Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Oklahoma

Best Management Practice Implementation Results in Improved Bacteria Levels in Harper County's Clear Creek

Waterbody Improved

Oklahoma's Clear Creek was impaired for *Escherichia coli* (*E. coli*) bacteria due in part to practices associated with cattle, hog, and crop production, prompting Oklahoma to add the creek to the state's 2006 Clean Water Act (CWA) section 303(d) list of impaired waters. Implementing best management practices (BMPs) to improve cropland and grazing land condition and to improve wildlife habitat led to decreased runoff of bacteria into the creek. As a result, Clear Creek was removed from Oklahoma's 2010 CWA section 303(d) list for *E. coli* impairment.

Problem

The 30-mile-long Clear Creek flows through Harper and Ellis counties in northwestern Oklahoma (Figure 1). The majority of the land in the 72,896-acre watershed is used for cattle and wheat production. Several large hog operations are also found in the watershed. Erosion of both cropland and grazing land, coupled with improper management of animal wastes were potentially the largest nonpoint source problems in the watershed, contributing to high levels of fecal bacteria in the stream. In the 2006 and 2008 water quality assessments, *E. coli* bacteria levels exceeded the state criterion, with a geometric mean of 261 and 202 colonies/100 milliliters (mL), respectively. The primary body contact recreation use is considered impaired if the geometric mean exceeds 126 colonies/100 mL for *E. coli*. As a result, Oklahoma added Clear Creek (OK720500020070 _ 00) to the state's 2006 CWA section 303(d) list of impaired waters for *E. coli*.

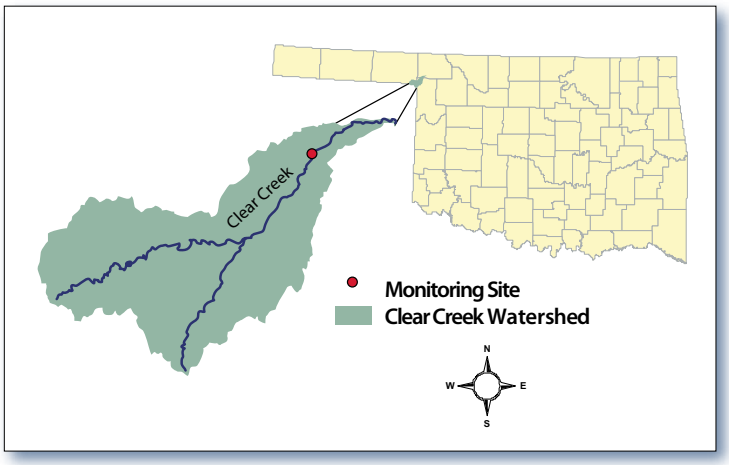

Figure 1. The Clear Creek watershed is in northwestern Oklahoma.

Project Highlights

Landowners implemented numerous BMPs with support from Oklahoma's locally led cost-share program and funds from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) general technical assistance programs, the Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), and Wildlife Habitat Incentive Program (WHIP). From 2004 to 2008, landowners implemented conservation tillage methods (no-till, strip till, mulch till, direct seed, or deep tillage) on 3,457 acres, with conservation cover/cover crops on 374 acres of cropland and pastureland. Prescribed grazing was implemented on 1,768 acres and nutrient management plans were adopted for 165 acres, which helped reduce the concentration of manure in heavy-use areas and reduced runoff of soil and wastes by improving pasture condition. The installation of several watering facilities and ponds also helped improve pasture usage, reducing erodible areas. Nearly 500 acres of upland wildlife habitat were actively managed to improve its condition, and several landowners planted field borders as well as range land and pasture land plants to reduce soil erosion.

Landowners installed additional BMPs from 2009 to 2012 that have enhanced the initial improvements. The 2008 CSP allowed incentives for good pasture and range management in the watershed. BMPs included adopting nutrient management plans for another 558 acres, grazing management plans for 774 acres, additional water supplies for livestock, supplemental planting of pasture and rangeland and nearly 4,000 acres of residue and tillage management (no-till, strip till, mulch till, direct seed, or deep tillage).

