WATER RESOURCES ACTIVITIES, GEORGIA DISTRICT, 1985

By Carolyn A. Casteel and Mary D. Ballew

U.S. GEOLOGICAL SURVEY

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Doraville, Georgia

1986

UNITED STATES DEPARTMENT OF THE INTERIOR

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INTRODUCTION

The U.S. Geological Survey, through its Water Resources Division, investigates the occurrence, quantity, quality, distribution, and movement of the surface and underground water that composes the Nation's water resources. The Geological Survey is the principal Federal water-data agency and, as such, collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage our water resources. This nationwide program, which is carried out through the Water Resources Division's District offices and Regional offices, consists of the collection of basic hydrologic data, areal resource appraisal and interpretive studies, research projects, and the analysis and dissemination of the data and results of its investigations. Much of the work is a cooperative effort in which planning and financial support are shared by State and local governments and other Federal agencies. The Geological Survey also is responsible for the coordination of specific water-data acquisition activities by other Federal agencies. Information on these activities is consolidated into a central file known as the "Catalog of Information on Water Data," which is maintained by the Geological Survey. Many State and local agencies and private organizations that have related water-data-acquisition activities also contribute information to this catalog. Indexes to the catalog are published at selected intervals.

This report contains a brief description of the water-resources investigations in Georgia in which the Geological Survey participates, and a list of selected references. Additional or more detailed information can be obtained from the District Chief, Water Resources Division, 6481 Peachtree Industrial Blvd., Suite B, Doraville, GA 30360.

Water-resources data for the 1984 water year for Georgia consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground-water levels. These data include discharge records for 108 gaging stations; stage and contents for 17 lakes and reservoirs; stage for 11 gaging stations; water quality for 4 continuous stations, 109 periodic stations, and miscellaneous sites; peak stage and discharge only for 130 crest-stage partial-record stations and 44 miscellaneous sites; and water levels of 27 observation wells. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State, local, and Federal agencies in Georgia.

Records of discharge and stage of streams, and stage and contents of lakes and reservoirs were first published in a series of U.S. Geological Survey Water-Supply Papers entitled, "Surface-Water Supply of the United States." Through September 30, 1960, these Water-Supply Papers were in an annual series and then in a 5-year series for 1961-65 and 1966-70. Records of chemical quality, water temperature, and suspended sediment were published

from 1941 to 1970 in an annual series of Water-Supply Papers entitled, "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of Water-Supply Papers entitled, "Ground-Water Levels in the United States." Water-Supply Papers may be consulted in the libraries of the principal cities in the United States or may be purchased from the Distribution Branch, U.S. Geological Survey, Books and Open-File Reports, Federal Center, Building 41, Box 25425, Denver, CO 80225.

For water years 1961 through 1970, streamflow data were published by the Geological Survey in annual reports on a State-boundary basis. Water-quality records for water years 1964 through 1970 were similarly published either in separate reports or in conjunction with streamflow records.

Beginning with the 1971 water year, data for streamflow, water quality, and ground water are published in Survey reports on a State-boundary basis. These reports carry an indentification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number, for example, "U.S. Geological Survey Water-Data Report GA-82-1." These water-data reports may be purchased in paper copy or on microfiche, from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

BASIC MISSION AND PROGRAM

The mission of the Water Resources Division is to provide the hydrologic information and understanding needed for the optimum utilization and management of the Nation's water resources for the overall benefit of the people of the United States.

This is accomplished, in large part, through cooperation with other Federal and non-Federal agencies, by:

- Collecting, on a systematic basis, data needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources.

- Conducting analytical and interpretive water-resource appraisals describing the occurrence, availability, and the physical, chemical, and biological characteristics of surface and ground water.

- Conducting supportive basic and problem-oriented research in hydraulics, hydrology, and related fields of science to improve the scientific basis for investigations and measurement techniques and to understand hydrologic systems sufficiently well to quantitatively predict their response to stress, either natural or manmade.

- Disseminating the water data and the results of these investigations and research through reports, maps, computerized information services, and other forms of public releases.

- Coordinating the activities of Federal agencies in the acquisition of water data for streams, lakes, reservoirs, estuaries, and ground waters.

- Providing scientific and technical assistance in hydrologic fields to other Federal, State, and local agencies, to licensees of the Federal Energy Regulatory Commission, and to international agencies on behalf of the Department of State.

LIST OF COOPERATORS

The U.S. Geological Survey and organizations of the State of Georgia have had joint-funding (cooperative) agreements for the systematic collection of streamflow records since 1896, and for other hydrologic records since 1937. Organizations that assisted in collecting and evaluating hydrologic data through joint-funding agreements with the Survey are:

State Agencies:

Georgia Department of Natural Resources,
    Environmental Protection Division
        Geologic Survey Branch
        Water Protection Branch
        Water Resources Management Branch
Georgia Department of Transportation

Local Agencies:

City of Albany Water, Gas, and Light Commission
City of Brunswick
Consolidated Government of Columbus
City of Covington
City of Valdosta
City of Helena
City of Thomaston
Bibb County
Clayton County Water Authority
Macon-Bibb County Water and Sewerage Authority

Assistance in the form of funds or services, or both, were provided by other Federal agencies as follows:

Department of the Army
    Corps of Engineers
        Mobile District
        Savannah District
Federal Energy Regulatory Commission licensees
Tennessee Valley Authority
Department of Commerce
    National Weather Service (NOAA)
Department of the Navy
Environmental Protection Agency
Department of Agriculture
    Agricultural Research Service
Federal Emergency Management Agency

HYDROLOGIC CONDITIONS, 1984

Streamflow

Streamflow for the water year was slightly above normal throughout the State except for central Georgia, where runoff was only slightly above normal. The ratio of the 1984 water-year runoff to the long-term-average runoff for unregulated streams having more than 5 years of streamflow record ranged from about 2.0 at Alapaha River at Statenville to 0.9 at Upatoi Creek near Columbus.

Monthly mean runoff in the northern part of the State was below normal in October, near normal in January, February, March, June, and September, and above normal for the remainder of the year. In the central part, monthly mean runoff was below normal in October, June, and September, near normal in November, January and February, and above normal for the remainder of the year. In the southern part, monthly mean runoff was below normal in October, November, June, July, and September and above normal for the remainder of the year.

Significant flooding occurred in south Georgia during March. On March 5 and 6, rainfall totaling about 5.0 to 6.5 inches fell in south Georgia, producing peak flows of up to 50-year recurrence intervals on several streams. Another, more localized, rainfall occurred in the Valdosta area on March 27 and 28, producing floods of up to 50-year recurrence intervals on streams in this area. The National Weather Service station in Valdosta reported a total of 10.0 inches of rainfall for the March 27-28 storm. Information on peak stages and flow for the March flooding was obtained at many discontinued streamflow and crest-stage stations and miscellaneous stream sites.

The only significant drought of the year occurred in the Ohoopee River and Canoochee River basins during early November, when minimum daily flows equivalent to 20-year recurrence intervals were recorded. In the remainder of the State, minimum daily flows for the year ranged from less than 2-year to 8-year recurrence intervals, the former being much more common than the latter.

Monthly and yearly streamflows for the 1984 water year at three representative long-term gaging stations and the average monthly and yearly streamflows for the period 1951-80 are shown in figure 1.

Water Quality

The chemical quality of surface water in Georgia during the 1984 water year was similar to that of previous years. This assessment is based on a comparison of selected water-quality data collected during the 1984 water year versus those for the period of record. Fifteen water-quality sampling stations were selected for this comparison and the results are presented in the table on page 6. The statistics presented in the table were calculated from water-quality data collected on a periodic basis. No continuous water-quality data were used in the calculations.

The pH, specific conductance, alkalinity, and nutrient concentrations for the 1984 water year were comparable to period-of-record means. The low pH values for Satilla River at Atkinson and Suwannee River at Fargo are typical of streams draining swamps and bogs.

Trace-metal concentrations measured in water samples collected at six stations were less than the levels permitted for various beneficial uses.

Ground Water

Ground-water levels during the first half of the 1984 water year were from 18 feet lower to 7 feet higher than in 1983. During the second half of the water year, water levels were from 10 feet lower to 5 feet higher than in 1983.

The water level in the Floridan aquifer system (formerly principal artesian aquifer) in the southwestern part of the State was from 2 to 5 feet higher than in 1983 during the first half of the 1984 water year. During the second half of the water year, the water level was from 2 feet lower to 3 feet higher than in 1983.

In the coastal area, the water level in the Floridan aquifer system at Savannah was from 1 to 18 feet lower than in the 1983 water year. In Brunswick, the water level was about the same to 5 feet higher than in 1983 from October through March, and was from about the same to 3 feet lower from April through September.

In the south-central part of the State, the water level in the Floridan aquifer system at Valdosta was from 1 foot lower to 3 feet higher than in 1983.

In the southwestern part of the State, the water level in the Clayton aquifer at Albany was from 5 feet lower to 7 feet higher than in 1983 from October through March, and was from 8 feet lower to 5 feet higher from April through September.

During the 1984 water year, water levels in the crystalline rock aquifers of the Piedmont were from 1 to 3 feet higher than in 1983 during the first half of the 1984 water year. During the second half of the water year, water levels were from 1 foot lower to 2 feet higher than in 1983.

More information concerning water-level fluctuations in the State can be found in open-file reports entitled, "Ground-Water Data for Georgia, 1983," which is for calendar year 1983, and "Ground-Water Data for Georgia, 1984," which is for calendar year 1984.

