

United States Geological Survey

Programs in Missouri



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

Floods of 1993

Damages from the 1993 flood on the Missouri and the Mississippi Rivers have been estimated at \$4 billion in Missouri. Some of the most critical issues facing Missouri after the flood were statewide flood-plain management, levee construction and repair, flood damage behind levees, hazardous materials, and emergency preparedness. The U.S. Geological Survey (USGS), in cooperation with the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the Missouri Department of Natural Resources, and the Missouri Highway and Transportation Department, is undertaking several studies to address these issues.

The USGS operates and maintains a statewide network of streamflow-gaging stations that provide continuous rainfall and river-stage data. These data were used to aid in decisions that protected the lives and property of individuals in the flood plains and in the operations of major reservoirs that reduced flooding downstream from the reservoirs. These data also will be used in emergency preparedness for communities during similar or larger floods and will be used to plan future flood-plain development.

In response to the extensive flooding in the Midwest during 1993, the White House Interagency Floodplain Management Task Force directed seven Federal agencies to establish a Scientific Assessment and Strategy Team (SAST) to determine the immediate effects of flooding and longer-term implications for flood-plain management within the region. The team was hosted by the USGS because of its extensive computer-based technological capabilities, multidisciplinary staff, and experience in the development, scientific application, and management of large amounts of geographically referenced information. One of the team's initial objectives was to develop an interactive data base that con-

tains various types of flood-relevant information for the affected nine-State region. The data base included geographically referenced information on manmade structures, hazardous and toxic-waste sites, water-treatment facilities, land cover and land use, fish and wildlife habitats, rainfall, topography, surficial geology and soils, stream and river hydrology and hydrography, demography, and economic bases. Digital data bases for large geographic areas were compiled, and essential data for flood-related land management and environmental research have been consolidated and made available by Internet-accessible programs for State planning officials and natural resources investigators.

Agricultural Chemicals

The USGS, in cooperation with the Missouri Department of Health, has completed agricultural chemical studies in Missouri (fig. 1). More than 20 percent of the shallow wells used for drinking-water supplies in intensely cultivated parts of Missouri have concentrations of nitrate in water samples that exceed the U.S. Environmental Protection Agency's maximum contaminant level of 10 milligrams per liter. Less than 10 percent of water samples from these wells have detectable concentrations of herbicides. On the basis of these data, the USGS has undertaken

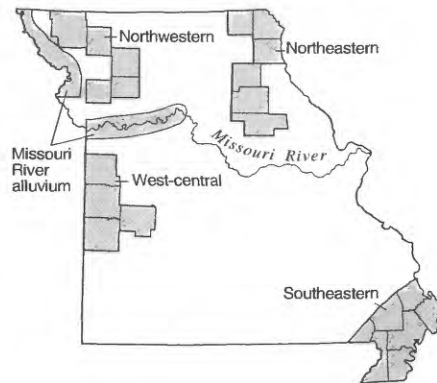


Figure 1. Agricultural chemical studies in Missouri.

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studies to determine the contribution of nitrogen fertilizers to nitrate in ground and surface water, provide data for the optimum design of fertilizer management practices, and determine the effects of the 1993 flood on herbicide concentrations in the Missouri River alluvium. These studies provide information needed by water-resource planners and managers to minimize contamination of ground and surface water by agricultural chemicals. Other agencies cooperating in these studies include the Missouri Department of Natural Resources; the U.S. Department of Agriculture, Agriculture Research Service and Cooperative State Research Service; and the U.S. Environmental Protection Agency.

National Water-Quality Assessment Program

The long-term goals of the National Water-Quality Assessment (NAWQA) Program are to describe the status and trends in the quality of a large representative part of the Nation's surface- and ground-water resources and to identify the natural and human factors that affect their quality. The NAWQA Program produces a wealth of water-quality information that is useful to policymakers and water managers at the local, State, and national levels.



Figure 2. National Water-Quality Assessment Program study units in Missouri.

Two NAWQA Program studies are underway in Missouri—the Ozark Plateaus and the Mississippi Embayment (fig. 2). Communication and coordination among the USGS and water-management and other water-resource agencies are key components of the Program projects in the State. The projects distribute findings in a variety of reports to local, State, and Federal agencies as results become available.

