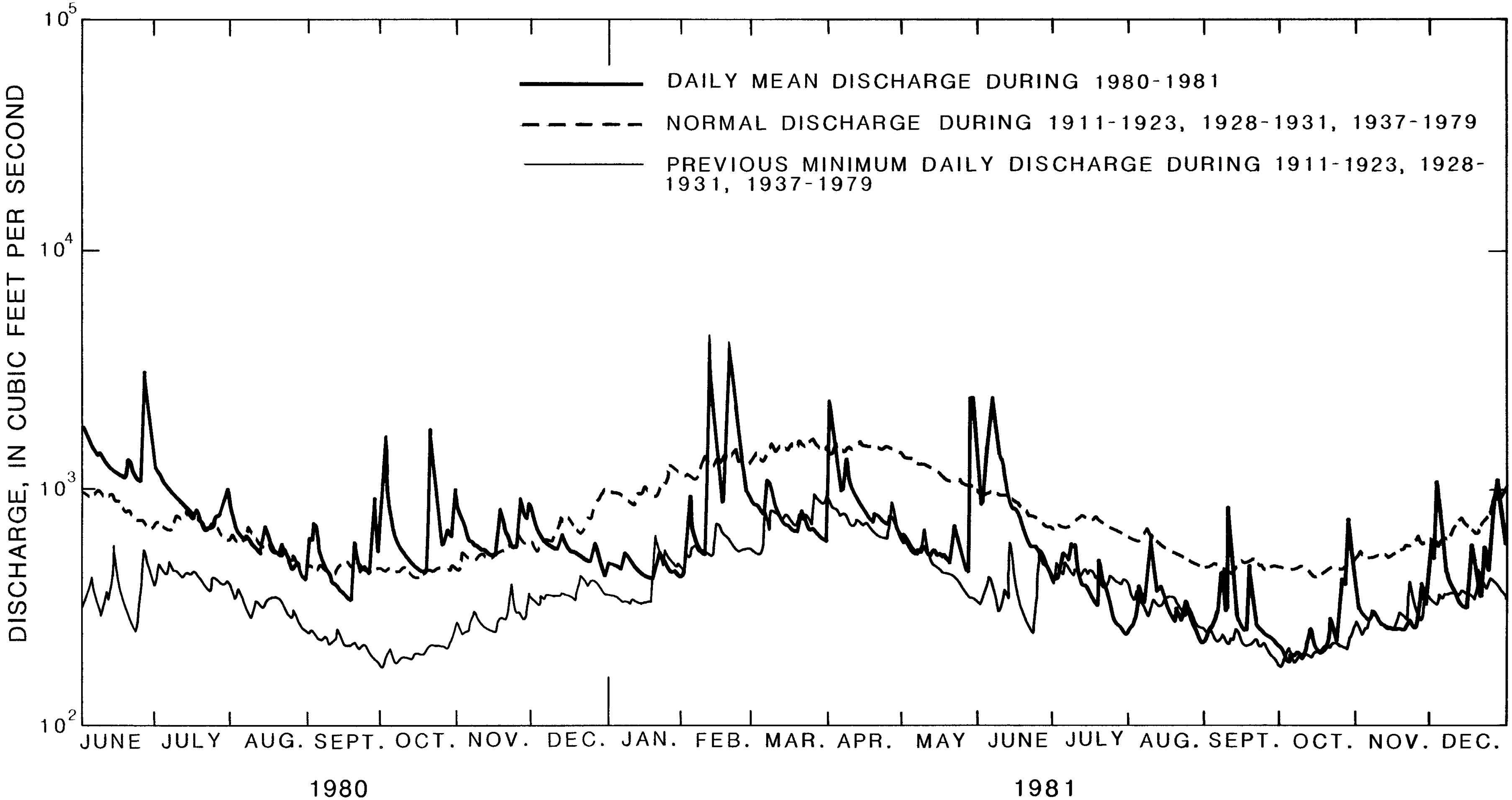

Figure 14.— Daily mean flows at Etowah River at Canton (02392000), June 1980 - December 1981.

reservoirs were affected because those locations did not receive the full amount usually released from storage to augment low flows during the season when natural inflow is normally low.

The effect of below normal hydropower generation, necessitated by low inflow to the reservoirs, was compensated for as much as practicable by use of more energy from thermal generation plants, both fossil and nuclear fueled. By curtailing hydropower production, power companies were able to slow the decline of lake levels to some extent, but the severity of the drought was such that recreational activities at most lakes were greatly hampered (Holler, 1982). These activities were adversely affected at practically all reservoirs, but the effect was especially severe at Lake Lanier.

Reduced flows from reservoirs during the drought caused concern about the adequacy of water supply for some downstream communities and industries. In the Atlanta metropolitan area, there was concern over water available throughout 1981 because of the rapid reduction of storage in Sidney Lanier Reservoir. State water officials urged measures to conserve water in an effort to alleviate the effects of the drought.

During the height of the drought, modifications had to be made in the operating schedule at hydropower plants to maintain satisfactory flows for water-supply and waste-assimilation in the vicinity of Atlanta.

