

# WATER RESOURCES DATA, GEORGIA 2000

## INTRODUCTION

Water resources data for the 2000 water year for Georgia consists of records of stage, discharge, and water quality of streams; and the stage and contents of lakes and reservoirs published in one volume in a digital format on a CD-ROM. This volume contains discharge records of 123 gaging stations; stage for 21 gaging stations; information for 18 lakes and reservoirs; continuous water-quality records for 10 stations; the annual peak stage and annual peak discharge for 78 crest-stage partial-record stations; and miscellaneous streamflow measurements at 21 stations. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Georgia.

Records of discharge and stage of streams, and contents or stage of lakes and reservoirs were first published in a series of U.S. Geological 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 U.S. Geological Survey, Branch of Information Services, Federal Center, Box 25286, Denver, CO 80225.

For water years 1961 through 1970, streamflow data were released by the U.S. Geological Survey in annual reports on a State-boundary basis prior to the two 5-year series water-supply papers, which cover this period. The data contained in the water-supply papers are considered the official record. Water-quality records for water years 1964 through 1970 were similarly released either in separate reports or in conjunction with streamflow records.

Beginning with the 1971 water year, water data for streamflow, water quality, and ground water are published in official Survey reports on a State-boundary basis. These official Survey reports carry an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report GA-00-1." These water-data reports are for sale in various formats, by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the District Office at the address provided at the end of this text in the section titled "Access to USGS Water Data".

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### SPECIAL NETWORKS AND PROGRAMS

*Hydrologic Bench-Mark Network* is a network of 53 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

*National Stream Quality Accounting Network (NASQAN)* is a nationwide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in national or regional water-quality planning and management. The 142 sites in the NASQAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objective of NASQAN is to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis and reporting such that the data may be used (1) for the description of the areal variability of water quality in the Nation's rivers through the analysis of data from this and other programs, (2) for the detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (3) to provide a nationally consistent data base useful for water-quality assessment and hydrologic research.

NASQAN was redesigned in 1995 and will be known as NASQAN II beginning in 1996. NASQAN II will focus on four of the largest river basins in the Nation-- the Mississippi, the Columbia, the Colorado, and the Rio Grande. The objective of NASQAN II is to characterize the water quality of these large rivers by measuring concentration and mass transport of a wide range of dissolved and suspended constituents, including nutrients, major ions, dissolved and sediment-bound heavy metals, common pesticides, and inorganic and organic forms of carbon. This information will be used (1) to describe the long-term trends and changes in concentration and transport of these constituents; (2) to test findings of the National Water-Quality Assessment Program (NAWQA); (3) to characterize processes unique to large-river systems such as storage and re-mobilization of sediments and associated contaminants; and (4) to refine existing estimates of off-continent transport of water, sediment, and chemicals for assessing human effects on the world's oceans and for determining global cycles of carbon, nutrients, and other chemicals.

*National Trends Network (NTN)* is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of wet atmospheric deposition which includes snow, rain, sleet and hail. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

*The National Water-Quality Assessment (NAWQA)* Program of the U.S. Geological Survey is a long-term program with goals to describe the status and trends of water-quality conditions for a large, diverse, and geographically distributed part of the Nation's ground- and surface-water resources, and to identify, describe, and explain the major natural and human factors that affect these observed conditions and trends.

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Assessment activities have begun in about two-thirds of the study units and ultimately will be conducted in 60 study units (major watersheds and aquifer systems) that represent a wide range of environmental settings nationwide and that account for a large percentage of the Nation's water use. A wide array of chemical constituents will be measured in ground water, surface water, streambed sediments, and fish tissues. The coordinated application of comparative hydrologic studies at a wide range of spatial and temporal scales will provide information for decision-making by water-resources managers and a foundation for aggregation and comparison of findings to address water-quality issues of regional and national interest.

*Radiochemical program* is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

*Tritium network* is a network of stations that has been established to provide baseline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

### **Explanation of Records**

The surface-water records published in this report are for the 2000 water year that began on October 1, 1999, and ended September 30, 2000. The records contain streamflow data and information for lakes and reservoirs. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

### **Station Identification Numbers**

Each data station in this report, whether stream site, or other site, is assigned a unique identification number. This number is unique in that it applies specifically to a given station and to no other. The number usually is assigned when a station is first established and is retained for that station indefinitely. The system used by the U.S. Geological Survey to assign identification numbers for surface-water stations and for ground water well sites differ, but both are based on geographic location. The "downstream order" system is used for surface-water stations and the "latitude-longitude" system is used for wells and other off-stream sites.

### **Downstream Order System**

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a mainstream station are listed before that station. A station on a tributary that enters between two mainstream stations is listed between them. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. This downstream order and system of indentation show in stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

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The station-identification number is assigned according to downstream order. In assigning station numbers, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete number for each station, such as 02351890, which appears just to the left of the station name, includes the two-digit Part number "02" plus the downstream-order number "351890", which can be from six to 12 digits. Most of the station-identification numbers in this report are eight digits; however, up to 14 digit numbers are permissible.

