

The U. S. Geological Survey (USGS) has served as the Nation's principal collector, repository, and interpreter of earth-science data for more than a century. In this capacity, the USGS in Arkansas works in partnership with State, county, and municipal public-works departments, public-health agencies, natural-resource agencies, water and sanitation districts, and other Federal agencies. The Arkansas Geological Commission (AGC) has been a leading cooperater with the USGS in Arkansas for more than 60 years. Working together, the two agencies have greatly contributed to the understanding of earth sciences in Arkansas. When local and State agencies are involved, activities typically are funded on a matching (50:50) basis. This Fact Sheet describes a few of the current (1996) USGS activities in Arkansas.

## National Water-Quality Assessment Program

In 1991, the USGS's National Water-Quality Assessment (NAWQA) Program began work to provide policymakers and managers with nationally consistent information that describes the status and trends in the quality of the Nation's ground- and surface-water resources on local, regional, and national levels. In providing this information, the USGS is analyzing hydrological, geological, biological, climatological, land-use, and agricultural processes that can affect water quality and is helping identify hydrologic issues that affect specific hydrologic regions of the United States.

There are two NAWQA Program studies in Arkansas (fig. 1)—the Ozark Plateaus, which began in 1991, and the Mississippi Embayment, which began in 1994. In conducting these studies, the USGS is cooperating with more than a

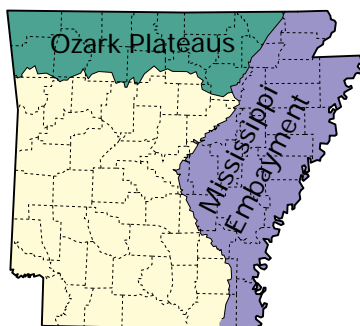


Figure 1. National Water-Quality Assessment Program study units in Arkansas.

dozen other Federal agencies, State agencies, and universities within Arkansas.

### Ozark Plateaus

The Ozark Plateaus NAWQA Program study unit covers 48,000 square miles in northern Arkansas, southern Missouri, and small parts of Kansas and Oklahoma. Field data were collected from 1993 to 1995 for ground and surface waters and aquatic biological communities within the study unit. Beginning in 1996, these data are being analyzed, and numerous topical reports that describe the water quality are being published. A less-intensive phase of sampling also began in 1996 and continues through 2000. Samples at selected locations during this low-intensity phase will aid in describing water-quality trends. The Ozark Plateaus study unit expects to begin its second round of high-intensity sampling in 2001.

### Mississippi Embayment

The Mississippi Embayment NAWQA Program study unit covers 48,200 square miles in the Mississippi Alluvial Plain of Arkansas and parts of six other States in the South-Central United States. In 1994–95, after existing

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water-quality data were gathered and examined, the sampling plan for the high-intensity phase of the study was formulated. In 1996, the 3-year phase of intensive data collection on ground and surface waters and aquatic plant and animal communities began.

### Critical Ground-Water Areas

Pumping from the most productive aquifers in Arkansas—the Mississippi River Valley alluvial aquifer and the Sparta aquifer (fig. 2)—has led to declining water levels throughout the

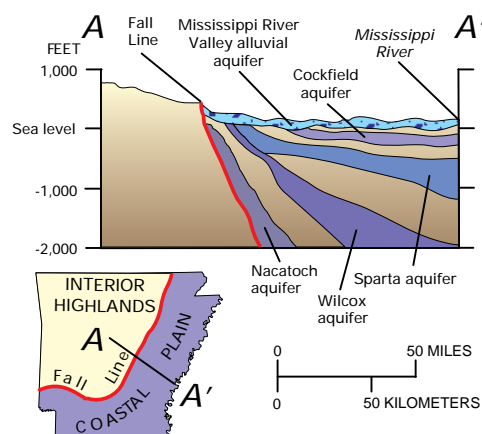


Figure 2. Generalized hydrogeologic section of the Arkansas part of the Coastal Plain.

