

# Georgia

The U.S. Geological Survey (USGS), the Nation's largest natural sciences and civilian mapping agency, provides reliable and impartial scientific information to resource managers, planners, and others throughout the Nation. This information contributes to sound conservation and management of natural resources; enhances the quality of life by monitoring water, biological, energy, and mineral resources; and minimizes losses from numerous natural hazards.

USGS activities in Georgia are conducted in cooperation with numerous local, State, and Federal agencies. Cooperating agencies include the City of Brunswick; Albany Water, Gas, and Light Commission; City of Lawrenceville; Georgia Department of Natural Resources; U.S. Army Corps of Engineers; U.S. Environmental Protection Agency; and National Park Service.

## Earth Resources

Georgia has a rich endowment of natural resources. The average annual precipitation of 50 inches results in a generally abundant supply of fresh-water that includes numerous productive aquifers (fig. 1) and an extensive system of rivers (fig. 2). The USGS has been collecting water-resources data in Georgia since the 1890's. The USGS currently collects data at approximately 120 continuous-record and 77 partial-record streamflow-gaging stations, 18 reservoir stage and contents gaging stations, and 180 continuous-record monitoring wells. These data are used by water-resources managers to make decisions concerning water supplies, flood control, hydroelectric power, irriga-

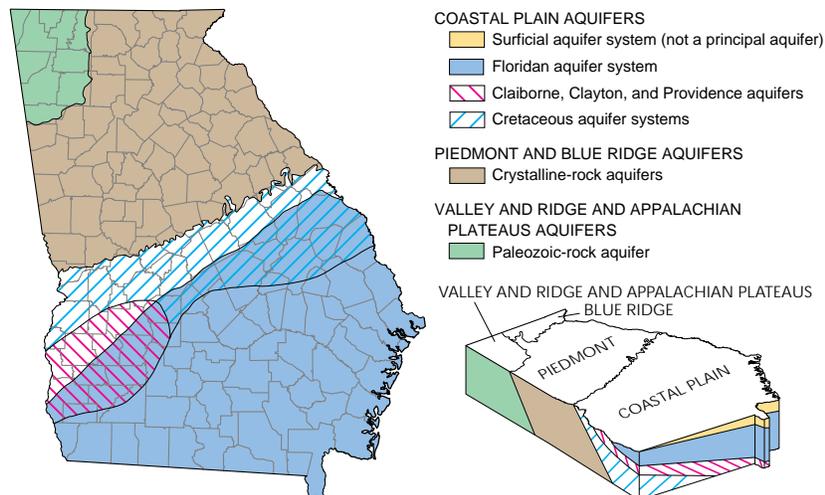


Figure 1. Principal aquifers, areas of use; and physiographic provinces.

tion, bridge design, wildlife management, and pollution abatement.

## Water Use and Competition

Water-resources management requires information about water use. During 1995, Georgia water consumption, excluding use for thermoelectric power generation, was about 2,740 million gallons per day (Mgal/d) (fig. 3), an increase of about 450 Mgal/d (16 percent) from 1990. Total water use in Georgia during 1995 was about 5,800 Mgal/d. Ground water accounted for about 20 percent of total withdrawals, 99 percent of which was used for irrigation, industry and mining, public supply, and domestic and commercial purposes. Surface water accounted for about 80 percent of total withdrawals, almost 70 percent of which was used for thermoelectric power generation, and most of the remainder was used for public supply, industry and mining, and irrigation.

Historically, an adequate water supply has met the needs of users in

Georgia. However, population growth, economic development, and recent droughts have increased demand, decreased supplies, and created competition among water users. Georgia is a "headwaters" State, and the effects of increased water development and drought on rivers that originate in Georgia spread downstream (southwestward) into Alabama in the Alabama-Coosa-

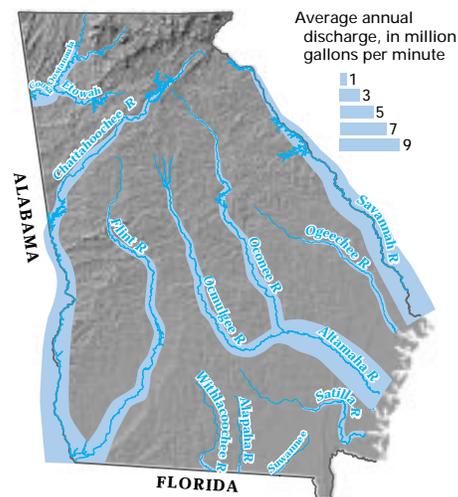


Figure 2. Average annual discharge of major streams in Georgia.