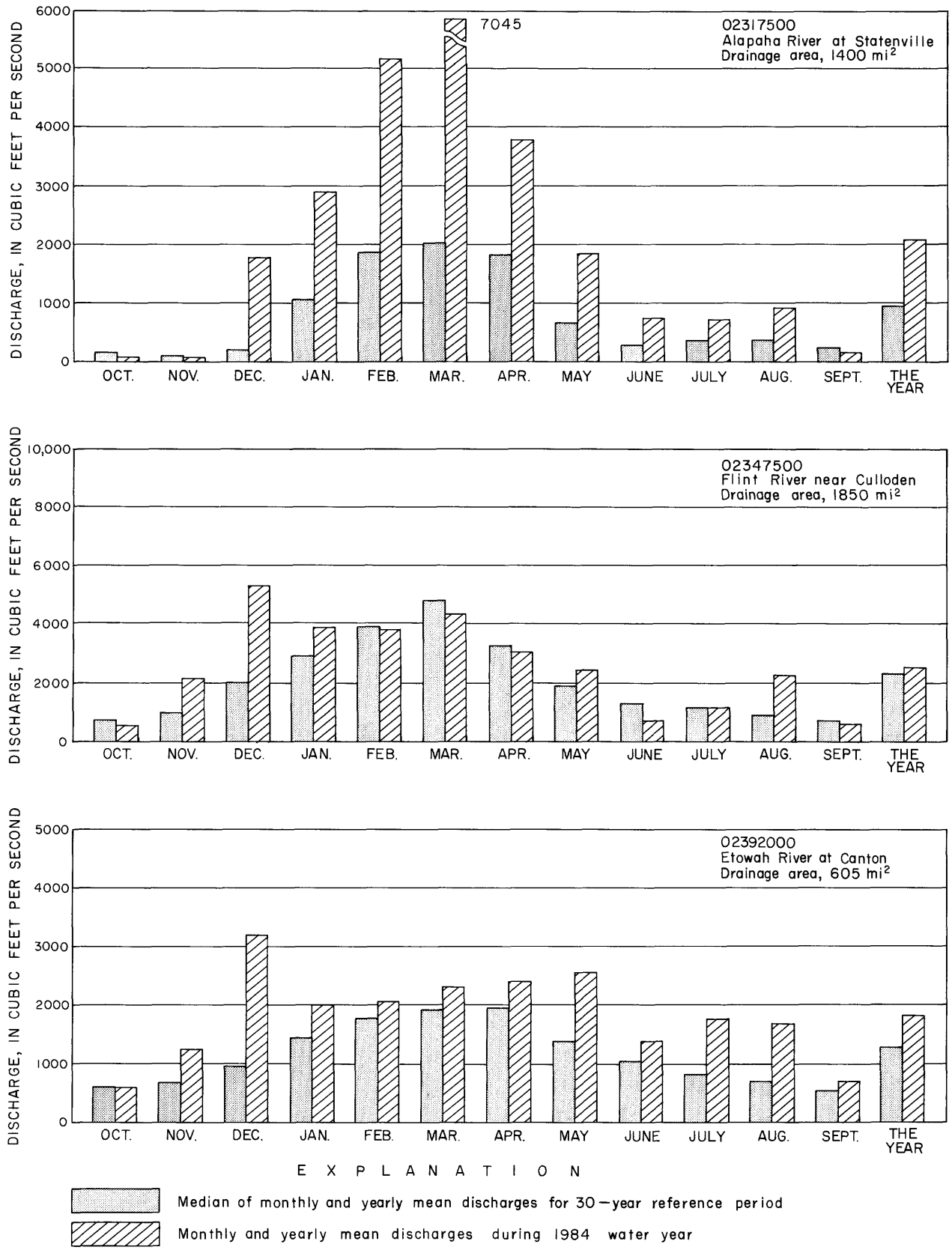
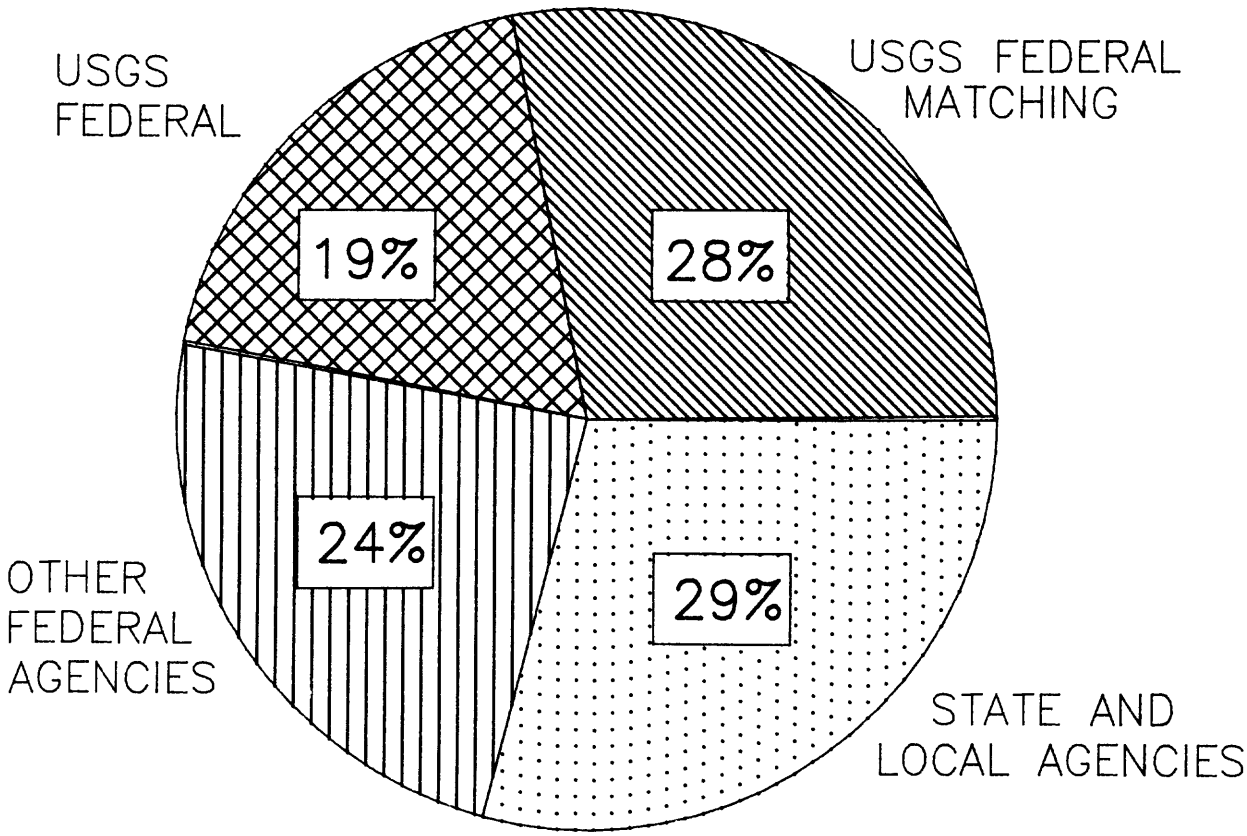


Figure 1.—Comparison of discharge at three representative long-term gaging stations during 1984 water year and median discharge for 30-year reference period.

Table 1.--Water-quality characteristics of Georgia surface water at selected periodic sampling stations

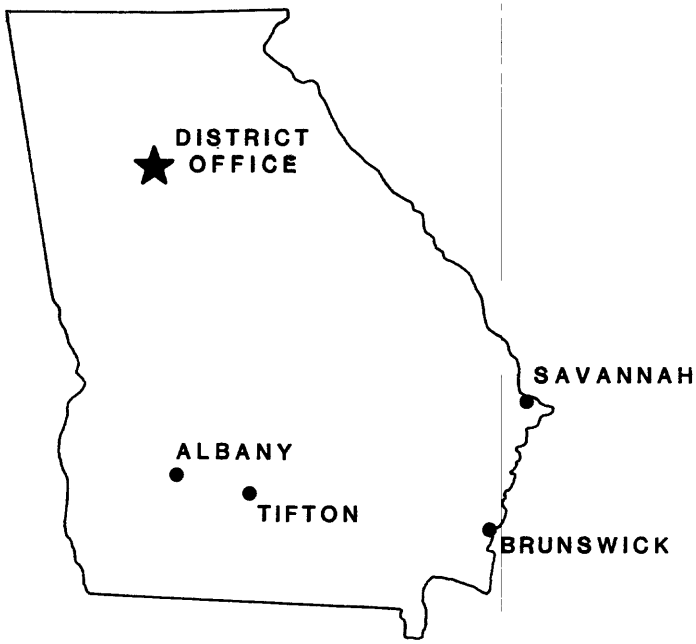
[N, number of samples; mean pH calculated from antilogarithms; d, analysis discontinued; na, analysis not part of the station schedule]

Stream and location	Downstream order number	Sample period (water) years)	pH (standard units) N	pH (standard units) Mean	Specific conductance (umhos) N	Specific conductance (umhos) Mean	Alkalinity (mg/L as $CaCO_3$) N	Alkalinity (mg/L as $CaCO_3$) Mean	Nitrogen, NO_2+NO_3 total (mg/L as N) N	Nitrogen, NO_2+NO_3 total (mg/L as N) Mean	Phosphorus, total (mg/L as P) N	Phosphorus, total (mg/L as P) Mean	Carbon, organic total (mg/L as C) N	Carbon, organic total (mg/L as C) Mean
Chattooga River near Clayton	02177000	1968-84	149	6.6	137	13	126	5.3	113	.03	112	.03	108	2.0
		1984	12	6.9	12	14	12	5.6	12	.03	12	.03	12	1.8
Ogeechee River near Eden	02202500	1974-84	146	6.5	137	74	123	23	94	.10	111	.05	55	8.8
		1984	6	7.0	6	72	6	23	0	d	5	.06	0	d
Falling Creek near Juliette	02212600	1968-84	173	6.7	172	116	157	50	77	.06	86	.09	30	3.6
		1984	4	7.6	5	119	4	58	0	d	4	.02	0	d
North Oconee River at Athens	02217740	1974-84	113	6.9	113	54	101	20	113	.33	113	.05	110	2.9
		1984	12	6.9	12	54	12	19	12	.36	12	.06	12	3.6
Altamaha River near Everett City	02226160	1974-84	155	6.7	157	116	143	27	135	.25	153	.07	124	8.6
		1984	18	6.9	19	107	17	27	11	.24	17	.06	12	8.2
Satilla River at Atkinson	02228000	1968-84	158	4.8	150	55	137	4.1	115	.10	127	.09	89	19
		1984	8	5.1	8	55	8	4.1	4	.15	8	.11	4	22
Suwannee River at Fargo	02314500	1968-84	148	4.1	134	54	82	1.2	109	.04	110	.04	106	37
		1984	12	3.9	12	60	12	1.0	12	.03	12	.08	12	42
Withlacoochee River near Clyattsville	02318960	1975-84	115	6.2	114	118	101	39	115	.30	115	.17	112	11
		1984	12	6.5	12	109	12	40	12	.30	12	.15	12	9.7
Chattahoochee River near Fairburn	02337170	1968-84	289	6.5	321	79	133	19	307	.57	307	.45	286	5.9
		1984	12	6.9	12	74	12	17	12	.71	12	.33	12	5.7
Chattahoochee River at Andrew's L&D near Columbia	02343801	1983-84	12	7.2	12	60	12	16		na	12	.04		na
		1984	6	7.3	6	60	6	17		na	6	.03		na
Kinchafoonee Creek at Preston	02350600	1970-84	69	6.5	62	33	63	9.3	58	.15	59	.03	57	4.5
		1984	2	6.7	2	37	2	11	2	.15	2	.03	2	4.6
Flint River at Albany	02352500	1968-84	95	7.1	80	70	76	23	57	.27	57	.11	52	4.5
		1984	4	7.1	4	86	4	26	4	.35	4	.04	4	4.6
Flint River at Newton	02353000	1968-84	85	7.3	70	99	66	37	35	.37	46	.07	30	4.5
		1984	6	7.5	6	116	6	42	0	d	5	.06	0	d
Conasauga River near Dalton	02384748	1974-84	117	7.4	116	101	104	45	115	.20	114	.05	112	3.2
		1984	12	7.4	12	92	12	40	12	.19	12	.07	12	4.3
Conasauga River near Resaca	02387050	1974-84	114	7.3	113	160	102	58	113	.49	113	.56	111	6.1
		1984	12	7.3	12	136	12	51	12	.51	12	.66	12	6.8



TOTAL – $3,876,000

Figure 2. — Program fund sources, Georgia District, fiscal year 1985.



