

Continuous Real-Time Water Information— A Vital Kansas Asset

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Continuous real-time information on streams, lakes, and ground water is a vital Kansas asset that can safeguard lives and property and ensure adequate water resources for a healthy State economy. The U.S. Geological Survey (USGS) operates more than 190 water-monitoring stations that keep watch on Kansas streams, lakes, and ground water. The majority of these stations are jointly funded in partnerships with local, tribal, State, or other Federal agencies. The USGS real-time water-monitoring network provides long-term, accurate, and unbiased information that meets the needs of many customers. Whether the customer is a water-management or water-quality agency, an emergency planner, a power or navigational official, a farmer, a canoeist, or a fisherman, all can benefit from the continuous real-time

water information gathered by the USGS and made available on the World Wide Web at URL: <http://ks.waterdata.usgs.gov/nwis>

CONTINUOUS REAL-TIME DATA

The USGS has collected hydrologic data in Kansas since 1886. The first USGS streamflow-monitoring station in Kansas, Cimarron River near Liberal, began recording data on October 1, 1895. Over time, the USGS monitoring network (fig. 1) has changed as new needs for water information have emerged and new technologies for data collection, analysis, and dissemination have evolved. In recent years, the USGS has focused on adapting new communication technologies to better serve its



Fishing on the Kansas River below Bowersock Dam in Lawrence, Kansas

customers.

The most profound change in the USGS water-monitoring network in Kansas has been the development and widespread use of continuous near real-time data. All continuous monitoring stations in Kansas are equipped with automated data-collection platforms (DCPs) that use satellite technology to transmit data 24 hours a day directly to the USGS office in Lawrence and then onto the World Wide Web. These stations, equipped with real-time