In addition, the Oklahoma Conservation Commission's (OCC) education program, Blue Thumb, has been very active in this area. Staff from the Ellis County Conservation District and the local NRCS have participated in Blue Thumb training sessions, and a local high school teacher and her students have monitored a local stream monthly for several years. They submitted reports on the monitoring results to the local newspaper to inform local citizens about the stream and its problems. The Blue Thumb volunteers also educated younger students about nonpoint source pollution using the Enviroscape watershed model and a groundwater model at least annually. Annual "mini-academy" training is offered for students and teachers at Gage High School, which allows further education of the watershed residents. Active volunteer monitoring and education is continuing in this area.

Results

The OCC's Rotating Basin Monitoring Program, a statewide nonpoint source ambient monitoring program, documented improved water quality in Clear Creek due to landowners implementing BMPs (Figure 2). The installed cropland, grazing land, and nutrient management BMPs work to decrease erosion and reduce bacteria loading. BMPs designed to improve pasture and rangeland result in denser vegetation and fewer bare spots, which equates to less potential runoff of soil, nutrients, and bacteria from animal wastes into waterbodies. Monitoring data showed that the geometric mean of *E. coli* in the 2010 assessment was 82 colonies/100 mL, below the state standard of 126 colonies/100 mL (Figure 3). On the basis of these data, Oklahoma removed Clear Creek from the 2010 CWA section 303(d) list for *E. coli* impairment. The creek is in partial attainment of the primary body contact recreation use.

Partners and Funding

The improvement in water quality in Clear Creek was documented by the OCC's statewide nonpoint source ambient monitoring program. The Rotating Basin Monitoring Program, which now includes a probabilistic component, is supported by CWA section 319 funds at an average annual cost of $1 million. Monitoring costs include personnel, supplies, and lab analyses for 18 parameters from samples collected every 5 weeks at about 100 sites for a total of 20 episodes per 5-year cycle. In-stream habitat, fish, and macroinvertebrate samples are also collected. Statewide educational efforts through Blue Thumb are also funded by CWA section 319 at a cost of approximately $600,000 annually. These costs include supplies for monthly monitoring of 100 sites, as well as trainings and other outreach activities.

Figure 2. Oklahoma's Clear Creek after the implementation of BMPs.

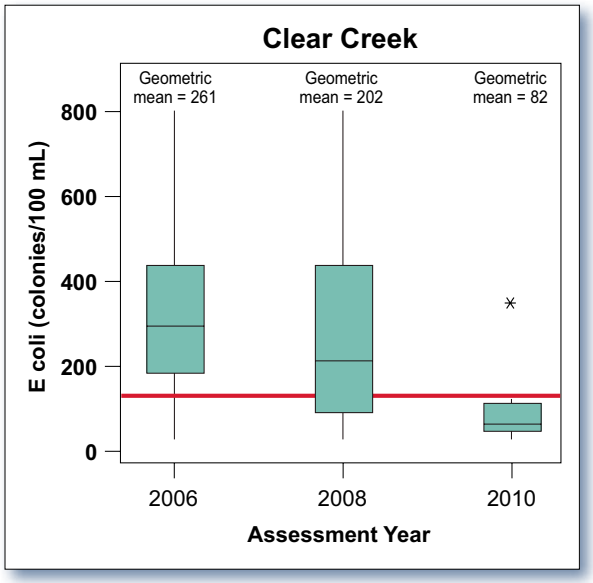

Figure 3. Boxplots indicate the interquartile range (25th–75th percentile) and median of the data for assessment years 2006, 2008 and 2010. These data indicate that bacteria levels in Clear Creek met water quality standards by 2010.

The Oklahoma cost-share program provided $21,699 in state funding for BMPs in this watershed through the Ellis County and Harper County conservation districts, and landowners contributed $35,338 through this program. The NRCS spent approximately $2 million for implementation of BMPs in the area from 2004 through 2008, with another $1,275,000 spent from 2009 to 2012 for additional BMPs.

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