GEORGIA DISTRICT OFFICE ADDRESSES

District Office	(404) 331-4858	Jeffrey T. Armbruster, District Chief U.S. Geological Survey, WRD 6481-B Peachtree Industrial Blvd. Doraville, GA 30360
Albany Field Headquarters	(912) 888-5720	U.S. Geological Survey, WRD 314 Roosevelt Avenue P. O. Box 1232 Albany, GA 31702
Savannah Field Headquarters	(912) 944-4350	U.S. Geological Survey, WRD 125 Bull Street, Room B-10 P. O. Box 8223 Savannah, GA 31412
Tifton Field Headquarters	(912) 382-6353	U.S. Geological Survey, WRD 225 Tift Avenue P. O. Box 721 Tifton, GA 31793
Brunswick Field Headquarters		U.S. Geological Survey, WRD Brunswick, GA 31521

Figure 3.--Location and addresses of District Office and Field Headquarters.

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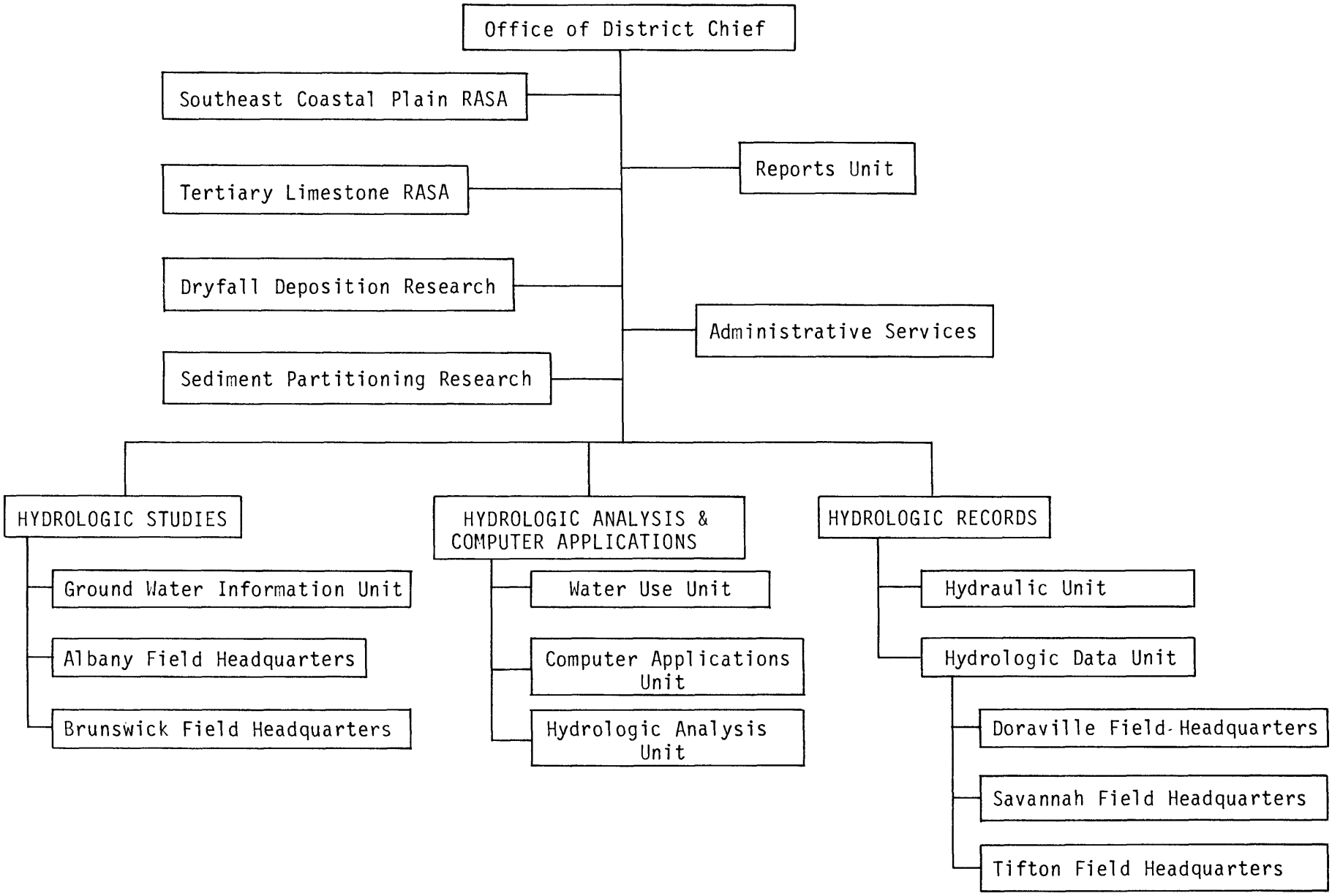
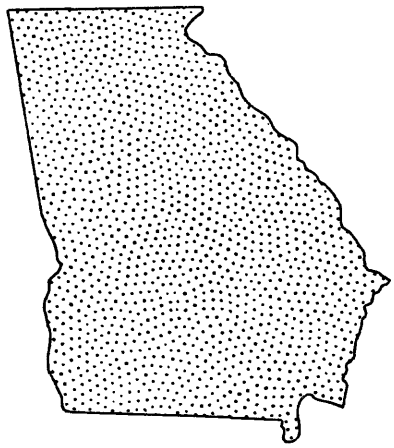


Figure 4.--District Office organization.

DISTRICT PROJECTS

A brief description of current District projects follows, including information on the project leaders, the period of the project, the location within the State, the objectives, and the progress made during fiscal year 1985.

Surface-Water Monitoring, GA001



Location: Statewide

Project Chief: W. R. Stokes, III

Period of Project: Continuing

Cooperation: Many agencies

Problem: Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management in water-related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water-resources development.

Objectives: Collect surface-water data sufficient to satisfy needs for current-purpose uses, such as (1) assessment of water resources, (2) operation of reservoirs or industries, (3) forecasting, and (4) pollution control and disposal of wastes. Collect data necessary for analytical studies to define for any location the statistical properties of, and trends in, the occurrence of water in streams, lakes, and estuaries for use in planning and design.

Approach: Standard methods of data collection will be used as described in the series, "Techniques of Water-Resources Investigations of the Geological Survey." Partial-record gaging is used instead of complete-record gaging where it serves the required purpose.

Progress: Daily discharges were computed for 102 sites and peak stage and discharge were obtained at 130 peak-flow partial-record stations. Final processing of these data was completed and the data report published. Six daily-flow stations were installed and eight were discontinued. Computation and preparation of 1985 data for publication was about 60 percent completed. Many miscellaneous requests for streamflow data were answered during the year. Minor updates were made to the District Surface-Water-Quality Assurance Plan and the Flood Plan. A study, prompted by several recent drownings in the Chattahoochee River immediately downstream from Buford Dam, was conducted by the Corps of Engineers to evaluate alternative turbine-loading schemes. For several stream cross sections in this area, the U.S. Geological Survey collected rate-of-change in stage and velocity data associated with various loading schemes.

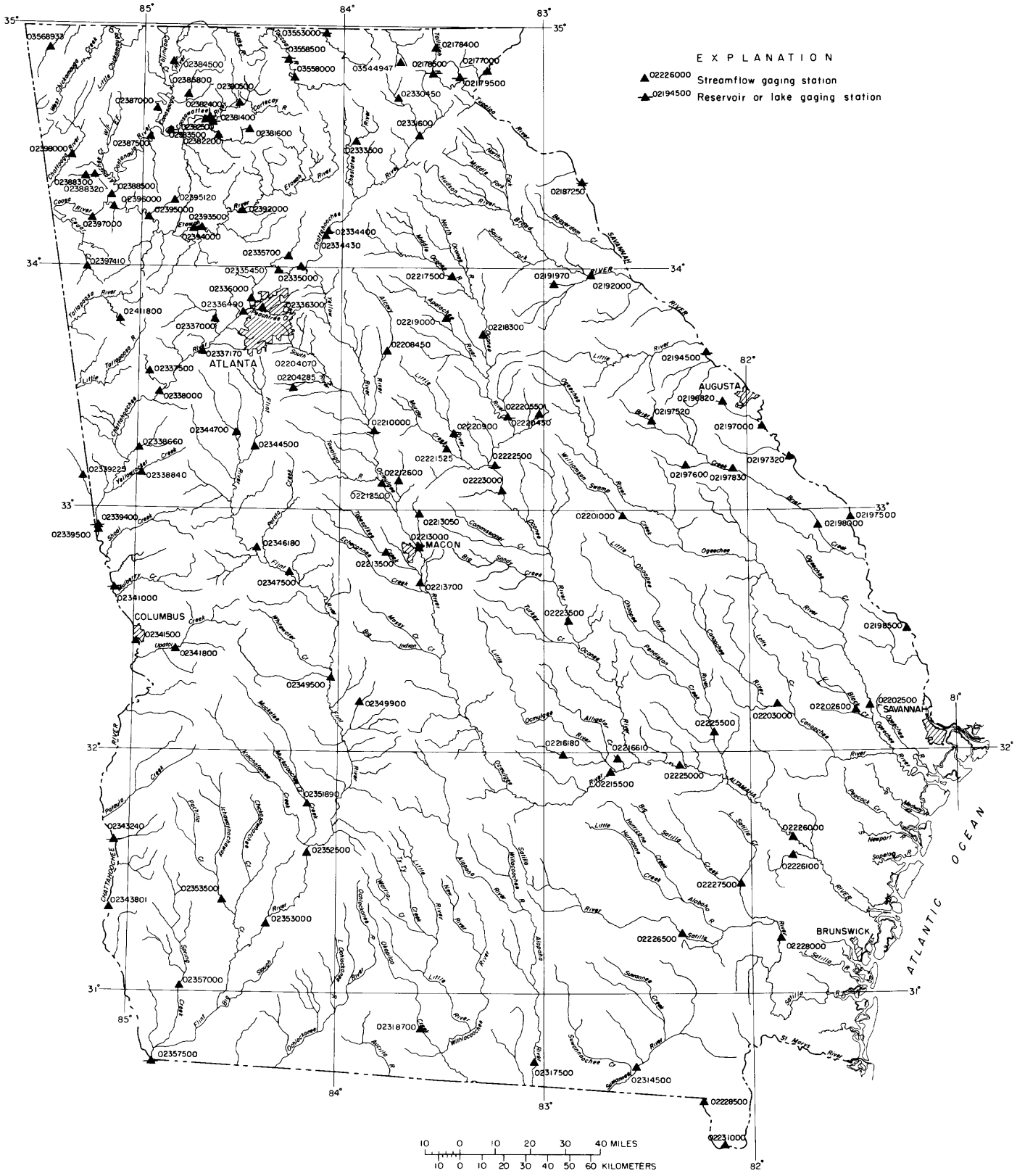


Figure 5.—Location of gaging stations.

Ground-Water Monitoring, GA002

Location: Statewide

Project Chief: J. S. Clarke

Period of Project: Continuing

Cooperation: Many agencies

Problem: Long-term water-level records are needed to evaluate the effects of climatic variations on the recharge to and discharge from the ground-water systems, to provide a data base against which to measure the effects of development, to assist in the prediction of future supplies, and to provide data for management of the resource.

