Carl Collins and Brian Klager, hydrographers, Wichita Field Office, sediment sampling above Cheney Reservoir, North Fork of Ninnescah River, July 6, 2010. Photo by Beatrice Ritchie, Wichita Field Office.

Water Science Programs in Kansas

The U.S. Geological Survey (USGS), an agency within the U.S. Department of the Interior, serves the Nation through its mission of providing reliable, unbiased scientific information on resource issues where natural science can make a substantial contribution to the well-being of the Nation and the world. USGS mission areas include: Climate and Land Use Change, Core Science Systems, Ecosystems, Energy, Minerals, and Environmental Health, Natural Hazards, and Water (*http://www.usgs.gov/start_with_science/*). This information sheet highlights selected Water Science Programs in Kansas.

Water Programs in Kansas have a long history

The USGS has collected hydrologic information in Kansas since 1895 with the first USGS Cooperative Water Program funding agreement for 6 streamflow gages with the Kansas Water Board. USGS collects streamflow and gage-height data; reservoir content; water-quality, suspended sediment water-quantity; and groundwater level data. Hydrologic studies are conducted on national, regional, statewide, and local levels. The USGS in Kansas works cooperatively with 31 Federal, State, and local agencies, such as the Kansas Water Office, the U.S Army Corps of Engineers, and the City of Wichita.

Who and where are we?

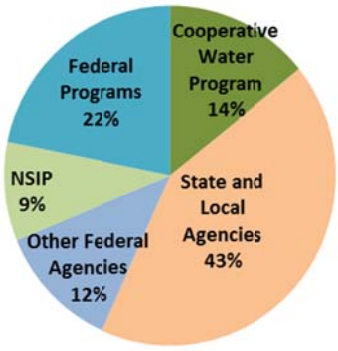
There are 75 USGS employees located in Kansas. The main water science center office and laboratory are in Lawrence and field offices are located in Hays and Wichita, Kansas.

USGS Activities in Kansas

National Programs

- Ecosystems research into occurrence and movement of pesticides; antibiotics; and algal toxins, taste and odor compounds in the environment
- National Streamflow Information Program
- Streamflow and water quality data visualization
- Application of hydrologic modeling to USGS National Water-Quality Assessments
- Sediment research
- National evaluations of water use

FY12 ~$7.7 million FUNDING SOURCES



Statewide Programs

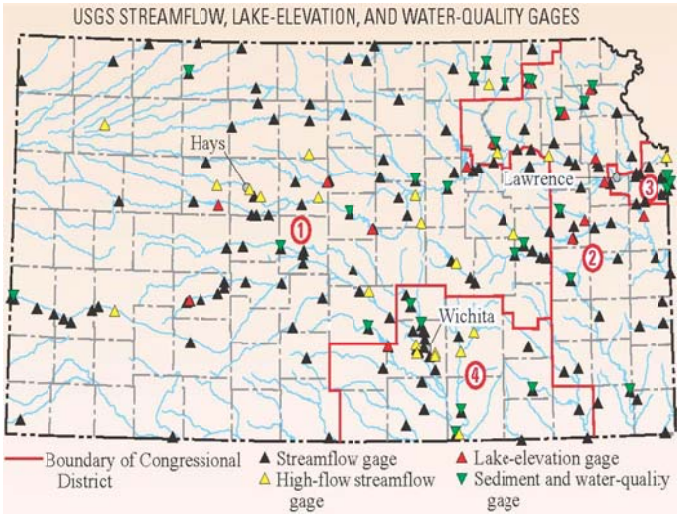
- Streamflow monitoring at more than 200 locations for flood forecasting, reservoir operations, and many other uses
- Monitoring of real-time water-quality conditions at 25 locations
- Assessment of sedimentation in Kansas reservoirs
- Compilation of Kansas municipal and irrigation water-use data

Streamflow Information

Continuous real-time streamflow information is a vital Kansas asset that can safeguard lives and property and ensures adequate water resources for a healthy State economy. The USGS operates more than 200 streamflow-monitoring stations in Kansas. These stations are funded through the National Streamflow Information Program and the Cooperative Water Programs in partnerships with local, tribal, State, and other Federal agencies. The USGS real-time water-monitoring network provides long-term, accurate, and impartial information that meets the needs of customers. This was particularly evident during the drought that began in 2011 and during the 2011 flooding of the Missouri River. http://waterwatch.usgs.gov/

Uses of Continuous Real-time Streamflow Information

- State and local water-management and supply agencies—to plan, monitor, regulate, and adjust water withdrawals
- National Weather Service River Forecast Centers—to determine flood stages for various streams and to help forecast when and where streams will crest during floods
- U.S. Army Corps of Engineers—to most efficiently schedule reservoir releases
- Federal Emergency Management Agency—to delineate flood-prone areas, develop flood-insurance rates, and address emergency-response needs before, during, and after flooding
- Fishermen, swimmers, and boaters—to monitor water conditions for safe, optimum recreational use



