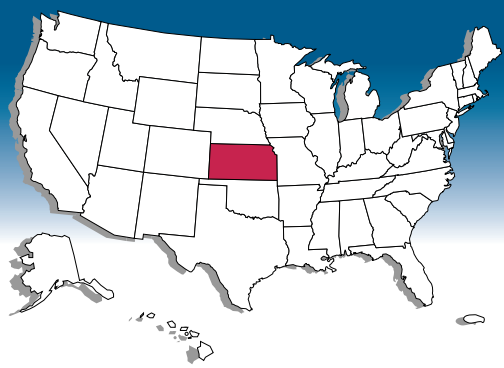
# U.S. Geological Survey Programs in Kansas



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

For more than 100 years, the U.S. Geological Survey (USGS) has been mapping, describing, and seeking to further the understanding of Kansas' natural resources. The USGS is known for impartial data collection and data interpretation that enables resource planners and others to make informed decisions. Today's issues are more pressing than ever—understanding natural hazards to minimize their effects on life and property, the continuing need for mineral- and water-resource development, and understanding the effects of human activities on biological and water resources.

As the Nation's leading earth science agency, the USGS cooperates with more than 30 Federal, State, and local agencies in Kansas to produce USGS maps, interpretive reports, and data to help our customers manage Kansas' resources better. Cooperators include State natural resource agencies, county and municipal public works departments, tribal governments, universities, and other Federal agencies. The USGS also provides support to the Kansas Water Resources Research Institute, which conducts research, education, and information and technology transfer programs at Kansas State University in Manhattan and at the University of Kansas in Lawrence.

## Floods

Realtime flood information, such as watches and warnings issued by the National Weather Service, use data collected by the USGS at 140 automated streamflow-gaging stations. USGS streamflow data also are used throughout Kansas by many Federal, State, and local agencies, as well as by private users. These customers use the streamflow data to manage the State's reservoir system to reduce the damage caused by floods (fig. 1); to zone and regulate activity in flood plains, thereby saving lives and reducing property damage; to set insurance rates; and to design safe and economical highway bridges, culverts, and other structures. Streamflow-data analysis by the USGS has provided an independent verification of the benefits of the Kansas River Basin reservoir system during the 1993 floods.

## Water Availability

Demand for water in Kansas is frequently greater than the available supply. The USGS provides critical information about supply and demand to State agencies that are responsible for water-resources management, such as the Kansas Department of Agriculture's Division of Water Resources (DWR) and the Kansas Water Office (KWO). In cooperation with 14 Federal State, and local agencies, the USGS established and operates a near realtime data-collection network of more than 170 streamflow gages. This network (fig. 2) provides information necessary to quantify the amount of water available for various uses; the network is continually updated to reflect changing information needs. Near-realtime streamflow information for selected sites is available on the World Wide Web at URL:

**http://www-ks.cr.usgs.gov/**

Information for many other surface- and ground-water sites also is available.

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The USGS, in cooperation with the DWR and KWO, also has developed data bases to estimate water use and ground-water recharge. This helps water-management officials minimize overdevelopment of water resources and prevent the infringement of water rights. The data collected by the USGS also are critical for reconciling interstate conflicts over water in rivers that cross

Figure 1. Flooding of Neosho River near Parsons, Kansas, spring 1994.

State boundaries. The USGS also has assisted the city of Wichita in assessing the potential for innovative solutions to meet future water-supply needs. The information provided by the USGS helps water managers balance supply and demand so that the citizens of Kansas can prepare for future water-supply problems before they become crises.

## Effects of Urbanization on Public Water Supply

Parts of Kansas have undergone significant urbanization during the past several decades. This urbanization has led to deterioration in surface- and ground-water quality in some areas. The USGS has filled an important role in assessing the effects of urbanization on water quality by determining the effects of landfills on ground-water quality and by evaluating the effects of urbanization on stormwater runoff and surface-water quality. This information can be used by municipal planners and others to manage the effects of present and future development.

## Effects of Agriculture on Public Water Supply

Modern agricultural practices use pesticides and fertilizers to produce crops economically. Some of these chemicals may be harmful to humans and aquatic life and have been detected in several rivers and reservoirs used as public drinking-water supplies.

