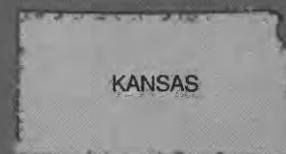


# United States Geological Survey

## Programs in Kansas



*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.*

The customers of the U.S. Geological Survey (USGS) are the citizens of Kansas and the Nation, and the local, State, and Federal agencies that manage the State's natural resources. In gathering and distributing natural-resources information, the USGS cooperates with more than 40 local, State, and Federal agencies in Kansas. Cooperators include State natural-resource agencies, public-health agencies, county and municipal public works departments, water and sanitation districts, and other Federal agencies. When local and State agencies are involved in cooperative projects, many activities typically are funded on a matching-funds basis (up to 50:50 sharing of costs).

The USGS also provides support to the Kansas Water Resources Research Institutes, which conduct programs of research, education, and information and technology transfer at Kansas State University in Manhattan and at the University of Kansas in Lawrence.

The USGS provides impartial information on water, energy, mineral, and land resources, and on natural hazards to our customers in Kansas and throughout the Nation. This information is provided to help our customers solve problems related to natural resources and hazards. Some examples of the types of information provided by the USGS and how this information helps solve problems in Kansas are described below.

### Landscape Characteristics Information

Assessment of water, energy, mineral, and land resources and assessment of natural hazards require a variety of types of information. Widely used sources of information include maps, photographs, and satellite images of land-surface fea-

tures. This information is collected through the USGS National Mapping Program and is archived and distributed at the Earth Resources Observation Systems Data Center near Sioux Falls, South Dakota.

### National Mapping Program

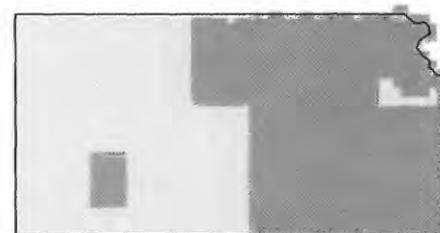
Among the most popular and versatile products of the USGS are its topographic maps at a scale of 1:24,000 (1 inch on the map represents 2,000 feet on the ground). These maps depict natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Contour lines are used to depict the elevation and shape of terrain. Kansas is covered by 1,563 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.

For many years the USGS has jointly funded and produced maps and, more recently, computerized (digital) geographic data products (fig. 1) in cooperation with Federal and State governmental agencies in Kansas. Agencies that are currently participating in the joint production of geographic data include the Kansas Geological Survey, the Kansas Water Office, and the U.S. Department of Agriculture's (USDA's) Natural Resources Conservation Service. Currently, geographic spatial data compilation in Kansas that is partially funded in partnership with the USGS includes 1:100,000-scale topographic county maps, 1:24,000-scale Public Land Survey System digital data, 1:12,000-scale digital image files, and 1:24,000-scale

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digital elevation models. The resulting digital, geographic data products serve a myriad of geographic information system (GIS) uses for addressing various natural-resources, conservation, waste-disposal, emergency, hazard, and other environmental and societal issues confronting the State's citizens.



### EXPLANATION

□ In work  
■ Completed

**Figure 1.** Public Land Survey System, Digital Line Graph (DLG) coverage at the 1:24,000 scale for the State of Kansas.

The Kansas GIS Policy Board is a gubernatorial appointed body established to encourage initiatives, coordinate efforts, avoid duplication, develop guide-

lines, promote policies and standards, promote education and training, and make recommendations on the use of GIS technology to benefit the entire 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 Kansas Water Office, through a joint funding agreement with the USGS, is co-producing the Public Land Survey System digital data statewide. These data are being produced as part of the State's effort to acquire various data layers for GIS data-base development, forecast analyses, and problem-solving applications by using GIS technology.

The USDA's Natural Resources Conservation Service, the Kansas Department of Revenue, and the USGS are jointly funding the production of 1:12,000-scale digital mapping photographs. Currently, coverage for approximately the eastern one-third of the State has been authorized for production.