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Sediment Science in Kansas

In Kansas and the rest of the United States, excessive sediment cause degraded water quality and aquatic habitat, increased water-treatment costs, decreased channel capacity and degradation, and loss of water-storage capacity in reservoirs. Sediment carries some contaminants such as nutrients (nitrogen and phosphorus) and can be a source of contaminants to water and biota. Loss in reservoir water-storage capacity led the State of Kansas through the Kansas Water Plan to begin a Reservoir Sustainability Initiative to preserve water-supply storage in reservoirs for as long as possible. Scientists study sediment transport from watersheds and river channels and effects of accumulation of sediment and associated in reservoirs. This is important to understand because accumulation can lead to algal blooms and other water-quality issues. The USGS role in sediment science has been to determine storage capacity trends in sediment and water quality for reservoirs; sources of sediment, and operate a statewide monitoring network of stream sediment transport in cooperation the Kansas Water Office.
http://ks.water.usgs.gov/studies/sedsci/

Key findings:

- Some reservoirs are filling with sediment at rates faster than designed and decreasing storage for water supply
- Streambanks are a substantial source of sediment to streams and downstream reservoirs
- Even with implementation of many land management practices, sediment transport from fields remains large
- Nutrients are transported with sediment and in some instances concentrations have increased with time potentially leading to increased frequency of algal blooms.

City of Wichita Water Supply

In 1995, the City of Wichita determined the projected city water needs would not be met into the 21st century. To meet future water demands, the City began Aquifer Storage and Recovery (ASR) coupled with greater use of Cheney Reservoir—the city's existing surface water supply—will help Wichita provide water for more than 600,000 users by the year 2050. The project will be done in four phases, and will add up to 65 billion gallons of water to the aquifer as well as create a hydraulic barrier to slow down the intrusion of saltwater into the groundwater supply. Phase 1 was completed in September 2006. The USGS role in the ASR project includes monitoring water quality changes, determining changes in the *Equus* Beds aquifer storage, and measuring streamflow availability for ASR use.
http://ks.water.usgs.gov/Kansas/studies/equus/

Key findings:

- Through July 2010, water storage in the *Equus* Beds aquifer has recovered more than 63 percent of lost storage volume since January 1993 largely because of decreased aquifer pumpage by Wichita and increased reliance on Cheney Reservoir for City of Wichita water supply. However, as of July 2011, 71 percent of the recovered storage volume was lost due to drought conditions and increased irrigation pumpage in the *Equus* beds aquifer.
- Between 1960 and 1992, chloride has moved about 3 miles from the saltwater contamination area near Burrton toward municipal and irrigation production wells. Chloride movement has slowed to less than 0.5 miles since 1992, because of water-level recoveries. http://ks.water.usgs.gov/studies/equus/

Harmful Algal Blooms

Harmful algal blooms (HABs) can occur anytime water use is impaired because of excessive accumulations of algae. In freshwater, the majority of HABs are caused by cyanobacteria (blue-green algae). Cyanobacteria cause a multitude of water-quality concerns, including the potential to produce taste-and-odor causing compounds and toxins that are potent enough to poison animals and humans. Taste-and-odor compounds and toxins are of particular concern in lakes, reservoirs, and rivers that are used for either drinking water supplies or full body contact recreation, result in increased treatment costs and loss of aquacultural and recreational revenue. During 2011, KDHE posted advisories or warnings at more than 20 Kansas reservoirs. Understanding the environmental factors associated with the occurrence and concentration of taste-and-odor compounds and cyanotoxins is key to lake management and drinking water treatment decisions and minimization of human and environmental health risks.
http://ks.water.usgs.gov/studies/qw/cyanobacteria/

Key findings:

- A study done in September-October 2011 showed that cyanobacteria and associated toxins and taste-and-odor compounds from upstream reservoirs were transported in the Kansas River.
- A complex mixture of compounds affect drinking and recreations water quality. Biological, physicochemical, hydrological, and meteorological processes influence the occurrence of cyanos and associated toxins and taste-and-odor compounds, as detected in a study done on Cheney Reservoir, drinking water supply for the City of Wichita, during the early 1990's. http://ks.water.usgs.gov/studies/qw/cheney/

USGS Programs in Congressional Districts

Congressional District 1

- Water-quality conditions in Cheney Reservoir and watershed
- Groundwater quality in the glacial till aquifer of northeast Kansas
- Kansas River Algal Study
- Long-term monitoring of Cheney watershed and reservoir

Congressional District 2

- Monitoring of hydrologic conditions at Fort Riley
- Groundwater quality in the glacial till aquifer of northeast Kansas
- Baseline sediment studies in Perry Lake watershed
- NSIP streamgage installed on Lyon Creek near Junction City
- Sediment transport in Clinton Lake and watershed
- Sediment transport in Hillsdale Reservoir and watershed
- John Redmond Reservoir sediment study
- Neosho River streambank stabilization study
- Kansas River Algal Study

Congressional District 3

- Effects of land use on biology of streams in Johnson County
- Effects of stormwater on water quality in Johnson County streams
- Effects of wastewater treatment facilities on Indian Creek
- Sediment transport in Hillsdale Reservoir and watershed
- Kansas River Algal Study

Congressional District 4

- Water-quality and quantity effects of Equus Beds ASR project
- Flood warning and inundation mapping on Cowskin Creek