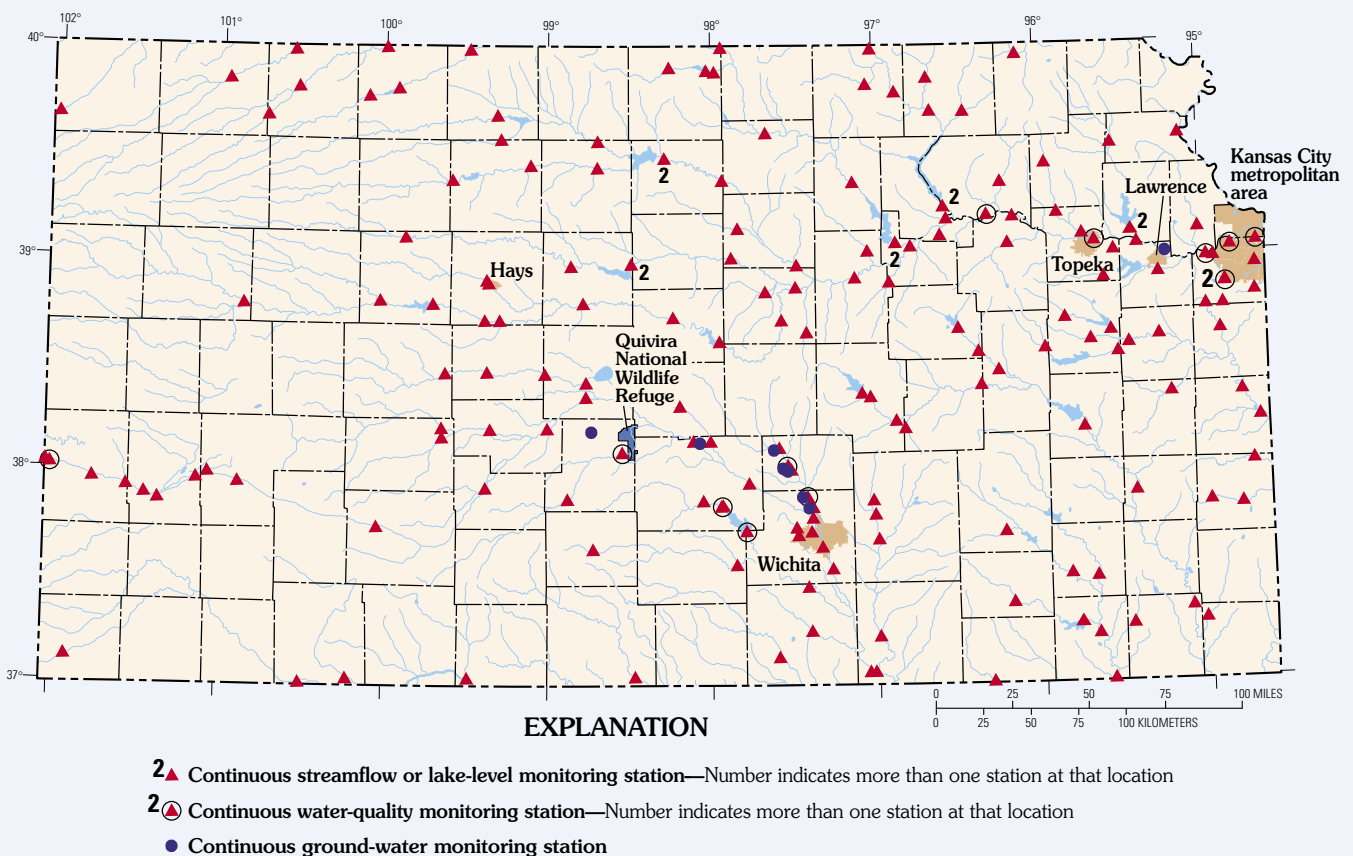


Figure 1. Location of U.S. Geological Survey continuous near real-time water-monitoring stations in Kansas as of 2003.

telemetry, provide critical information for reservoir operations, river forecasting, and flood warnings and facilitate water-supply management, environmental monitoring, and recreational use of the State's water.

Continuous real-time streamflow, lake-level, ground-water, and water-quality data for Kansas can be accessed at URL:

<http://ks.waterdata.usgs.gov/nwis>

USES OF CONTINUOUS REAL-TIME WATER INFORMATION

Continuous real-time water information from the USGS is used by:

- **State and local water-management and supply agencies**—to plan, monitor, and adjust water-withdrawal and treatment strategies in protecting public health.
- **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 schedule reservoir releases that are designed to lessen the amount of potential damage from overflowing streams and to prevent water from backing up into smaller tributaries when the main stem is already bank-full.

- **Kansas Department of Transportation**—to safely and efficiently design bridges, highways, and culverts that will convey sufficient streamflow so that roadways and bridges remain above water during flooding and escape structural damage.

- **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.

FROM THE REAL WORLD TO YOUR COMPUTER SCREEN

The remainder of this fact sheet provides brief descriptions of the various types of USGS water information for Kansas that are available in near real time on the World Wide Web. For each water-monitoring station, the Web information includes a site description, a list of the water characteristics (parameters) that are measured, and a site location map.

Real-Time Streamflow and Lake-Level Information

Continuous, near real-time stream discharge and water-level information is currently available on the World Wide Web for 171 monitoring stations on streams and 14 locations on lakes in Kansas (fig. 1). This real-time information can help Web viewers decide when water levels are too low for specific activities such as boating or fishing, when conditions are unsafe such as dur-

ing flooding, when those who withdraw water for irrigation and drinking-water supply may need to use alternative sources, when emergency management officials may need to issue flood warnings or close roads in an area, and when reservoir operators may need to open or close outflow gates.

Instantaneous discharge (streamflow) and gage-height (water-level or stage) data recorded at the monitoring stations are relayed via satellite to USGS computers and processed every 4 hours or more frequently during floods for distribution on the World Wide Web. Access real-time streamflow and lake-level information at URL:

<http://ks.waterdata.usgs.gov/nwis/sw>

Real-Time Ground-Water Information

Currently, continuous real-time ground-water information from eight monitoring wells in Kansas (fig. 1) are available on the World Wide Web at URL:

<http://ks.waterdata.usgs.gov/nwis/gw>
Available information on ground water

may include ground-water levels, water temperature, barometric pressure, and specific conductance recorded at 1-hour intervals and transmitted via satellite telemetry to the USGS office in Lawrence, Kansas.