An important function of some multipurpose reservoirs is release of water for maintenance of the channel depths needed for navigation. For example, water usually is released in the fall of each year from Buford Dam at Lake Sidney Lanier, specifically to help maintain the navigation channel on the lower Apalachicola River. However, navigation on that river was severely curtailed from April through December 1981 because storage in Lake Lanier was too small to provide the usual releases.

Table 3 shows the minimum level reached during 1981 at selected reservoirs and the previous minimum levels. The years of available record of the levels at these reservoirs is also shown. As may be noted, Lake Sidney Lanier and Lake Hartwell experienced the minimum levels observed during long periods of record.

Stage Hydrographs

Stage hydrographs for Lake Sidney Lanier and Lake Hartwell for the 1980-81 drought period are shown in figures 15 and 16. Locations of the lakes are shown in figure 11.

Lake Lanier was one of the most seriously affected reservoirs in the State during the drought. The U.S. Army Corps of Engineers has estimated that during the drought, about 800,000 acre-ft of runoff that normally would have flowed into the lake did not arrive (Holler, 1982). In figure 15, the daily mean lake levels at Lake Sidney Lanier for April 1, 1980, to February 28, 1982, are compared with the minimum level of record for that day and with the median (considered as the normal in figure 15) of all mean daily levels that have been observed for that day. The level fell below median in August 1980, fell to a new record daily minimum in March 1981, and did not rise above the previous minimum for the day until February 1982.

In figure 16, the daily mean level at Lake Hartwell is also compared with the previous minimum of record for that day and with the median (normal) of observed levels for that day. Lake Hartwell experienced severe low-level conditions similar to those at Lake Lanier. The level fell below median in August 1980, fell to a new record daily minimum in March 1981, and did not rise above the previous minimum for the day until January 1982.

Table 3.--Minimum pool levels at selected reservoirs during 1981 and previous minimum pool levels

Station number	Name	Length of record (years)	Minimum level observed in 1981: Feet (NGVD of 1929)[1]	Minimum level observed in 1981: Date	Previous minimum level observed since filling: Feet (NGVD of 1929)[1]	Previous minimum level observed since filling: Date
02187250	Hartwell Lake	20	[2]642.4	Dec. 24	647.4	Jan. 1, 1971
02194500	Clarks Hill Reservoir	29	317.6	Nov. 18	296.5	Feb. 3, 1950
02334400	Lake Sidney Lanier	25	[2]1,052.7	Dec. 23	1,057.5	Dec. 18, 1970
02339400	West Point Lake	7	[2]621.0	Nov. 24	622.9	Sept. 26, 1980
02343240	Walter F. George Lake	19	184.9	Oct. 9	183.2	Apr. 24, 1965
02357500	Lake Seminole	25	74.3	Oct. 26	74.2	Nov. 26, 1978
02381400	Carters Lake	8	[2]1,062.9	Oct. 16	1,064.3	Nov. 3, 1976
02393500	Allatoona Reservoir	32	820.9	Nov. 27	809.3	Dec. 4, 1954