### **Latitude-Longitude System**

The identification numbers for wells and other off-stream sites, such as rain gages, are assigned according to the grid system of latitude and longitude. The number consists of 15 digits. The first six digits denote the degrees, minutes, and seconds of latitude, the next seven digits denote degrees, minutes, and seconds of longitude, and the last two digits (assigned sequentially) identify the wells or other sites within a 1-second grid. This site-identification number, once assigned, is a pure number, and has no location significance. In the rare instance where the initial determination of latitude and longitude are found to be in error, the station will retain its initial identification number; however, its true latitude and longitude will be listed in the LOCATION paragraph of the station description.

### **Records of Stage and Water Discharge**

Records of stage and water discharge may be complete or partial. Complete records of stage or discharge are those obtained using a continuous or specified time-interval stage-recording device through which either instantaneous or mean daily discharges may be computed for any time, or any period of time, during the period of record. Occasionally, other parameters such as tainter gate openings and stream velocity will also be needed to compute discharges. Stations for which daily mean discharges or gage heights are published are referred to as "daily stations".

By contrast, partial records are obtained through discrete measurements without using a continuous stage-recording device and pertain only to a few flow characteristics, or perhaps only one. The nature of the partial record is indicated by table titles such as "Crest-stage partial records," or "Low-flow partial records." Records of miscellaneous peak discharge at selected sites or of measurements from specific studies, such as low-flow seepage studies, may be considered as partial records and these are presented under the appropriate heading. Locations of all complete-record and crest-stage partial-record stations for which data are given in this report are displayed by activating the appropriate theme on the user interface.

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### Data Collection and Computation

The data obtained at a complete-record gaging station on a stream or canal consist of a continuous record of stage, individual measurements of discharge throughout a range of stages, and notations regarding factors that may affect the relations between stage and discharge. These data, together with supplemental information, as weather records, are used to compute daily discharges.

Continuous records of stage are obtained with devices that record stage values at selected time intervals or with analog recorders that trace continuous graphs of stage. Measurements of discharge are made with current meters using methods adapted by the Geological Survey as a result of experience accumulated since 1880. These methods are described in standard textbooks, in Water-Supply Paper 2175, and in U.S. Geological Survey Techniques of Water-Resources Investigations (TWRI), Book 3, Chapters A1 through A19 and Book 8, Chapters A2 and B2. The methods referenced above are consistent with the American Society for Testing and Materials (ASTM) standards and generally follow the standards of the International Organization for Standards (ISO).

In computing discharge records, results of individual measurements are plotted against the corresponding stages, and stage-discharge relation curves are then constructed. From these curves, rating tables indicating the approximate discharge for any stage within the range of the measurements are prepared. If it is necessary to define extremes of discharge outside the range of the current-meter measurements, the curves are extended using: (1) logarithmic plotting; (2) velocity-area studies; (3) results of indirect measurements of peak discharge, such as slope-area or contracted-opening measurements, and computations of flow-over-dams or weirs; or (4) step-backwater techniques.

Daily mean discharges are computed by applying the daily mean stages (gage heights) to the stage-discharge curves or tables. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is determined by the shifting-control method, in which correction factors based on the individual discharge measurements and notes of the personnel making the measurements are applied to the gage heights before the discharges are determined from the curves or tables. This shifting-control method is also used if the stage-discharge relation is changed temporarily because of aquatic growth or debris on the control. For some stations, formation of ice in the winter may so obscure the stage-discharge relations that daily mean discharges must be estimated from other information such as temperature and precipitation records, notes of observations, and records for other stations in the same or nearby basins for comparable periods.

At some stream-gaging stations the backwater from reservoirs, tributary streams, or other sources affects the stage-discharge relations. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relations are affected by changing stage; at these stations the rate of change in stage is used as a factor in computing discharge.

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For some gaging stations there are periods when no gage-height record is obtained, or the recorded gage height is so faulty that it cannot be used to compute daily discharge. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged; the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are estimated from the recorded range in stage, previous and following record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins. Information explaining how estimated daily-discharge values are identified in station records is included in the next two sections, "Data Presentation" (REMARKS paragraph) and "Identifying Estimated Daily Discharge."

Computation of records of lake or reservoir contents requires a stage-contents relation, which can be obtained from surveys, curves, or tables defining this relationship. The application of stage to the stage-contents curves or tables gives the contents from which daily, monthly, or yearly changes then are determined. If the stage-contents relation changes because of deposition of sediment in a lake or reservoir, periodic resurveys may be necessary to redefine the relation.

### *Data Presentation*

Streamflow data in the report are presented in a new format that is considerably different from the format in data reports prior to the 1992 water year. The major changes are that statistical characteristics of discharge now appear in tabular summaries following the water-year data table and less information is provided in the text or station manuscript above the table. These changes represent the results of a pilot program to reformat the annual water-data report to meet current user needs and data preferences.

The records published for each continuous-record surface-water discharge station (gaging station) now consist of four parts, the manuscript or station description; the data table of daily mean values of discharge for the current water year with summary data; a tabular statistical summary of monthly mean flow data for a designated period, by water year; and a summary statistics table that includes statistical data of annual, daily, and instantaneous flows as well as data pertaining to annual runoff, 7-day low-flow minimums, and flow duration.

