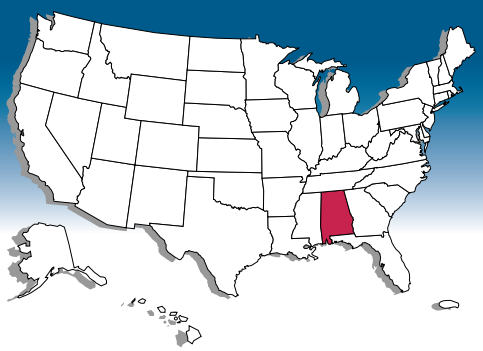
U.S. Geological Survey Programs in Alabama



U.S. Department of the Interior ■ U.S. Geological Survey

The U.S. Geological Survey (USGS) has offices in every State, thus providing a local presence and facilitating relations with the public and private sectors, academia, and Federal, State, and local agencies. This widely distributed network of scientific personnel is a resource that provides a valuable and nationally consistent, long-term earth science information base. This Fact Sheet describes several of the USGS activities in Alabama.

Flood Magnitude and Frequency

Floods are a natural hazard in Alabama. Damage from severe floods cannot be averted completely, but with sound hydrologic information, reliable estimates of peak river stages and discharge can be made, and communities can be warned of impending danger. With accurate estimates of flood magnitude and frequency, planners and managers can improve the design of highway bridges and culverts, determine locations for water- and wastewater-treatment facilities, prepare zoning ordinances, and establish flood-insurance rates. The USGS has developed methods of estimating peak discharges for floods of various recurrence intervals for rural streams in Alabama not affected by regulation or urbanization. Flood-frequency characteristics have been defined for 200 streamflow-gaging stations that have 10 or more years of record through September 1991.

Coal Assessment

Coal usage accounts for one-third of the total energy and more than one-half of the electricity generated in the United States. Even with substantial increases in energy conservation and in the use of natural gas to meet increased demand for energy, coal will continue to be a major energy source. New technologies to use coal require resources that fit very defined quality parameters. Therefore, the location, quantity, and quality of the Nation's coal resources to be consumed during the next 20 years, classified particularly by its best intended use, will be necessary information for national and regional planners.

In the National Coal Assessment, the USGS is working with the Geological Survey of Alabama to identify the locations of coal resources. About 24 million tons of coal are mined in Alabama each year. The quality of these coal resources is being characterized. The products that result from the National Coal Assessment are useful for all levels of government, which include regulatory, information, and land-management agencies, as well as industrial and academic research teams.

Little River Canyon—A New National Park

The Little River and the canyon it has formed are two of the most unique geologic features in Alabama, if not in the entire United States. It is the only river in the United States that forms on and flows the entire length of a mountaintop. The USGS has collected discharge records on the river since 1958, and extensive water-quality data were collected from 1966 until 1983.

The National Park Service (NPS) recently purchased about 9,000 acres of land from the Alabama Power Company to form the Little River Canyon National Preserve; it is the first major national park in Alabama. An additional 5,000 acres of State-owned land, which includes DeSoto State Park, will be donated to the Preserve. Another 130 acres owned by Cherokee County also will be acquired.

The NPS uses streamflow and water-quality data collected by the USGS to document the pristine character of the Little River Canyon and to develop management plans to maintain the natural beauty of the canyon. The NPS and the USGS are planning additional studies to increase scientific knowledge on the biota, geology and hydrology of the canyon. Plans also exist to catalog the data by using a geographic information system.

Index of Subjects

Monitoring the Quality of Public Water Supplies

For several years, the USGS has had ongoing cooperative agreements with the cities of Tuscaloosa, Birmingham, and Mobile to monitor the quality of water in their public supply reservoirs. All three cities were concerned that various land uses within the drainage basins of the reservoirs could have a negative effect on the quality of the water in the reservoirs. In the case of Tuscaloosa, the major concerns were strip mining for coal and residential development within the basin. In Birmingham, the concerns were residential development and industrial discharges. In Mobile, the concerns are plant nurseries, logging activities, and the transport of hazardous chemicals and material across the reservoir on a major U.S. highway and railroad, as well as residential development. In all cases, the basic study involves monitoring the major tributaries of the reservoirs to establish a baseline of water-quality data.