1 National Geodetic Vertical Datum of 1929, formerly mean sea level.
2 Lowest level of record.

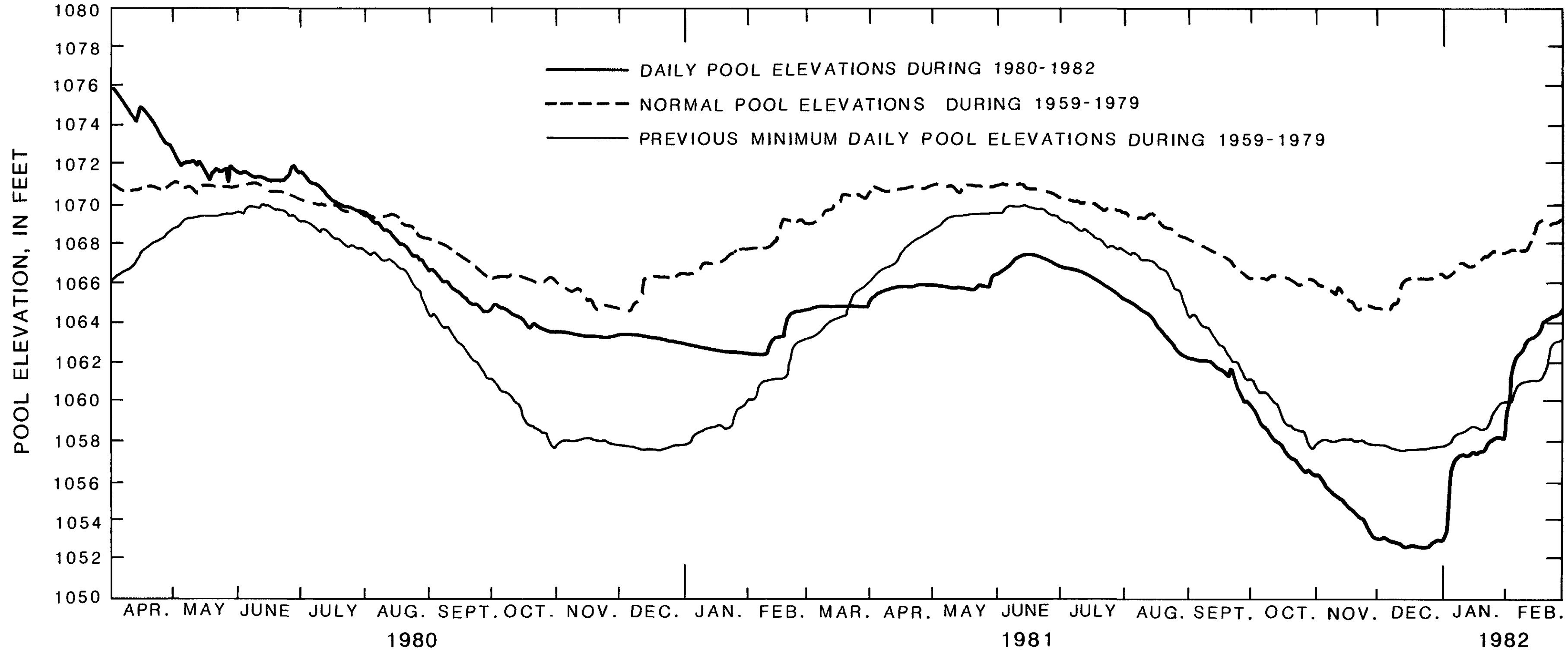

Figure 15.— Daily pool elevations at Lake Sidney Lanier (02334400), April 1980 February 1982.

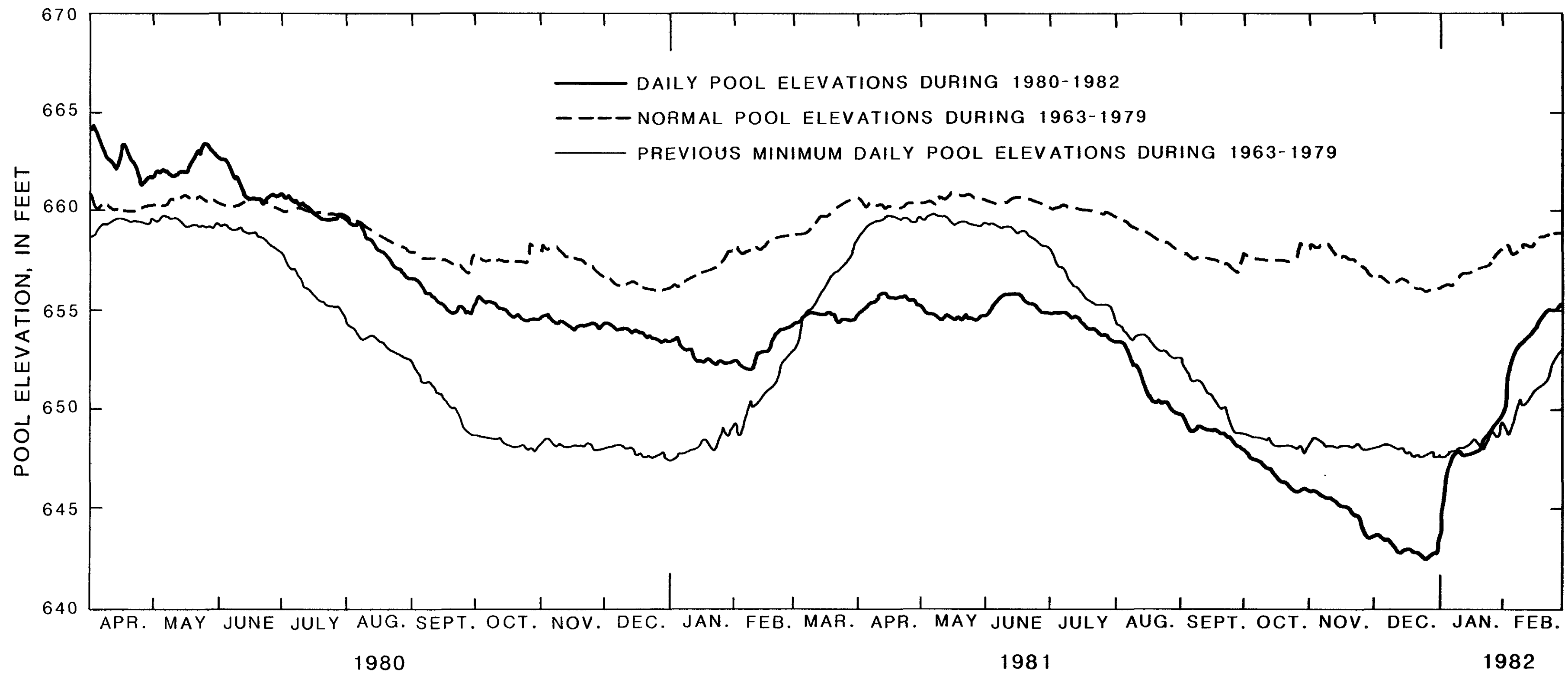

Figure 16.— Daily pool elevations at Hartwell Lake (02187250), April 1980 - February 1982.