Objectives: Collect water-level data sufficient to provide (1) a minimum long-term data base so that the general response of the hydrologic system to natural climatic variations and induced stresses is known and potential problems can be defined early enough to allow proper planning and management, and (2) provide a data base against which the short-term records acquired in areal studies can be analyzed. Such analyses will provide an assessment of the ground-water resource, allow prediction of future conditions, detect and define pollution and supply problems, and provide the data base necessary for management of the resource.

Approach: Evaluation of regional hydrogeology allows broad, general definition of aquifer systems and their boundary conditions. Within this framework and with some knowledge of the stress on the system in time and space and the hydrologic properties of the aquifers, subjective decisions can be made on the most advantageous locations for observation of long-term system behavior. This subjective network can be refined as additional records become available and detailed areal studies of the ground-water system more closely define the aquifers, their properties, and the stresses that are applied.

Progress: One hundred and forty-nine continuous water-level recorders were operated during the year. Approximately 1,700 periodic water-level measurements were obtained at sites throughout the State. Maps showing the potentiometric surface of the Floridan, Claiborne, Clayton, and Providence aquifers were prepared. In the coastal area 192 water samples were collected during October-November for analysis of chloride and dissolved solids. In the Savannah area water samples were collected monthly from 11 wells and in the Brunswick area water samples were collected semiannually from 89 wells for analysis of chloride and measurement of specific conductance. The preparation of well-inventory, water-level, and hydrogeologic data for entry into the National Water Data Storage and Retrieval System (WATSTORE) was continued. Data in the Ground-Water Site Inventory System (GWSI) were checked for accuracy.

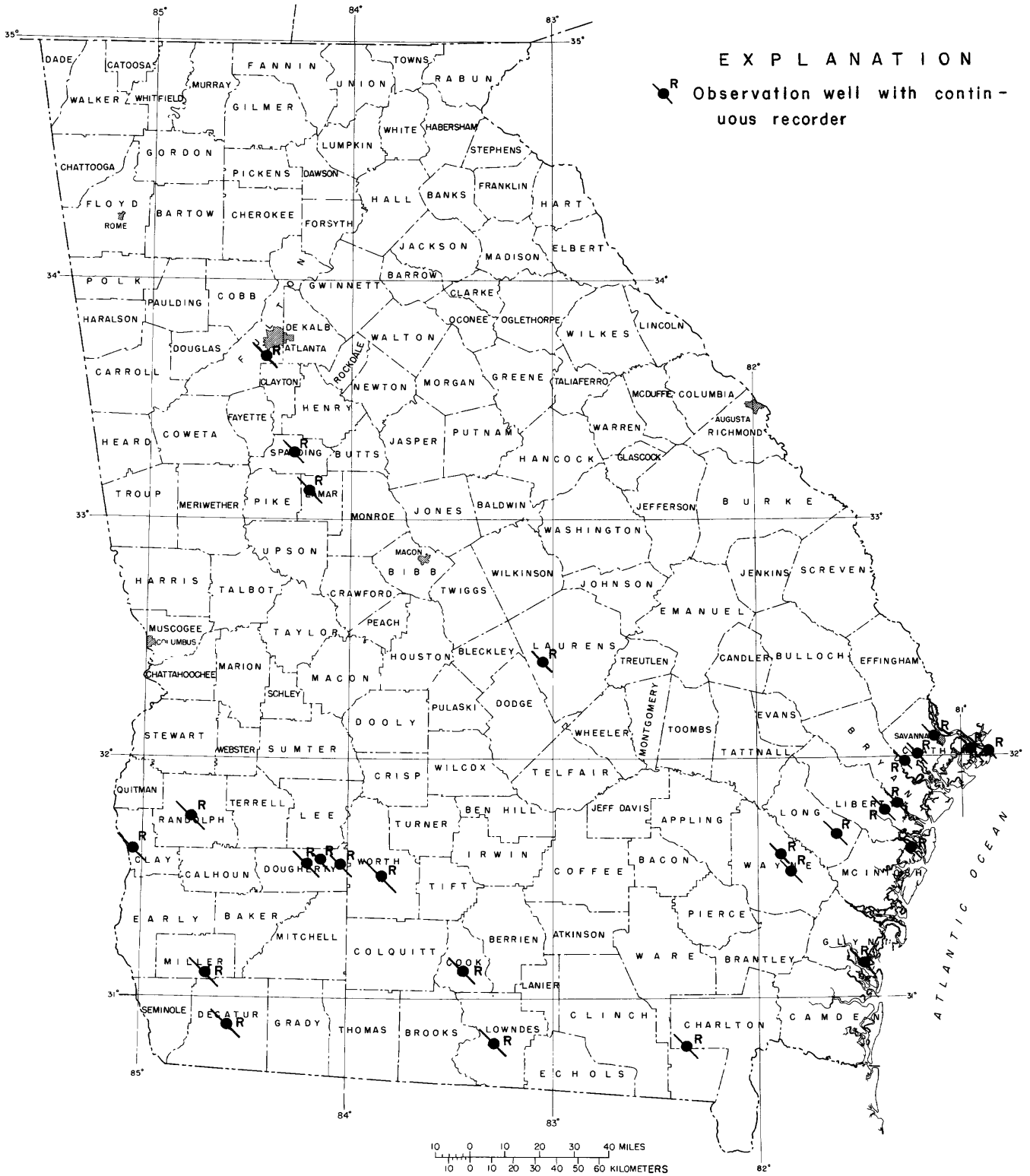


Figure 6.—Location of selected observation wells.

Quality-of-Water Monitoring, GA003

Location: Statewide

Project Chief: W. R. Stokes, III

Period of Project: Continuing

Cooperation: Georgia Department of Natural Resources, Environmental Protection Division, Water Protection Branch

Problem: Water-resource planning and water-quality assessment require a base of relatively standardized water-quality information. For intelligent planning and realistic assessment of the water resource, the chemical and physical quality of the rivers, streams, and ground-water reservoirs must be defined and monitored.

Objectives: To provide a data base of water-quality information for broad planning and action programs and to provide data for management of rivers, streams, and ground-water reservoirs.

Approach: Operate a network of water-quality stations to provide average chemical concentrations, loads, and time trends as required by planning and management agencies. Collect water-quality samples periodically throughout the State and note any changes in water quality that may occur in the various aquifers of the State.

Progress: Flow-through monitors were continued at six stream sites. The standard four parameters (pH, temperature, dissolved-oxygen concentration, and specific conductance) were obtained at five sites while only temperature and dissolved-oxygen concentration were obtained at one site. A mini-monitor for obtaining the standard four parameters was installed at a stream site. Periodic chemical-quality sampling was completed at 106 surface-water sites during the year and data furnished currently to cooperators. The periodic network includes one Benchmark and five NASQAN stations. The Benchmark and one NASQAN station are sampled quarterly while the other NASQAN stations are sampled bimonthly. Two water samples from one NASQAN site, Altamaha River at Everett City, and one water sample from the Benchmark station, Falling Creek near Julliette, were analyzed for radio-chemical constituents. Periodic samples from wells in the Savannah area were analyzed for chloride and non-recurring chemical analyses were performed on samples from several other wells. The 1984 water-year data were compiled and published in the annual water-data report (see project GA001), and preparation of 1985 data for publication was 50 percent completed. A number of water-quality-data requests were answered during the year. Program quality-assurance activities were conducted according to quality-assurance plans.

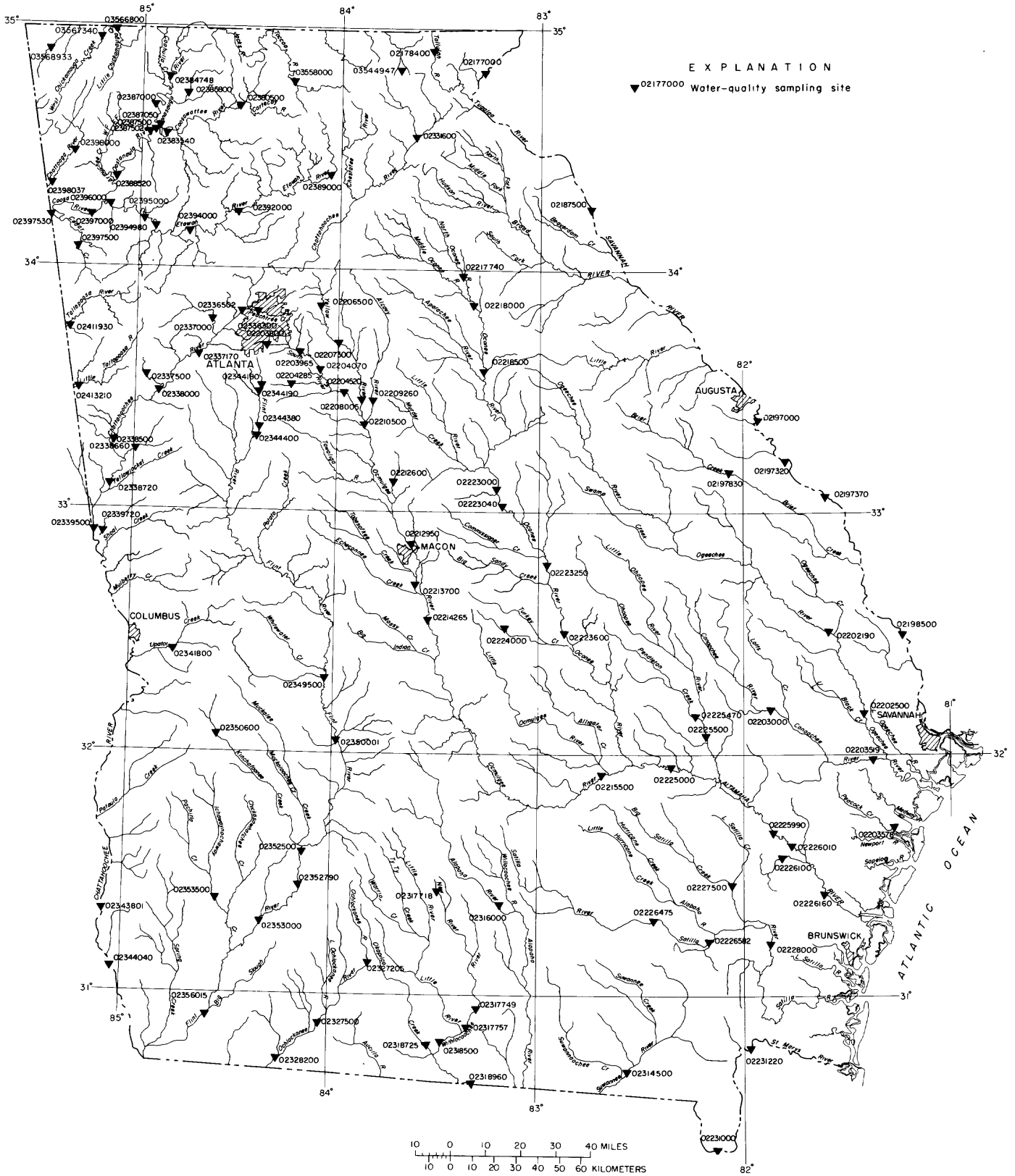
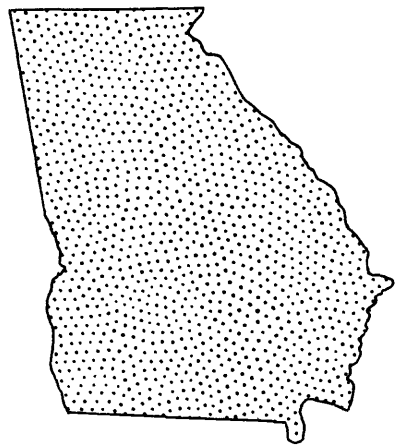


Figure 7.—Location of surface-water-quality stations.