The USGS is providing water-resources information to several State agencies, such as the Kansas Department of Agriculture, and municipal water suppliers to help them define and manage this problem. The USGS collects samples to determine concentrations of pesticides and nutrients in streams and reservoirs in the northeastern and south-central parts of the State. USGS streamflow measurements also are important for computing chemical loads and the measurements contribute to understanding the sources and movement of pesticides and nutrients in water.

The USGS, in cooperation with the Kansas State Conservation Commission, studied whether or not particular agricultural management practices can help minimize the amount of pesticides and fertilizers transported into streams. The State of Kansas established the Delaware River Basin, in northeastern Kansas, as a Pesticide Management Area (PMA) by using information previously collected as part of the USGS's National Water-Quality Assessment (NAWQA) Program. The Delaware River Basin PMA was the first such PMA in the Nation. The USGS monitored pesticide concentrations in the Delaware River basin and below Perry Lake, which receives water inflows from the PMA, to determine pesticide loads and concentrations in the streams and the Lake. Findings indicate that more than half of the annual load of the herbicide atrazine to Perry Lake occurs during only 10 days of the year and that climatic and hydrologic variations frequently have greater effect on annual loads than do changes in management practices. These findings are important for designing effective monitoring programs and management strategies.

## Depletion of the High Plains Aquifer

Many farmers in western Kansas irrigate their crops because precipitation does not provide adequate moisture during the growing season for optimum yields. In much of western Kansas, the main source of irrigation water is the High Plains aquifer (fig. 2). The steady decline of water levels in parts of the aquifer during the past several decades (fig. 3) has prompted stringent management practices to reduce the severity of future water shortages.

The USGS, in cooperation with the Kansas Geological Survey (KGS) and the DWR, monitored the High Plains aquifer by measuring water levels in more than 1,400 wells. Water-level data are provided to the public annually so that the quantity of water in the aquifer can be monitored and the effectiveness of water-management measures can be assessed. The USGS also developed a computer simulation model of the aquifer that has been used to understand the factors that contribute to the water-level declines.

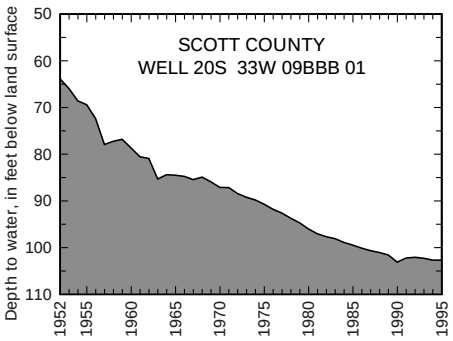


Figure 3. Declining water levels in well completed in the High Plains aquifer in Scott County, western Kansas, 1952–95. Well location shown in figure 2.

## Saltwater in Aquifers

Aquifers beneath many areas of central Kansas naturally contain water that is too salty for many uses. Natural processes sometimes cause the salty water to intrude into shallower freshwater aquifers, which can seriously affect public water-supply sources. Abandoned oil wells also can provide a connection between deep, salty aquifers and shallow, fresh ground-water resources. The USGS has conducted studies with the KWO and the DWR to identify sites of saltwater intrusion. This information is used for locating new water supplies.