GROUND WATER

The drought caused ground-water levels to decline to well below normal throughout the State. Mean annual water levels were as much as 14.9 ft lower in 1981 than in 1980, and in wide areas 1981 levels were the minimum of record. Many observation wells in the Principal Artesian aquifer in the southern part of the State (a northward extension of the aquifer generally referred to as the Floridan aquifer in Florida) have experienced declining levels for a number of years, likely due to rapid escalation of water use for irrigation in that area. Steeper declines were noted in 1980-81 as a result of the drought. Increased pumpage in the Albany area for agricultural use has caused water levels in the Clayton aquifer (of the Paleocene Clayton Formation) to decline in some areas as much as 8 ft below the 1980 minimums, and as much as 32 ft below the 1979 minimums. Water levels in the near-surficial part of the Eocene Ocala Limestone declined to record lows in the Albany area causing many springs to cease flowing. Because of the drought and also because of high levels of pumping, Radium Springs, an historic landmark which normally discharges as much as 90 million gallons per day from the Ocala aquifer, ceased to flow during the summer and fall of 1981, the first time on record. Because the drought was of very long duration, levels remained below normal for an exceptional length of time.

Figure 17 shows the location of observation wells at which record low water levels were observed in 1981. The month in which the record low level occurred and the aquifer into which the well is drilled are indicated in table 4. The identification number is that used to identify the well in the U.S. Geological Survey Open-File Report, "Ground-Water Data for Georgia, 1981."

Withdrawal for industrial use also affects water levels. In many areas they are commonly much below levels that would represent natural conditions because of heavy pumping by industries. This condition is most common in areas near the coast. In the Savannah area, ground-water levels in the Principal Artesian aquifer were only slightly lower in 1981 than in 1980, but levels were 1 to 8 ft below previous daily record lows during much of the year in other areas along the coast, because the effect of the drought was superimposed on normal withdrawals.

Water-Level Hydrographs

Figure 18A shows water levels in a well at the University of Georgia Experiment Station near Griffin (local number 11AA01) for the period 1944 to early 1982. The level in 1981 was the lowest that occurred during this period. Figure 18B shows that the daily mean levels in this well, which is not pumped, receded below normal in August 1980 and remained below normal through February 1982. The graphs show that levels were below the previous minimum of record for the calendar date from April through December 1981 except for September.

Figure 19A shows monthly water levels in an observation well at Albany, in Dougherty County (local number 13L003), for the period 1963-82. The level in this well during 1981 was the lowest of record. Figure 19B shows that the daily mean water level in this well also receded below normal in

Table 4.--Observation wells at which record low levels were observed during 1981

Well I.D. number	County	Month in 1981 of record low level
	PRINCIPAL ARTESIAN AQUIFER WELLS	
26R001*	Toombs	July
39Q003*	Chatham	July
34N089*	Liberty	August
31M054*	Liberty	December
31L001*	Long	June
33M004*	Long	July
30L003*	Wayne	June
35M013*	McDuffie	December
34G001*	Glynn	June
25Q1	Montgomery	October
27E002*	Charlton	July
17K001	Tift	July
18H016	Cook	June
19E009*	Lowndes	October
13L003*	Dougherty	December
15L020*	Worth	July
08G001	Miller	July
	CLAYTON LIMESTONE WELLS	
11L002	Dougherty	August
13L002*	Dougherty	August
	UPPER CRETACEOUS SERIES WELL	
18U001*	Twiggs	October
	RESIDUUM WELL	
11AA01	Spalding	December

* Subject to long-term water-level decline due to regional pumpage.