Tallapoosa (ACT) River Basin and southward into Florida in the Apalachicola-Chattahoochee-Flint (ACF) River Basin. As part of a multi-State and multi-Federal agency Comprehensive Study of the ACT and ACF basins, the USGS investigated water availability and the hydrologic effects of increased water-resource development to support development of a water-allocation formula that is planned to distribute water resources equitably to meet the needs of society and the environment.

### Piedmont Hydrogeology

USGS scientists are using surface geologic mapping and borehole geophysical methods to evaluate ground-water availability by characterizing complex, fractured crystalline-rock aquifers near Lawrenceville. Because of rapid population growth and water-supply needs, many communities in the Metropolitan Atlanta area are exploring ground water as a supplement to surface-water supplies. Because of the complexity of metamorphic and igneous rocks and their secondary fractures, well yields can differ tremendously over short distances. Conceptual models of these aquifers often are inaccurate. USGS personnel are mapping these rocks and fractures in three dimensions and refining the conceptual models of these complex

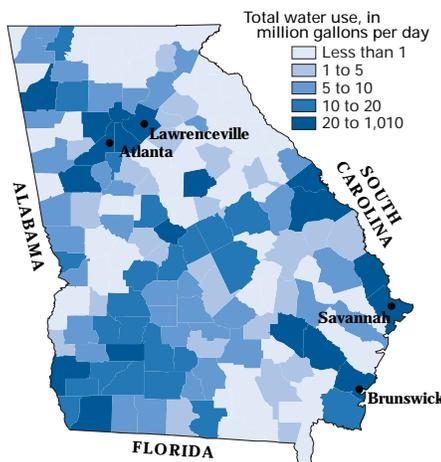


Figure 3. Water use in Georgia, by county, 1995.

aquifers. Results from this investigation will assist water-management agencies in developing and protecting Piedmont ground-water resources in Georgia.

### Coastal Ground Water and Saltwater Intrusion

Ground-water pumping in coastal southeastern Georgia and adjacent parts of South Carolina and Florida has degraded the quality of water locally in the Upper Floridan aquifer. The pumping has resulted in substantial ground-water-level decline and upward migration of saltwater in the Brunswick area and in encroachment of seawater into the aquifer at the northern end of Hilton Head Island, South Carolina, about 30 miles northeast of Savannah. The USGS, in cooperation with the Georgia Department of Natural Resources (DNR), is conducting a hydrologic investigation of the coastal area to determine the paths and rates of saltwater movement into the aquifer; determine other areas where saltwater contamination could occur; assess alternative sources of freshwater supplies; and develop a monitoring-well network to assess ground-water levels and quality. In cooperation with the City of Brunswick and Glynn County, the USGS also is investigating possible mechanisms and movement of saltwater contamination in the Brunswick area and the susceptibility of other areas to upward migration of saltwater, and monitoring and evaluating changes in ground-water levels and quality.

### Mineral Resource Investigations

Geologic, geophysical, geochemical, minerals information, and related geoscience data are being compiled by USGS scientists to help evaluate the mineral resources of the Southeastern United States. Potential environmental effects of mineral-resource development also are being evaluated. USGS partnerships with

State Geological Surveys, universities, and other cooperators have resulted in completion of a new geochemical database for Georgia, compilation of digital geologic and lithologic maps, and evaluation of and significant revisions to mineral deposits records.

The USGS collects, analyzes, and disseminates information about the supply and demand for minerals. In 1997, Georgia produced \$1.68 billion in nonfuel raw minerals (mainly kaolin and crushed stone). Georgia is the leading clay-producing State, accounting for about one-fourth of the national total. In 1997, Georgia led the Nation in the production of kaolin and fuller's earth, was second in barite and crude mica, third in iron-oxide pigments, fourth in common clays, fifth in dimension stone and feldspar, and seventh in crushed stone. USGS mineral production information is available on the World Wide Web (WWW) at <http://minerals.er.usgs.gov/minerals>, on Mines Faxback at (703) 648-4999, and is published three times annually on CD-ROM.

