WATERSHED INFLUENCES AND IN-LAKE PROCESSES—A REGIONAL-SCALE APPROACH TO MONITORING A DRINKING-WATER RESERVOIR, LAKE HOUSTON, TEXAS

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ABSTRACT

Lake Houston is a shallow, turbid reservoir with a mean depth of about 12 feet that is currently (2007) the source for about 20 percent of the water supply for Houston, Texas. The reservoir will become the city's primary source of water supply by 2010. With demand for Lake Houston water expected to increase, a comprehensive understanding of the factors that affect water quality of the lake is needed. Of particular interest are (1) the timing of large inflows from the surrounding watershed and (2) the in-lake processes that might affect drinking-water quality. In 2006, the U.S. Geological Survey and the City of Houston began research to evaluate the effects of watershed influences and in-lake processes by establishing a water-quality monitoring network for the Lake Houston watershed. Two major inflows and three sites on Lake Houston are continuously monitored for physical properties—pH, dissolved oxygen, water temperature, specific conductance, and turbidity. Monthly and event-driven discrete water-quality samples are collected and analyzed for constituents of interest (nutrients, taste-and-odor compounds, phytoplankton, actinomycetes bacteria, and manganese).

Preliminary data indicate the monitoring network can provide extensive information on the factors affecting water quality in Lake Houston. In October 2006, nearly 10 inches of rain fell in the Lake Houston watershed in about 36 hours. Using continuously measured turbidity as a tracer of inflows, data from the network indicate travel time from initial entry point to the downstream end of Lake Houston is approximately 2 days. Vertical profile data over a year has shown several occurrences of temporary stratification in shallow (less than 20 feet deep) areas of the lake. Stratification in water temperature and dissolved oxygen occurs rapidly and might persist for days, allowing nutrient release from lake-bed sediment. Analysis of discrete samples collected during periods of stratification indicates an increase in manganese concentrations near the bottom, a potential cause of taste-and-odor in drinking water. Preliminary data indicate that monitoring will increase understanding of factors affecting water quality of Lake Houston and might provide an early warning of changes that could affect drinking-water quality.

KEYWORDS
Water quality, lake, watershed, real-time monitoring