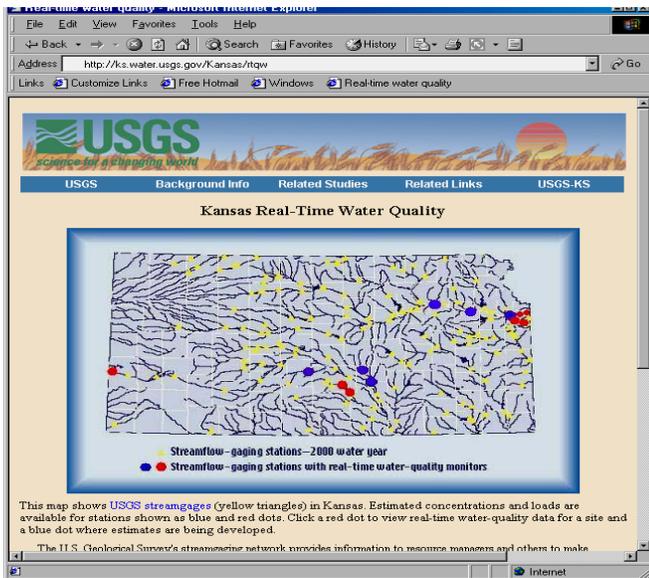


Real-time water-quality monitoring system in Kansas

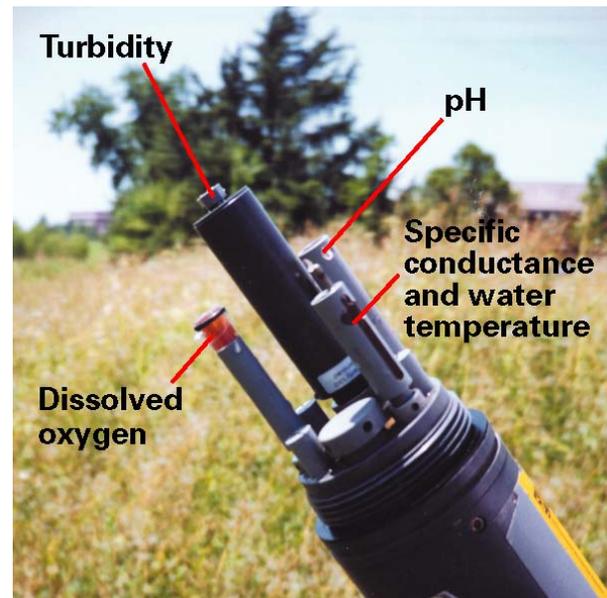


<http://ks.water.usgs.gov/Kansas/rtqw/>

U.S. Geological Survey (USGS) development of a real-time water-quality monitoring system for 13 sites in Kansas began in 1998 in cooperation with the city of Wichita as part of the *Equus* Beds Groundwater Recharge Demonstration Project. Real-time estimates from the monitoring system eliminates the waiting time inherent in chemical analyses to be reported by a laboratory and provides continuous concentrations and loads. The city of Wichita can then alter treatment of the water to meet the changes in the water quality in the Little Arkansas River and prevent degradation of the *Equus* Beds aquifer by artificial recharge.

Real-time water-quality information also is used by water suppliers on the Kansas River from Wamego through Kansas City to adjust water treatment. A real-time water-quality monitoring system has been installed in the Olathe Lake watershed to assist the city of Olathe in predicting when taste and odor problems may occur and allow treatment of the water before it is distributed to the public. This system also is used to help the city of Olathe minimize water-quality effects to benefit water supply and preserve the recreational benefits in the lake and Cedar Creek. In September 2002, two sites were added to the network in Johnson County, Kansas, to aid in quantifying the continuous chemical concentrations

and loads from stormwater and to preserve recreational benefits in urban green-belt corridors. As part of the ongoing Total Maximum Daily Load (TMDL) program in Kansas, real-time water-quality information is used to determine the optimal timing for sample collection and to monitor both point and nonpoint sources of pollution in Kansas by using the continuous information to estimate chemical loads in Kansas streams.



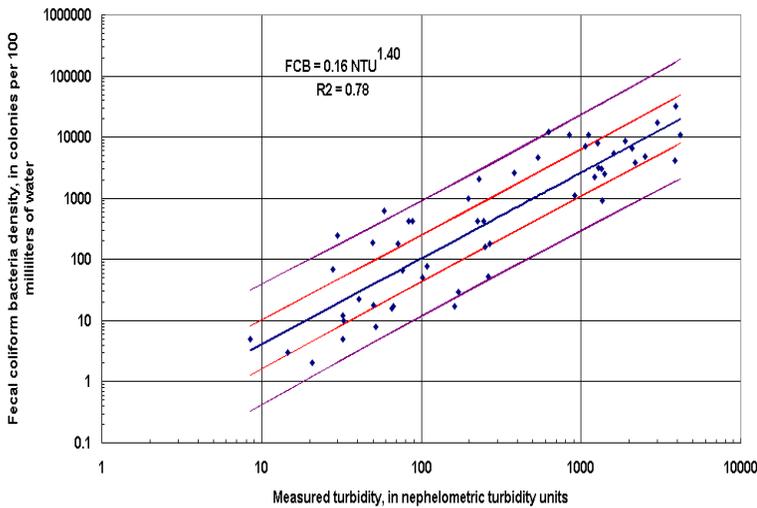
Water-Quality Monitor

Real-time water-quality information in the monitoring system includes hourly measurements of streamflow, specific conductance, pH, water temperature, dissolved oxygen, and turbidity. Because sensor technology currently is not available to directly measure many chemicals of interest in a stream, statistical models are developed to link constituents in laboratory-analyzed samples with the in-stream continuous-sensor measurements. As the hourly sensor measurements are transmitted from the gaging stations to the USGS computers in Lawrence, Kansas, the models are applied and the computed estimates displayed to the web page. The uncertainty of the estimates also is documented so decisions made on the basis of the estimates can be put in proper management perspective.

