Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Oklahoma

Installing Best Management Practices Reduces Bacteria Levels in Lagoon Creek

Waterbody Improved

High levels of *Escherichia coli* bacteria, attributed in part to practices associated with cattle production, resulted in impairment of Lagoon Creek. As a result, Oklahoma added Lagoon Creek to the Clean Water Act (CWA) section 303(d) list of impaired waters in 2006. Landowners implemented best management practices (BMPs) to limit livestock's stream access and to protect the riparian areas, thereby decreasing the amount of animal waste and sediment runoff into the creek. Bacteria levels declined, prompting Oklahoma to remove Lagoon Creek from the state's 2010 CWA section 303(d) list for *E. coli* impairment.

Problem

Lagoon Creek is a 25-mile-long stream flowing through Pawnee and Creek counties in north central Oklahoma (Figure 1). Land use in the watershed is primarily cattle and forage production. Poor management of livestock and grazing lands, as well as a lack of healthy riparian areas, contributed to excess runoff of animal wastes into the creek. *E. coli* are bacteria common in animal wastes and 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 126 colony forming units per 100 milliliters of water (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 *E. coli* in Lagoon Creek in 2006 showed a geometric mean of 199 CFU/100 mL, which indicated impairment. On the basis of these assessment results, Oklahoma added Lagoon Creek to the 2006 CWA section 303(d) list for failing to support the primary body contact recreation designated use due to *E. coli* impairment.

Figure 1. Lagoon Creek flows through Creek County in north central Oklahoma.

Project Highlights

Landowners implemented BMPs with assistance from Oklahoma's locally led cost-share program and through the local Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program, Wildlife Habitat Incentive 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 14,733 feet of fencing, four new ponds, one alternative watering facility and one heavy use protection area to keep livestock out the creek and protect riparian areas. Landowners have implemented residue management practices on 172 acres to help reduce cropland erosion. To improve the condition of pasture and rangeland, landowners also implemented prescribed grazing on 4,023 acres and developed nutrient management plans for 651 acres. Producers planted forage on 51 acres, practiced better forage harvest management on 99 acres, installed critical area planting on nine acres, and used integrated pest management on 2,906 acres. Brush management occurred on 3,445 acres, and prescribed burning took place on 157 acres after installing 22,800 feet of firebreak. Landowners also installed one grade stabilization structure and managed upland wildlife habitat on 11 acres.

Current NRCS initiatives in Pawnee and Creek Counties include managing Eastern red cedar, controlling waste from animal feeding operations, and closing failing animal waste lagoons. All of these should continue to improve water quality in the Lagoon Creek watershed.

Results

The Oklahoma Conservation Commission's (OCC) Rotating Basin Monitoring Program, a statewide nonpoint source ambient monitoring program, documented improved water quality in Lagoon Creek after landowners implemented BMPs. Reductions in animal access to the stream, increases in protected riparian areas, and improvements to grazing lands resulted from the implemented practices and the accompanying education of landowners, which ultimately led to decreased levels of *E. coli*. Data show that the geometric mean for *E. coli* had dropped below the impairment level to 97 CFU/100 mL in 2010 and 2012—down from a high of 346 CFU/100 mL in 2008 (Figure 2). On the basis of these data, Oklahoma removed Lagoon Creek from the state's 2010 CWA section 303(d) list for *E. coli* impairment. The creek partially attains its primary body contact recreation designated use.

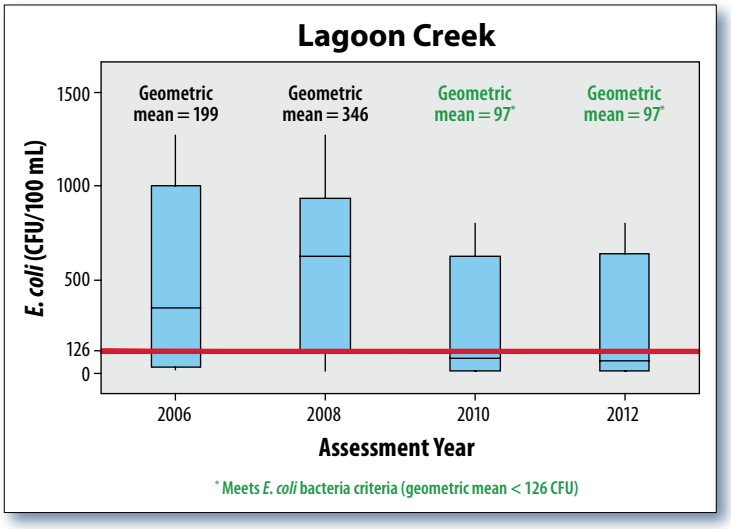

Figure 2. Data show that Lagoon Creek has complied with the water quality criteria for *E. coli* since 2010. Boxplots indicate the interquartile range (25th–75th percentile) and median of the data.

Partners and Funding

The Rotating Basin Monitoring Program, which includes both fixed and probabilistic components, is funded through the 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. Over the past decade, the Oklahoma cost-share program has provided $2,278 in state funding for BMPs in this watershed through the Lincoln and Creek County Conservation Districts. The NRCS has spent approximately $215,000 to implement BMPs in the watershed from 2006 through 2012. Landowners have provided a significant percentage of the cost toward BMP implementation.

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