### *Station manuscript*

The manuscript provides, under various headings, descriptive information, such as station location; period of record; historical extremes outside the period of record; record accuracy; and other remarks pertinent to station operation and regulation. The following information, as appropriate, is provided with each continuous record of discharge or lake content. Comments to follow clarify information presented under the various headings of the station manuscript.

LOCATION.--Information on locations is obtained from the most accurate maps available. The location of the gage with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

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**DRAINAGE AREA.**--Drainage areas are measured using the most accurate maps available. Because the type of maps available at the time of determination of drainage area varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps and funds become available.

**PERIOD OF RECORD.**--This indicates the period for which there are published records for the station or for an equivalent station. An equivalent station is one that was in operation at a time that the present station was not, and whose location was such that records from it can reasonably be considered equivalent with records from the present station.

**REVISED RECORDS.**--Published records, because of new information, occasionally are found to be incorrect, and revisions are printed in later reports. Listed under this heading are all the reports in which revisions have been published for the station and the water years to which the revisions apply. If a revision does not include daily, monthly, or annual figures of discharge, that fact is noted after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the most recently revised figure was first published is given.

**GAGE.**--The type of gage in current use, the datum of the current gage referred to mean sea level (see glossary), and a condensed history of the types, locations, and datums of previous gages are given under this heading.

**REMARKS.**--All periods of estimated daily-discharge record will either be identified by date in this paragraph of the station description for water-discharge stations or flagged in the daily-discharge table. (See next section, "Identifying Estimated Daily Discharge.") If a remarks statement is used to identify estimated record, the paragraph will begin with this information presented as the first entry. The paragraph is also used to present information relative to the accuracy of the records, to special methods of computation, to conditions that affect natural flow at the station and, possibly, to other pertinent items.

**COOPERATION.**--Records provided by a cooperating organization or obtained for the U.S. Geological Survey by a cooperating organization are identified here.

**EXTREMES OUTSIDE THE PERIOD OF RECORD.**--Included here is information concerning major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the U.S. Geological Survey.

**PEAK DISCHARGES FOR CURRENT YEAR.**--For stations meeting certain criteria, all peak discharges and stages occurring during the water year and greater than a selected base discharge are presented under this heading. The peaks greater than the base discharge, excluding the highest one, are referred to as secondary peaks. Peak discharges are not published for canals, ditches, drains, or streams for which the peaks are subject to substantial control by man. The time of occurrence for peaks is expressed in 24-hour local standard time. For example, 12:30 a.m. is 0030, and 1:30 p.m. is 1330.

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REVISIONS.--If a critical error in published records is discovered, a revision is included in the first report published following discovery of the error.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because, for these stations there would be no current or, possibly, future station manuscript published to document the revision in a "Revised Records" entry, users of data for these stations who obtain the record from published data reports may wish to contact the District office to determine if the published records were revised after the station was discontinued. Data obtained from computer files for discontinued stations will be current since these files are updated with appropriate revisions at the time revisions are made.

Manuscript information for lake or reservoir stations differs slightly from that for stream and stage stations. A paragraph describing the dam, beginning storage date, if known, and pertinent contents and elevation information is included in the description. Normally there is no "REMARKS" section. "EXTREMES" sections are presented only for those reservoirs where daily or more frequent pool elevations are available.

Headings for AVERAGE DISCHARGE, EXTREMES FOR PERIOD OF RECORD, AND EXTREMES FOR CURRENT YEAR have been deleted and the information contained in these paragraphs, except for the listing of secondary instantaneous peak discharges, which are now presented in the PEAK DISCHARGES FOR CURRENT YEAR paragraph, is now presented in the tabular summaries following the discharge table or in the REMARKS paragraph, as appropriate. No changes have been made to the data presentations of lake contents.

### *Data table of daily mean values*

The daily table of discharge records for stream-gaging stations gives mean discharge for each day of the water year. In the monthly summary for the table, the line headed "TOTAL" gives the sum of the daily figures for each month; the line headed "MEAN" gives the average flow in cubic feet per second for the month; and the lines headed "MAX" and "MIN" give the maximum and minimum daily mean discharges, respectively, for each month. Discharge for the month also is usually expressed in cubic feet per second per square mile (line headed "CFSM"); or in inches (line headed "IN."); or in acre-feet (line headed "AC-FT"). Figures for cubic feet per second per square mile and runoff in inches or in acre-feet may be omitted if there is extensive regulation or diversion or if the drainage area includes large noncontributing areas. At some stations monthly and (or) yearly-observed discharges are adjusted for reservoir storage or diversion, or diversion data or reservoir contents are given. These figures are identified by a symbol and corresponding footnote.

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### *Statistics of monthly mean data*

A tabular summary of the mean (line headed "MEAN"), maximum (line headed "MAX"), and minimum (line headed "MIN") of monthly mean flows for each month for a designated period is provided below the mean values table. The water years of the maximum and minimum monthly flows are provided immediately below those figures. The designated period will be expressed as "FOR WATER YEARS \_\_\_\_\_-\_\_\_\_\_, BY WATER YEAR (WY)," and will list the first and last water years of the range of years selected from the PERIOD OF RECORD paragraph in the station manuscript. It will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript.

