# *Identification of Sources of Fecal Coliform Bacteria and Nutrient Contamination in the Shoal Creek Basin, Southwestern Missouri*

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Missouri is a leader in the Nation in livestock and poultry production. According to the U.S. Department of Agriculture (USDA) 1997 Census of Agriculture, Missouri ranks second in the Nation in the number of beef cattle, sixth in the Nation in the number of hogs and horses, and 11th in the Nation in the number of broilers, pullet chicks, and pullets sold. Much of the beef and poultry production is concentrated in the southwestern part of the State in Barry and Lawrence Counties. From 1992 to 1997, beef-cattle production in Barry County increased in rank from 154th to 92nd in the Nation with more than 41,000 beef cattle inventoried in 1997. Broiler production increased during this same period, and Barry County increased in rank from 32nd to 20th in the Nation with more than 56 million broilers sold during 1997. Recent (1998) estimates place the number of broilers in Barry County between 90 and 100 million.

The rapid growth in the livestock and poultry industries has caused concern about impacts on surface- and ground-water quality in southwestern Missouri. Shoal Creek drains much of the intense beef-cattle and poultry-producing areas of Barry and adjacent counties, and more than 500 poultry houses are located within the upper 233 $mi^2$ (square miles) of the basin. Between 1992 and 1999, concentrations of fecal coliform bacteria in water samples collected by the Missouri Department of Natural Resources from the upper reach of Shoal Creek averaged more than 5,000 colonies per 100 mL (milliliters). These concentrations greatly exceed the Missouri limit of 200 colonies per 100 mL for the stated uses of Shoal Creek and have resulted in the upper Shoal Creek basin being placed on the 303(d) list of impaired water bodies in Missouri. The U.S. Geological Survey, U.S. Environmental Protection Agency, Region VII, and Missouri Department of Natural Resources recently (1999) initiated a cooperative study to identify the sources of bacterial contamination in Shoal Creek. This multi-discipline investigation combines standard water-quality assessment tools with emerging techniques, including microbial source tracking of *Echerichia coli* using ribotyping and pulse-field electrophoresis; identification of *Salmonella* by culture; and the determination of concentrations of optical brighteners, antibiotics, and hormones in water samples. A network of stream and tributary sites is being monitored monthly for discharge, field parameters, distribution of indicator bacteria, nutrients, and optical brighteners. An expanded suite of analytes including hormones, antibiotics, and major ions are being collected quarterly from all surface-water sites, four springs, and selected sites during storm events. Preliminary results suggest that the largest bacteria densities are not associated with known sewage treatment plant effluents. Of the one dozen *Escherechia coli* isolates initially examined, a single isolate of *E. coli* O157:H7 has been identified from a tributary site outside the Shoal Creek basin.

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