



NONPOINT SOURCE SUCCESS STORY

Oklahoma

Implementing Best Management Practices Reduced Bacteria Levels in Bitter Creek

Waterbody Improved

Bitter Creek was impaired for *Escherichia coli* (*E. coli*) bacteria due in part to practices associated with crop and cattle 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, grazing land, and nutrient management led to decreased levels of sediment and bacteria in the creek. As a result, Bitter Creek was removed from Oklahoma's 2010 CWA section 303(d) list for *E. coli* impairment.

Problem

The 23-mile-long Bitter Creek flows through Kay and Grant counties in north central Oklahoma (Figure 1). The majority of the land in the 40,409-acre watershed is used for wheat and cattle production, although corn and sorghum are also grown. Erosion of both cropland and grazing land, coupled with improper management of livestock wastes, were potentially the largest nonpoint source problems in the watershed, contributing to high levels of fecal bacteria in the stream. In the 2006 water quality assessment, *E. coli* bacteria levels exceeded the state criterion, with a geometric mean of 171 colonies/100 milliliters (mL). 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 the entire length of Bitter Creek (OK621100000100_00) to the state's 2006 CWA section 303(d) list of impaired waters for *E. coli* bacteria.

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), Wildlife Habitat Incentive Program (WHIP), Conservation Stewardship Program (CSP), and the Conservation Reserve Program (CRP). The focus of most BMPs in this watershed was erosion control, as runoff of sediment might also carry fecal bacteria into waterbodies. From 2006 to 2009, landowners improved pasture and range quality by planting supplemental forage on 494 acres, implementing

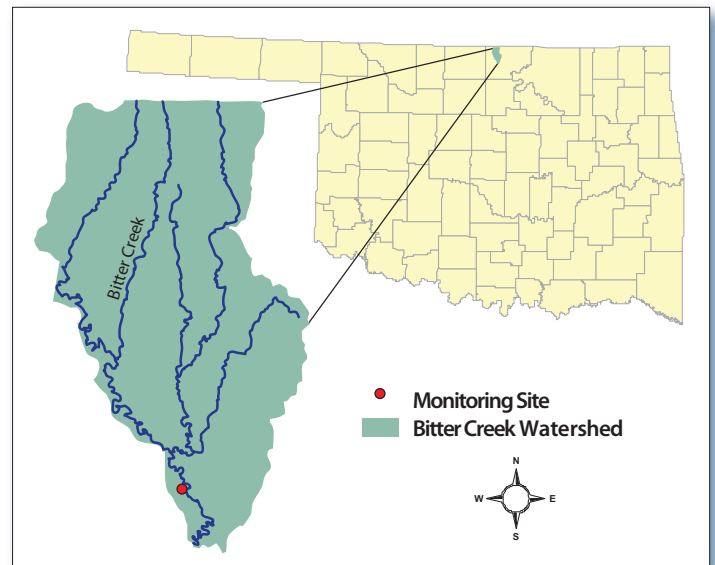


Figure 1. The Bitter Creek watershed is in north central Oklahoma.

prescribed grazing on 679 acres and nutrient management on 1,166 acres, and managing brush on 142 acres. Thirty-two ponds and six water tanks were installed to provide alternative water supplies for livestock after adding cross-fences to optimize grazing land usage. To reduce erosion from cropland, producers implemented conservation crop rotations, conservation tillage methods (no-till, strip till, mulch till, and deep till), cover crops, and residue management on 3,706 acres. Producers also planted field borders and filter strips and installed grassed waterways, terraces, diversions, and grade stabilization structures. In addition, upland wildlife habitat management occurred on more than 1,000 acres, and 227 acres of wetland habitat was properly managed.

Landowners installed additional BMPs from 2010 to 2012 that have enhanced the initial improvements. BMPs included adopting nutrient management plans for 45 acres, grazing management plans for 633 acres, forage harvest management on 317 acres, and weed/pest management on 484 acres. Range and pasture planting occurred, along with supplemental vegetation plantings in critical, erosive areas. Conservation crop rotations, cover crops, residue management, and conservation tillage methods have been implemented on 3,635 acres, and 18,439 feet of terraces, 18 acres of grassed waterways, and four grade stabilization structures were installed to reduce erosion. Fifty-one acres of wetland restoration and 1,280 acres of upland wildlife habitat management have resulted in more natural, less-erosive land cover in the watershed.

Results

The Oklahoma Conservation Commission's (OCC's) Rotating Basin Monitoring Program, a statewide nonpoint source ambient monitoring program, documented improved water quality in Bitter 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 93 colonies/100 mL, below the state standard of 126 colonies/100 mL (Figure 3). As a result, Bitter Creek was removed from the 2010 CWA section 303(d) list for *E. coli* bacteria impairment and is in partial attainment of the primary body contact recreation use.

Partners and Funding

The improvement in water quality in Bitter Creek was documented by OCC's statewide nonpoint source ambient monitoring program. The OCC's Rotating Basin Monitoring Program is supported by U.S. Environmental Protection Agency CWA section 319 funding 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



Figure 2. Water quality improved in Oklahoma's Bitter Creek after landowners implemented BMPs.

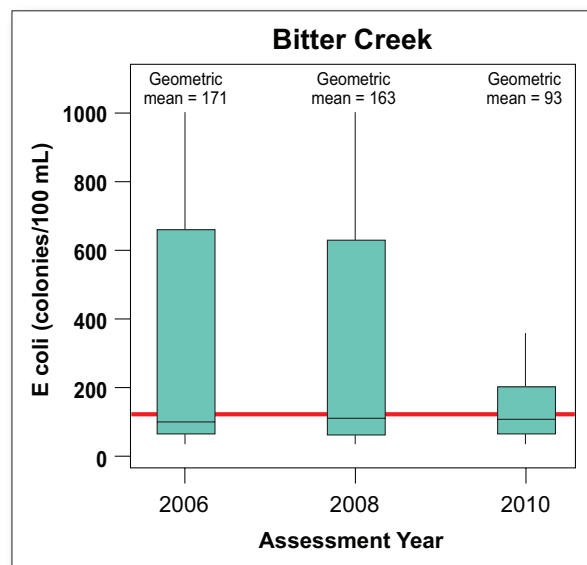


Figure 3. Bacteria levels in Bitter Creek met bacteria water quality standards by 2010. Boxplots indicate the interquartile range (25th–75th percentile) and median of the data for assessment years 2006, 2008, and 2010.

cost of approximately \$600,000 annually. These costs include supplies for monthly monitoring of 100 sites, as well as trainings and other outreach activities. The Oklahoma cost-share program provided \$2,284 in state funding for BMPs in this watershed through the Kay Conservation District, and landowners contributed \$2,276 through this program. NRCS spent nearly \$1.4 million for implementation of BMPs in the area from 2006 to 2009. Another \$2 million was expended from 2010 to 2012, and implementation is ongoing.



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For additional information contact:

Shanon Phillips
Oklahoma Conservation Commission
405-522-4500 • shanon.phillips@conservation.ok.gov