Topographic Mapping

The use of maps and digital cartographic data is widespread, and demands for this information are expanding dramatically. The National Mapping Program of the USGS strives to ensure the availability of map data in graphic and digital forms to the general public through timely and effective data-collection and revision procedures. Among the most popular and versatile products of the USGS are its 1:24,000-scale topographic maps (1 inch on the map represents 2,000 feet on the ground). These maps depict natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Alabama is covered by 912 maps at this scale, most of which were produced under cooperative arrangements with State agencies. The Program fosters partnerships with State and Federal agencies to improve the effectiveness of its data-collection activities, to maximize resource sharing, and to enhance the availability of timely and accurate data to the general public.

Earth Science Information Center

The Earth Science Information Centers (ESIC) provide information about USGS programs, products, and technological developments to the public. The ESIC in Tuscaloosa was established under a cooperative agreement between the USGS and the Geological Survey of Alabama. As part of the national ESIC network, this office provides information on such earth science topics as cartography, geography, digital data, remote sensing, geology, geophysics, geochemistry, hydrology, geohydrology, aerial photography and land use. It is supported by the USGS with reference materials, technical assistance, training and outreach activities, and access to USGS data bases.

Geologic Mapping

The STATEMAP component of the National Cooperative Geologic Mapping Program funds important geologic mapping in Alabama. Geologic mapping is being used to aid in the protection of ground-water supplies, to document areas of subsidence caused by dissolving of underground limestone, and in the siting and monitoring of landfills and hazardous-waste facilities. Additionally, the maps outline extensive cement quality limestones and significant dolomite aggregate resources.

The EDMAP component helps fund geologic mapping in Alabama in cooperation with professors and students at Auburn University, Florida State University, and the University of Kentucky. The purpose of this component is to support the teaching of good geologic mapping techniques.

Mineral-Resource Information

The USGS Mineral Resource Data System (MRDS) is a digital data base that contains mineral information from more than 110,000 sites in the United States and worldwide. The MRDS provides up-to-date information on mineral occurrences and related data to support USGS research and mineral-resource assessments. It also is a principal tool for providing mineral-related information to Federal and State agencies, industry, and the public. The records in this data base are compiled from the results of USGS studies and other published data. The MRDS contains information that mostly describes occurrences of iron, gold, and sand and gravel at more than 730 sites in Alabama.

The USGS Minerals Information Team collects, analyzes, and disseminates information on the domestic and international supply and demand for minerals and materials essential to the U.S. economy and National security. In 1995, the estimated $676 million worth of minerals produced in Alabama for uses other than fuel was ranked 18th in value among nonfuel minerals produced by the 50 States, and it was slightly less than 2 percent of the total value of nonfuel minerals produced in the United States. The most valuable nonfuel mineral products from Alabama were portland cement, crushed stone, lime, and construction sand and gravel; the value of these four products accounted for about $581 million or almost 86 percent of the value of nonfuel mineral products from Alabama.

Compared with USGS estimates of the quantities of minerals produced in the other 49 States during 1995, Alabama was first in bauxite production, third in fire clay production, fourth in masonry cement production, fifth in bentonite clay production, and eighth in salt production. Significant amounts of common clays, kaolin clay, crushed stone, and sand and gravel for industrial uses also were produced in Alabama. The bauxite that is mined in the State is a mixture of low-grade bauxite and bauxitic clay; this mixture is low in iron oxide, and it is used to make some heat-resistant products. The nonfuel minerals produced in Alabama during 1995 were industrial minerals, which have economic value but that do not include metallic ores, fuel minerals, or gemstones.

Collection of Hydrologic Data

Alabama has 10 major rivers—the Tennessee, the Mobile, the Tombigbee, the Black Warrior, the Alabama, the Cahaba, the Coosa, the Tallapoosa, the Conecuh, and the Chattahoochee. The USGS, in cooperation with numerous local, State, and Federal agencies, has collected streamflow, groundwater, and water-quality data at sites throughout the State (fig. 1). The data are needed for surveillance, planning, design, hazard warning, operation, and management in water-related fields, such as water supply, hydroelectric-power generation, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water-resources development.