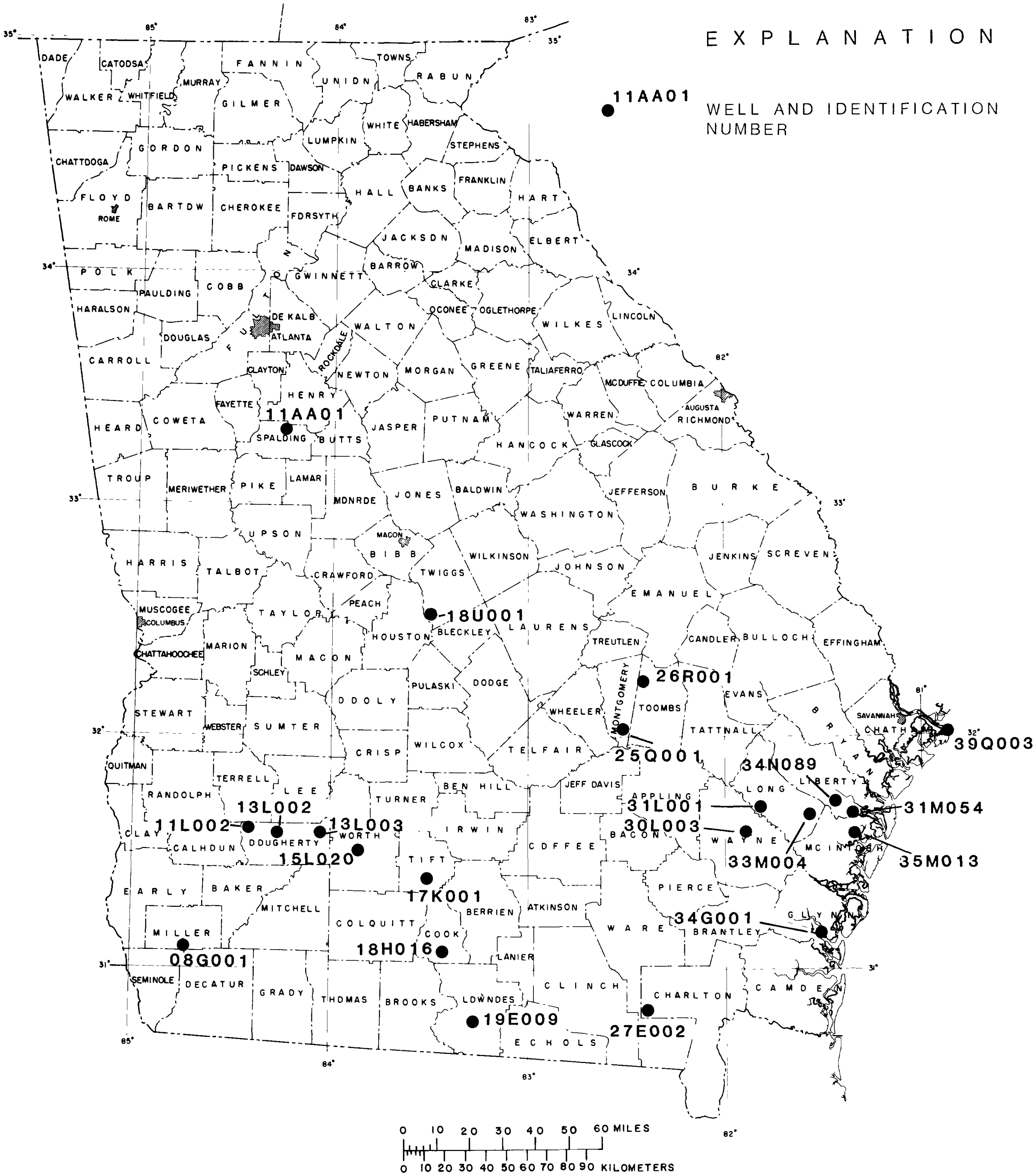

Figure 17.— Location of observation wells at which record low levels were observed during 1981.

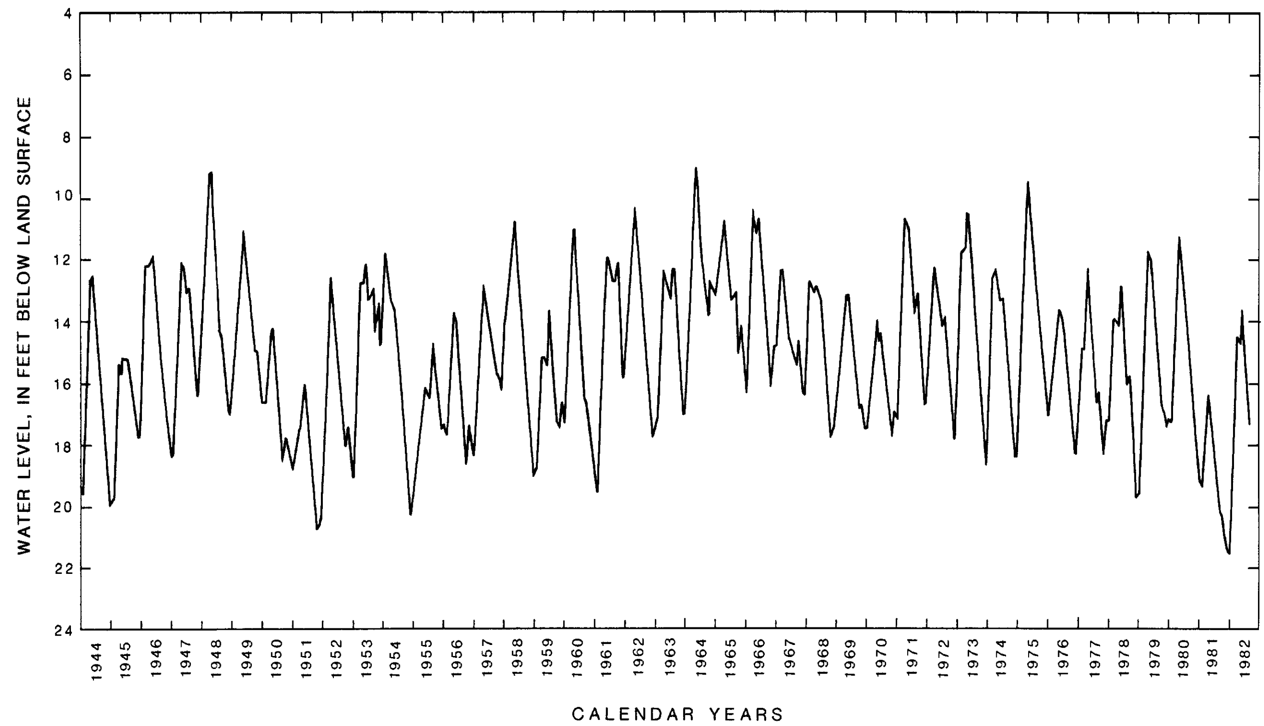

Figure 18A.— Monthly average water levels in well 11AA01 at University of Georgia Experiment Station near Griffin during 1944-82.

