Best Management Practice Implementation Results in Decreased Bacteria Levels in Bois d'Arc Creek

Waterbody Improved
Bois d'Arc 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 sediment and bacteria in the creek. As a result, Bois d'Arc Creek has been removed from Oklahoma's 2012 CWA section 303(d) list for *E. coli* bacteria impairment

Problem

The 37-mile-long Bois d'Arc Creek flows through Kay County in north central Oklahoma (Figure 1). The majority of the land in the 63,239-acre area is used for wheat and cattle production, although some corn and soybeans are also grown. Erosion of both cropland and grazing land, coupled with improper management of cattle wastes were potentially the largest nonpoint source problems in the watershed, contributing to high bacteria levels in the stream. In the 2006 water quality assessment, *E. coli* bacteria levels exceeded the state criterion, with a geometric mean of 248 colonies (col) per 100 milliliters (mL). The primary body contact recreation use is considered impaired if the geometric mean exceeds 126 col/100 mL for *E. coli*. On the basis of these assessment results, Oklahoma added the entire length of Bois d'Arc Creek (OK62100030010 _ 00) to the state's 2006 CWA section 303(d) list for *E. coli* bacteria impairment.

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 Reserve Program (CRP), and the Conservation Stewardship Program (CSP). From 2006 to 2011, landowners planted supplemental vegetation on more than 300 acres of rangeland, pasture, and critically erosive areas to improve pasture and range quality in the watershed. Landowners
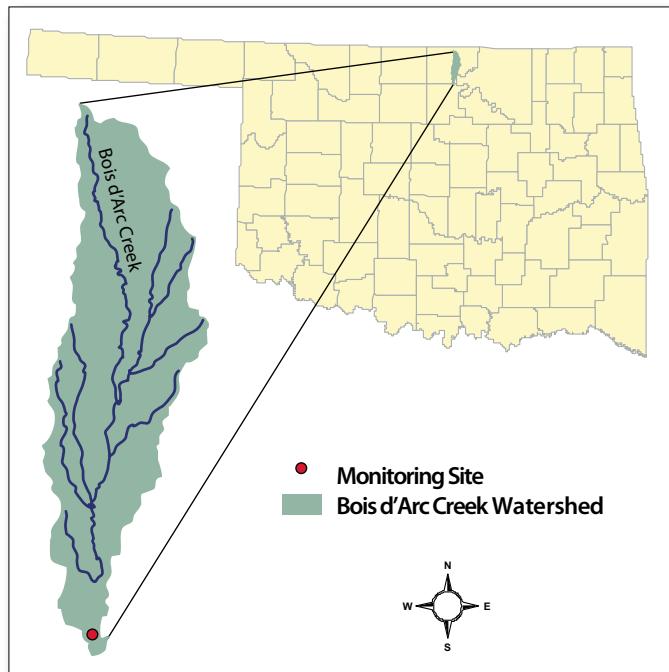

Figure 1. The Bois d'Arc watershed is in north central Oklahoma.

implemented prescribed grazing on 1,734 acres and nutrient management on 2,268 acres and constructed seven ponds for alternative livestock water sources. To reduce erosion from cropland, producers implemented conservation crop rotations and cover crops on 1,250 acres and conservation tillage methods—including no-till, strip till, direct seed, deep tillage, and residue management—on 6,814 acres. More than 37,000 feet of terraces were constructed, along with 50 acres of grassed waterways, to reduce cropland erosion. Upland wildlife habitat management occurred on 2,827 acres.

The Oklahoma Conservation Commission's (OCC's) education program, Blue Thumb, held a volunteer training event in Kay County in 2010 and has a group of committed volunteers that help educate local citizens about nonpoint source pollution in the area.

Implementation of additional BMPs in 2012 has enhanced the initial improvements. These include conservation crop rotations and conservation tillage methods on 3,240 acres, range/pasture/hay planting on 38 acres, installation of fencing, terraces, and two grassed waterways, and construction of four ponds.

Results

The OCC's Rotating Basin Monitoring Program, a statewide nonpoint source ambient monitoring program, documented improved water quality in Bois d'Arc Creek due to landowner implementation of 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 2012 assessment was 120 col/100 mL, below the state standard of 126 col/100 mL (Figure 3). Accordingly, Bois d'Arc Creek has been removed from the 2012 CWA section 303(d) list for *E. coli* impairment and is in partial attainment of the primary body contact recreation use.

Partners and Funding

The improvement in water quality in Bois d'Arc Creek was documented by the 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 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 $22,295 in state funding for BMPs in this watershed
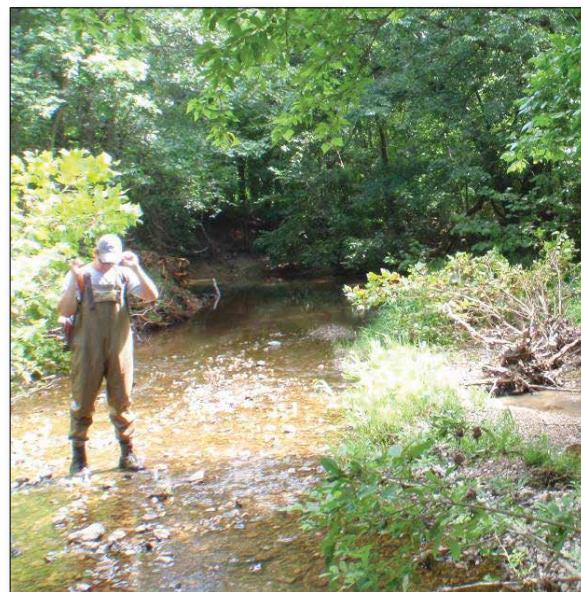
Figure 2. Oklahoma's Bois d'Arc Creek after restoration.
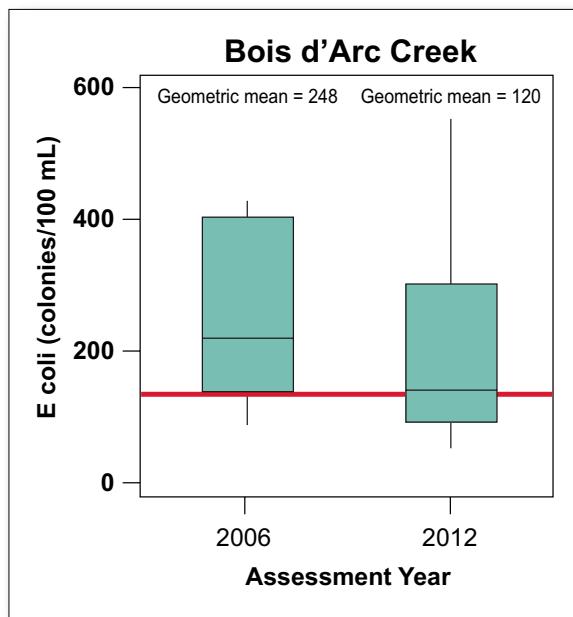
Figure 3. Boxplots indicate the interquartile range (25th-75th percentile) and median of the data for assessment years 2006 and 2012. These data indicate that bacteria levels in Bois d'Arc Creek met water quality standards by 2012.

through the Kay County Conservation District, and landowners contributed $22,317 through this program. NRCS spent approximately $2.1 million for implementation of BMPs in the area from 2006 through 2011 and spent an additional $118,000 on BMP implementation in 2012.

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