Bacterial persistence in streams

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A research team from the University of Tennessee (UT) has completed a study on an East Tennessee river to determine the connection between watershed hydrology and fecal bacteria statistical time series analysis. Shesh Koirala and colleagues report their findings in the July-August issue of the *Journal of Environmental Quality*.

The article presents a study of the temporal patterns and statistical persistence of total coliform based on data gathered from the Little River near an intake at a public water supply plant. The research was funded by UT's Center for Environmental Biotechnology.

The presence of bacteria from fecal pollution continues to be a problem in both rural and urban streams in the United States. Since 1990, when the U.S. EPA adopted the Coliform Rule, the presence of total coliform in water distribution systems has been closely monitored as an indicator of fecal pollution and possible bacterial or viral enteric pathogens. Many public water supply operations have monitored total coliform presence in streams near water intakes to assess the quality of the water prior to treatment.

Coliform bacteria are often present in nature, however bacteria in certain streams, particularly total coliform, may indicate on-going and ever-present issues related to fecal pollution and bacterial transport within watersheds. The UT research team investigated the temporal relationship between watershed processes and the presence of bacteria to better determine management needs related to potential pollution sources.

For the UT study, daily samples were collected from the Little River by water plant personnel, and the time series was analyzed to determine the persistence of total coliform in the stream. The analysis included both time-domain and frequency-domain approaches for comparison purposes. Koirala's team discovered that total coliform bacteria exhibit both short-term and long-term persistence at four-week and one-year intervals. Comparison of the total coliform time series with hydrologic data indicated that short-term persistence is dominated by runoff events, whereas longer-term persistence is likely related to baseflow, or groundwater, supply.

The UT research team's study will help scientists develop better conceptual models and provide direct benefit to local communities contending with fecal pollution. The UT team has been working closely with regional watershed groups to facilitate technology transfer and guide use of these data in managing watersheds. The researchers continue to build upon this study, as well as previous efforts, to devise better tools for quantifying fecal bacteria loads and defining temporal behavior in hydrologic watershed processes. These outcomes will assist local communities in improving management of their water supplies.

Source: American Society of Agronomy