



NONPOINT SOURCE SUCCESS STORY

Oklahoma

Conservation Practices Reduce Bacteria in Crooked Creek (Beaver County)

Waterbody Improved

High bacteria levels resulted in the impairment of Crooked Creek and placement on Oklahoma's Clean Water Act (CWA) section 303(d) list of impaired waters in 2004. Pollution from grazing lands contributed to this impairment. Implementing conservation practice systems (CPs) to promote better agricultural land management decreased *Escherichia coli* (*E. coli*) levels in the creek. As a result, Oklahoma removed lower Crooked Creek from its 2014 CWA section 303(d) list for *E. coli*. Crooked Creek remains listed as impaired for *Enterococcus*, although levels have declined. Crooked Creek now partially supports its primary body contact (PBC) designated beneficial use.

Problem

Crooked Creek is a 39.8-mile stream flowing through Meade County, Kansas, into Beaver County, Oklahoma, before it joins the Cimarron River (Figure 1). Land use in the 90,443-acre watershed is predominantly rangeland (approximately 87 percent) with only 7 percent cropland. Challenges with rangeland management contributed to listing the Oklahoma portion of the stream as impaired for *E. coli* and *Enterococcus* in 2004 when the geometric mean of samples collected during the recreation season was 272 colony-forming units *E. coli* per 100 milliliters (CFU/100 mL) and 525 CFU/100 mL for *Enterococcus*. The PBC designated use is considered impaired if the recreation season geometric mean exceeds 126 CFU/100 mL for *E. coli* and/or 33 CFU/100 mL for *Enterococcus*. Oklahoma added a 6.4-mile segment of Crooked Creek (OK620930000100_00) to the 2004 CWA section 303(d) list for nonattainment of its PBC designated beneficial use. Although it was later determined that the 2004 listing had been in error due to an insufficient number of samples, the assessments in 2006 through 2010 confirmed the impaired status of Crooked Creek.

Story Highlights

Improvements in the watershed are linked to management changes by both Kansas and Oklahoma land managers in partnership with local conservation districts, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and Farm Services Agency (FSA), and other agencies in both

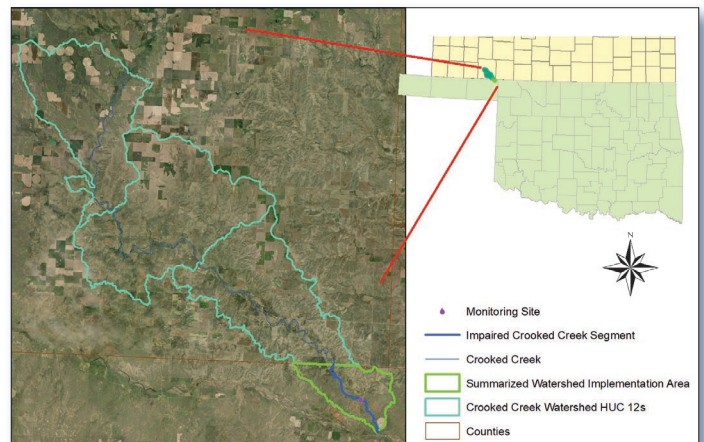


Figure 1. Crooked Creek is in northwestern Oklahoma.

states. In the 7,200-acre Oklahoma portion of the watershed, agricultural producers worked with the Beaver County Conservation District, the NRCS, and the Oklahoma Conservation Commission (OCC) to implement CPs through NRCS's Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Conservation Stewardship Program (CStWP), and general conservation technical assistance program, FSA's Conservation Reserve Program and Oklahoma's Locally Led Cost Share Program (LLCP). CPs installed between 2002 and 2017 focused on reducing erosion and pollutant runoff from rangeland in the watershed, and included access control (2,734 acres [ac]), brush management (392 ac), cover crop (409 ac), restoration of rare and declining natural habitat (221 ac), four water wells, conservation crop rotation