Sediment Monitoring, GA004



Location: Statewide

Project Chief: W. R. Stokes, III

Period of Project: Continuing

Cooperation: U.S. Army Corps of Engineers, Mobile District

Problem: Water-resources planning and water-quality assessment require a base of relatively standardized sediment information. Sediment concentrations and discharges in rivers and streams need to be defined and monitored.

Objectives: To provide a base of sediment information for use in broad State and Federal planning and active programs and to provide data for management of interstate and intrastate waters.

Approach: Establish and operate a network of periodic and stormwater sampling stations to provide spatial averages of sediment concentration and particle size of sediment being transported by rivers and streams.

Progress: Periodic collection and analysis of sediment samples continued at 10 continuous-record streamflow stations. Sampling of storm runoff continued at five of these streamflow stations located in the vicinity of three major Corps of Engineers projects. However, storm runoff was sampled at only three of these sites, because of the almost total lack of surface runoff during the year. The 1984 water-year data were compiled and published in the annual water-data report (see project GA001), and preparation of 1985 data for publication was 55 percent completed.

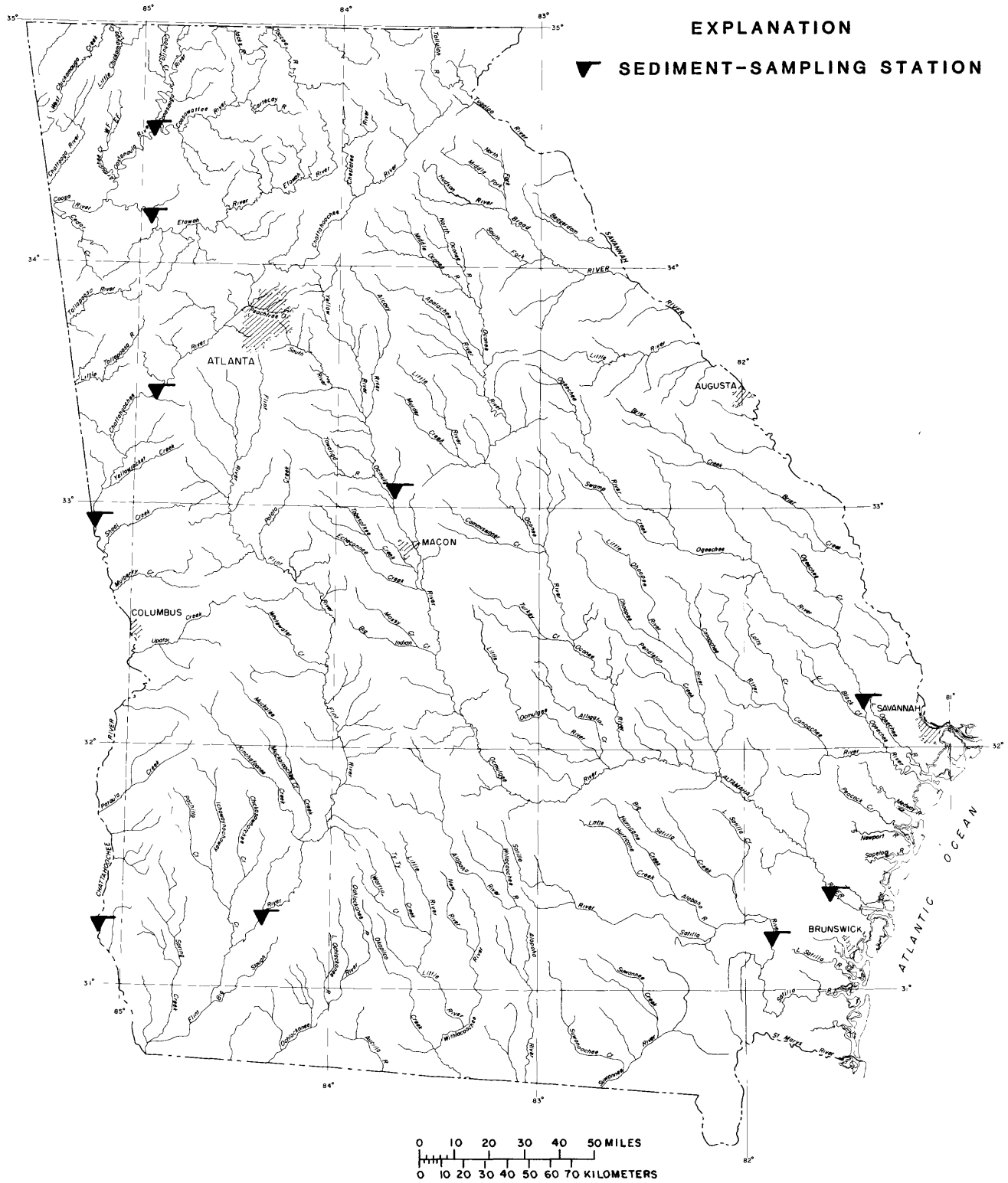


Figure 8.—Location of periodic sediment-sampling stations.

Atmospheric Deposition Monitoring, GA005

Location: Statewide

Project Chief: Gary R. Buell

Period of Project: Continuing

Cooperation: U.S. Geological Survey, Federal

Problem: Data on the chemical quality of atmospheric deposition are needed to provide a baseline against which future changes in atmosmpheric chemical quality can be evaluated. These data are also an essential input to studies designed for assessment of possible aquatic and terrestrial effects related to atmospheric deposition of strong acids. Until recently, there has been no uniform data-collection effort aimed at providing a consistent precipitation chemical-quality data base on a national scale. There are a number of regional studies currently underway but these differ slightly in methods of collection and analysis and do not provide uniform national coverage. The anthropogenic influences on precipitation chemical quality and effectiveness of any mitigation strategies cannot be determined without national network coverage.

Objectives: (1) Define the chemical quality of wet precipitation in Georgia, and (2) analyze the spatial and temporal variability in the chemical quality of wet precipitation in Georgia.

Approach: A precipitation-sampling station will be installed and operated in Tifton in cooperation with the U.S. Department of Agriculture, Agricultural Research Service, as one of the National Trends Network (NTN) sites. This network has been designed and implemented as part of the National Acid Precipitation Assessment Program (mandated by Congress in 1980) to provide a nationally consistent data base on precipitation chemical quality. Weekly composite wet-precipitation samples will be analyzed for pH, specific conductance, major chemical constituents, and trace metals. These data will be coanalyzed with other regional network data for resolution of temporal and spatial trends in precipitation chemistry.

Progress: At the Tifton-ARS NTN site, 107 weekly composite wet-precipitation samples have been collected. Preliminary lab results from the Illinois State Water Survey Central Analytical Laboratory have been received for 91 of these sample sets and complete analytical results for 84 of these sample sets. Dry-fall sampling was temporarily discontinued in September 1984 pending development of new sampling methodology. Trace-metals sampling was initiated in FY-85 and then temporarily discontinued in September 1985.

Impact of Acid Deposition on Stream Chemistry of Brier Creek, Northeast Georgia, GA00501

Location: Towns County

Project Chief: Gary R. Buell

Period of Project: March 1984 - March 1987

Cooperation: United States Environmental Protection Agency, Region IV Atlanta, Georgia

Problem: Acid precipitation is now recognized as a major environmental problem in North America. Data indicate that acidic precipitation (pH less than 5.6) now falls over nearly all the Eastern United States and that the acidity of this precipitation is increasing at most locations. Studies indicate that streams in many areas of the Southeastern United States may be vulnerable to acidification. Further studies are needed on southeastern watersheds that will provide systematic precipitation and stream-chemistry data which can be used to evaluate the extent of the effects of acid precipitation on stream chemical quality.

Objective: To determine whether the Brier Creek watershed is being acidified by atmospheric deposition of strong acids.

Approach: A chemical mass balance will be used to determine whether the buffering capacity of the Brier Creek watershed is changing with time and whether the system is accumulating strong acids. Net mass fluxes will be calculated for the major ions by subtracting the amount received in acidic precipitation from that transported from the watershed by the stream. Stream-chemistry data from storms will be used to assess the combined effects of hydrology, physical and chemical soils characteristics, topography, and vegetative cover on stream chemistry. An input-output chemical budget and data on the within-storm variation in stream chemistry should provide information on watershed processes which influence the stream chemistry. Data will be collected during a 2-year period beginning in March 1984.

Progress: The equipment installation at the Brier Creek watershed is nearly complete. An automatic sampler was wired to a microprocesser for stage-activated storm sampling. Three recording rain gages and three bulk rain gages were installed in the upper part of the basin. At the uppermost site, a wet-dry collector and solar panel has been installed. Bulk precipitation collectors will be installed when the equipment is received. Additional streamflow measurements provided improved definition to the low-water stage-discharge rating.

Flood Investigations, GA006

Location: Statewide

Project Chief: McGlone Price

Period of Project: Continuing

Cooperation: Federal Emergency Management Agency (FEMA)

Problem: The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 provide for the operation of the flood insurance program. The Federal Emergency Management Agency (FEMA) needs flood studies in selected areas to determine applicable flood insurance premium rates.

Objectives: To conduct the necessary hydrologic and hydraulic evaluations and studies of areas assigned by FEMA and to present the results in an appropriate format.

Approach: Conduct stream surveys by ground or photogrammetric methods. Determine flood-discharge frequency relations using local historical information, gaging-station records, or other applicable information. Determine water-surface profiles using step-backwater models or by other acceptable methods and furnish the results in reports prepared to FEMA specifications.

Progress: Less-than-detailed flood insurance studies for FEMA have been completed for the cities of Jesup, Bainbridge, Gordon, and Winder. The reports for these cities are in the final review process. Surveying has been completed for FEMA less-than-detailed studies for Swainsboro and Vidalia. Less-than-detailed flood insurance studies have been completed for four cities in Georgia and surveying completed for two other cities. For selected communities, determined flood-frequency discharge relations and computed water-surface profiles using step-backwater and other acceptable methods. Prepared eight less-than-detailed flood-insurance reports to FEMA specifications.

Use of Water in Georgia, GA007

Location: Statewide

Project Chief: Robert R. Pierce

Period of Project: Continuing

Cooperation: Georgia Department of Natural Resources, Environmental Protection Division, Geologic Survey Branch

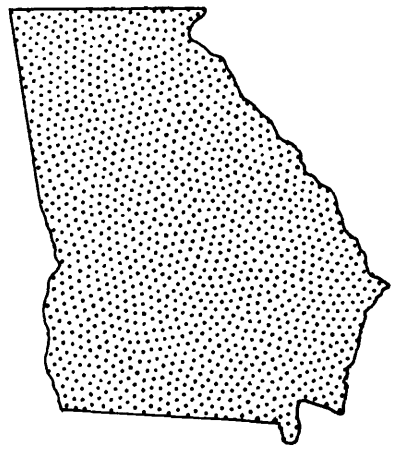
Problem: Water resources in Georgia are under mounting pressures from increasing population, growing industry, and the recent rapid increase in agricultural use. Information is being collected which describes the quantity and quality of available water, but relatively little information is being collected describing water use. Without such information, decision makers cannot resolve many critical problems such as water-quality residuals, environmental impact, energy development, and resources allocations. Methods for comprehensive acquisition of water-use data have not been developed. Data now in the files of State and Federal agencies are not in a form suitable for automatic storage and retrieval and contain many deficiencies.