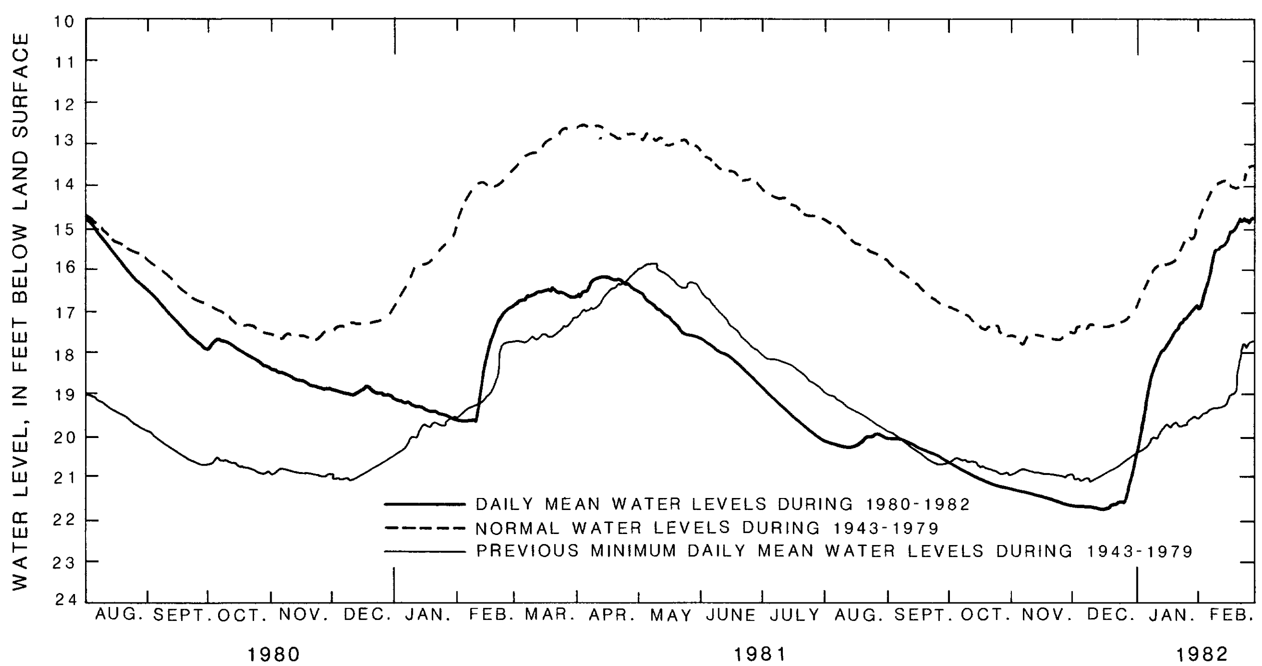

Figure 18B.— Daily mean water levels in well 11AA01 at University of Georgia Experiment Station near Griffin, August 1980 - February 1982.