### *Summary statistics*

A table titled "SUMMARY STATISTICS" follows the statistics of monthly mean data tabulation. This table consists of four columns, with the first column containing the line headings of the statistics being reported. The table provides a statistical summary of yearly, daily and instantaneous flows, not only for the current water year but also for the previous calendar year and for a designated period, as appropriate. The designated period selected, "WATER YEARS \_\_\_\_\_-\_\_\_\_\_" will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript. All of the calculations for the statistical characteristics designated ANNUAL (See line headings below.), except for the "ANNUAL 7-DAY MINIMUM" statistic, are calculated for the designated period using complete water years. The other statistical characteristics may be calculated using partial water years.

The date or water year, as appropriate, of each statistic reporting extreme values of discharge is provided adjacent to the statistic. Repeated occurrences may be noted in the REMARKS paragraph of the manuscript or in footnotes. Because the designated period may not be the same as the station period of record published in the manuscript, occasionally the dates of occurrence listed for the daily and instantaneous extremes in the designated-period column may not be within the selected water years listed in the heading. When this occurs, it will be noted in the REMARKS paragraph or in footnotes. Selected streamflow duration curve statistics and runoff data are also given. Runoff data may be omitted if there is extensive regulation or diversion of flow in the drainage basin.

The following summary statistics data, as appropriate, are provided with each continuous record of discharge. Comments to follow clarify information presented under the various line headings of the summary statistics table:

ANNUAL TOTAL.--The sum of the daily mean values of discharge for the year. At some stations, the annual total discharge is adjusted for reservoir storage or diversion. The adjusted figures are identified by a symbol and corresponding footnotes.

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**ANNUAL MEAN.**--The arithmetic mean of the individual daily mean discharges for the year noted or for the designated period. At some stations, the yearly mean discharge is adjusted for reservoir storage or diversion. The adjusted figures are identified by a symbol and corresponding footnotes.

**HIGHEST ANNUAL MEAN.**--The maximum annual mean discharge occurring for the designated period.

**LOWEST ANNUAL MEAN.**--The minimum annual mean discharge occurring for the designated period.

**HIGHEST DAILY MEAN.**--The maximum daily mean discharge for the year or for the designated period.

**LOWEST DAILY MEAN.**--The minimum daily mean discharge for the year or for the designated period.

**ANNUAL 7-DAY MINIMUM.**--The lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The date shown in the summary statistics table is the initial date of the 7-day period. This value should not be confused with the 7-day 10-year low-flow statistic.)

**INSTANTANEOUS PEAK FLOW.**--The maximum instantaneous discharge occurring for the water year or for the designated period. Note that the secondary instantaneous peak discharges above a selected base discharge are stored in District computer files for stations meeting certain criteria. Those discharge values may be obtained by writing to the District Office. (See address on back of title page of this report.)

**INSTANTANEOUS PEAK STAGE.**--The maximum instantaneous stage occurring for the water year or for the designated period. If the dates of occurrence for the instantaneous peak flow and instantaneous peak stage differ, the REMARKS paragraph in the manuscript or a footnote may be used to provide further information.

**INSTANTANEOUS LOW FLOW.**--The minimum instantaneous discharge occurring for the water year or for the designated period.

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ANNUAL RUNOFF.--Indicates the total quantity of water in runoff for a drainage area for the year. Data reports may use any of the following units of measurement in presenting annual runoff data:

*Acre-foot (AC-FT)* is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

*Cubic feet per second per square mile (CFSM)* is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming the runoff is distributed uniformly in time and area.

*Inches (INCHES)* indicate the depth to which the drainage area would be covered if all of the runoff for a given time period were uniformly distributed on it.

10 PERCENT EXCEEDS.--The discharge that has been exceeded 10 percent of the time for the designated period.

50 PERCENT EXCEEDS.--The discharge that has been exceeded 50 percent of the time for the designated period.

90 PERCENT EXCEEDS.--The discharge that has been exceeded 90 percent of the time for the designated period.

There are several exceptions to the above-described format. First, if a station was operated under both non-regulated and significantly regulated flow regimes, two sets of monthly mean and summary statistics are furnished. One set of monthly mean and summary statistics represents the period prior to regulation, and the second set represents the period since flow has been regulated. The summary statistics prior to regulation do not include current calendar or water year statistics since they are included in the SINCE REGULATION summary statistics. Also, in the station manuscript there is an AVERAGE DISCHARGE line heading, which is the arithmetic mean of the complete water-year mean discharges for the entire period of record, and includes both the regulated and non-regulated periods of record. Some AVERAGE DISCHARGE computations may include mean discharges adjusted for reservoir storage or diversion. Another exception occurs when discharge records are fragmentary for various reasons. Then, the monthly mean and summary statistics have been eliminated or modified, based on available information, and EXTREMES FOR PERIOD OF RECORD and EXTREMES FOR CURRENT YEAR line headings have been included in the station manuscript. Extremes may include maximum and minimum stages and maximum and minimum discharges. The highest stage may have been obtained from a graphic, digital, or electronic recorder, a crest-stage gage, or by direct observation. Similarly, the minimum is the instantaneous minimum discharge, unless otherwise qualified, and was determined and reported in the same manner as the maximum.