Real-Time Water-Quality Information

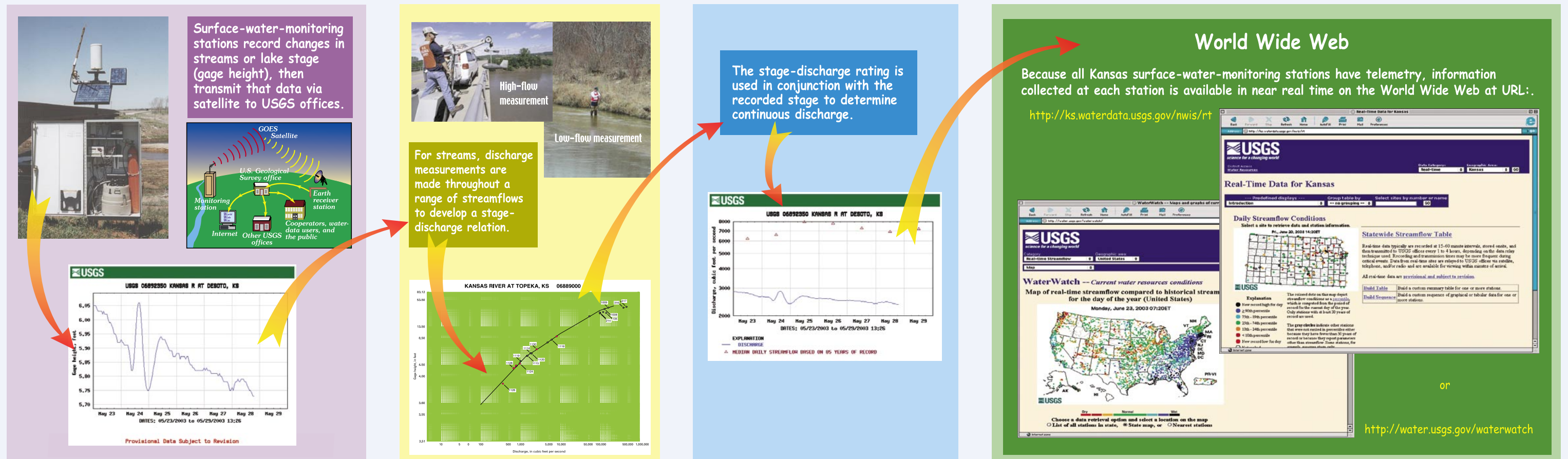
At selected streamflow- and lake-monitoring stations, the USGS maintains instruments that continuously record physical and chemical characteristics of the water, including specific conductance, pH, temperature, turbidity, fluorescence (chlorophyll concentration), and dissolved oxygen concentration. Supporting data such as air temperature and barometric pressure are also monitored at some stations. This water-quality information is recorded at 5-minute to 1-hour intervals using the DCPs and uploaded to the USGS computer database every 4 hours via satellite.

For some monitoring stations (currently 13, see fig. 1), the continuously

recorded information and data from periodic collection of water-quality samples are being used to develop statistical relations between certain properties of water that can be measured continually in real time and chemical constituents of concern, such as bacteria densities and atrazine, chloride, total nitrogen, and total phosphorus concentrations, that cannot be measured continuously as yet. The statistical relations used to estimate the concentrations of constituents of concern are specific to each monitoring station.