Objectives: To (1) identify sources of water-use data, (2) develop and evaluate techniques for collecting water-use data, especially data not in State agency files, (3) identify requirements for a water-use data handling system, (4) select and implement a Georgia water-use data handling system, and (5) develop a system for sample verification of data reported to the State.

Approach: Responsibilities will be divided between the cooperator and the U.S. Geological Survey. Project management, data storage, and data processing will be the responsibility of the U.S. Geological Survey. Data acquisition will be the primary responsibility of the cooperator. The implementation phase of the project will be devoted to design of the data-collection system. The subsequent work will be for maintenance and updating.

Progress: The Georgia Water-Use Program has established a framework for collection of annual withdrawal and discharge information. The data are entered into the Georgia Water-Use Data System (GWUDS). GWUDS has evolved through the Program's continued handling of site-specific and area-based water-use data and the fulfilling of District project needs and the program needs of other State, Federal, and local agencies in Georgia. GWUDS is microcomputer-based and provides great latitude for interactively producing reports including high-quality graphics. Updates of 1981 information for municipal, industrial, and power-generation withdrawals and returns have been added to the system. The Georgia Irrigation Reporting System (GIRS), designed by the Georgia Water-Use Program and implemented by the Georgia Environmental Protection Division, is being used to update information annually on irrigation water use.

Statewide Flood Studies, GA059



Location: Statewide

Project Chief: McGlone Price

Period of Project: Continuing

Cooperation: Georgia Department of Transportation

Problem: A knowledge of flood characteristics is essential for the design of highway drainage structures, for planning the best use of flood-prone lands, and for establishing flood-insurance rates. Only through reliable estimates of flood magnitude and frequency is it possible to obtain economically optimum designs of highway bridges and culverts, to determine locations for waste treatment and water-supply facilities, to prepare realistic zoning ordinances, and to establish equitable flood-insurance rates.

Objectives: To collect supplemental flood data, to analyze the data and to prepare reports describing the hydrologic and hydraulic characteristics of selected stream reaches, and to collect data and prepare reports describing unusual flood events.

Approach: (1) Operate a network of crest-stage gages to supplement the statewide gaging-station network to improve the areal distribution of flood data that provide the base-line data for the determination of the magnitude and frequency of floods, (2) determine the hydraulic and hydrologic characteristics, including determination of the flow distribution, backwater, and velocity studies, for selected stream reaches for use in flood zoning, flood-insurance studies, evaluating highway drainage structures, and siting waste-treatment and water-supply facilities, and (3) collect field measurements including indirect measurements of peak flows for major floods and prepare reports describing unusual floods.

Progress: Analyses describing flooding characteristics of 10 stream reaches were prepared. The annual flood-peak data for 1984 were entered into the WATSTORE peak-flow file for 46 crest-stage-gage sites.

Flood-Frequency Characteristics of Urban Streams in Georgia, GA062

Location: Selected metropolitan areas in Georgia

Project Chief: Ernest J. Inman

Period of Project: 1978-1986

Cooperation: Georgia Department of Transportation

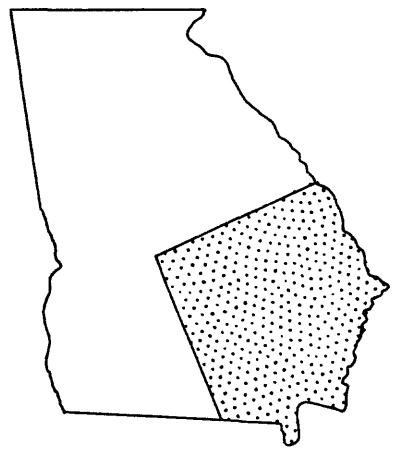
Problem: A method is needed for estimating the magnitude and frequency of floods occurring in streams in metropolitan areas of Georgia. Urban flood-frequency information is needed for bridge, culvert, and drainage design and for flood-mapping studies. Urbanization produces large changes in the flood runoff characteristics of streams; natural (rural) basin flood-frequency relations are, therefore, not applicable to urban or suburban streams. Few hydrologic data observations currently are available for streams in metropolitan areas.

Objectives: The objectives of this study are to (1) collect hydrologic data for selected urban streams in selected metropolitan areas of Georgia, and (2) analyze these data to develop relations that may be used to estimate the magnitude and frequency of floods in urban streams throughout the State.

Approach: Selected urban drainage basins will be instrumented to obtain flood-hydrograph and storm-rainfall data in Athens, Augusta, Columbus, Rome, and Savannah. These basins will represent a range in drainage area (0.2 to 20 mi^2), amount of impervious area, channel slopes, and types of land use. All significant flood-runoff events, generally from 3 to 6 events per year, will be processed for use in calibrating the U.S. Geological Survey urban-hydrology models. Depending on weather conditions, 4 to 7 years of data collection will be required to obtain the desired data base. When the rainfall-runoff model is calibrated for a station, National Weather Service long-term rainfall data will be used to simulate a long-term peak-discharge record for the calibrated sites. Flood frequency at each site will then be defined from the synthesized flood peaks using the log-Pearson Type III analysis. The multiple-regression method will be used to relate to physical and climatological basin characteristics. From the regional relation, estimates of the magnitude and frequency of floods can be made for an ungaged drainage basin.

Progress: Stage-discharge relations have been established and verified at 29 of 30 sites. Data collection and processing continued on a near-current basis. Impervious area has been computed for all 30 sites. Data collection and processing continued. One stage-discharge relation was established during the 1985 water year.

Tertiary Limestone Regional Aquifer-System Analysis (RASA), Southeast Georgia, Northeast Florida, and Southern South Carolina, GA070



Location: Southeast Georgia and adjacent parts of Florida and South Carolina

Project Chief: Richard E. Krause

Period of Project: 1979 - 1985

Cooperation: U.S. Geological Survey, Federal

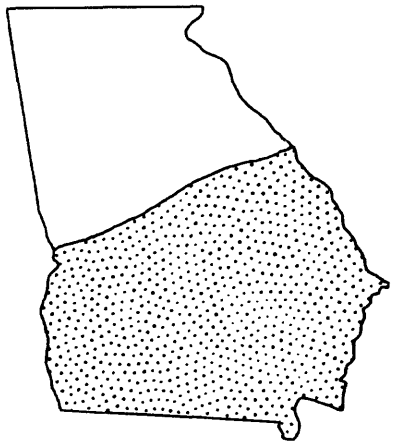
Problem: The Tertiary limestone aquifer is the major source of water supply for the eastern half of the Coastal Plain of Georgia, the southern tip of South Carolina, and northeast Florida, where ground-water withdrawals total more than 700 million gallons per day. Problems that have recently developed include declining water levels, chiefly around pumping centers, but area-wide as well; infiltration of mineralized water into the aquifer from underlying strata; and lateral movement of seawater toward pumping centers from offshore.

Objective: The objective of the project, covering one of six subareas constituting the Tertiary Limestone Regional Aquifer-System Analysis, is to describe the areal hydrogeologic framework of the aquifer, and develop and utilize computer simulation of the ground-water-flow system to aid in the description of that flow regimen.

Approach: Existing data were assembled and a computer model simulating the ground-water-flow systems for the entire project area was made to define the areal ground-water-flow system. Additional hydrogeologic data were collected on the basis of need as determined by the computer simulation. The model was updated, calibrated, and verified.

Progress: Completed model simulations and verifications with known data, and made predictive simulations. Completed report on the hydrogeology and digital model evaluation. Report approved by the Director (USGS) and project completed.

Southeast Coastal Plain Regional
Aquifer-System Analysis (RASA), GA072



Location: Parts of the Georgia, Alabama, and South Carolina Coastal Plain

Project Chief: Robert E. Faye

Period of Project: 1980 - 1986

Cooperation: U.S. Geological Survey, Federal

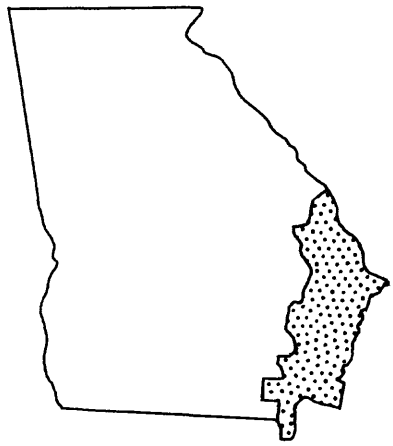
Problem: Throughout the Georgia Coastal Plain, interlayered sand, clay, and limestone of Late Cretaceous and Tertiary age act regionally as several distinct aquifers. The regional effects of industrial and municipal pumping require study and evaluation of these aquifers in order to assure adequate water supplies of suitable quality.

Objectives: Study objectives include the determination of ground-water-flow patterns and boundaries of the various aquifer systems and their simulation through the use of digital models.

Approach: Pertinent information from the U.S. Geological Survey and other agencies will be reviewed and compiled. Water-level data will be reduced to potentiometric maps relative to each aquifer system. Geophysical data will be used to determine stratigraphic and hydrologic boundaries. Aquifer-test data will be analyzed and used to determine aquifer properties. Interpreted data will be applied to a digital model designed to simulate ground-water flow.

Progress: Satisfactory steady-state and transient simulations have been completed. With the exception of minor changes, the subregional modeling effort has been completed, including both the areal model and several cross-section models. Two of four remaining project reports are in review.

Impact of Increased Water Use on the Quantity and Quality of the Ground-Water Resources of Coastal Georgia, GA075



Location: Southeastern Georgia

Project Chief: Richard E. Krause

Period of Project: 1981 - 1986

Cooperation: Georgia Department of Natural Resources, Environmental Protection Division, Geologic Survey Branch

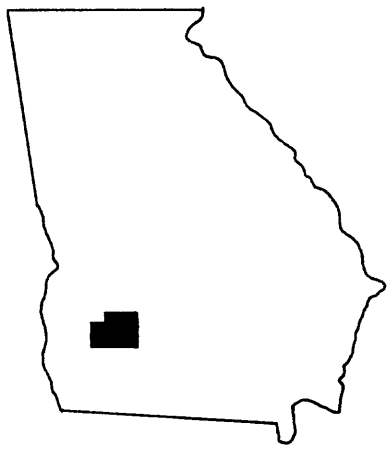
Problem: The Floridan aquifer system is the major source of water supply for the coastal area of Georgia, with ground-water withdrawal, including that in extreme northeast Florida, totaling over 400 million gallons per day. This heavy withdrawal has created problems of declining water levels and the contamination of the freshwater aquifer by highly mineralized water. In addition, the rapidly increasing use of large-scale irrigation systems in the area will produce an additional impact on the ground-water system.

