NONPOINT SOURCE SUCCESS STORY

Oklahoma

Conservation Practices Restore Water Quality in Ranger Creek

Waterbody Improved

High bacteria and low dissolved oxygen (DO) levels resulted in the impairment of Ranger Creek and placement on Oklahoma's Clean Water Act (CWA) section 303(d) list of impaired waters in 2002 for *Escherichia coli* (*E. coli*) and in 2010 for DO. Pollution from grazing lands contributed to this impairment. Implementing conservation practice systems (CPs) to promote better agricultural land management decreased *E. coli* and improved DO levels in the creek. As a result, Oklahoma removed Ranger Creek from its 2014 CWA section 303(d) list for *E. coli* and DO. Ranger Creek now fully supports its Fish and Wildlife Propagation (FWP) beneficial use and partially supports its Primary Body Contact (PBC) designated beneficial use.

Problem

Ranger Creek is a 7.94-mile stream that flows through Cherokee County before emptying into Fort Gibson Lake (Figure 1). Land use in the 23,324-acre (ac) watershed is about 60 percent grazing lands and 32 percent forested. Less than 1 percent of the watershed is cropland. Challenges with grazing lands management contributed to listing the stream as impaired for *E. coli* in 2002 when 50 percent of individual samples violated the individual sample maximum of 406 colony forming units per 100 milliliters (CFU/100 mL) during the recreation season. In 2002, the PBC designated use was considered impaired if more than 10 percent of samples violated the individual sample maximum. The assessment method changed in 2008 and streams were considered violating if the recreation season geometric mean exceeded 126 CFU/100 mL for *E. coli*. During the 2010 assessment, 25 percent of DO values violated the criteria for a warm-water aquatic community. A stream is impaired if more than 10 percent of samples violate the criteria. Based on these results, Oklahoma added Ranger Creek (OK121600010060_00) to the 2002 CWA section 303(d) list for nonattainment of its PBC designated beneficial use and to the 2010 303(d) list for nonattainment of its FWP beneficial use.

Story Highlights

Landowners in the watershed worked with the Cherokee County Conservation District, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), and the Oklahoma Conservation Commission (OCC) to implement CPs through Oklahoma NRCS's Environmental Quality Incentives Program (EQIP), and general conservation technical assistance program, and Oklahoma's Locally Led Cost Share Program (LLCP). CPs installed between 2002 and 2017 focused on reducing erosion and pollutant runoff from grazing lands in the watershed (Table 1).

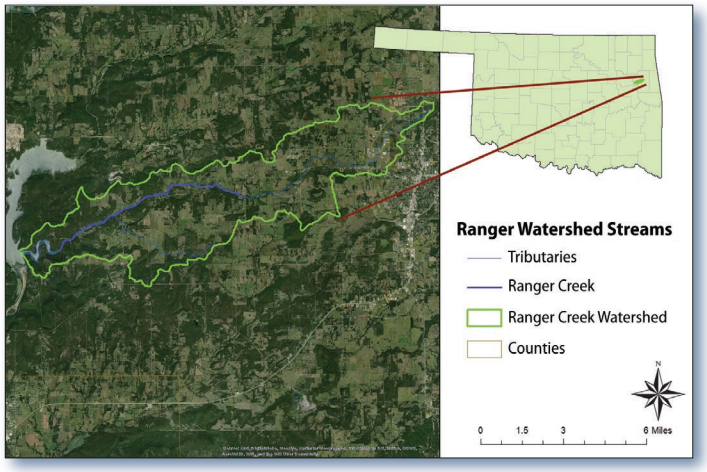

Figure 1. The Ranger Creek watershed is in eastern Oklahoma.

Results

The OCC documented improved water quality in Ranger Creek due to installation of CPs. The installed CPs worked to decrease the runoff of fecal bacteria and other pollutants to downstream waterbodies. Monitoring data compiled for the 2002 integrated report had showed that Ranger Creek *E. coli* levels violated the individual sample maximum 50 percent of the time (Figure 2). However, by the 2014 assessment,

Table 1. CPs installed in the Ranger Creek watershed.

Practice name	Amount installed
Comprehensive nutrient management plan	2
Brush management	447 ac
Forage harvest management	956 ac
Pond	9
Nutrient management	473 ac
Heavy use area protection	745 ft^2
Pest management	2,430 ac
Prescribed grazing	2,179 ac
Livestock pipeline	408 ft
Forage and biomass planting	98 ac
Groundwater testing	1
Watering facility	1
Herbaceous weed treatment	297 ac

bacteria levels had dropped and the *E. coli* geometric mean was 30 CFU/100 mL. Although DO levels were of concern in 2008, during the 2010 assessment, 25 percent of samples violated the DO criteria of 5 milligrams per liter (mg/L) (Figure 3). However, by 2014, only 9 percent of samples violated the criteria. Based on these data, Oklahoma removed Ranger Creek from the CWA section 303(d) list for *E. coli* and DO in 2014. Ranger Creek now fully supports its FWP and partially supports its PBC beneficial uses.

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 319 funds support statewide water quality educational efforts through Blue Thumb. Approximately $215,000 of these federal and matching state funds have been devoted to Ranger Creek. From 2002 to 2017, NRCS supplied approximately $30,000 for implementation of CPs in the watershed through NRCS EQIP. Additional funds were provided through NRCS for technical assistance. The state LLCP provided $12,202 matched by $16,522 from landowners. In addition, many practices were funded by landowners based on recommendations through NRCS general technical assistance and conservation planning.

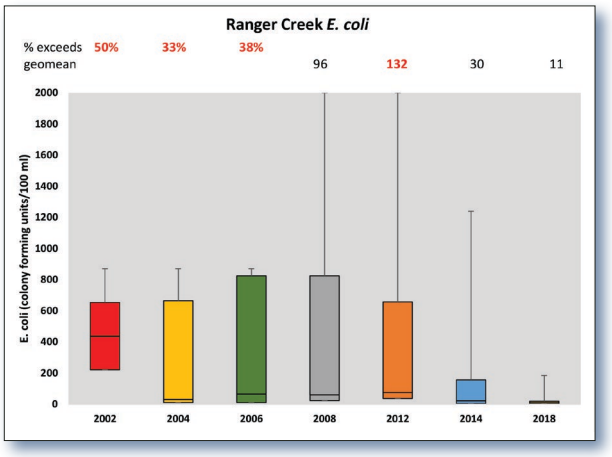

Figure 2. *E. coli* bacteria concentrations decreased in Ranger Creek with the installation of CPs.

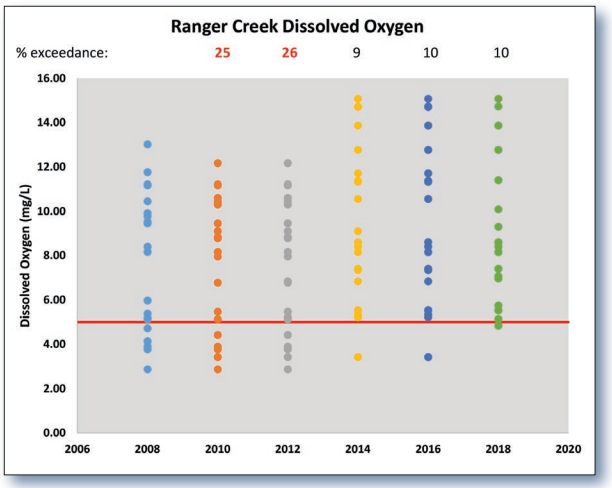

Figure 3. DO concentrations improved with the installation of CPs.

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