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The daily table of gage-height stations gives mean gage-height for each day. In the monthly summary, the line headed "MEAN" gives the average gage height during the month. The lines headed "MAX" and "MIN" provides the maximum and minimum daily gage heights, respectively, for the month.

Data for reservoirs are presented following the continuous-station data for the basin in which they are located. Month-end elevations, contents, and monthly and yearly change in contents are presented in tabular form following the reservoir station description.

Data collected at partial-record stations follow the information for continuous-record sites. If collected, data for partial-record discharge stations are presented in two tables. The first is a table of annual maximum stage and discharge at crest-stage stations, and the second is a table of discharge measurements at low-flow partial-record stations. The data contained in the partial-record station tables are often supplemented by information gathered at miscellaneous sites that are neither continuous record nor partial-record stations. This information is presented in tables similar to those for the partial-record stations and the table headings explain the data that are shown.

### Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified either by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated," or by listing the dates of the estimated record in the REMARKS paragraph of the station description.

### Accuracy of the Records

The accuracy of streamflow records depends primarily on: (1) The stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements; and (2) the accuracy of measurements of stage, measurement of discharge, and interpretation of records.

The accuracy attributed to the records is indicated under "REMARKS". "Excellent" means that about 95 percent of the daily discharges are within 5 percent of the true; "good," within 10 percent; and "fair," within 15 percent. Records that do not meet the criteria mentioned are rated "poor." Different accuracies may be attributed to different parts of a given record.

Daily mean discharges in this report are given to the nearest hundredth of a cubic foot per second for values less than 1 ft<sup>3</sup>/s; to the nearest tenth between 1.0 and 10 ft<sup>3</sup>/s; to the nearest whole numbers between 10 and 1,000 ft<sup>3</sup>/s; and to 3 significant figures for values more than 1,000 ft<sup>3</sup>/s. The number of significant figures used is based solely on the magnitude of the discharge value. The same rounding rules apply to discharges listed for partial-record stations and miscellaneous sites.

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Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, and increase or decrease in evaporation due to artificial causes or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff, in inches, are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

### *Other Records Available*

Information used in the preparation of the records in this publication, such as discharge-measurement notes, gage-height records, temperature measurements, and rating tables are on file in the Georgia District office. Also, most of the daily mean discharges are in computer-readable form, and have been analyzed statistically. Information on the availability of the unpublished information or on the results of statistical analyses of the published records may be obtained from the District office.

The National Water Data Exchange (NAWDEX), U.S. Geological Survey, Reston, VA 22092, indexes the water data available from more than 400 organizations, and serves as a focal point to help those in need of water data to determine what information is available. Information and assistance on how to use this system can be obtained from the Georgia District office.

### **Records of Surface-Water Quality**

Records of surface-water quality are usually obtained at or near stream-gaging stations because interpretation of records of surface-water quality nearly always requires corresponding discharge data. Records of surface-water quality in this report may involve a variety of types of data and measurement frequencies.

### *Classification of Records*

Water-quality data for surface-water sites are grouped into one of three classifications. A continuing-record station is a site where data are collected on a regularly scheduled basis. Frequency may be once or more times daily, weekly, monthly, quarterly or semi-annually. A partial-record station is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A miscellaneous station is a site other than a continuing or partial-record station, where random samples are collected to give better areal coverage to define water-quality conditions in the river basin.

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A careful distinction needs to be made between "continuing records", as used in this report, and "continuous recordings," which refers to a continuous graph or a series of discrete values punched at short intervals on a paper tape. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface-water appear in this report are displayed by activating the appropriate theme coverage.

### *On-Site Measurements and Sample Collection*

A primary concern of the water-quality data acquisition efforts of the U.S. Geological Survey is how well the data collected represent on-site water-quality conditions. Measurements of unstable variables such as water temperature, pH, and dissolved oxygen are made on site when samples are taken to assure that the reported readings accurately represent the water-quality at the time of sampling. Standard U.S. Geological Survey procedures for the collection, treatment, and, if necessary, shipment of samples prior to laboratory analysis are also followed to assure that the constituents for which these samples are analyzed have changed minimally from their on-site values. These representative sampling procedures are documented in publications on "Techniques of Water-Resources Investigations," Book 1, Chapter D2; Book 3, Chapter C2; and Book 5, Chapters A1, A3, and A4. These TWRI's are listed in the "Publications on Techniques of Water-Resources Investigations" section of this report. The procedures are consistent with ASTM standards and generally follow ISO standards. Supplemental information to that found in the listed references may be obtained from the U.S. Geological Survey, Georgia District Office.

