Story by Kathy Wythe

Toxic and deadly

Working to manage algae in Lake Granbury

Lake Granbury, located about 33 miles southwest of Fort Worth, is a recreation haven for water enthusiasts. In recent years, however, bacteria and golden algae have threatened the lake's water quality.

Educating citizens about water quality issues affecting Lake Granbury and determining ways to manage the deadly algae are the focus of two Texas Water Resources Institute (TWRI) projects.

Lake Granbury, a critical water supply in North Central Texas, provides water for more than 250,000 people in about 15 cities. It also supplies water for industrial use, including cooling water for a natural gas–fired steam electric power plant and the Comanche Peak nuclear power plant.

Brazos River Authority (BRA) studies have detected contamination of *E. coli* in several areas of the lake, primarily in coves with poor water circulation. *E. coli* is an indicator bacteria used to detect fecal contamination of water and the presence of pathogens. These *E. coli* sources can be from sewage overflows, polluted stormwater runoff, or malfunctioning septic systems.

Toxic golden algae blooms have killed fish in Lake Granbury and Lake Whitney, downstream of Lake Granbury, and in more than 21 lakes in five Texas river basins. These fish kills have caused substantial economic loss in these areas.

Through the project *Improve Water Quality in Hood County*, managed by TWRI and funded by the U.S. Department of Agriculture's Natural Resources Conservation Service, Texas AgriLife Extension Service staff members have developed education programs to help landowners, homeowners, businesses, and the city of Granbury reduce nonpoint source pollution.

Dr. Bruce Lesikar, AgriLife Extension agricultural engineer, and a team of AgriLife specialists and county Extension agents have educated residents about watershed planning, land management for small acreages, on-site wastewater treatment systems, graywater systems, rainwater harvesting, pet and wildlife waste management, and bacterial sources in water. The group has also produced six publications and a series of more than 20 fact sheets about specific water quality issues, including nutrient and sediment loadings, bacteria, urban and agricultural nonpoint sources, and landscape chemicals.

"The education programs provided through this project increase participants' knowledge of the connection between their activities and the lake and how specific management practices can limit the impact on lake water quality," Lesikar said. "This information will lead to a change in behavior and create a sense of ownership of Lake Granbury and ultimately lead to improved water quality."

In the project *Testing Approaches to Golden Algae Control: In-Lake Mesocosm Experiments*, funded by the U.S. Army Corps of Engineers, and previous projects funded by the U.S. Department of Energy and the Texas Parks and Wildlife Department (TPWD), scientists from three universities are investigating golden algae's

Lake Granbury and the city of Granbury with its historic buildings, including the Hood County Courthouse, have grown into a popular tourist destination. Texas Water Resources Institute manages two projects helping to improve the lake's water quality.

explosive growth and deadly toxins. In research started at Lake Possum Kingdom and continuing at Lakes Whitney, Granbury, and Waco, the scientists have identified environmental and chemical factors—including low temperatures, low nutrients, and brackish salinities—that stress the organism, causing it to become more toxic and enabling blooms, said Dr. Daniel Roelke of Texas AgriLife Research.

Roelke said 10 years of monitoring data collected by Texas AgriLife Research, TPWD, and the BRA show that the incidence and magnitude of golden algae blooms are linked to river inflows, with systemwide, fish-killing blooms occurring at lower inflows and higher salinities. In addition, termination of blooms is linked to high river inflows that typically occur in the spring.

"The linkage between incidence of golden algae blooms, inflows, and salinity is of concern because combined effects from human population increase and climate change could lead to periods of decreased inflow and increased salinity, which may then increase the frequency and magnitude of blooms," he said.

Roelke, Dr. Bryan Brooks of Baylor University, and Dr. James Grover of the University of Texas at Arlington have also discovered an apparent competition between golden algae and blue green algae in certain Texas lakes. "There appears to be a chemical warfare between golden algae and blue green algae. Only when golden algae wins this chemical warfare is it able to bloom," Roelke said.

The research team is exploring potential management strategeties to mitigate blooms. "It may be that through the manipulation of water chemistry in the coves of these lakes, systemwide blooms can be avoided," Roelke said. "It may also be possible to create areas of refuge for fish, accelerating the recovery of fish populations."

The control strategies involve the manipulation of hydrology, pH, or ammonia. The team is also investigating the influence of blue green algae on golden algae and the influence of aquatic plants on golden algae blooms.

Recent research from this team was published in a dedicated volume (46, 2010) of the *Journal of American Water Resources Association* and will be further showcased in a special collection of papers to be published by the *Journal of Plankton Research.*

Dr. B.L. Harris, TWRI's acting director, said these two projects not only benefit Lake Granbury residents but will also help "protect the tourist industry around lakes around the state, encourage more widespread lake usage by fishermen, and generally protect the economic base of the impacted areas."

Much of the information gained through TWRI's two projects is being used by the BRA as it develops a watershed protection plan for the lake. The plan's development is funded through the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency.

Find links to AgriLife Extension Bookstore publications, fact sheets, and scientific publications at *twri.tamu.edu/txH2O.*