### Environment

Georgia's environment is constantly changing as natural processes and human actions affect it. The USGS plays an important role in integrating the physical and biological sciences to provide critical scientific information to help society make informed environmental decisions.

### Pesticides from Suburban, Urban, and Agricultural Sources

In Georgia, a wide range of pesticides is applied to suburban and urban areas, forests, crops, and pastures. Leaching or runoff of even small amounts of pesticides in these areas could harm aquatic life or contaminate drinking-water supplies. The potential for pesticide contamination goes beyond agricultural areas that

typically are emphasized in most environmental monitoring programs and evaluation of best management practices for pest control. In Georgia, pesticides are most prevalent in streams draining suburban and urban areas. Although pesticide concentrations generally are below existing U.S. Environmental Protection Agency (EPA) standards for drinking water, concentrations of selected pesticides used to control insects often exceed guidelines for protection of aquatic life in streams draining suburban and urban areas. The continued urbanization of forest and pasture land, surrounding Metropolitan Atlanta in particular, is likely to be accompanied by increasing numbers and concentrations of pesticides in streamwater, the area's primary source of drinking water.

Intensive analysis of streamflow and pesticide-concentration data from selected sites has shown that stormwater runoff carries much of the total quantity of pesticides transported by streams. The quantities of pesticides transported by streams, however, often represent less than 1 percent of annual pesticide use within the associated watersheds.

### ***Drinking Water Initiative***

USGS research, in collaboration with the Centers for Disease Control and Prevention and the EPA, is focusing on the protozoan *Cryptosporidium*, a parasite of major concern to water utility companies and regulatory agencies. *Cryptosporidium* is known to cause illness and death. A major goal of the USGS study is to develop and field test sample-collection and processing techniques that will improve the recovery and precision of analyses for *Cryptosporidium*. Work to date has concentrated on developing appropriate methods for public-supply water. Future work will concentrate on methods appropriate for raw water, using the Chattahoochee River in the Metropolitan Atlanta area as a field testing site.

### ***Dredge Spoil Runoff and Habitat Quality, Lower Savannah River***

USGS scientists are investigating the effects of upland disposal of materials dredged from Savannah Harbor on the wildlife in disposal areas and in the Savannah River downstream from disposal areas. Contaminants from municipal and industrial activities along the lower Savannah River concentrate in harbor sediment, which is periodically dredged during channel maintenance. The USGS is testing the toxicity of sediments and water from areas downstream from dredge spoils, and is analyzing tissue residues in birds and raccoons collected from the disposal areas. Testing revealed an accumulation of trace elements such as mercury and selenium in freshwater worms exposed to sediments and in the livers of wildlife from the spoil areas. Results from this USGS study indicate that dredge spoil runoff may be adversely affecting wildlife habitat along the lower Savannah River.

### ***Striped Bass Evaluation, Savannah River Estuary***

The installation of a tide gate in 1975 to enhance navigability in the Savannah River Estuary created salinity levels on striped bass spawning grounds that were toxic to eggs and larvae. Reproductive failure followed, and the bass population declined throughout the 1980's, leading to closure of the recreational fishery. In 1991, the tide gate was removed, and other modifications were made to prevent the transport of bass eggs and larvae from suitable spawning grounds to high-salinity areas downstream. Also in 1991, the Georgia DNR began an intensive restocking program of striped bass fingerlings, expecting that restocked females would mature and begin spawning by 1995. USGS scientists monitor the number and distribution of striped bass eggs and salinity throughout the estuary. Salinity currently seems suitable on spawning grounds;

however, egg numbers have not changed significantly and are still critically low. USGS biologists are investigating whether the maturational status of restocked females, or hydrologic and salinity factors are responsible for unsuccessful reproduction in the striped bass population.

### **Natural Hazards**

Natural hazards cause financial losses that average \$52 billion per year in the United States. In Georgia, the USGS provides information on selected natural hazards including floods, droughts, coastal storm surges and hurricanes, sinkholes, and earthquakes.