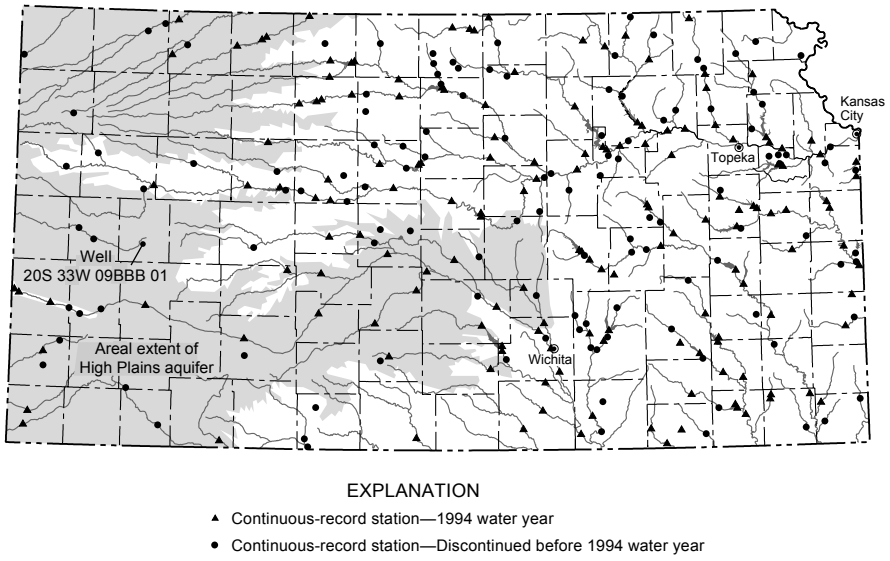


Figure 2. Location of streamflow gages and the High Plains aquifer in Kansas.

## Topographic Mapping

Among the most popular and versatile products of the USGS are its topographic maps at the scale of 1:24,000 (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. Kansas is covered by 1,563 maps at this scale, which are 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, hunting, exploring, and back-country fishing expeditions.

## Mapping Partnerships

For many years the USGS, in cooperation with Federal and State governmental agencies in Kansas, has jointly funded and produced printed maps and, more recently, digitized geographic data products. Agencies currently participating in mapping partnerships include the KGS, the KWO, the Kansas Department of Revenue, and the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). The Public Land Survey System Digital Line Graphs, which are digitized map features, have been completed statewide for the 1:24,000-scale map series under a joint funding agreement with the KWO. Other products being prepared in Kansas under mapping partnerships include 1:100,000-scale topographic county maps; digital orthophotoquads (DOQ's), which are digital images of an aerial photograph in which displacements caused by the camera and the terrain have been removed; and digital elevation models. These products serve numerous computerized geographic information system (GIS) applications including natural resource management, conservation, waste disposal, emergency response and hazard mitigation, and other environmental and societal issues confronting the State's citizens.

The Kansas GIS Policy Board has been established to encourage initiatives, avoid duplication of effort, develop guidelines, promote policies and standards, promote education and training, and make recommendations on the use of GIS technology to benefit the State. USGS representatives participate in meetings of the GIS Policy Board and provide updated information on USGS programs, services, and data availability to help solve natural resource and other problems within the State.

The NRCS, Kansas GIS Policy Board, Kansas Department of Revenue, and USGS jointly fund the production of DOQ's; coverage is complete for more than one-half of the State. The DOQ's are distributed by the USGS on CD–ROM's by county. DOQ data for Douglas, Geary, Jefferson, Meade, Osage, Riley, Shawnee, and Stevens Counties are available from the USGS on CD–ROM.

The Kansas Department of Revenue, the NRCS, and the USGS are participating in a test and demonstration project in Osage County using DOQ's and land-ownership data for integrated agricultural analysis and other applications. This project will demonstrate how the activities of the mapping and geographic data communities can be organized to address earth science issues effectively.

## The Grassland Fire Danger Assessment

Grassland fires are a serious threat to agricultural and urban areas. Serious grassland fire danger conditions exist when grasses are dry and the weather is hot, dry, and windy. In response to the need for timely information on grassland conditions, the USGS provides to the Kansas State and Extension Forestry Offices vegetation condition or "greenness" information that is derived from satellite data. USGS satellite observations provide a weekly statewide update of greenness conditions. The greenness information also is sent to the National Weather Service in Topeka, where it is combined with daily weather information to forecast fire-danger conditions. Whenever severe conditions exist, current information is provided to emergency monitoring centers and the news media for broadcast to the public.

## Earth Science Information

The Earth Science Information Centers (ESIC's) provide information about USGS programs, products, and technological developments to the public. Two ESIC's are in Lawrence and they were established under a cooperative agreement between the USGS, the KGS, and the University of Kansas Space Technology Center. As part of the national ESIC network, these offices provide information on such earth science topics as cartography, geography, digital data, remote sensing, geology, geophysics, geochemistry, hydrology, geohydrology, aerial photography, and land use. They are 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 (NCGMP) provides funds to the KGS to do important geologic mapping in Kansas. The focus of the mapping is to increase an understanding of oil and gas fields, coal deposits, and aquifers. The geologic map data generated are archived at the State Survey level and within the National Geologic Map Data Base of the NCGMP.