Objectives: To (1) better define the fresh ground-water flow system, (2) determine the occurrence, flow regimen, and quality of the water underlying the system, and (3) determine the impact of faults on the flow system.

Approach: The first phase will involve data collection--specifically, test drilling and modification of existing wells, particularly oil-test wells that fully penetrate the sequence of interest; geophysical logging; testing of aquifer characteristics; and water-quality sampling to better define the geohydrology of the freshwater aquifer system and the saline-water bearing formations underlying the aquifer system. Appropriate analyses will be made of the data. Ground-water-flow models will be developed, including a regional, coastal-area model that uses data and model results from the Regional Aquifer-System Analysis (RASA) limestone study. Management-level models will be developed for high-priority areas, such as Brunswick. Results of the study will be published by the cooperator.

Progress: Prepared a report describing the pertinent water-resource data (through June 1983), which was published by the cooperator. Conducted and analyzed a local aquifer test, and analyzed data from an aquifer test of the same aquifer and area which was regional in scope, made comparisons and conrasts, and prepared a report on the findings. Designed a model which simulates ground-water flow in the fractured limestone aquifer in the Glynn County area. Constructed 11 test-monitor wells at 4 sites and in 5 water-bearing zones; made borehole-geophysical logs, conducted selected tests and analyses, and installed continuous recording water-level monitors. Measured water levels throughout the study area and made 4 potentiometric maps in selected areas for two aquifers.

Geohydrologic Evaluation of the Upper Floridan Aquifer in Dougherty, Southeastern Lee, and Western Worth Counties, Georgia, GA077



Location: Southwestern Georgia

Project Chief: David W. Hicks

Period of Project: 1981 - 1986

Cooperation: Albany Water, Gas, and Light Commission

Problem: Heavy ground-water pumpage in this rapidly growing area, presently averaging over 70 million gallons per day, has caused water levels to decline significantly in the Tallahatta, Clayton, and Upper Cretaceous aquifers. Declining water levels have created an immediate need to evaluate the development potential of the overlying Upper Floridan aquifer as an alternate ground-water source. The effects of extensive applications of agricultural chemicals need to be evaluated in this potential ground-water source.

Objective; The development potential of the Upper Floridan aquifer will be evaluated for the Albany area. Ground-water and surface-water quality will be monitored through a broad range of ground-water and surface-water conditions. Water-sampling frequency will enable the evaluation of potential seasonal variations in water quality and the impact of the applications of agricultural chemicals.

Approach: (1) Wells drilled for the recently completed Dougherty Plain ground-water study will be utilized to sample for water-quality changes related to agricultural practices. (2) Ten shallow wells will be installed to supplement existing wells to determine head, yield, aquifer geometry, water quality, and the stream-aquifer relations with the Flint River.

Progress: All field work and data analyses were completed. Results of the study have been included in the report, "Geohydrologic Evaluation of the Upper Floridan aquifer in the Albany area, Georgia." The report is in review.

Migration of Pesticides Through the Unsaturated and Saturated Zones at a Selected Site in Southeast Lee County, Georgia, GA079

Location: Lee County

Project Chief: Sandra C. Cooper

Period of Project: 1983 - 1986

Cooperation: U.S. Environmental Protection Agency, Environmental Research Laboratory, Athens, Georgia

Problem: Increased agricultural productivity in southwest Georgia has resulted in the use of large-scale irrigation, multicropping, and increased applications of fertilizers and pesticides. The major water-bearing unit in the Dougherty Plain is the Upper Floridan aquifer of late Eocene age, which is recharged through permeable residuum of varying thickness. The expanded use of land-applied toxic pesticides indicates the urgent need to thoroughly investigate the migration and degradation of toxic chemicals so the quality of the ground-water resources in the Dougherty Plain can be preserved.

Objectives: Use field data to calibrate, test, and refine ground-water-flow and solute-transport models designed to predict movement of chemicals within the residuum and underlying aquifer.

Approach: Work elements include geologic and hydrologic evaluations of the study site, installation of a permanent ground-water monitoring network using wells and lysimeters, and monitoring two small test tracts. Data collection includes water-quality samples; soils samples for biological, physical, chemical, and moisture-release analyses; climatic and surface-water data; and data concerning aquifer characteristics. Water-table and potentiometric maps will define the flow system; geophysical logs, drill cuttings, and cross sections will define the stratigraphic sequence and geohydrologic framework.

Progress: Made potentiometric measurements of the Upper Floridan aquifer in a 60-square-mile area and measured water levels in 21 observation wells. Continued collecting climatic, soil-temperature, and soil-moisture data. Collected 160 soil samples, 60 soil-water samples, and 25 ground-water samples for background bromide analysis. Installed 4 shallow wells along the perimeter and sampled for background aldicarb. Applied bromide to the field as a tracer and collected 100 filter discs on the day of application. Planted 1,150 lbs of peanuts and applied aldicarb at the rate of 2 pounds of active ingredient per acre (15 percent formulation). Collected 431 soil samples on the day of application. Applied the herbicide metolachlor to the field, and collected 200 filter discs on the day of application. Collected 400 soil samples, 195 soil-water samples, 45 ground-water samples, and 60 plant samples for aldicarb analysis. Submitted peanuts to the Food and Drug Administration for aldicarb analysis which showed a zero concentration of residues.

Simulation of Fluid Flow in Fractured Limestone Formations near Brunswick, Georgia, GA083

Location: Glynn County

Project Chief: Morris L. Maslia

Period of Project: October 1983 - September 1987

Cooperation: Glynn County

Problem: Significant reductions in the potentiometric surface near Brunswick are allowing highly saline brines to move upward into the freshwater zone. Because faults and fractures in the limestone are believed to be vertical conduits for the upward movement of saltwater, it is necessary to be able to simulate flow in faulted and fractured media so that both vertical and lateral ground-water movement in the Brunswick area can be simulated accurately.

Objectives: (1) Available field data will be used to establish initial aquifer hydraulic properties for the area. (2) Review existing fractured flow analyses, and develop an original mathematical model and accompanying analytical and numerical solutions for simulating flow in the fractured and locally faulted limestone aquifer in the area.

Approach: Determine initial estimates of aquifer hydraulic properties by using two- and three-dimensional digital models to model the conceptualized fractured flow system. These models are the conventional ground-water-flow and transport models. Research literature and develop mathematical models for describing fluid flow in fractured and faulted rock aquifers. Obtain simplified solutions to mathematical models. Develop numerical simulation models for fluid flow in fractured and faulted rock aquifers.

Progress: Used tensor analyses and optimization techniques to determine directional properties of aquifer ground-water flow. Field data previously omitted because of lack of fit to an isotropic homogeneous porous medium model were used because the aquifer was conceptualized as being an anisotropic porous medium. Results indicate a correlation between direction of flow and structural features mapped by geophysical techniques. Results of this phase of the study are being prepared for publication in a scientific journal. Initial modification of the two-dimensional one-layer finite element model by L. J. Torak and R. L. Cooley was started to make the model into a multilayer aquifer model for possible use in the Brunswick area. A report that documents a tensor analysis computer code was written and modified as per colleague reviews.

Simulation of Flood Hydrographs for Georgia Streams, GA084

Location: Selected streams in Georgia

Project Chief: Ernest J. Inman

Period of Project: 1983-1985

Cooperation: Georgia Department of Transportation

Problem: The design of highway bridges generally needs to include an evaluation of the flood related risks associated with the design. These risks can be divided into three categories: (1) direct damage to the roadway and bridge, (2) traffic related losses, and (3) losses due to additional flood damage in the upstream flood plain. To quantify losses 2 and 3, the Department of Transportation needs information on flood hydrographs associated with peaks of specified recurrence intervals at a particular site. For ungaged streams this information is difficult to obtain. The problem, therefore, is to provide the highway engineer with a method that can be used to estimate flood hydrographs which can reasonably be expected to occur in Georgia.

Objective: The object of this study is to define techniques for estimating the flood hydrographs to be expected from given flood-peak discharge information and other hydrologic and basin characteristics.

Approach: Previous studies will provide all necessary data for rural areas. Hydrologic data for urban basins in the State are being collected as part of an ongoing study in cooperation with the Georgia Department of Transportation. Additional data collection will not be required for this study. Several methods for deriving dimensionless hydrographs will be examined and the method most applicable to Georgia's small streams will be used to develop mean dimensionless hydrographs. For the large streams (larger than 500 mi^2) numerous flow-routing models are available. One of these models will be selected and applied to these streams.

Progress: One dimensionless hydrograph has been selected for use statewide to estimate hydrographs for basins of less than 500 square miles. The computer model CONROUT was tested and found to be satisfactory for estimating hydrographs for basins greater than 500 square miles. Regression analysis was used to define relations between lagtime and certain physical basin characteristics, of which drainage area and slope were significant for rural conditions, with impervious area being added for the Atlanta urban equation. The report was completed and forwarded for Director's approval.

Acid Rain, Dry Deposition, and Terrestrial Processes Research at Panola Mountain State Park, GA085

Location: Rockdale County

Project Chief: Norman E. Peters

Period of Project: 1984-1989

Cooperation: U.S. Geological Survey, Federal

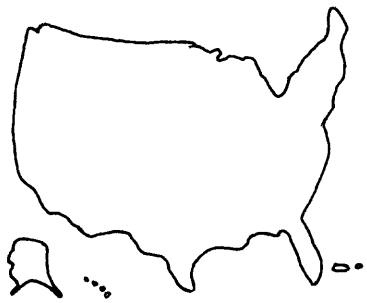
Problem: Acidic atmospheric deposition is thought to be responsible for acidification of surface waters in the Eastern United States. This acidification is responsible for several deleterious effects on fauna and flora through changes in the chemical regime. Acids may be deposited in a watershed by several processes. The area receiving acid rain is expanding and extending southward. It is pertinent to evaluate the effects this phenomenon may have on watersheds in this region.

Objectives: To (1) evaluate and devise methods for measuring dry deposition, and (2) investigate terrestrial processes that control water chemistry.

Approach: Initially, dry deposition will be estimated by using (1) a chemical mass balance, (2) micrometeorological methods implemented by Bruce Hicks (NOAA), and (3) analyses of material collected in a bucket when it is not raining. Identify flow system and related chemical characteristics of the various compartments including precipitation, soil water, throughfall, ground water, and surface water.

Progress: The site has been instrumented and data are being collected.

Development of Interactive Controller Subsystem of WRD's National Water Information System (NWIS), GA086



Location: Nationwide

Project Chief: Thomas R. Dyar

Period of Project: 1984-1985

Cooperation: U.S. Geological Survey, Federal

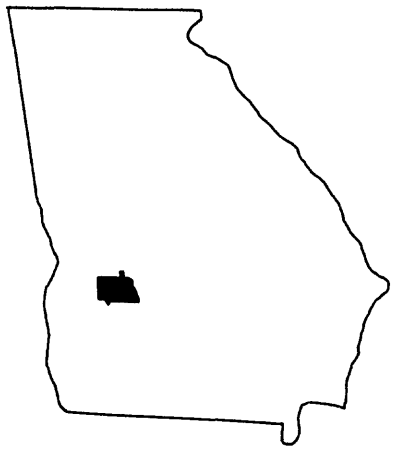
Problem: In September 1982, the U.S. Government awarded a multiyear contract to Prime Computer, Inc., for the purchase of up to 75 minicomputers to be located at the major offices of the Water Resources Division (WRD) of the U.S. Geological Survey. This Distributed Information System (DIS) is to provide an environment within which related information systems will be developed for the WRD in pursuit of its primary hydrologic mission and the performance of various managerial and administrative tasks. The major information system to be developed in the DIS is the National Water Information System (NWIS). The NWIS has been planned to encompass all data processing, storage, analysis, and dissemination capabilities needed at all levels of the WRD--District, Region, and National Headquarters. The NWIS will be developed through a series of prototypes of the various system components.