### **Earth Observation Data**

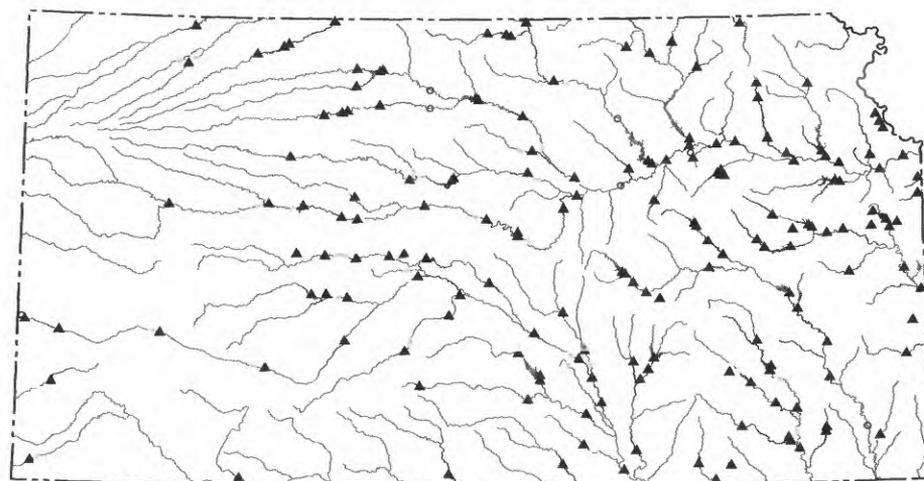
Through its Earth Resources Observation Systems (EROS) Data Center, the USGS distributes a variety of aerial photographs and satellite-image data products that cover the entire State of Kansas. Mapping photographs of some sites go back at least 40 years. Satellite images can be used to study changes in landscapes dating from 1972.

### **Water-Resources and Hazards Information**

One of the most important natural resources in Kansas is water. The following issues illustrate how the USGS provides information to Kansans that helps them better utilize their water resources.

#### **Demand for Water**

Demand for water in Kansas is frequently greater than the supply. The USGS provides critical information about supply and demand to State agencies responsible for water-resources management, such as the Kansas Department of Agriculture's Division of Water



#### **EXPLANATION**

- ▲ Complete-record streamflow-gaging station
- National Stream-Quality Accounting Network station

**Figure 2.** Location of streamflow gages and water-quality monitoring sites.

Resources and the Kansas Water Office. The USGS established and operates a data-collection network of 161 streamflow gages, water-quality monitoring sites (fig. 2), and about 1,400 ground-water level observation wells. This network provides information necessary for quantifying the amount of water available for various uses.

The USGS, in cooperation with the Division of Water Resources, 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 to reconciling interstate conflicts over water in rivers that cross State boundaries. The information provided by the USGS helps water managers balance supply and demand and the citizens of Kansas to prepare for water-supply crises in the future.

#### **Floods**

During severe flooding, damage can be substantial in rural and urban areas. Real-time flood information, such as watches and warnings issued by the National Weather Service, use data collected by the USGS in a network of 117 earth-satellite linked and 22 telephone linked 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. This diverse group of users needs the streamflow data to manage the State's reservoir system to reduce the damage caused by floods, to determine potential flooded areas, 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.

#### **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 the quality of surface water and ground water in some areas. The USGS has played an important role in the assessment of the effects of urbanization on water quality by determining the effects of landfills on ground-water quality and by evaluating the effects of urban stormwater runoff on surface-water quality. This information can be used by municipal planners to decide how to manage the effects of present and future development.

#### **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 fresh-water 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 Kansas Water Office and the Division of Water Resources to identify sites of saltwater intrusion. This information is used for the location of new water supplies.

### **Effects of Agriculture on Public-Water Supply**

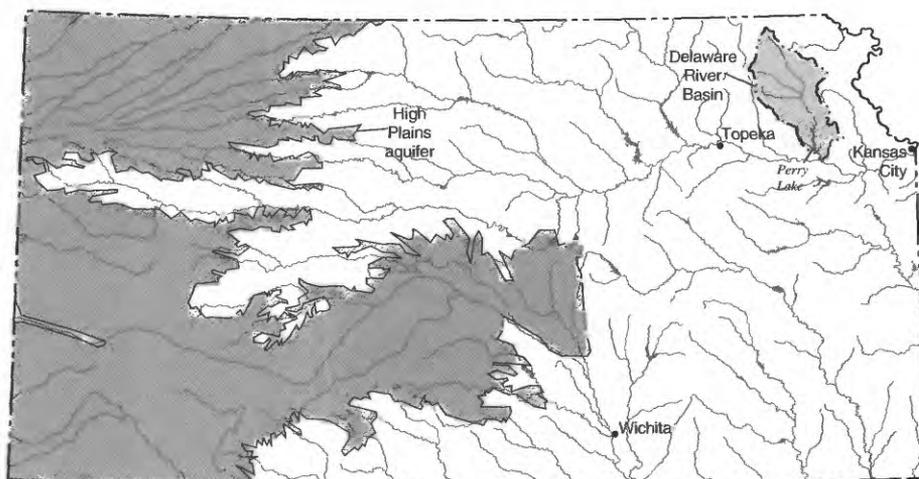
Modern agricultural practices use pesticides and fertilizers to produce crops economically, but these chemicals have been detected in several rivers and reservoirs used as public drinking-water supplies.