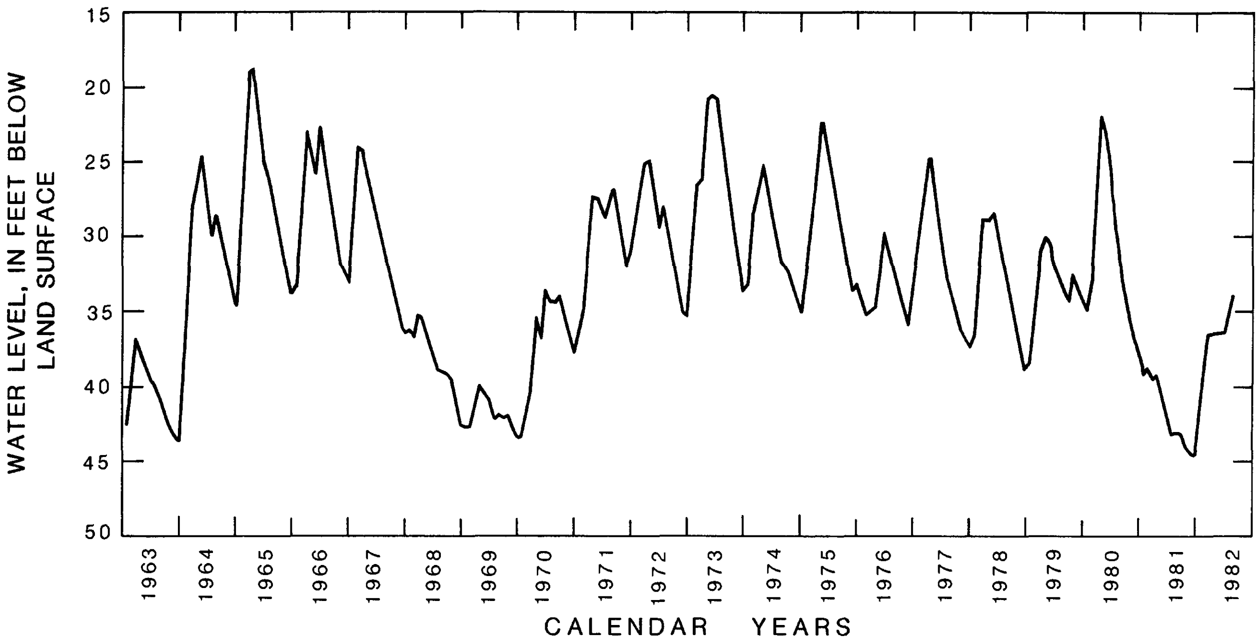

Figure 19A.— Monthly water levels in well 13L003 at Albany during 1963-82.

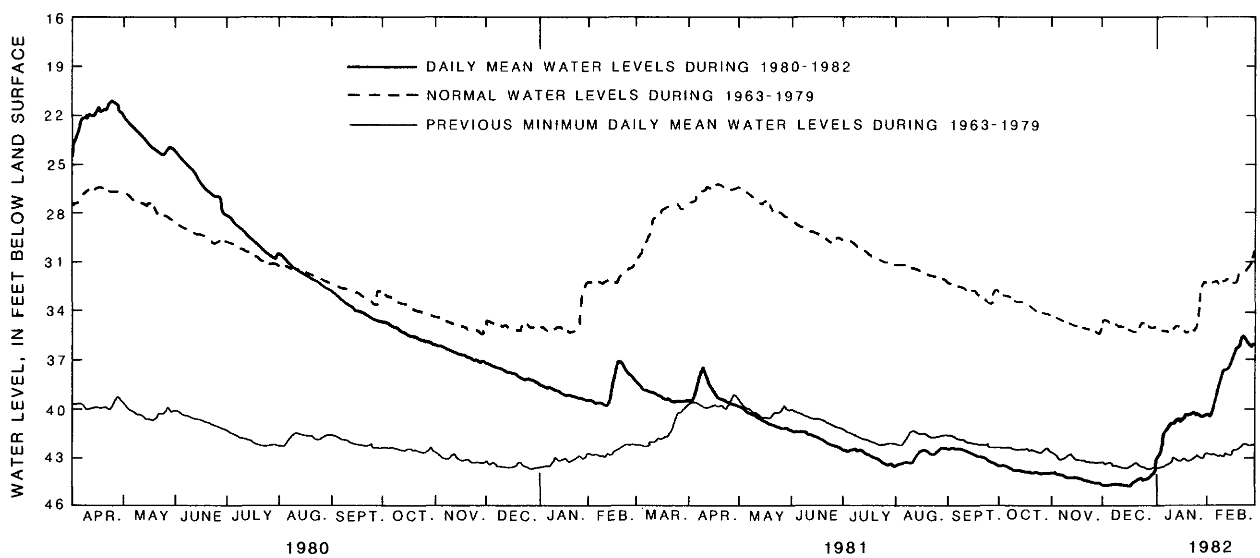

Figure 19B.— Daily mean water levels in well 13L003 at Albany, April 1980-February 1982.

August 1980, and remained substantially below normal on into 1982. The level in this well was the lowest of record for the season from April through December 1981. The water level in this well was in almost continuous recession for 20 consecutive months, May 1980 through December 1981.

Figure 20A shows monthly water levels in an observation well in the principal artesian aquifer at Uvalda, Montgomery County (local number 25Q1). This graph shows the long-term decline due to heavy regional pumping and shows the much steeper decline due to drought in 1980 and 1981. Figure 20B shows that the water level in this well from January 1980 through February 1982 was below median for the period 1979-82. The level dropped below its previous seasonal minimum of record in June 1980 and had not risen to that previous minimum by February 1982. Indeed, unless there is a change to very wet conditions or some other factor counteracts the continuing downward trend of water levels in this area, the level in this well may not return to elevations representative of median conditions for the period 1979-82.

More information concerning water-level fluctuations in the State is in open-file reports, "Ground-Water Data for Georgia, 1980," which includes calendar year 1980, and "Ground-Water Data for Georgia, 1981," which includes calendar year 1981.

SUMMARY

Rainfall during 1981 was significantly below the long-term average over most areas of the State. Monthly average rainfall in those areas was also significantly below the long-term average for each month during 1981.

Streamflow was well below normal for most areas of the State. Minimum average flows for periods of from 1 to 183 consecutive days were at low levels estimated to be reached at average intervals of 10 to 25 years. Streamflow deficiency was even more severe in the lower Flint River where flow rates were the lowest in long periods of record. Flows there were at low levels estimated to be reached at average intervals of 70 years. By contrast the severity of the drought, as indicated by streamflow was much less in the northwest, in the extreme south, and (for periods up to 30 consecutive days) in the east in the vicinity of Augusta.

