Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Oklahoma

Installing Best Management Practices Reduces Bacteria Levels in Pennington Creek

Waterbody Improved

High levels of *Enterococcus* bacteria, attributed in part to practices associated with livestock production (cattle, pigs, goats and sheep), resulted in impairment of Pennington Creek. As a result, Oklahoma placed Pennington Creek on the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 2006. Landowners implemented best management practices (BMPs) to limit livestock access to the stream and to protect the riparian areas, thereby decreasing the amount of animal waste and sediment reaching the creek. Bacteria levels declined, prompting Oklahoma to recommend that Pennington Creek be removed from Oklahoma's CWA section 303(d) list in 2012.

Problem

Pennington Creek flows for more than 25 miles through Johnston County in southeastern Oklahoma (Figure 1). The creek is the sole source of drinking water for the city of Tishomingo and serves as a regional recreational resource. Cattle production is the primary agricultural activity in the area, with over 90 percent of the land use in the county being range or pastureland. Poor management of livestock and grazing lands, as well as a lack of healthy riparian areas, contributed to animal waste entering the creek.

Enterococcus, a species of bacteria common in animal waste, can cause human illness. These bacteria are used as an indicator of the possible presence of other harmful pathogens. Waterbodies with a geometric mean above 33 colony-forming units per 100 mL water (33 CFU/100 mL) during the recreation season (May 1–September 30) are considered impaired for primary body contact recreation due to an unacceptably high health risk from waterborne diseases. Water quality assessment of Pennington Creek in 2006 showed a geometric mean of 104 CFU/100 mL, indicating impairment. On the basis of these assessment results, Oklahoma added Pennington Creek to the 2006 and subsequent CWA section 303(d) lists for nonattainment of the primary body contact recreation designated use because of *Enterococcus*.

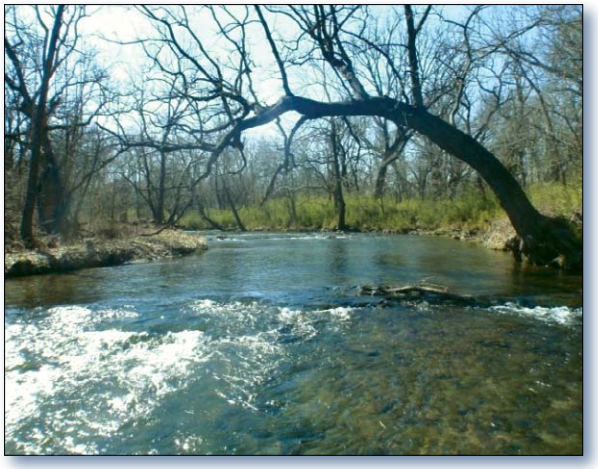

Figure 1. Pennington Creek flows through Johnston County in southeastern Oklahoma.

Project Highlights

Landowners implemented BMPs with assistance from Oklahoma's locally led cost-share program and through the local Natural Resources Conservation Service's (NRCS) Environmental Quality Incentives Program, Conservation Stewardship Program and general technical assistance program. These projects focused on keeping livestock away from the stream, protecting riparian areas and improving grazing lands. Since 2006, landowners added 15,948 feet of fencing, four new ponds, two watering facilities and 500 feet of pipeline to keep livestock out of the creek and provide alternative watering sources. To improve the condition of pasture and rangeland, landowners implemented prescribed grazing on 1,018 acres, developed nutrient management plans for 1,773 acres, improved 219 acres through rotation of supplement and feeding areas, and installed one heavy-use area protection practice. Producers planted supplemental

Figure 2. Blue Thumb volunteers visit Pennington Creek.

grasses on 77 acres, including three acres of critical area, and practiced integrated pest management on 1,510 acres. Brush management occurred on 105 acres, and prescribed burning took place on 925 acres. One grade stabilization structure was installed.

In addition, the Oklahoma Conservation Commission's education program, Blue Thumb, actively promoted restoration efforts in the Pennington Creek watershed starting in 2006 (Figure 2). Two volunteer training events were held in Tishomingo; participants included the mayor of the City of Tishomingo, staff of the Tishomingo National Wildlife Refuge and members of the Chickasaw Nation. These activities provided vital education of the residents of the watershed and helped facilitate behavior changes. Active volunteer monitoring and education efforts continue in the area.

Results

The Oklahoma Conservation Commission's Rotating Basin Monitoring Program, a statewide nonpoint source ambient monitoring program, documented improved water quality in Pennington Creek after landowners implemented BMPs. BMP implementation and landowner education efforts led to reductions in animal access to the stream, increases in protected riparian areas, and improvements to grazing lands, which ultimately led to decreased levels of *Enterococcus* bacteria in the creek. Data show that the geometric mean decreased from a high of 104 CFU in 2006 to 61 CFU/100 mL in 2008. By 2010 and 2012, *Enterococcus* levels had fallen

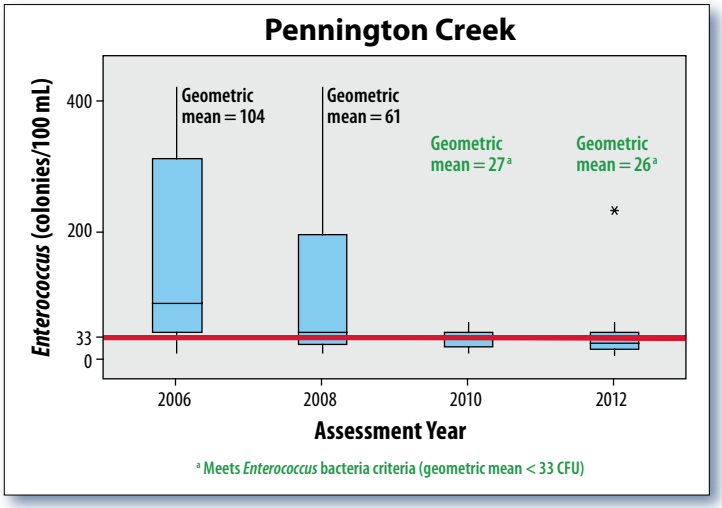

Figure 3. Data show that Pennington Creek has complied with the water quality criteria for *Enterococcus* since 2010. Boxplots indicate the interquartile range (25th–75th percentile), median of the data (noted as line) and data sample outlier (noted as *).

to 27 CFU/100 mL and 26 CFU/100 mL, respectively, which are below the impairment level (Figure 3). On the basis of these data, Oklahoma has recommended that Pennington Creek be removed from the state's 2012 CWA section 303(d) list for *Enterococcus* impairment. The creek now fully attains all of its designated uses.

Partners and Funding

The Rotating Basin Monitoring Program, which includes both fixed and probabilistic components, is funded through U.S. Environmental Protection Agency's (EPA) CWA section 319 funds at an average annual cost of $1 million. Monitoring costs include personnel, supplies and lab analysis for 19 parameters from samples collected every five weeks at about 100 sites. In-stream habitat, fish and macroinvertebrate samples are also collected. Approximately $600,000 in EPA section 319 funds support statewide education, outreach and monitoring efforts through the Blue Thumb program. During the past few years, the Oklahoma cost-share program has provided $3,500 in state funding for BMPs through the Johnston County Conservation District. The NRCS has spent approximately $75,000 to implement BMPs in the watershed from 2006 through 2012. Landowners have provided a significant percentage of the funding for BMP implementation, usually contributing 40 to 60 percent of the cost of a practice.

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