

The battle of bacteria

AGENCIES, STAKEHOLDERS FOCUSING ON RESTORING WATER QUALITY

Bacteria is the No. 1 pollutant of water in Texas, causing many of the state's water bodies to be placed on the *Texas Water Quality Inventory and 303(d) List* for failing to meet contact recreation use standards.

Across the state, agencies and local stakeholders are identifying the sources of pollution in bacteria-impaired water bodies and are developing management strategies to restore water quality and remove these water bodies from the impaired-water list.

In 2006 the Texas Commission on Environmental Quality (TCEQ) and the Texas State Soil and Water Conservation Board (TSSWCB) established the joint task force on Total Maximum Daily Loads (TMDLs). Chaired by then director of Texas Water Resources Institute (TWRI) Dr. Allan Jones, its goal was to identify the best and most cost-effective and time-efficient tools for developing bacteria TMDLs and TMDL implementation plans (I-Plans). The task force recommended a three-tier

approach for stakeholders to use in implementing TMDLs. This step-by-step tiered approach is incorporated into numerous TWRI bacteria-related projects.

The *Improving Water Quality in Carters and Burton Creeks Project*, funded by TCEQ, is developing a TMDL and TMDL I-Plan, using Tier 1 objectives, to reduce *E. coli* loading. The Texas Institute for Applied Environmental Research is providing technical support for the TMDL development for these creeks, located in central Brazos County, and TWRI is working with local watershed stakeholders to develop the TMDL I-Plan.

Projects in Attoyac Bayou, Lampass and Leon rivers, and Big Cypress Creek watersheds are following the Tier 1 and Tier 2 steps.

Project members of the *Development of a Watershed Protection Plan for Attoyac Bayou* are collecting water quality and stream-flow data, conducting a watershed source survey and developing a comprehensive GIS inventory, and analyzing

water quality data using load duration curves and spatially explicit modeling. They are also conducting bacterial source tracking (BST) and evaluating the sources of *E. coli* that are contributing to the bayou's bacterial load. In addition, members are conducting a Recreational Use Attainability Analysis to determine the most appropriate water quality standard for the bayou, a subwatershed within the Upper Neches River Watershed.

Lucas Gregory, TWRI project manager, said local stakeholders are giving their input on possible sources contributing *E. coli*; collecting that information is a critical step in developing an effective watershed protection plan (WPP). TSSWCB funds the project through a Clean Water Act Nonpoint Source Grant from the U.S. Environmental Protection Agency (EPA).

In addition to the typical water quality data collection, *Lampasas and Leon River Bacterial Source Tracking Assessment Project*

AUGIE DE LA CRUZ WITH WATER MONITORING SOLUTIONS INSTALLS A STAFF PLATE AS PART OF THE WATER QUALITY MONITORING FOR THE BIG CYPRESS CREEK BACTERIA ASSESSMENT PROJECT.



members are collecting bacteria from known animal feces to include in the Texas *E. coli* BST library, Gregory said. TSSWCB funds this project through its State General Nonpoint Source Grant Program.

The goal of *Modeling Support and Bacterial Source Tracking for Big Cypress Creek Bacteria Assessment* is to remove Big Cypress Creek, located in northeast Texas, and its tributaries, Tankersley and Hart creeks, from the state's impaired water list. TSSWCB funds this project from its TMDL general revenue fund.

A group of Big Cypress Creek Watershed stakeholders has learned about water quality rules and approaches to watershed planning and has expressed interest in addressing the bacterial impairments in the watershed, Berthold said. Through information gained from this project, they will decide to develop either a WPP or a TMDL and TMDL I-Plan, he said.

The institute recently finished three projects using Tier 2 steps that examined bacterial pollution in tributaries of the Little Brazos River in Robertson County. Findings will be presented to watershed stakeholders, who will determine the next steps in managing water quality in the tributaries.

The TMDL task force was also charged with developing a roadmap for scientific research on how bacteria behave under different conditions. Tailored to address some of the specific issues identified in the report, the project *Fate and Transport of E. coli in Rural Texas Landscapes and Streams* was initiated to better understand *E. coli* in the environment and evaluate better bacteria management strategies, Berthold said. TSSWCB is funding the project through a Clean Water Act Nonpoint Source Grant from EPA.

Through this project, team members are identifying, characterizing, and quantifying *E. coli* loading from various sources in

an impaired watershed. Members are also monitoring bacteria survival, growth, regrowth, and die-off under different environmental conditions and monitoring re-suspension of *E. coli* in streams to test current assumptions regarding the fate and transport of bacteria in an environment and outside of the host animal.

"These areas being investigated are relative unknowns as far as understanding bacteria goes," Berthold said. "Information gleaned from this project will provide much needed information and will help improve modeling applications that are used to illustrate the transport of bacteria throughout a watershed and are dependent upon assumptions made regarding bacteria life cycles, their ability to survive and regenerate, and their impacts on water quality."

For more information, visit twri.tamu.edu/txH2O.