



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Oklahoma

Implementing Best Management Practices Improves Water Quality

Waterbody Improved

High levels of *E. coli* bacteria and low dissolved oxygen due in part to runoff from agricultural areas impaired Oklahoma's Little Elk Creek, preventing the waterbody from attaining its primary body contact recreation and fish and wildlife propagation designated uses. In addition, the stream was impaired from the presence of oil and grease, which prevented it from attaining its aesthetics designated use. In response, Oklahoma added a 16-mile-long segment of Little Elk Creek to the state's 2002 Clean Water Act (CWA) section 303(d) list of impaired waters. Implementing best management practices (BMPs) that promoted conservation tillage and proper nutrient management led to decreased bacteria and nutrient levels in the creek. As a result, a segment of Little Elk Creek was removed from Oklahoma's 2008 CWA section 303(d) list for *E. coli* and dissolved oxygen. The creek was also delisted for oil and grease. The creek now partially attains its primary body contact recreation designated use and fully attains its fish and wildlife propagation and aesthetics uses.

Problem

Little Elk Creek is in Washita and Kiowa counties in west-central Oklahoma (Figure 1). Land use in the watershed is primarily cow/calf and wheat production. The most likely nonpoint source pollution problems in the watershed are improperly managed cattle waste and sediment from eroding crop and grazing lands. Excess nutrients from agricultural runoff contributed to the overgrowth of nuisance algae, and the subsequent breakdown of the algae caused dissolved oxygen levels to decrease in Little Elk Creek.

A 2002 water quality assessment found that 16 percent of Little Elk Creek's dissolved oxygen values fell below the dissolved oxygen criterion of 2.0 milligrams per liter (mg/L). In addition, the runoff of manure from grazing lands has contributed to high levels of bacteria in the creek. To meet standards, levels of *E. coli* in the stream must not exceed 406 colonies/100 milliliters (mL), and the geometric mean must be less than 126 colonies/100 mL. In the 2002 assessment, Little Elk Creek's geometric mean for *E. coli* bacteria was 177.6 colonies/100 mL, which violated the standard.

Because elevated bacteria levels (*E. coli*, *Enterococcus*, and fecal coliform) and low dissolved oxygen prevented Little Elk Creek from meeting its primary body contact recreation and fish and wildlife propagation designated uses, respectively, Oklahoma added a 16-mile segment of the creek to the 2002 CWA section 303(d) list of impaired waters. Additionally, in 2004 Oklahoma added an impairment for oil and grease to the CWA section 303(d) list for Little Elk Creek.

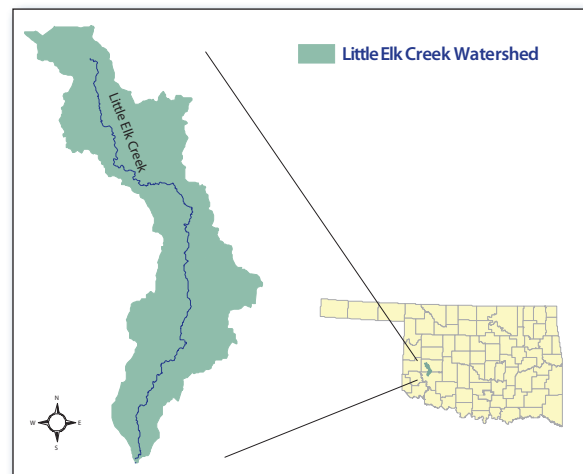


Figure 1. The Little Elk Creek Watershed is in west-central Oklahoma.

Project Highlights

Landowners implemented numerous BMPs with support from Oklahoma's locally led cost-share program; Natural Resources Conservation Service (NRCS) general technical assistance funds; and NRCS programs such as the Environmental Quality Incentives Program (EQIP) and the Conservation Reserve Program. The Little Elk Creek watershed was part of the EQIP Cheyenne-Arapahoe Local Emphasis Area project, which began in 2002 and focused on reducing erosion by improving cropland and grazing land. From 2003 to 2007, landowners implemented conservation tillage (mulch till, no till, strip till) on 1,452 acres and conservation/cover