Coastal Plain region of southern and eastern Arkansas. These aquifers are the principal sources of water for irrigation, industrial, and public supplies in this region. Citizens have become concerned about the declining water levels, the reduced well yields, and the deterioration of the chemical quality of water in some areas. The State Legislature has passed a bill that allows the Arkansas Soil and Water Conservation Commission (ASWCC) to define critical ground-water areas.

The ASWCC and the USGS have joined in a cooperative study to collect the data and information needed by the ASWCC to define these critical areas. A part of the ASWCC's definition for a critical ground-water area involves the degree to which water levels are declining and how rapidly water levels are declining on an annual basis.

Currently, the USGS is providing the ASWCC with updated digital water-level maps and water-level difference maps every 2 years for the Sparta aquifer and the Mississippi River Valley alluvial aquifer. The ASWCC is required by law to reevaluate critical ground-water areas every 2 years.

Through this cooperative effort, the ASWCC and the USGS are working together to assure that future Arkansans have an ample supply of high-quality ground water.

## National Coal Assessment

As the United States emerges into the next century, coal will continue to be a major energy source. Coal usage accounts for one-third of the total energy and more than one-half of the electricity generated in the United States. New technologies to use coal will require resources that fit well-defined quality characteristics. 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 AGC to identify the location and quality of these resources in Arkansas.

## New Madrid Seismic Zone

A new set of USGS maps shows many kinds of geological and geophysical information that is used by earth scientists and engineers to understand the causes and likely effects of earthquakes in the New Madrid earthquake zone of Missouri, Arkansas, Tennessee, and Kentucky (fig. 3). The maps are a product of a cooperative effort among the USGS, university, State, and private-sector scientists. The maps show the locations of earthquakes and instrument sites used to study them, faults and other buried geologic structures, and earthquake-generated liquefaction features that date from the 1811–1812 New Madrid earthquake, which was the largest seismic event to occur in the conterminous United States in recorded history.

Another new USGS map of the Central United States shows the main roads, railroads, oil and natural gas pipelines, dams, nuclear facilities, and urban areas that might be at risk from large New Madrid-style earthquakes. This map is useful in planning responses for regional earthquake emergencies.

The USGS funds and works with the Central United States Earthquake Consortium (CUSEC). The CUSEC consists of a State Geologist advisory group that is conducting earthquake research activities in the multi-State New Madrid seismic area. The final product, such as an earthquake-hazards map, is designed for civil authorities for zoning and emergency disaster planning.



Figure 3. Location of New Madrid earthquake zone.

## Magnitude and Frequency of Floods

The USGS, in cooperation with the Arkansas State Highway and Transportation Department, recently published a flood-frequency report titled *Magnitude and Frequency of Floods in Arkansas*. This report provides a means to predict peak discharges with recurrence intervals of 2, 5, 10, 25, 50, 100, and 500 years. This information is critical in the design of bridges, culverts, roadways, and other structures near streams.

Two methods to estimate flood magnitude and frequency are presented in the report. The first is an analysis that relates the physical characteristics of gaged streams to their flood characteristics. The second method uses a computer program to develop equations for ungaged sites that have similar basin and climatic characteristics. Both methods assist transportation engineers in the design of structures near streams and rivers.

## Hydrology of Northwestern Arkansas

The Fayetteville Project Office (FPO) of the USGS is a hydrogeologic research office on the campus of the University of Arkansas. The FPO represents a one-of-a-kind experiment for the USGS, in which resources and personnel are shared with a diverse group of researchers, teachers, and scientists from the academic community, and local, State, and Federal agencies. In addition to training young scientists, the FPO conducts applied research, collects basic data, and actively participates in extensive outreach efforts. The Office has facilitated an interdisciplinary approach for answering practical questions about land use and water quality in one of the most intensive poultry-producing regions of the country and has established one of the few long-term karst research installations in the United States.