Objective: To develop the first NWIS prototype, the Interactive Controller Subsystem (ICS).

Approach: The prototype of the Interactive Controller Subsystem (ICS) is being developed under the NWIS project of WRD's Office of Computer Technology, Scientific Publications and Data Management. The software development team is from the Georgia District. The NWIS furnishes the initial ICS conceptual design. The team then is responsible for the following steps: (1) ICS design specifications, (2) program specifications, (3) training and users guide, (4) design review, (5) systems testing, (6) development, (7) Alpha testing, (8) Beta testing, and (9) implementation of maintenance.

Progress: The Interactive Controller Subsystem (ICS) for the Interim WATSTORE was completed and is now loaded into the WATSTORE directory. The ICS was tested and reviewed by the NWIS and by the Interim WATSTORE development team. After the review, final modifications were made and documentation was furnished. The ICS is now ready for implementation at local PRIME nodes.

Movement and Fate of Agricultural Chemicals
in the Subsurface, Southwest Georgia, GA087



Location: Ty Ty Creek, Sumter County, Georgia

Project Chief: David W. Hicks

Period of Project: 1984-1989

Cooperation: U.S. Department of Agriculture,
Agricultural Research Service
U.S. Geological Survey,
Office of Hazardous Waste

Problem: Increased demand for agricultural products from limited prime cropland has resulted in many areas being multicropped. To stimulate plant growth in these heavily planted soils, and to control weeds, disease, and insects, myriad organic and inorganic substances are applied by using standard, accepted agricultural practices. When pesticides and fertilizers are applied to cropland, the chemicals that enter the soil are mobilized or transported by water to varying degrees. Water that infiltrates the surface mobilizes the chemicals and moves them downward toward the ground-water-flow system. Runoff during intense rainfall washes chemicals attached to erodible material into nearby streams.

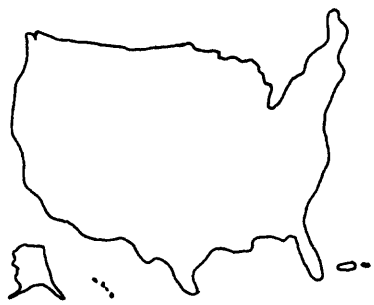
Objectives: (1) Determine the degradation characteristics and fate of agriculturally applied organic and inorganic substances as they are transported through the unsaturated (including the root zone) and saturated zones in a 0.5-square mile headwater watershed of Ty Ty Creek, Sumter County. (2) Determine movement patterns of these substances and their degradation products in the aquifer. (3) Develop improved processes to describe the infiltration rate and chemical nature of potential ground-water recharge in the unsaturated zone by using existing computer models.

Approach: From borehole and geophysical logs, describe the geology, stratigraphy, and lithology of the watershed. Install continuous ground-water monitoring wells at six sites and make periodic water-level measurements in 44 wells. Water-level-contour maps will be constructed to reflect aquifer conditions during the winter, spring, summer, and fall. Two- and three-dimensional ground-water-flow models will be developed. Additionally, a two-dimensional finite-element saturated-unsaturated ground-water-flow model will be used to describe the flow of water from the ground surface through the unsaturated zone to the saturated part of the aquifer. Continuous and intermittent streamflow stations will be established at several sites in the watershed. A V-notch weir, compound weir, or flume will be installed on the main channel of Ty Ty Creek to determine storm runoff and stream-sediment loading.

Progress: Drilled 42 reconnaissance test holes, completed 30 test holes as screened monitor wells, and installed continuous recorders on three additional wells. Completed geophysical logs in test holes and monitor wells, installed four continuous rainfall-recording stations, and constructed V-notch weir, H-flume weir, and slope-discharge rainfall-runoff measuring stations.

Methods Development for the Determination of Inorganic Partitioning in Sediments, GA088

Location: Nationwide



Project Chief: Arthur J. Horowitz

Period of Project: 1983-1986

Cooperation: U.S. Geological Survey, Federal

Problem: There is a strong association of numerous inorganic elements and compounds with both suspended and bottom sediments. The investigation of these sediments is a requisite for understanding the distribution, transport and availability of inorganic constitutents in a hydrologic system. The WRD lacks, at present, the capabilities and requisite procedures to investigate and delineate the concentration and partitioning of inorganics with sediments. Partitioning entails both a physical aspect (relation to particle size, density) and a chemical aspect (association with other substances, type of association).

Objectives: To (1) develop an acceptable "production-line" method for the total trace-metal analysis of sediments; (2) develop a size separation technique that does not alter chemistry; (3) investigate and evaluate methods for determining trace metal-sediment associations (partitioning); and (4) provide guidelines for the interpretive use of the methods developed by the project.

Approach: Methods for the first three objectives will be examined for the following factors: (1) applicability to various types of sediment, (2) reproducibility, (3) ease of use with emphasis on adaptability to automation and utility in the Central Laboratory System, and (4) maximum data recovery for minimum effort. Work will concentrate on a small suite of diverse samples to maximize comparisons and to determine method utililty. Once laboratory methods of Objective 1 have been established, various field collection and preservation methods for suspended sediment will be tested and evaluated. Guidelines will be developed as methods come "on-line".

Progress: Analytical methods for the total analysis of rocks and sediments have been developed for a large number of elements, and new capabilities have been provided for the direct analysis of suspended sediment and for particle size-trace metal chemistry.

PUBLICATIONS OF THE U.S. GEOLOGICAL SURVEY

Professional Papers, Bulletins, Water-Supply Papers, the Geological Survey's Annual Report, and other text products pertaining to Georgia are sold by the Distribution Branch, U.S. Geological Survey, Books and Open-File Reports, Federal Center, Building 41, Box 25425, Denver, CO 80225. Hydrologic Investigations Atlases and other map series are available from the Distribution Branch, U.S. Geological Survey, Map Distribution, Federal Center, Building 41, Box 25286, Denver, CO 80225. Circulars are free upon application to the U.S. Geological Survey, National Center, Reston, VA 22092. For those interested in forthcoming reports, subscriptions to the monthly list, "New Publications of the Geological Survey," are available free upon application to the U.S. Geological Survey, 329 National Center, Reston, VA 22092.

Records of streamflow, floods, ground-water levels, and quality of water have been published as Geological Survey Water-Supply Papers (WSP) in the series explained below. For further information on these publications refer to the "State list" mentioned in the following paragraphs or contact the District Chief, Water Resources Division, at the address given in figure 3.

Streamflow data.--Records of daily flows of streams prior to 1971 were published in the Water-Supply Paper series, "Surface Water Supply of the United States," which were released in numbered parts as determined by natural drainage basins. Until 1961 this was an annual series; monthly and yearly summaries of these data also were reported in "Compilation of Records of Surface Waters of the United States through September 1950," and Compilation of Records of Surface Waters of the United States, October 1950 to September 1960." For the period 1961-70, two 5-year compilations were published. Data for Georgia are published in Parts 2 and 3. Daily streamflow records also have been published on a State-boundary basis during the period 1961-74; these reports are published as "Open-File Reports of the U.S. Geological Survey." Beginning with the 1975 water year, a new report series, "U.S. Geological Survey Water-Data Reports," combined data for surface water with ground-water-level data from the basic network of observation wells. Reports for water years 1975 through 1984 are listed under "Selected References."

Floods.--Methods for estimating the magnitude and frequency of floods for particular streams are given in the WSP series, "Magnitude and Frequency of Floods in the United States," which is comprised of reports released in parts by drainage basins; data for Georgia are in Parts 2 and 3. The U.S. Geological Survey is outlining flood-prone areas on topographic maps as part of a recent nationwide Federal program for managing flood losses. In Georgia, 374 maps have been completed. Information on these maps is available from the District Chief, Water Resources Division, at the address given in figure 3.

Ground-water data.--Ground-water levels in observation wells are reported by geographic areas in the 5-year WSP series described above. Data for Georgia are in "Ground-Water Levels in the United States, Southeastern States."

Quality-of-water data.--Data on quality of surface water are given in the WSP series, "Quality of Surface Waters of the United States," which also is released in numbered parts as determined by natural drainage basins. Data for Georgia are in Parts 2 and 3. As of the 1964 water year, these data also are released annually as Open-File Reports on a State basis.

Research in progress and results of completed investigations are given by fiscal year in Geological Survey Research (Professional Paper (PP) series): 1969, PP 650-A; 1970, PP 700-A; 1971, PP 750-A; 1972, PP 800-A; 1973, PP 850; 1974, PP 900; 1975, PP 975; 1976, PP 1000; 1977, PP 1050, and 1978, PP 1100; 1979, PP 1150; 1980, PP 1175, and 1981, PP 1275.

The U.S. Geological Survey's Annual Report provides a comprehensive description of the Federal Government's largest earth-science agency; copies are available for fiscal years 1975-1984.

A more complete list of U.S. Geological Survey reports for Georgia is given in the pamphlet, "Geologic and Water-Supply Reports and Maps--Georgia." Summary statements about the National water situation are presented in the "Water Resources Review," which is issued monthly. The State list and the Review may be obtained free upon application to the U.S. Geological Survey, National Center, Reston, VA 22092. Additional information is contained in "Summary of Water Resources in Georgia," a monthly release about the current trends and conditions of water resources in Georgia. This summary can be obtained from the District Chief, Water Resources Division, at the address given in figure 3.

Open-File Reports are available for inspection in the Doraville, Ga., and Reston, Va., offices of the U.S. Geological Survey; selected reports may be purchased from the Open-File Services Section, Western Distribution Branch, U.S. Geological Survey, Box 25425, Federal Center, Denver, CO 80255. Orders must include the Open-File series and number (such as Open-File Report 77-123) and complete report title. Further information on the availability of these reports may be obtained from the District Chief, Water Resources Division, at the address given in figure 3.

Selected reports of the U.S. Geological Survey in the Water-Resources Investigations series and all Water-Data Reports may be purchased as hard copy or microfiche only from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161. These reports are available for inspection at the Doraville, Ga., and Reston, Va., offices of the U.S. Geological Survey.

PUBLICATIONS OF THE GEORGIA GEOLOGIC SURVEY, GEORGIA DEPARTMENT OF NATURAL RESOURCES

These reports can be obtained from the State Geologist, Georgia Geologic Survey, 19 Martin Luther King, Jr., Drive, S.W., Atlanta, GA 30334; or they may be inspected in the offices of the Georgia Geologic Survey.

A complete list of Georgia Geologic Survey reports may be obtained at the address above by asking for Circular No. 1.

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