One sample can adequately define the water quality at a given time if the mixture of solutes throughout the stream cross-section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentration and for use in calculating load. All samples obtained for the National Stream-Quality Accounting Network (NASQAN) program are obtained from at least several verticals. Whether samples collected at other sites are obtained from the centroid of flow or from several verticals, depends on flow conditions and other factors that must be evaluated by the collector.

### *Water Temperature*

Water temperatures are measured at the water-quality stations, and are also obtained at the time of discharge measurements for water-discharge stations. At stations where recording instruments are used, maximum and minimum temperatures for each day are published. Daily-mean temperatures for these stations and water temperatures measured at the time of water-discharge measurements are on file in the District Office.

Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharge.

## WATER RESOURCES DATA, GEORGIA 2000

### *Sediment*

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples are usually obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross section. Although data collected periodically may represent conditions only at the time of sampling, data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of a stream. The methods used in the computation of sediment records are described in the TWRI Book 5, Chapter C1 and are consistent with ASTM standards and generally follow ISO standards.

In addition to the records of suspended-sediment discharge, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included for some stations.

### *Laboratory Measurements*

Samples for indicator bacteria are analyzed locally. Samples for the National Stream-Quality Accounting Network, the Hydrologic Benchmark Network (see definitions), and several long-term trend stations are analyzed in the U.S. Geological Survey laboratory in Arvada, Co. The Alabama District Sediment Laboratory or the Pennsylvania District Sediment Laboratory analyzes all sediment samples. Georgia Environmental Protection Division (EPD) network samples are analyzed by the Laboratory Services Section, Georgia Department of Natural Resources, Environmental Protection Division, and this is so stated in the "Remarks" section of the station description. Methods used to analyze sediment samples and to compute sediment records are described in the TWRI Book 5, Chapter C1. Methods used by the U.S. Geological Survey laboratories are given in the TWRI Book 1, Chapter D2; Book 3, Chapter C2; and Book 5, Chapters A1, A3, A4, and A5. These methods are consistent with ASTM standards and generally follow ISO standards.

### *Data Presentation*

Water-quality records collected at a surface-water daily-record station are published immediately following that record, regardless of the sampling frequency. Station number and name are the same for both records. If no daily surface-water record is available, continuing water-quality record is published with its own station number and name in the regular downstream-order sequence, while data for partial-record stations and miscellaneous sites appear in separate tables following tables of discharge at partial-record stations and miscellaneous sites. Here each partial-record station and miscellaneous site is published with its own station number and name in the regular downstream-order sequence and without descriptive statements.

## WATER RESOURCES DATA, GEORGIA 2000

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for constituents measured daily. Tables of chemical, physical, biological, and radiochemical data obtained at a frequency less than daily are presented first. In tables where both field and laboratory measurements of the same parameter are published (pH, specific conductance, and total alkalinity in this report), the laboratory determinations represent the quality of the sample at the time of analysis. Laboratory values for parameters measured in the field generally will be comparable to the field values for these parameters. Differences between the field and laboratory values represent a summation of (1) actual changes in the sample between the time of collection and the time of analysis, (2) errors in precision associated with instrument operation, and (3) errors in accuracy inherent in the instruments themselves. Tables of "daily values" of specific conductance, pH, water temperature, dissolved oxygen, and suspended sediment then follow in sequence.

If the location is identical to that of the discharge-gaging station, the LOCATION and the DRAINAGE AREA statements are not repeated in the descriptive headings. The following information, as appropriate, is provided with each continuing record station. Comments that follow clarify information presented under the various headings of the station description:

LOCATION.--See Data Presentation under "Records of Stage and Water Discharge;" same comments apply.

DRAINAGE AREA.--See Data Presentation under "Records of Stage and Water Discharge;" same comments apply.

PERIOD OF RECORD.--This indicates the periods for which there are published water-quality records for the station. The periods are shown separately for records of constituents measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the constituents individually.

EXTREMES.--Maximums and minimums are given only for constituents measured daily or more frequently. None are given for constituents measured weekly or less frequently, because the true maximums or minimums may not have been sampled. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.--If errors in water-quality records are discovered after publication, appropriate updates are made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. Environmental Protection Agency's STORET system. Because the usual volume of updates makes it impractical to document individual changes in the State data-report series or elsewhere, potential users of U.S. Geological Survey water-quality data are encouraged to obtain all required data from the appropriate computer file to insure the most recent updates.

## WATER RESOURCES DATA, GEORGIA 2000

### *Remark Codes*

The remark codes that may appear with the water-quality data in this report are as follows:

#### PRINTED OUTPUT REMARK

- E Estimated value.
- > Actual value is known to be greater than the value shown.
- < Actual value is known to be less than the value shown.
- & Biological organism estimated as dominant.
- D Biological organism count equal to or greater than 15 percent (dominant).
- K Results based on colony count outside the acceptance range (non-ideal colony count).
- L Biological organism count less than 0.5 percent (Organism may be observed rather than counted).
- V Analyte was detected in both the environmental sample and the associated blanks.

### **Records of Ground-Water Levels**

Water-level data from National and State networks of observation wells are given in this report. These data are intended to provide a sampling and historical record of water-level changes in the State's most important aquifers.