Cooperating agencies include the University of Arkansas—Fayetteville, the Arkansas Department of Pollution Control and Ecology, and the Arkansas Soil and Water Conservation Commission.

The University of Arkansas—Fayetteville cooperatively funds the research associated with processes and controls that affect the evolution of porosity and permeability in carbonate rocks. The University also is interested in integrating the research from USGS studies into training, which is presented as formal classes and a 6-week field hydrogeology course. Five graduate research assistantships are supported by the USGS on an external grant to the University.

The Arkansas Department of Pollution Control and Ecology is funding research that includes continuous monitoring of precipitation, stage, pH, specific conductance, temperature, and dissolved oxygen at four springs. The focus of the study is to explain the observed daily, seasonal, and annual fluctuations in the variables being studied.

The ASWCC is funding research that deals with the effects of best-management practices (BMP's) of agriculture on the quality of water in wells and springs. The FPO is delineating the hydrogeologic framework and developing conceptual models of ground-water flow and transport for each of the areas where BMP's are being implemented.

## Environmental Monitoring

The unique missions of the U.S. Armed Forces often require the use of hazardous materials. The USGS provides technical assistance for support of the U.S. Department of Defense's (DOD) environmental programs in such areas as environmental regulation compliance, hazardous waste management, data management, research and development, training, and water-quality and site hydrogeology characterization. The USGS designs and conducts environmental investigations that assess the geologic, hydrologic, and biological/ecological conditions at military facilities; provides monitoring of ground and surface waters, and soil environments to ensure a continuing understanding of environmental quality on military facilities; characterizes the nature and extent of contaminant releases and contaminant transport characteristics

before cleanup efforts; and evaluates the efficacy of contaminant cleanup efforts. These efforts allow the DOD to make the most effective use of military facilities in Arkansas for the diverse applications required—from military tactical, command, and training uses to simple outdoor recreational uses.

The USGS is currently involved in projects for the U.S. Army at Fort Chaffee and for the U.S. Air Force at the Little Rock Air Force Base (LRAFB). Projects at Fort Chaffee include monitoring storm-water for contaminants to determine if water moving off base is of acceptable quality, investigating a pesticide storage site where DDT was stored and spilled more than 30 years ago, and studying a remote site where an unknown material was disposed of in unlined trenches to determine the nature of the contaminant and if the contaminant is moving. At the LRAFB, the USGS is conducting a resource assessment to determine if contaminants are present in water, sediment, and fish in lakes and ponds, which are important recreational assets for the base.

## Earth Science Information

The Earth Science Information Centers (ESIC's) provide information about USGS programs, products, and technological developments to the public. The ESIC, which is located at the AGC in Little Rock, was established under a cooperative agreement between the USGS and the AGC. As part of the 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.

## Topographic Mapping

Topographic maps at a scale of 1:24,000 are among the most popular and versatile products of the USGS. These

maps depict basic natural and cultural features of the landscape and use contour lines to depict the elevation and shape of terrain. Arkansas is covered by 917 maps at this scale.

The USGS currently has a cooperative agreement with the AGC for the revision of 1:24,000-scale topographic maps. The AGC has been a cooperative partner with the USGS for many years in the initial production and the subsequent revision of topographic maps that are used by the AGC as a base for geologic mapping. The AGC is the primary distributor for topographic maps in Arkansas.

Additionally, the USGS has a cooperative agreement with the University of Arkansas at Fayetteville Center for Advanced Spatial Technologies for the production of computerized elevation data for numerous geographic information systems and mapping projects in Arkansas.

## Geologic Mapping

STATEMAP is one of the external funding opportunities offered by the USGS National Cooperative Geologic Mapping Program (NCGMP). Funding announcements for STATEMAP are issued each year, and a competitive proposal process is used to distribute funds. Federal funding is matched equally by the recipients of the cooperative agreements. Typically, proposals focus on issues important to the environment and society, such as ground-water quality, geologic hazards, landfill siting, and management. Proposals also address a range of resource issues such as oil and gas assessments, coal quantity, sand and gravel resources, and economic mineral development. The geologic map data are archived at the State Survey level and within the National Geologic Map Data Base of the NCGMP.