A critical requirement of the NAWQA Program is up-to-date information on land use/land cover to determine their effect on water quality. The USGS, in cooperation with several other Federal agencies, is acquiring satellite image data for the entire United States. These data are processed according to a consistent standard, then forwarded to NAWQA Program projects, as well as to other water-resource agencies, for water-quality research applications.

Land-use and Climatic Effects on Aquatic Ecosystems

During the past 100 years, residents of the Ozarks have noted excessive aggradation of streambeds with gravel and increased channel instability associated with decreases in game-fish populations. Because recreational fishing is an important economic resource in the Ozarks, degradation of aquatic habitat is of concern to State, Federal, and local land managers. The USGS is involved in a comprehensive, multidisciplinary study with the objectives to determine the cause/effect link between historical land-use changes in the Ozarks and stream instability, to evaluate the effects of stream instability on the quality and sta-

bility of physical aquatic habitat, and to develop a predictive understanding of how future land use and climate change will affect the aquatic ecosystem. The results of this study will help land managers optimize their efforts to maintain and improve aquatic habitat and to plan for the future. The study is a cooperative effort of the USGS, the Missouri Department of Conservation, and the National Park Service.

Earthquake Monitoring

The magnitude of some earthquakes during 1811–12 at New Madrid in southeastern Missouri are estimated to have been in the range of 8.4 to 8.7 on the Richter scale. The minimal loss of life and property during these earthquakes can be attributed to the fact that there were few inhabitants in the area and that houses were small and sturdily built. However, the potential damage and destruction from an earthquake of similar magnitude today would be greatly increased.

Researchers from the USGS and the Missouri Department of Natural Resources, Division of Geology and Land Survey, are conducting geologic mapping and geophysical surveys in southeastern Missouri near Cape Girardeau and in the Benton Hills. Although these areas are north of the New Madrid seismic zone and currently seismically quiet, they contain evidence of faulting. These surveys will be used to determine if the faults pose additional threats in the event of an earthquake.

Monitoring a Wetland/Wastewater Treatment System

The Missouri Department of Conservation and the city of Columbia have initiated a project that is anticipated to be a milestone in the treatment of municipal sewage. As expansion of the Columbia wastewater-treatment facility became necessary, constructed treatment wetlands were chosen instead of expanding the existing facilities. The Missouri Department of Conservation agreed to accept the treated wastewater from the Columbia treatment wetlands as a water source for managing 1,200 wetland acres on the Eagle Bluffs Wildlife Area, a restored riverine wetland on the Missouri River.

Because wetland areas are sensitive to chemical and physical changes in the

hydrologic environment, the USGS began a study in cooperation with the Missouri Department of Conservation and Columbia to collect and analyze hydrologic data in the Columbia/Eagle Bluffs Wetland Complex. An objective of the study is to evaluate changes and analyze trends in surface- and ground-water flow and quality as the result of the construction of the effluent-wetland treatment system. The study provides information to communities that are considering a similar type of treatment system. Potential concerns will be identified before they become widespread or irreversible so that the wetland area continues to provide habitat for wildlife, an alternative wastewater treatment method, and a recreational area.

National Mapping Program

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 basic natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Contour lines are used to depict the elevation and shape of terrain. Missouri is covered by 1,299 maps at this scale, which is useful for civil engineering, land-use planning, natural-resource monitoring, and other technical applications. These maps have long been favorites with the general public for outdoor uses, including hiking, camping, exploring, and back-country fishing expeditions.

The USGS has jointly funded and produced graphic maps for many years and, more recently, computerized (digital) geographic data products in cooperation with Federal and State governmental agencies in Missouri. Agencies that are participating in the joint production of geographic data include the Missouri Department of Conservation; the Missouri Department of Natural Resources, Division of Geology and Land Survey; the U.S. Army Corps of Engineers; and the U.S. Department Agriculture, Natural Resources Conservation Service. The resulting geographic data products serve many geographic information system uses for addressing various natural resources, conservation, waste-disposal, emergency, hazard, and other environmental and societal issues confronting the State's citizens.

Currently (1995), production of geographic products in Missouri partly funded in partnership with the USGS includes 1:100,000-scale topographic county maps, 1:24,000-scale digital data, 1:12,000-scale digital mapping photos, 1:24,000-scale digital elevation models (fig. 3), and updated 1:24,000-scale topographic maps.