Biological and Ecological Studies

The USGS Biological Resources Division (formerly the National Biological Service) conducts research on many aspects of Alabama's ecosystems. Much of this research is done by the Alabama Cooperative

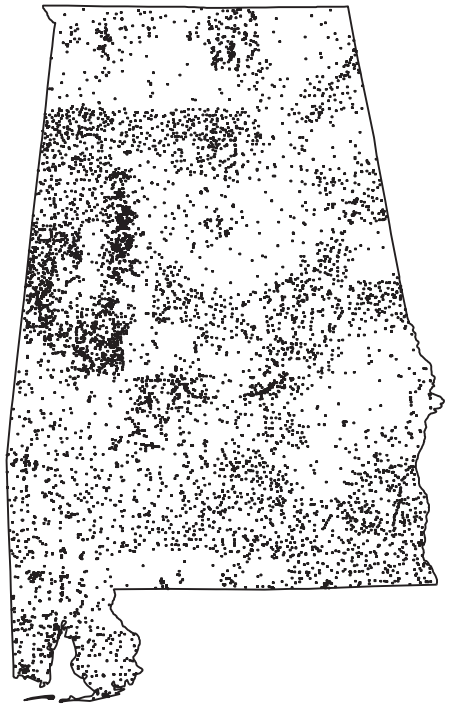


Figure 1. Water-quality data-collection sites in Alabama.

Fish and Wildlife Research Unit, which is located on the Auburn University campus, in close cooperation with the State and the U.S. Fish and Wildlife Service (USFWS).

The USGS is tracking the abundance and locations of sensitive species, such as the white-topped pitcher plant, wherry's red pitcher plant, Henslow's sparrow, and other species found on forested lands in southern Alabama and the Gulf Coastal Plain. By understanding the habitat requirements of rare species like these, timber harvest can be designed to be compatible with species protection. Research on foraging patterns of wading birds in west-central Alabama has helped the Catfish Farmers of America and the Alabama State Catfish Committee design ponds that are less vulnerable to fish-eating birds. The National Wetlands Research Center in Lafayette, Louisiana, has mapped seagrasses on the coast of Alabama as part of the U.S. Environmental Protection Agency's E–Map Program to assess the status of seagrasses in the Gulf of Mexico and to determine long-term monitoring locations.

Alabama has the most species-rich aquatic ecosystems in North America. Aquatic research focuses on effects of river-management alternatives on the diversity and abundance of native river fauna. Projects include investigation of growth of sport fishes, such as spotted bass and flathead catfish. This work includes development of appropriate methods for evaluating habitat quality for species-rich communities that are characteristic of Southeastern U.S. rivers. Research on habitat requirements for larval and juvenile fishes is critical for understanding population regulation in multiple-use river systems. Other projects include studies of the relations between landscape characteristics and fish movements in reservoirs and large rivers; the effects of acidic-mine drainage on stream fishes; and the conditions of fish communities affected by gravel mining. Cooperators include the USFWS, the Alabama Game and Fish Division, and the Alabama Power Company.

The USGS is participating in the Appalachian Clean Streams Initiative, along with other Federal, State, and local government agencies; local Natural Heritage associations and community groups; industry; and academia. The goal for the Initiative is to develop a comprehensive plan for acidic-mine drainage prevention and restoration. In Alabama, efforts are focused on the Coal Valley watershed, which feeds into the Mulberry Fork of the Black Warrior River. Scientists also are working to determine the range and abundance of six species of imperiled freshwater mussels in the Apalachicola, the Chattahoochee, and the Flint Rivers.

Evolution and History of Buried Valleys—Benefits to Shoreline Erosion Mitigation

Erosion along the Gulf Coast of Alabama is being combated by State and local agencies through the addition of sand to the seaward parts of wetlands and through other strategies. This enables natural erosion processes to take place without destroying the fragile wetlands. The USGS contributes to this effort by supplying information on the distribution of sand and clay deposits, and also by explaining the nature of modern shoreline processes. Knowing the location of buried, sand-filled channels, which were created when sea level was lower during an ice age, is particularly important. This information helps the State predict which engineering strategies are most likely to succeed in achieving a stable shoreline.

