

NONPOINT SOURCE SUCCESS STORY

Adoption of No-Till and Improved Grasslands Management Restores Water Quality in Roaring Creek

Waterbody Improved

High *Escherichia coli* (*E. coli*) concentrations and low dissolved oxygen (DO) resulted in impairment of Roaring Creek and

placement on Oklahoma's Clean Water Act (CWA) section 303(d) list of impaired waters in 2002. Pollution from grazing and crop lands contributed to this impairment. Implementing conservation practice systems (CPs) to promote better land management decreased runoff of bacteria and other pollutants and improved oxygen levels. As a result, Oklahoma removed the *E. coli* and DO impairments from its 2018 CWA section 303(d) list. Roaring Creek now fully supports its primary body contact (PBC) and warm water aquatic community (WWAC) designated beneficial uses and is no longer on the 303(d) list.

Problem

The Roaring Creek watershed covers approximately 42,500 acres in Grady County in south-central Oklahoma (Figure 1). Watershed land use includes about 72% grazing lands (managed pasture and rangeland), 13% forest land and 13% cropland. Roaring Creek and neighboring Dry Creek watersheds support a system of 40 flood control dams constructed by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). These reservoirs reduce the impacts of flooding in 56.3 square miles and provide an estimated \$1.11 million in benefits, including reducing flood damages to crops, bridges, roads, fences and similar items and supporting irrigation, municipal or industrial water supply. and recreation. These structures protect 199 farms or ranches and 12 bridges, create or enhance 290 acres of wetlands and reduce sedimentation to downstream waterbodies by 59,373 tons per year. The primary agricultural products from the watershed are wheat, alfalfa hay and cattle.

Water quality monitoring in the early to mid-2000s determined that challenges with grazing and cropland management contributed to a 2002 listing of the 18.27-mile stream. *E. coli* samples collected during this time period were elevated with the geometric mean of samples collected during the recreation season (May 1–September 30) of 159 colony-forming units per 100 milliliters (CFU/100 mL). A stream is considered impaired for *E. coli* if the geomean is greater



Figure 1. Roaring Creek Watershed is in central Oklahoma.

than 126 CFU/100 mL. In addition, DO readings in 2014–2015 were especially low in summer when the stream was clogged with aquatic macrophytes: 18% of samples collected were below acceptable water quality standards. A waterbody is considered impaired for DO if more than 10% of samples fall below 6 milligrams per liter (mg/L) from April 1 through June 15 or below 5.0 mg/L during the remainder of the year. Based on these results, Oklahoma added segment OK310810020170_00 to the CWA section 303(d) lists for nonattainment of the PBC (in 2002) and WWAC (in 2016) designated beneficial uses.



Figure 2. Dissolved oxygen levels increased after installation of CPs.

Story Highlights

At least 24 landowners in the watershed worked with the Grady County Conservation District, NRCS, USDA Farm Service Agency (FSA) and the Oklahoma Conservation Commission (OCC) to implement CPs through Oklahoma NRCS's Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CStwP), Wetland Reserve Program (WRP) and general conservation technical assistance program; FSA's Conservation Reserve Program (CRP); and the OCC's Locally Led Cost Share Program (LLCP).

From 2000 to 2020, landowners improved crop and grazing land management, which reduced runoff of sediment, bacteria and other pollutants by increasing vegetative cover and reducing bare soil. Landowners implemented conservation crop rotation (186 acres [ac]), brush management (5 ac), no-till residue and tillage management (2,248 ac), reduced tillage residue and tillage management (350 ac), grassed waterway (90 ac), contour farming (271 ac), critical area planting (122.3 ac), heavy use area protection (1,427 square feet), fence (20,631 feet [ft]), one grade stabilization structure, irrigation water management (350 ac), livestock pipeline (1,444 ft), nutrient management (2,482 ac), pasture and hayland planting (861.5 ac), range planting (156 ac), pest management (2,823 ac), five ponds, prescribed grazing (8,182.5 ac), upland wildlife habitat management (656 ac), tree/shrub establishment (31 ac), one water pumping plant, three watering facilities, seven water wells and wetland enhancement

(80 ac). In addition, at least 866.5 acres were enrolled in CStwP, meaning conservation plans had already addressed the most urgent natural resource concerns and producers were working towards even greater resource protection. In addition, OCC and conservation district staff maintained the watershed dams by clearing debris, removing tree growth from dams and spillways, and monitoring and controlling erosion on the dams themselves to protect against dam failure.

Results

The OCC documented improved water quality in Roaring Creek due to installation of CPs through its statewide nonpoint source Rotating Basin Ambient Monitoring Program. By 2018, the *E. coli* geometric mean had dropped to 65.5 CFU/100 mL and remained at similar or lower levels through the 2022 assessment period. DO concentrations had also improved: all collections were above the water quality standard (Figure 2). Based on these data, Oklahoma removed Roaring Creek from the CWA section 303(d) list for *E. coli* and DO in 2018. Roaring Creek now fully supports its WWAC and PBC beneficial uses and is currently supporting all assessed beneficial uses.

Partners and Funding

The OCC monitoring program is supported by U.S. Environmental Protection Agency's (EPA's) CWA section 319 funding at an average annual statewide cost of \$1 million. Approximately \$500,000 in EPA 319 funds support statewide water quality educational efforts through Blue Thumb. Approximately \$289,870 of these federal and state matching funds have been devoted to Roaring Creek.

From 2000 to 2020, NRCS supplied more than \$200,000 for CP implementation in Oklahoma through EQIP. In addition, many practices were funded by landowners based on recommendations through CStwP, WRP, NRCS general technical assistance, and FSA's CRP. Finally, the OCC, Grady County Conservation District, and landowners funded more than \$42,987 worth of CPs (at least \$16,186 of which was funded by landowners through the LLCP). Finally, the OCC invested at least \$120,000 in operation and maintenance expenses to protect the watershed structures in the Roaring Creek system.



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