## Geologic Studies in 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 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 mixture of smaller urban centers and the intervening rural areas that support intensive agriculture. Geologic constraints such as collapsing or expanding soils, landslides, and subsidence affect land use in the corridor, especially in urban areas. Past practices of, and future needs for, municipal and industrial waste disposal, including hazardous waste, is of concern. Erosion, sedimentation, and surface-water contamination from nonpoint-source discharge are major issues in agricultural and urban areas. The identification, protection, and extraction of construction materials present a continuing problem, as does reclamation of mined areas. The geologic information obtained from these studies is essential for understanding the carrying capacity of the land, for identifying the potential consequences of land uses on the natural system, and for determining methods to reduce or mitigate any conflicts or consequences.

## Oil and Gas Resources

As part of the National Petroleum Assessment, the USGS, in consultation with Kansas geological and energy agencies, assessed undiscovered conventional and unconventional natural gas and oil resources in the State. The estimates and data from the assessment document Kansas' role in the future availability of the Nation's energy resources.

## Surficial Geology

Kansas faces immediate and long-term land-use, land-management, engineering construction, and water-quality problems. The State requires new sources of construction materials and water. Human activities and land uses contribute to erosion, reservoir siltation, floods, landslides, and swelling and collapsing soils. The USGS, in cooperation with the KGS, is 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, and chemical, physical, and engineering characteristics of surficial deposits are being mapped.

## National Coal Resources Data System

Coal usage accounts for one-third of the total energy and more than 56 percent of the electricity generated in the United States. Even with improved energy conservation and increased natural gas use to meet increased energy demands, coal will continue to be a major contributor to the Nation's energy mix.

Federal, State, and regional planners, as well as scientists, industry, and other government agencies require current, credible, understandable, and standardized information about the location, quantity, and quality of the coal resources of the United States to provide the basis for optimum energy development and utilization policies. A joint venture between the USGS and the State Geological Surveys was initiated in 1975 to develop the National Coal Resources Data System (NCRDS), with the USGS providing the central hardware, software, and analytical capabilities and with the USGS and the states building and utilizing the data bases. Currently, cooperative projects are ongoing with 22 states that represent 98 percent of current U.S. coal production.

A cooperative project between the USGS and the Kansas Geological Survey was initiated in 1979 to collect, evaluate, and correlate drill-hole, mine, and outcrop data; to encode and enter geologic and geochemical data into the NCRDS; and to access NCRDS data bases and software to generate new maps, reports, and resource assessments for the State. The continued data collection and support of the NCRDS data bases provide baseline information that can be accessed for annual State resource updates.

The locations and quality of coal beds are being identified by the National Coal Assessment, which is being conducted by the USGS in cooperation with State Geological Surveys including the Kansas Geological Survey. National Coal Assessment information may be useful to regulatory and land-management agencies, industry, and academic researchers.

## Biological Studies in the Great Plains of Kansas

The USGS Biological Resources Division (formerly the National Biological Service) conducts research and provides scientific data needed for sustained economic benefits from and conservation of the grassland ecosystems of the central Great Plains. USGS research includes studies by the Northern Prairie Science Center, which is studying the distribution and movement patterns of the swift fox, a species of special concern that has been extirpated from much of its former range, and documenting the wildlife values of the Conservation Reserve Program (CRP) for ring-necked pheasants in the State. The CRP has removed about 36 million acres nationally of marginal farmland from agricultural production, thus enhancing the value of that acreage as food and cover for wildlife. Other USGS activities include gathering information on migratory shorebirds in the Cheyenne Bottoms wetlands, which is used as a resting and feeding area during migration; evaluating the effects of military training activities on the unique prairie habitat at Fort Riley; and biological sampling and collecting in the Ozark Plateau region as part of the NAWQA Program. Scientists of the Kansas Cooperative Fish and Wildlife Research Unit at Kansas State University conduct research on grasslands, fisheries, migratory birds, and landscape ecology of the Great Plains while teaching and training graduate students for the natural resources profession.

# 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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