Although, in this report, records of water levels are presented for fewer than 10 wells, records are obtained through cooperative efforts of many Federal, State, and local agencies for about 1,400 wells throughout Georgia and are placed in computer storage. Each spring, the Georgia District and the Georgia Department of Natural Resources, Environmental Protection Division, Geologic Survey Branch, publish a report for the previous calendar year entitled "Ground-Water Conditions for Georgia, 200\_". This report contains hydrographs of recorder wells, detailed maps showing water levels from the previous year, and other useful items. Information about the availability of the data in the water-level file may be obtained from the District Chief, U.S. Geological Survey, Georgia District.

### *Data Collection and Computation*

Measurements of water levels are made in many types of wells under varying conditions, but the methods of measurement are standardized to the extent possible. The equipment and measuring techniques used ensure that measurements at each well are consistently accurate and reliable.

## WATER RESOURCES DATA, GEORGIA 2000

Tables of water-level data are presented alphabetically by county. The primary identification number for a given well is the 15-digit number that appears in the first line of the manuscript. The secondary identification number is the Local well number, derived according to a well-numbering system developed by the Georgia District Office, WRD, and based on the USGS index of 7 1/2-minute topographic maps for Georgia. A matrix has been created to assign an alphanumeric designation to each topographic map in the State, with the column of maps covering the western-most portion of the State assigned the number "01" and the row of maps covering the southern-most portion of the State assigned the letter "A". Column numbers increase sequentially from west to east, and row letters advance alphabetically from south to north. Rows north of "Z" are designated by double letters; AA, BB, and so forth. The letters "I", "O", "II", and "OO" are not used. Each well in each 7 1/2-minute quadrangle has been assigned a six-character designation consisting first of the column number, then of the row letter, or letters, of the quadrangle in which the well is located. The remaining digits of the local well number are assigned chronologically. The first well inventoried within the boundaries of a quadrangle is number 1. The number 1 is preceded by two zeros if the well is located on a quadrangle with a single-letter designation, and it is preceded by one zero if the well is located on a quadrangle with a double-letter designation. For example, the first well inventoried in the 08G quadrangle is designated the local well number 08G001, or the fourth well inventoried in the 11AA quadrangle is designated the local well number 11AA04.

Water-level records are obtained with devices that record water levels at selected time intervals. The water-level measurements in this report are given in feet with reference to land-surface datum (LSD). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the elevation of the land-surface datum is given in the well description.

### *Data Presentation*

Each well record consists of three parts, the station description, graphs of the water levels for the period of record and current water year, and a summary of water levels for the current water year consisting of the "MEAN", the average water level in feet for each month; the "LOW" and "HIGH", the lowest and highest daily mean water levels, respectively, for each month; and the annual water year mean water level based on available data and the highest and lowest water levels of the water year and their dates of occurrence are shown on the line below the monthly summary. If missing record occurs during the water year, it is implied that the highest and lowest water levels are the highest and lowest recorded water levels of the water year.

LOCATION.--This paragraph follows the well-identification number and reports the latitude and longitude (given in degrees, minutes, and seconds); the hydrologic-unit number; the distance and direction from a geographic point of reference; and the owner's name.

SITE NAME.--Furnishes the well owner's name and well designation, if any.

INSTRUMENTATION.--Identifies the type of instrumentation currently in use.

AQUIFER.--Designates by name (if a name exists) the aquifer(s) open to the well.

**WELL CHARACTERISTICS.**--This entry describes the well in terms of depth, diameter, casing depth and(or) screened interval method of construction, use, and additional information such as casing breaks, collapsed screen, and other changes since construction.

**DATUM.**--This entry describes both the measuring point and the land-surface elevation at the well. The measuring point is described physically (such as top of collar, notch in top of casing, plug in pump base and so on), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above (or below) mean sea level; it is reported with a precision depending on the method of determination.

**REMARKS.**--This entry describes factors that may influence the water level in a well or the measurement of the water level. It should identify wells that also are water-quality observation wells, and may be used to acknowledge the assistance of local (non-Survey) observers. Periods of missing record are described in this section.

**PERIOD OF RECORD.**--This entry indicates the period for which there are published records for the well. It reports the month and year of the start of publication of water-level records by the U.S. Geological Survey and the words "to current year" if the records are to be continued into the following year. Periods for which water-level records are available, but are not published by the Geological Survey, may be noted.

**EXTREMES FOR PERIOD OF RECORD.**--This entry contains the highest and lowest daily mean water levels of the period of published record, with respect to land-surface datum, and the dates of their occurrence.

Hydrographs for selected periods of record follow the station description. The first hydrograph is a period-of-record hydrograph of monthly mean water levels in feet above or below land-surface datum. The second is a hydrograph of daily mean water levels in feet above or below land-surface datum for the current water year. Blank areas on the hydrograph indicate missing records. Summary statistics of monthly and annual water levels for the current water year follow each hydrograph for the current water year.