The USGS is providing water-resources information to several State agencies (including 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 throughout the State. USGS measurements of stream-flow also are an important tool in computing chemical loads, and contribute to understanding the sources and movement of pesticides and nutrients in water.

The USGS, together with the Kansas State Conservation Commission, is studying whether particular agricultural management practices can help minimize the amount of pesticides and fertilizers transported into streams. The Delaware River Basin (fig. 3) was established as a Pesticide Management Area (the first such management area in the Nation) using information previously collected as part of the USGS's National Water-Quality Assessment Program. Pesticide concentrations currently are being monitored in the Delaware River watershed and below Perry Lake, which receives water inflows from the Pesticide Management Area, to determine how management practices affect pesticide concentrations in the lake.

### **Depletion of Water in the High Plains Aquifer**

Many farmers in western Kansas irrigate their crops because precipitation



**Figure 3.** Location of selected water-resources study areas.

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 (Ogallala) aquifer (fig. 3). The steady decline in water levels in the aquifer over the past several decades (fig. 4) has prompted stringent management practices to avoid future water shortages.

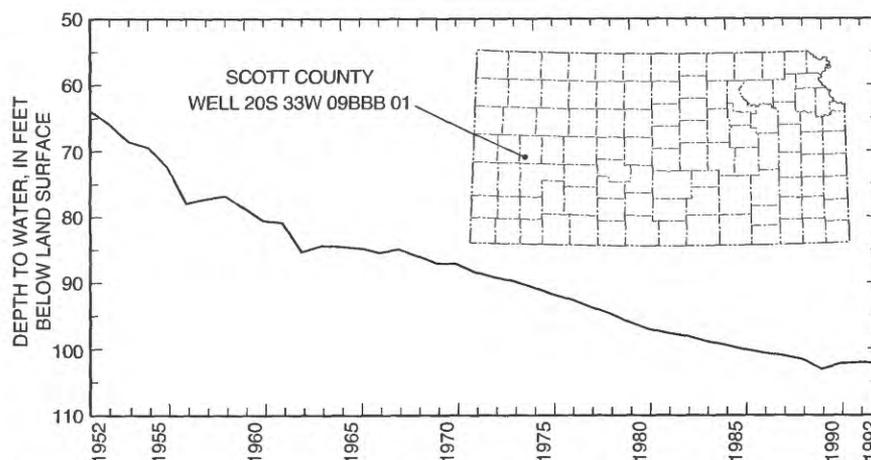
The USGS, in cooperation with the Kansas Geological Survey and the Division of Water Resources, monitors the High Plains aquifer by measuring water levels in about 1,300 wells. These data are provided to the public annually so that the quantity of water in the aquifer can be monitored and the effectiveness of water-management measures can be assessed. The USGS also developed a computer simulation model of the aqui-

fer that has been used to understand the factors that cause water-level declines.

### **Geologic-Resources and Hazards Information**

#### **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 mix of smaller urban centers and the intervening rural areas that support intensive agricultural activities. A variety of geologic issues affect land use



**Figure 4.** Declining water levels in the High Plains aquifer in Scott County, western Kansas, 1952-92.

in the corridor. Geologic constraints such as collapsing or expanding soils, landslides, and subsidence all present problems, especially in urban and urbanizing areas. Disposal of municipal and industrial wastes, including hazardous wastes, is of concern, in terms of past practices and future needs. Erosion, sedimentation, and contamination from non-point-source discharge are major issues in agricultural and urbanizing areas. The identification, protection, and extraction of construction materials present a continuing problem, as does reclamation of mined 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 reduce or mitigate any conflicts or consequences.

### **Studies in Surficial Geology**

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

### **Oil and Gas Resources**

In an effort to assess the future energy-resource potential of the Nation, the USGS is conducting a National Petroleum Assessment of undiscovered conventional and unconventional natural gas and oil resources. The USGS has the personnel, expertise, physical resources, and experience to produce unbiased estimates of our National endowment. With these estimates, Federal energy planners can chart a course for the future. Kansas currently is being evaluated for its ability to add more resources to our Nation's energy reserves. USGS scientists consult and work with their counterparts in Kansas' geological and energy agencies.

### **National Coal Resources Data System**

Federal, State, and regional planners, as well as scientists, industry, and other Government agencies require current, credible, understandable, and standardized information on 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 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 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 State 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 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 and recast to meet many foreseen and even unforeseen needs as they arise.

### **Benefits of Cooperative Studies**

The USGS provides the citizens of Kansas with the information they need to utilize their natural resources. The activities of the USGS in Kansas exemplify how government agencies can work together to reduce duplication of effort and resources used while increasing efficiency in managing their respective responsibilities.

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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.