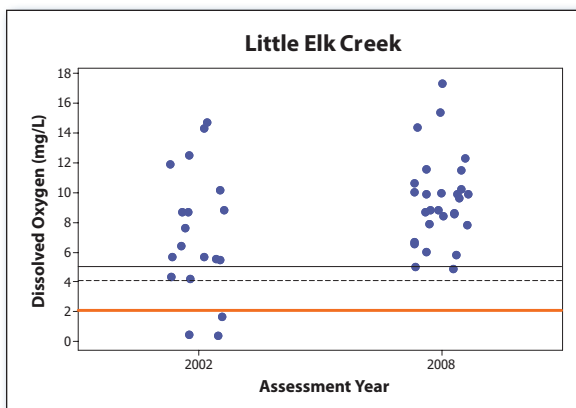


Figure 2. Little Elk Creek met standards by 2008. A stream is impaired for dissolved oxygen if two or more samples per year are below 2 mg/L (red line) or if more than 10 percent are below 5 mg/L (black line) [or 4 mg/L from June 16–Oct. 15 (dashed black line)].

crop rotations on more than 1,000 acres. They established contour farming on 237 acres, which included adding 51,549 feet of terraces, 1,842 feet of diversions, five grade-stabilization structures, three ponds, and 58 acres of grassed waterways. Landowners also improved grazing lands by planting 516 acres of pasture and 151 acres of range, adopting nutrient management on 1,565 acres, and initiating pest (weed) management on 1,455 acres.

BMP implementation continued during 2008 and 2009. Farmers converted another 1,647 acres of cropland to conservation tillage and added conservation crops in rotation on 184 acres. Other BMPs consisted of adding another 184 acres of contour farming, planting 8 acres of grassed waterways, adding almost 64,000 feet of terraces, adopting nutrient management on 456 acres, implementing weed management on 340 acres, conducting prescribed grazing on 152 acres, and planting 51 acres of pasture.

Results

The Oklahoma Conservation Commission's (OCC's) statewide nonpoint source ambient monitoring program, known as the Rotating Basin Monitoring Program, documented water quality improvements in Little Elk Creek. The installed cropland and grazing land BMPs decreased the amount of erosion, which in turn reduced nutrient loading to streams because phosphorus typically binds to soil particles. Reductions in nutrients reduced algal growth and resulted in increased levels of dissolved oxygen observed in Little Elk Creek. No samples fell below state dissolved oxygen criteria in the 2008 assessment (Figure 2).

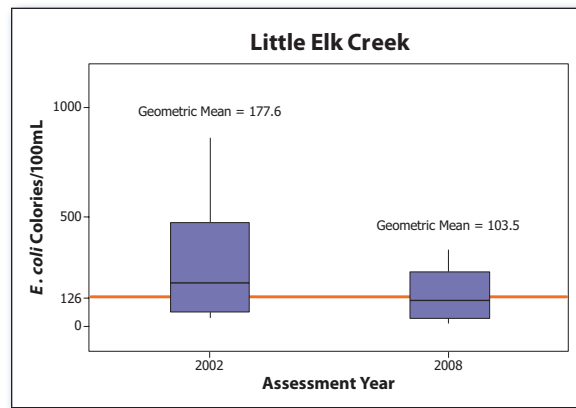


Figure 3. Bacteria levels in Little Elk Creek met bacteria water quality standards by 2008. Boxplots indicate the interquartile range (25th–75th percentile) and median of the data for assessment years 2002 and 2008.

In addition, implementing pasture and range land BMPs increased the density of vegetation, which helped to reduce the volume of runoff and the transport of soil, nutrients and bacteria into waterbodies. The geometric mean for *E. coli* bacteria was reduced from 177.6 colonies/100 mL in the 2002 assessment to 103.5 colonies/100 mL in 2008, indicating that the BMPs had been effective (Figure 3). Additionally, OCC did not observe any oil and grease in Little Elk Creek from April 2002 to February 2007. On the basis of those results, Oklahoma removed the 16-mile segment of Little Elk Creek from the 2008 CWA section 303(d) list of impaired waters for bacteria, dissolved oxygen, and oil and grease.

Partners and Funding

OCC's Rotating Basin Monitoring Program is funded using U.S. Environmental Protection Agency (EPA) CWA section 319 funds at an average annual cost of \$1 million. Monitoring costs fund personnel, supplies and lab analysis for 19 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. Approximately \$600,000 in EPA section 319 funds supports statewide education, outreach and monitoring efforts through the Blue Thumb program.

The Oklahoma cost-share program provided \$8,627 in state funding for BMPs in the watershed, and landowners contributed \$10,976. NRCS invested approximately \$183,493 to implement BMPs in the area from 2003 to 2007 and had committed \$264,075 for expanding the scope of BMPs in 2008 and 2009.



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