STATEMAP funds important geologic mapping in Arkansas through the AGC. Mapping of Cretaceous rocks in the southwestern part of the State is aiding the evaluation, development, and protection of mineral and ground-water resources.

## Arkansas Water Resources Research Center

The USGS provides technical and financial support to the Arkansas Water Resources Research Center in Fayetteville. The Center conducts programs of research, education, and information and technology transfer. Currently, the Center is focusing on water-quality issues related to animal waste in northern Arkansas and pesticides in eastern Arkansas.

### Water Use

The ASWCC, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), and the USGS have embarked on a cooperative effort to automate the registration of water-use data in 29 counties in Arkansas. A water-use data base and supporting software have been developed by the USGS and provided to Conservation District offices (located in the NRCS offices in each county). Conservation District personnel are using this system to enter and retrieve site-specific irrigation and agricultural water-use data and to upload and store data into the USGS's data base. Currently, the system has been installed in 17 eastern Arkansas counties and is expected to be installed in the final 12 in mid-1996 (fig. 4).

The task of entering and processing about 54,000 water-use registrations, which was previously handled by the USGS and the ASWCC staffs, is now divided among the county Conservation

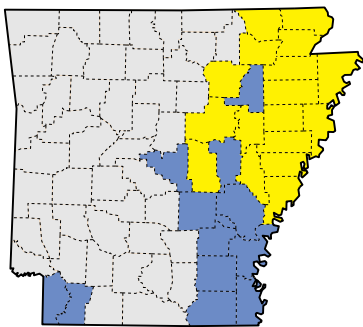


Figure 4. Natural Resources Conservation Service county offices with entry and retrieval software for the USGS water-use data base. Counties in yellow are currently connected to the data base. Counties in blue are scheduled to be connected in 1996.

District offices. Resources previously allocated for water-use registration processing can now be used for additional quality-assurance and interpretive water-use investigations to be pursued cooperatively by the USGS and the ASWCC. Proposed investigations would include an evaluation of the reported irrigation and agricultural water use by comparing the reported water use with measured water-use values and verification of the locations of withdrawals or diversions. A systematic evaluation of reported water-use data on a county-by-county basis will greatly improve the reliability of the data and the integrity of the Arkansas water-use data base.

### Avian Research and Forested Wetland Restoration

The USGS Biological Resources Division (formerly the National Biological Service) conducts research throughout Arkansas on avian ecology and forested wetlands. The National Wildlife Health Center has been conducting extensive studies on the deaths of more than 50 bald eagles and numerous coots at several southwestern Arkansas lakes, which have suffered disease outbreaks during 1994, 1995, and 1996. Despite extensive field and laboratory investigations, the cause of death has not been established, nor has a definitive link been established between eagle and coot mortality. USGS field investigators have been on site working with Arkansas Game and Fish, U.S. Fish and Wildlife Service, Army Corps of Engineers, and collaborating facilities, including the Southeast Cooperative Wildlife Disease Study. The Cooperative Fish and Wildlife Research Unit located at the University of Arkansas at Fayetteville conducts research on distribution of endangered red-cockaded woodpeckers; controlling brown-headed cowbird populations; and working with the State Game and Fish Commission on the effects of habitat quality on wild turkey populations. Other studies include aerial surveys of wintering mallards for the Arkansas Game and Fish Commission and establishment of a pilot site on the Cache River to evaluate forest restoration techniques.

## For More Information

USGS State representative  
401 Hardin Road  
Little Rock, AR 72211  
(501) 228-3600  
Fax: (501) 228-3601  
Email: dc\_ar@usgs.gov

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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