Water-Resources Investigations in Baldwin County

Baldwin County, which covers an area of 1,613 square miles, is the largest county and has one of the fastest growing populations in Alabama. Many features make Baldwin County attractive for future residential growth. The Gulf Shores–Orange Beach area (fig. 3, on page 4) is one of the major tourist attractions on the Gulf of Mexico.

The USGS, in cooperation with the Baldwin County Commission, is collecting data on ground-water availability and surface-water quality. The county is 100 percent dependent on ground water for public supply. Ground-water withdrawals were estimated to be about 30 million gallons per day in 1990. The objectives of the ground-water study are to describe the ground-water system, to locate areas where the ground-water system is stressed, to estimate the future availability of ground water, and to assess potential effects of alternative water-use management strategies.

The USGS inventoried 174 wells in Baldwin County. The water levels in 158 of those wells were measured during fall 1994. The water-level data collected are being used to construct a map of the potentiometric surface of the Miocene aquifer system, which supplies most of the ground water used in the county. Such maps summarize conditions in the ground-water system and are used to predict generalized directions of flow of ground water, to identify areas of recharge and discharge, and to locate areas where the aquifer is stressed.

In November 1994, the USGS installed a continuous water-level recorder in a city well at Gulf Shores. The data collected (fig. 2) are a continuous measure of ground-water levels and, when used in conjunction with periodic measurements at other wells, can be used in the analysis of conditions throughout Baldwin County. Long-term trends in the water level are influenced by seasonal rainfall while ground-water withdrawals by nearby users are reflected in the short-term level changes. Nearby ground-water withdrawals provide water for public supply, agriculture, and recreation.

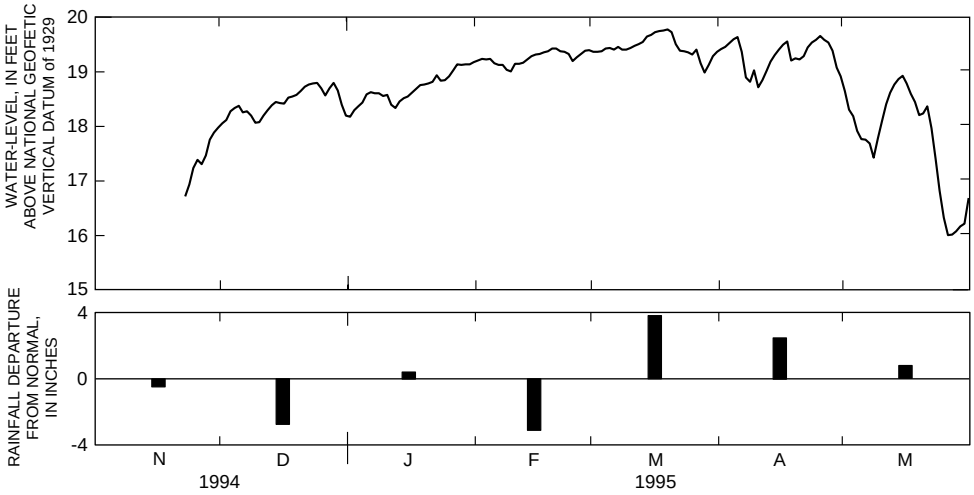


Figure 2. Maximum daily water level in well ZZ–10, in the city of Gulf Shores, and monthly departure from normal rainfall in Fairhope, Alabama.

Owing to increased stresses being placed on streams in the county from point and nonpoint pollution sources, concerns exist as to whether the streams are being affected by changes in land use and, if so, how severe those effects are. The USGS began an evaluation of the quality of water in the creeks and rivers by conducting a survey of 32 surface-water sites. On the basis of the findings, six fixed-station sampling sites were chosen for monthly sampling of water quality.

Figure 3. Baldwin County, showing towns and surrounding areas, the Gulf of Mexico, and Mobile Bay.

For More Information

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Additional earth science information can be found by accessing the USGS Home Page on the World Wide Web at **http://www.usgs.gov/**

For more information on all USGS reports and products (including maps, images, and computerized data), call **1-800-USA-MAPS**

The **USGS** provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, biological, and land resources. We help find the natural resources needed to build tomorrow, and supply the scientific understanding needed to help minimize or mitigate the effects of natural hazards and environmental damage caused by natural and human activities. The results of our efforts touch the daily life of almost every American.

U.S. Geological Survey
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