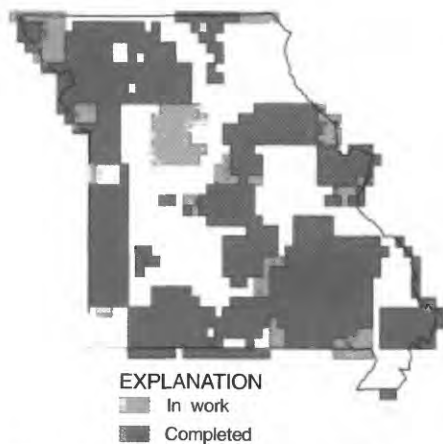


Figure 3. Digital elevation model (DEM) coverage at the 1:24,000 scale for Missouri.

Potential Mineral Resources of the St. Francois Mountains

The USGS, in cooperation with the Missouri Department of Natural Resources, Division of Geology and Land Survey, is studying the potential for a world-class copper-uranium-gold deposit in the St. Francois Mountains of southeastern Missouri. This investigation has helped determine that the geologic setting of southeastern Missouri is similar to that of South Australia where the giant \$130 billion Olympic Dam metal deposit is located. Moreover, processes that deposited metals at known sites in southeastern Missouri are similar to those that deposited metals at Olympic Dam. Such information has increased domestic and foreign exploration by mining companies to search for mineral deposits in southeastern Missouri and elsewhere in the midcontinent region of the United States.

Coal-Bed Methane Resources in the Forest City Basin

A new energy resource, methane gas from coal beds, is supplying the United States with a clean-burning fuel. The Forest City Basin (fig. 4) located partly in Missouri may contain coal beds capable

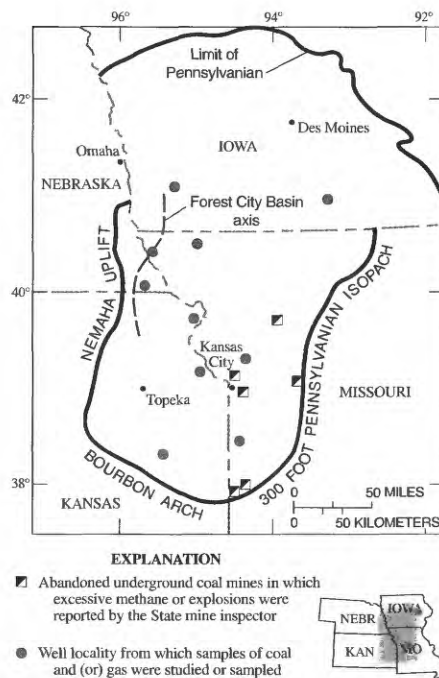


Figure 4. Location of the Forest City Basin.

of producing methane gas. As part of an assessment of national petroleum resources, the Forest City Basin is being evaluated for its potential to produce methane from coal. Assessment of this important resource and its potential use will help provide the State and the region with a new environmentally safe energy source and stimulate the local economy as exploration and production commences.

Geographic Information System for Urban Planning

The USGS and the city of Springfield participated in a joint funding agreement for the production of computerized (digital) maps derived from information on printed maps, including transportation networks, geologic and hydrologic features, the Public Land Survey System, and county boundaries. Other information was obtained by on-site inspection, including the location of sinkholes and springs in an area of karst terrane. The digital maps provide fundamental geographic, geologic, and hydrologic information used by city officials to increase their understanding of the nature of karst terrane and to provide information on how city development can best be tailored to protect water resources.

Mapping Surficial Geology

Missouri has immediate and long-term concerns of land use and land management, engineering construction, and water quality that will require new

sources of construction materials and new sources of water. Human activities will continue to contribute to environmental changes, such as erosion and reservoir siltation, and natural hazards, such as floods, landslides, and swelling and collapsing soils. Geologists from the USGS, in cooperation with the Missouri Department of Natural Resources, Division of Geology and Land Survey, are involved in studies to provide information about the distribution of geologic resources and to identify potential consequences of land-use and land-management policies. The distribution, thickness, chemical, physical, and engineering characteristics of surficial deposits are being mapped as part of the compilation of the *Quaternary Atlas of the United States*.