Although there are limitations, these real-time estimates of water quality provided by this new application of regression analysis can have considerable utility for protecting human health and wildlife populations. For example, real-time water-quality estimates from the monitoring network eliminate the waiting time inherent in chemical analyses reported by a laboratory and provide continuous concentrations and loads for monitored sites. Local water suppliers can then alter treatment of the water

Near Real-Time Streamflow and Lake-Level Information



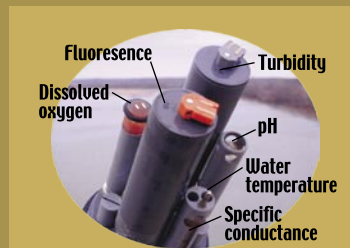
Schematic diagram showing flow of continuous near real-time streamflow and lake-level information.

Near Real-Time Water-Quality Information

Water-Quality Sample and In-Stream Water-Quality Monitor



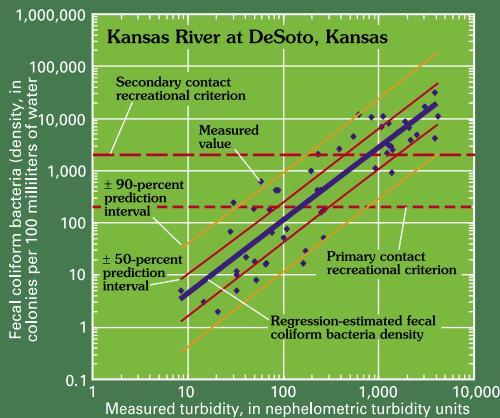
Results from laboratory analysis of water-quality samples



Measured water properties

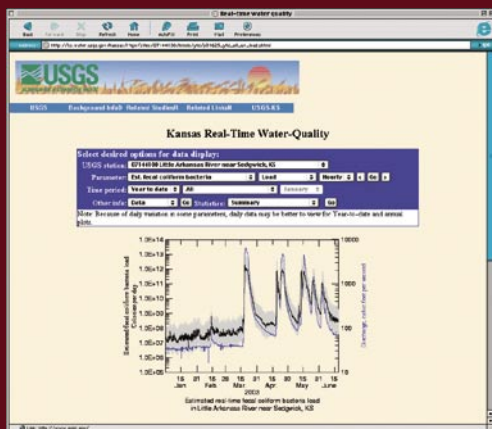
Simple Linear Regression Analysis

Results from laboratory analysis of water-quality samples are related to sensor measurements to develop site-specific models for estimating constituent concentrations.



World Wide Web

Real-time sensor measurements and regression analysis are used to estimate constituent concentrations. The sensor measurements and estimates are updated hourly and displayed on the World Wide Web.



<http://ks.water.usgs.gov/Kansas/rtqw>

withdrawn for public supply to meet the changes in water quality. The real-time water-quality monitoring network is also used to help preserve the recreational benefits of area waters. As part of the ongoing Total Maximum Daily Load (TMDL) program administered by the Kansas Department of Health and Environment, real-time water-quality information is used to:

- immediately identify undesirable levels of water-quality constituents in source water;
- more accurately estimate loads for TMDL development;
- optimize visits to water-quality sampling sites; and
- adjust management strategies rapidly when high concentrations of water-quality constituents may affect the quality of a water supply.

A TMDL is an estimate of the maximum pollutant load (material transported during a specified time period) from point and nonpoint sources that a receiving water can accept without exceeding water-quality standards.

For more information on real-time water-quality information available for Kansas, visit the USGS Web sites at URL:

<http://ks.waterdata.usgs.gov/Kansas/rtqw>
or
<http://waterdata.usgs.gov/ks/nwis/qw>

KANSAS AND THE PEOPLE BENEFIT

The water resources of Kansas are in many ways the lifeblood of our State and represent a vital asset that meets countless needs of many people every day. Accurate, timely scientific information is needed to assess, manage, and use the State's waters to their greatest benefit.

For more information, visit the USGS Web site at URL:

<http://ks.water.usgs.gov/>

or contact:

District Chief
U.S. Geological Survey
4821 Quail Crest Place
Lawrence, Kansas 66049-3839
(785) 842-9909

E-mail: dc_ks@usgs.gov

Schematic diagram showing flow of continuous near real-time water-quality information from monitoring stations to the World Wide Web.