Collection and analysis of bacteria samples take 24 hours with current analysis methods and can only

tell people what they were exposed to yesterday in the stream. Fisherman, boaters, and swimmers can use the real-time information to decide whether they want to pursue these activities.

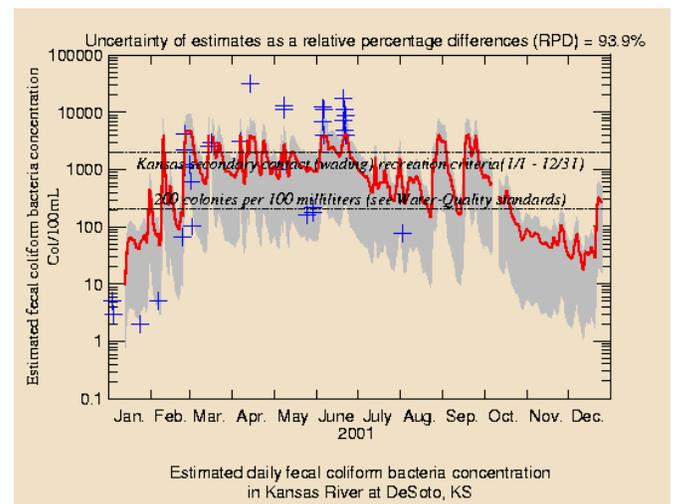
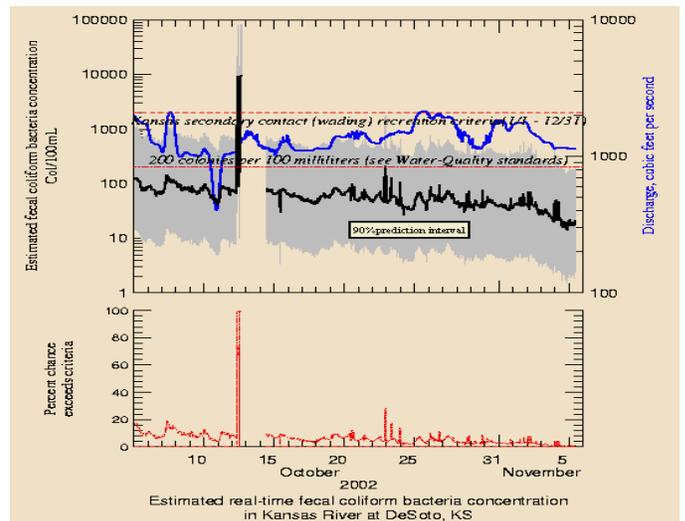
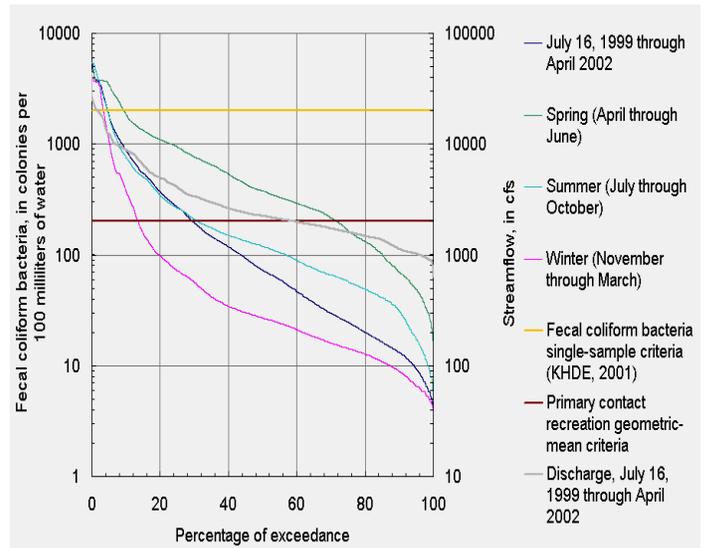
Example of estimated fecal coliform concentrations in the Kansas River near DeSoto, Kansas



Example graphs of estimated fecal coliform bacteria concentrations, duration of exceedance, and probability that concentrations exceed standards in the Kansas River are shown at right. Various time periods can be selected with estimates available since 1999. Real-time estimated concentrations have been developed for alkalinity, total dissolved solids, total suspended solids, chloride, sulfate, total organic nitrogen, total phosphorus, atrazine, and fecal coliform bacteria. Estimates for other chemicals are under development.

In the future, real-time estimates can be developed elsewhere in the United States using the USGS national network of more than 7,000 streamflow gages to provide real-time continuous information on the water quality of streams that can be used to improve the treatment of drinking water and to monitor the environment. As new sensors become available for direct in-stream measurement of chemicals of interest, the use of the network sites to provide continuous real-time water quality will be improved. Additional advances in technology are hoped to decrease the data uncertainty and the operation and maintenance requirements for the sensors. Improved methods for communicating the uncertainty and probability of concentrations exceeding water quality standards are in progress.

The 13-site real-time water-quality monitoring system in Kansas was developed by USGS in cooperation with the city of Wichita, city of Olathe, Johnson County Stormwater Management Program, Groundwater Management District No. 5, Kansas Department of Health and Environment, U.S. Fish and Wildlife Service, and U.S. Environmental Protection Agency.



For more information and publications on real-time water-quality monitoring, visit USGS Web site at: <http://ks.water.usgs.gov/Kansas/rtqw> or contact: Andy Ziegler, 4821 Quail Crest Place, Lawrence, Kansas 66049 telephone: 785-832-3539, email: aziegler@usgs.gov