Below normal water levels in major reservoirs during the drought adversely affected hydropower generation, recreational activities, downstream navigation, availability of water for municipal supplies, and industrial water supplies, especially cooling water for thermal-electric generation. Pool levels at Lake Sidney Lanier and Lake Hartwell were exceptionally low and were the minimum levels observed during long periods of record. Pool levels also were minimum of record at West Point and Carters Lakes.

Ground-water levels declined to well below normal throughout the State. Withdrawal of ground water for agricultural use caused especially large declines in the vicinity of Albany. Because the drought was of very long duration, levels remained below normal for exceptional lengths of time.

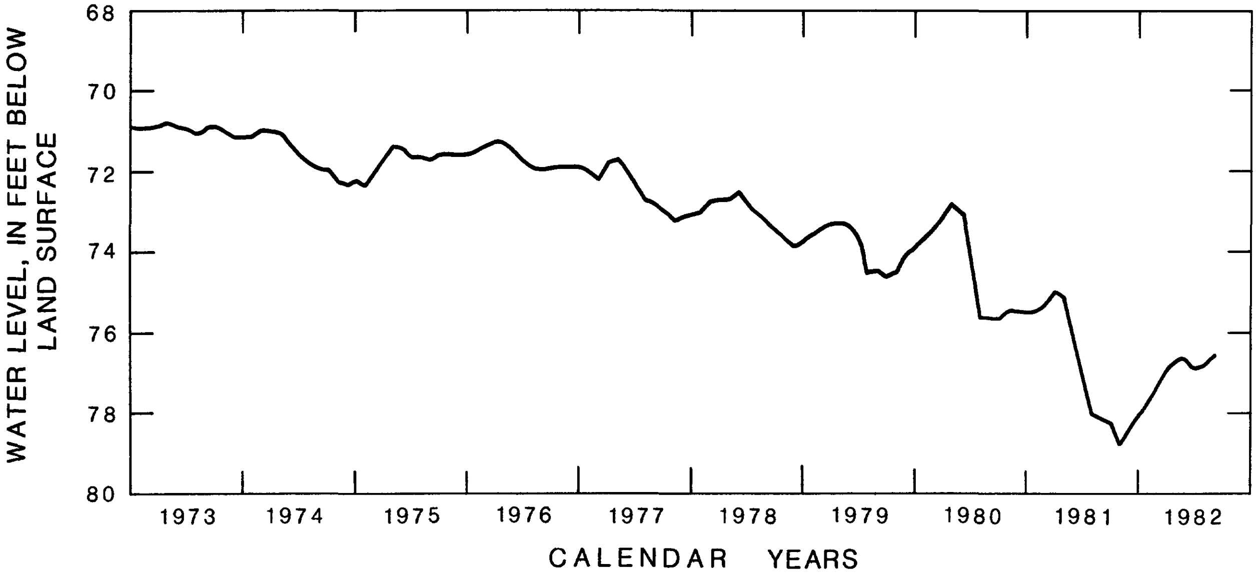

Figure 20A.— Monthly water levels in well 25Q1 at Uvalda School at Uvalda during 1973-82.

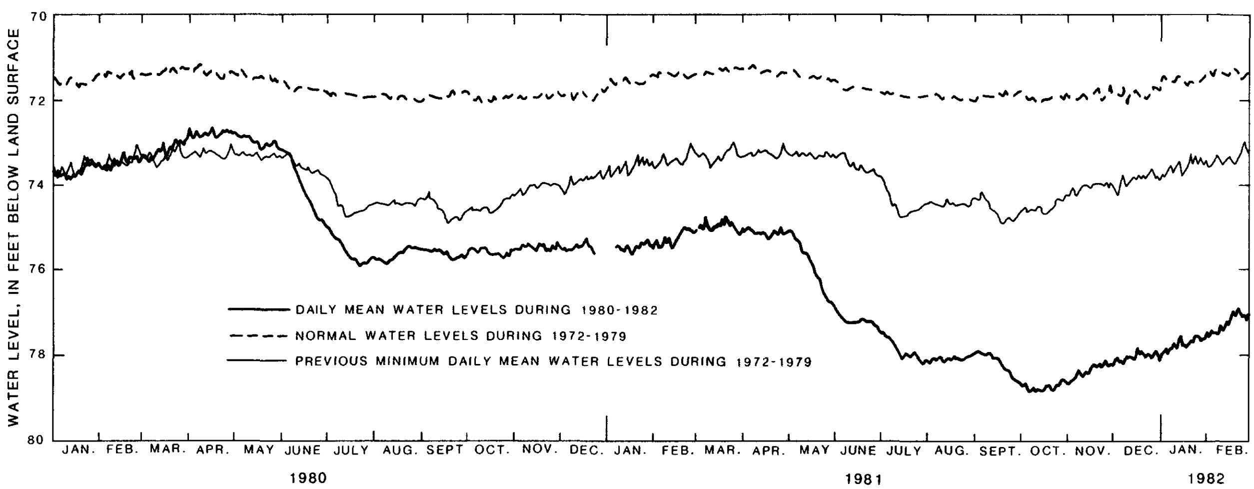

Figure 20B.— Daily mean water levels in well 25Q1 Uvalda School at Uvalda, January 1980-February 1982.

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