#### ***Floods and Droughts***

The USGS has documented floods and droughts in Georgia since the 1890's using data from its statewide streamflow-gaging network. About 60 USGS continuous-record streamflow-gaging stations are equipped with data transmitters that provide near realtime streamflow information that can be accessed from the USGS Georgia WWW site at <http://georgia.usgs.gov>. Since 1900, several major floods have occurred in Georgia. In July 1994, parts of central and southwestern Georgia in the Flint and Ocmulgee River Basins were inundated by record flooding from Tropical Storm Alberto, causing 33 deaths and property damage estimated at \$1 billion. USGS personnel work throughout the duration of a flood to maintain streamflow-gaging stations, measure peak flows and flood-elevation profiles, and provide critical information to emergency management personnel and the public.

The effects of droughts are not as immediate as those of floods. Droughts are sustained for several months, encompass large areas, and affect agriculture, recreation, navigation, power production, and municipal activities. Since 1900, several

major droughts have occurred in Georgia. The drought of 1985–86 was one the most severe of the century; streamflow throughout the State was at or near the lowest on record. USGS personnel monitor surface- and ground-water conditions throughout droughts and provide important information to water-management agencies and the public.

### **Geologic Hazards**

Earthquakes and ground failures are uncommon in Georgia; however, these events can pose threats to human life and property. Although only small to moderate earthquakes have occurred in Georgia in recorded history, large seismic events that occurred in nearby States during the 1800's affected Georgia. The USGS National Earthquake Information Center web site (<http://www.neic.cr.usgs.gov>) documents earthquake activity using the U.S. National Seismograph Network. Ground failures, such as landslides, are a common secondary effect of seismic shaking, and can be caused by unstable surface conditions. The USGS supports studies to identify areas of potential ground failure to ensure stability of large structures such as dams.

### **Information and Mapping**

USGS information and products are disseminated in a wide variety of formats, including numerous databases, WWW sites, and scientific reports and maps. Among the most popular USGS products are the 1:24,000-scale topographic maps that show natural and cultural landscape features, with contour lines that show elevation and the configuration of the terrain. Georgia is covered by 1,017 topographic maps at this scale. These maps are used for many purposes, including natural-resource monitoring, civil engineering, and recreation.

The USGS WWW site for Georgia <http://georgia.usgs.gov> contains additional information about USGS programs in Georgia, describes hydrologic conditions, describes the availability of various information products, and provides links to other USGS sites. Additional information about USGS hydrologic, geologic, biologic, and mapping programs throughout the Nation as well as instructions for obtaining USGS reports and maps is available on the USGS Home Page at <http://www.usgs.gov>.

### **Cooperative Mapping Program**

The USGS and University of Georgia have entered into an Innovative Partnership agreement to produce statewide digital line graph coverages for transportation and hydrography data categories. This agreement resulted from a requirements identification and review for these data categories, conducted by the Georgia Geographic Information Systems Advisory Council. The Statewide coverage originally collected by the Georgia Department of Transportation was used as the basis for this partnership. The 1:12,000-scale digital orthophoto quadrangles (1-meter resolution, digital black-and-white images produced from

National Aerial Photography Program photos) are being used to revise the existing State dataset to upgrade standards and data structures for National hydrologic datasets. Georgia is one of the first States to adopt these data standards.

### **Spatial Analysis Technologies**

The USGS and Georgia Institute of Technology established joint "Centers for Spatial Analysis Technologies" in 1991. These Centers are co-located on the Georgia Tech campus and house interdisciplinary teams that conduct geographic information system (GIS) projects, research, and education. The Centers apply GIS technologies in support of projects about natural hazards, environmental-quality indicators, infrastructure, land-resources management, and design and construction of geospatial datasets. An important recent product is the Digital Atlas of Georgia, which consists of numerous digital thematic datasets (land use, geology, hydrography, topography, highways, and political boundaries), compiled onto a CD-ROM. The product is designed for use by environmental professionals, resource managers and planners, educators and students, and many others.

### **USGS office locations**

The USGS has 145 employees in Georgia



### **USGS State Representative**

3039 Amwiler Road  
Suite 130  
Atlanta, GA 30360-2824  
(770) 903-9100  
FAX (770) 903-9199

**USGS Home Page:**  
<http://www.usgs.gov>

**Reports and products:**  
1-888-ASK-USGS