### **Records of Precipitation Quality**

Precipitation-quality data represent analyses of time-composite samples, most often for a collection period of one week. This is in contrast to most of the published surface-water-quality data which represent samples taken at specific times. The U.S. Geological Survey collects precipitation-quality data in Georgia collaborating with the National Atmospheric Deposition Program/National Trends Network (NADP/NTN), a cooperative research program of Federal, State and private organizations.

## WATER RESOURCES DATA, GEORGIA 2000

### On-Site Measurements and Sample Collection

Precipitation samples are collected with wet/dry collectors or bulk samplers. The wet/dry collector is the preferred precipitation sampler and consists of a bucket that is open only during periods of wet (rainfall, snow, etc.) precipitation. During dry periods the sample bucket is covered, thus excluding dry-fall precipitation from the sample. Bulk samplers are less desirable because they collect both wet- and dry-fall precipitation. However, they are useful as backups during times when the wet/dry samplers fail to properly function. Bulk samplers consist of a catchment area, such as a funnel, where the sample is collected and then fed through a delivery tube to the sample receptacle. The tubing is looped in order to minimize sample evaporation. If necessary, wet/dry samplers can also be used as makeshift bulk samplers by leaving them in the open position for the collection period.

Accurate measurements of precipitation quantity also are made at each station. One of two types of recording gages is normally used. National Trends Network (NTN) stations are equipped with weighing-bucket rain gages, which graphically record rainfall as well as count rainfall events. The other commonly used recording gage consists of a rainfall catchment pipe and a float-driven digital recorder that periodically records the water level in the pipe.

Time-composite wet- and bulk-precipitation samples are collected and brought back to the laboratory and weighed. Rainfall quantity is estimated from the sample weight. A temperature-density correction can be applied if desired but normally this correction results in a very small change in the estimated quantity of rainfall. An estimation of the sampler efficiency is made by computing the ratio of rainfall amount collected in the sample bucket to that measured by the recording rain gage. This collector efficiency ratio is an important indicator of possible collector malfunction. For example, a ratio substantially less than one indicates that the wet/dry collector was not opening properly and thus, excluding rainfall.

After weighing the sample, a small portion is removed for measurement of pH, specific conductance, and, in some instances, titratable acidity. The pH and specific conductance are both determined electrometrically according to methods described in the National Atmospheric Deposition Program "NADP Instruction Manual: Site Operation". The remainder of the sample is then used for laboratory chemical analyses. This portion of the sample is shipped to the laboratory raw and untreated. In the case of NTN operation, the original bucket is resealed and mailed to the Illinois State Water Survey Central Analytical Laboratory (CAL) for analysis. In all other instances, sample portions are preserved, treated, and analyzed according to specific project requirements.

## WATER RESOURCES DATA, GEORGIA 2000

### Data presentation

Records of precipitation quality are published following the "Records of ground-water" section of this report. As with records of daily water discharge and surface-water quality, precipitation-quality records consist of two parts, a station header and a data table. The station header contains the descriptive information pertinent to the establishment, location, and operation of the site. Records are presented alphabetically by county and, within each county, by latitude, longitude, and sequence number. As with ground-water wells, the primary site identifier used for precipitation-quality stations in this report is the 15-digit composite of these three numbers. The following text presents a clarification of the subheadings that follow the station identification number and station name.

**LOCATION.**--See Data Presentation under "Records of Stage and Water Discharge"; same comments apply.

**PERIOD OF RECORD.**--This indicates the periods for which there are published precipitation-quality records for the station. Periods of record are presented separately for each type of sample collected at the site (in this report, either wet precipitation, bulk precipitation, or both).

**INSTRUMENTATION.**--In this section, an abbreviated-style listing of the data recording and sample-collection equipment permanently housed at the site is presented.

**REMARKS.**--This section is reserved for comments pertaining to unusual or extraordinary circumstances or to qualifying information that must be used to accurately interpret the data presented for the site. More general comments, which may pertain to several or all of the sites, are presented in the "EXPLANATION OF RECORDS" section in the introductory part of the report.

Records of precipitation quality for site GA99 can be accessed through the World Wide Web (WWW) at:

<http://nadp.sws.uiuc.edu/nadpdata>

## **WATER RESOURCES DATA, GEORGIA 2000**

### **ACCESS TO USGS WATER DATA**

The U.S. Geological Survey (USGS) 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. The USGS provides near real-time stage and discharge data for many of the gaging stations equipped with the necessary telemetry and historic daily-mean and peak-flow discharge data for most current or discontinued gaging stations through the World Wide Web (WWW). Some water-quality and ground water data also are available through the WWW. These data may be accessed nation-wide at:

<http://water.usgs.gov>

In addition, considerable information concerning the water resources in Georgia can be accessed through the WWW at:

<http://ga.water.usgs.gov>

Data can also be provided in various machine-readable formats by email or 3-1/2 inch floppy disk. Information about the availability of specific types of data or products, and user charges, can be obtained locally from the Georgia District Office at the following address:

District Chief, Water Resources Division  
U.S. Geological Survey  
Peachtree Business Center  
3039 Amwiler Road, Suite 130  
Atlanta, GA 30360-2824  
(770) 903-9100