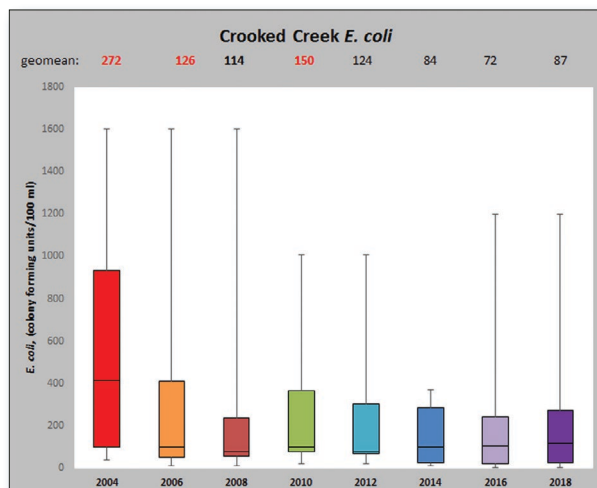


Figure 2. Crooked Creek *E. coli* concentrations now meet standards.

(480 ac), fence (16,478 feet), upland wildlife habitat management (4,447 ac), forage harvest management (1,655 ac), integrated pest management (2,398 ac), prescribed grazing (6,090 ac), livestock pipeline (36,249 feet), no-till (406 ac), four livestock pumping plants, no-till/strip-till (76 ac), wetland wildlife habitat management (268 ac), 16 watering facilities, herbaceous weed treatment (182 ac), and rotation of supplement and feeding areas (218 ac).

Results

The OCC documented improved water quality in Crooked Creek due to the installation of CPs. The installed CPs worked to decrease runoff of fecal bacteria to downstream waterbodies. Monitoring data compiled for the 2006 integrated report showed that the geomean of Crooked Creek recreation season *E. coli* was 127 CFU/100 mL, which violated the standard of 126 CFU/100 mL (Figure 2). However, by the 2012 assessment, bacteria levels had dropped, and the *E. coli* geometric mean was 124 CFU/100 mL. Levels continue to drop over time. Likewise, the 2006 assessment indicated a geomean of 145 CFU/100 mL for Enterococcus, which also decreased over time (Figure 3). Based on these data, Oklahoma removed Crooked Creek from the CWA section 303(d) list for *E. coli* in 2012. Although the stream remains listed for Enterococcus and is, therefore, only partially supporting its PBC beneficial use, concentrations are decreasing; all other assessed beneficial uses are now fully supported.

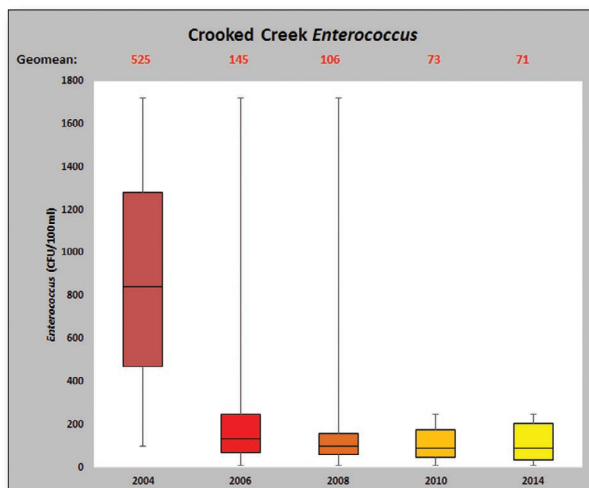


Figure 3. Enterococcus levels have declined but do not yet meet standards in Crooked Creek.

Partners and Funding

The OCC monitoring program is supported by U.S. Environmental Protection Agency (EPA) CWA section 319 funding at an average annual statewide cost of \$1 million. Approximately \$500,000 in EPA section 319 funds support statewide water quality educational efforts through Blue Thumb. Approximately \$153,000 of these federal and matching state funds have been devoted to Crooked Creek. From 2002 to 2015, NRCS and OCC supplied approximately \$42,000 for implementation of CPs in the watershed through NRCS EQIP and the LLCP. Additional funds were provided through NRCS and FSA for WHIP, CStwP, and CRP. In addition, many practices were funded by landowners based on recommendations through NRCS general technical assistance and conservation planning.



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