

News Release

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Surface- and Ground-Water Resources Are Vulnerable to Contamination in Karst Areas in the Lower Tennessee River Basin

A recent study by the U.S. Geological Survey indicates that the quality of surface and ground water sampled in the lower Tennessee River Basin generally meets Federal and State guidelines for drinking water and protection of aquatic life. However, caves, springs, and other karst landforms throughout much of the Basin increase the vulnerability of surface and ground water to contamination. Elevated concentrations of fecal indicator bacteria, nutrients, and the presence of mixtures of low levels of pesticides in streams and rivers and aquifers in the study area indicate that contaminants on the land surface can be transported rapidly into water resources in the karst areas of the Basin, according to USGS project leader Michael Woodside.

Stream and River Highlights

- Sediment from cultivated fields and eroded streambanks decreases water clarity and blankets the streambed, degrading spawning habitats for many fish, such as the saffron darter and laurel dace.
- During storms, runoff from pasture land and other nonpoint sources commonly contains bacteria that indicate fecal contamination, such as *Escherichia coli*. Concentrations of *Escherichia coli* in the Duck, Elk, and Flint Rivers frequently exceeded the United States Environmental Protection Agency recreational criterion during and up to 6 days following a storm event.
- Nonpoint sources, primarily livestock wastes and agricultural fertilizers, contribute the largest proportion (about 85 percent) of total nitrogen to streams and rivers in the lower Tennessee River Basin.
- Natural deposits of phosphatic limestone are a major source of phosphorus in streams and rivers in parts of the lower Tennessee River Basin.
- Fifty-two pesticides, including 38 herbicides, 11 insecticides, and 3 fungicides were detected in streams and rivers; however, aquatic-life guidelines were exceeded in less than 3 percent of the samples.
- Although uses of DDT and PCBs were discontinued more than 20 years ago, residues of these compounds continue to be detected in fish tissue throughout the Basin; however, less than 3 percent of the sites had concentrations that exceeded human health action levels or wildlife guidelines.

Ground-Water Highlights

- The presence of *Escherichia coli* in about 29 percent of the drinking-water wells and 80 percent of the springs sampled indicates that carbonate aquifers in the lower Tennessee River Basin are vulnerable to fecal contamination.
- Although about 45 tons per square mile of fertilizer is applied annually to cropland in the Eastern Highland Rim, concentrations of nitrate remain low (less than 2 milligrams per liter) in shallow monitoring wells installed near agricultural fields. The fine-grained soils and weathered rock that overlie bedrock in the Mississippian carbonate aquifer facilitate the natural removal of nitrate by denitrification.
- Although 35 pesticides were detected in wells and springs sampled in carbonate aquifers, none of the detected pesticides exceeded the USEPA drinking-water standards. Pesticides detected in the ground water reflect differences in land uses. General-use pesticides that are applied along road and powerline rights-of-way and in urban areas to control woody vegetation and weeds were detected at similar frequencies in the two carbonate aquifers sampled. Cotton, corn, and soybean production is concentrated in the rolling terraces and floodplains of the Eastern Highland Rim. The underlying aquifer in these areas had higher detection frequencies of agricultural pesticides than areas where pasture land is more prevalent.

This report summarizes major findings of a 1999—2001 assessment of water quality in the lower Tennessee River Basin. It is one of a series of reports by the U.S. Geological Survey National Water-Quality Assessment (NAWQA) Program that present major findings in 51 major river basins and aquifer systems across the Nation. Collectively, these 51 assessments of river basins and aquifer systems cover about one-half of the land area of the conterminous United States and include water resources that are available to more than 60 percent of the Nation's population. The water-quality conditions in the Lower Tennessee River Basin summarized in this report are discussed in detail in other reports that can be accessed from the lower Tennessee River Basin website at <http://tn.water.usgs.gov/lten/lten.html> For more information on the NAWQA program, visit the national NAWQA website at <http://water.usgs.gov/nawqa>

The report, "Water Quality in the Lower Tennessee River Basin, Tennessee, Alabama, Kentucky, Mississippi, and Georgia, 1999-2001", published as USGS Circular 1233 is available on the World Wide Web as downloadable portable document files (PDF) at: http://water.usgs.gov/nawqa/nawqa_sumr.html or in printed form (single copies of the report are at no cost) from: Branch of Information Services, P.O. Box 25286, Denver, CO 80225, or by fax request to: 303-202-4693. Please specify USGS report C-1233.

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