Collection of Hydrologic Data

Missouri has several major rivers, including the Mississippi, the Missouri, the Osage, the Current, the Muramic, the Spring, the Grand, and the Salt. These rivers supply water not only to users within Missouri, but to several downstream States. In addition, ground water is used extensively throughout the State. The USGS, in cooperation with more than 20 local, State, and Federal agencies, has collected water-quality data at sites throughout the State (fig. 5). These data are critical for daily administering and managing water resources, determining the extent and severity of droughts, characterizing and predicting conditions during floods, and monitoring the effects of human activities on streamflow and water quality. The data also are essential to interpretive studies that provide information for making decisions about water issues that affect millions of people.



Figure 5. Water-quality data-collection sites in Missouri.

Studies of Contamination at U.S. Department of Defense and U.S. Department of Energy Sites

The U.S. Department of Defense and U.S. Department of Energy sites in Missouri have some level of contamination caused by past production, storage, or destruction of chemical agents, munitions, or radioactive materials. Near some of the sites, radioactive and chemical contaminants have migrated into the ground water or have contaminated soils. The USGS is collecting hydrologic data and is conducting investigative studies at the Weldon Spring chemical plant site and training area near St. Louis and the Fort Leonard Wood Military Reservation in south-central Missouri. The purposes of the studies include characterization of the hydrology of the sites, definition of the extent of contamination, evaluation of monitoring networks, determination of contaminant transport mechanisms, and prediction of the fate of contaminants.

Partnership for Study of the Middle Missouri Basin

The State Geological Surveys of Iowa, Kansas, Missouri, and Nebraska and the USGS have formed a partnership to conduct geologic studies of land-use issues in the Middle Missouri Basin. These studies are being conducted in a corridor encompassing Omaha and Lincoln, Nebraska, Council Bluffs, Iowa, Kansas City, Missouri and Kansas, and Topeka, Kansas. Most of the areas between the cities are a combination of smaller urban centers and intervening rural areas that support intensive agricultural activities. Geologic and hydrologic constraints, such as collaps-

ing or expanding soils, landslides, subsidence, and flooding, are of concern, especially in urban areas. Disposal of municipal and industrial wastes, including hazardous wastes, is important in terms of past practices and future needs. Erosion, sedimentation, and contamination from nonpoint-source discharge are major issues in agricultural and urban areas. The identification, protection, and extraction of construction materials presents a continuing problem, as does reclamation of mining areas. Geologic information obtained by these studies is essential to understand the carrying capacity of the land, to identify potential consequences of land uses on the natural system, and to determine methods to decrease or mitigate those consequences.

Earth Observation Data

Through its Earth Resources Observation Systems Data Center near Sioux Falls, South Dakota, the USGS distributes a variety of aerial photographs and satellite image data products that cover the entire State. Mapping photographs of some sites go back about 40 years. Satellite images dating from 1972 can be used to study changes in regional landscapes.

Geologic Information Center

The USGS National Earthquake Information Center (NEIC) in Golden, Colorado, collects, processes, and distributes information from more than 20,000 seismic events each year. This information is distributed in the form of alerts, bulletins, and routine catalogs to emergency management officials at the Federal and State levels, operators of critical facilities, news media, the general public, and the earthquake research community. These cata-

logs of recent and historical earthquake information are used in earthquake hazards assessments. To fulfill its mission better, the NEIC has developed and is deploying the U.S. National Seismograph Network (USNSN), which, when completed, will consist of approximately 60 seismograph stations nationwide. The USNSN monitors nationwide seismicity, provides early notification of seismic events to national-level emergency services personnel, maintains an archive of high-quality digital data on national seismicity, and provides public information on earthquakes.

Cooperative Programs

The USGS cooperates with more than 50 local, State, and Federal agencies in Missouri. Cooperators include county and municipal public works departments, public health agencies, natural-resource agencies, conservation agencies, other Federal agencies, and many more. Cooperative activities include water-resources-data collection, interpretive water availability and water-quality studies, mineral-resource assessments, and mapping. When local and State agencies are involved, activities typically are funded on a matching-funds basis. In addition to agencies already mentioned, the USGS cooperates with the Cass County Soil and Water Conservation District, the City Utilities of Springfield, the Mid-America Regional Council, the U.S. Department of Commerce, and the University of Missouri at Columbia, to name only a few.

The USGS provides support to the Missouri Water Resources Research Center, which conducts a program of research, education, and information and technology transfer.

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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.