



NONPOINT SOURCE SUCCESS STORY

Oklahoma

Better Land Management Improves Water Quality in Eucheek Creek

Waterbody Improved

High bacteria, turbidity, pH, and ammonia levels resulted in impairment of Eucheek Creek and placement on Oklahoma's Clean Water Act (CWA) section 303(d) list of impaired waters in 2002 (for turbidity and pH), 2010 (for bacteria) and 2014 (for ammonia). Pollution from grazing lands and wastewater discharges contributed to these impairments. Implementing conservation practice systems (CPs) to promote better land management decreased turbidity, pH, ammonia, and *Escherichia coli* (*E. coli*) levels in the watershed. As a result, Oklahoma removed the pH impairment in 2008, the turbidity impairment in 2012, the *E. coli* impairment in 2014, and the ammonia impairment in 2016 from its CWA section 303(d) lists. Eucheek Creek now partially supports its warm water aquatic community (WWAC) and primary body contact (PBC) designated beneficial uses.

Problem

The Eucheek Creek Watershed extends over 63,782 acres in Payne, Lincoln, and Creek counties in central Oklahoma (Figure 1). Land use in the watershed is about 58 percent hay and grazing lands and 27 percent shrub and forest land. Approximately 3 percent of the watershed is cropland. A portion of Cushing, Oklahoma (population 7,704), lies in the watershed. Cushing is home to one of the largest crude oil storage hubs on earth, and is located in between oil production lands and refineries. However, other than transmission and storage, not much oil and gas activity occurs in the Eucheek Creek Watershed.

In 2002, challenges with grazing land management in the Cross Timbers Ecoregion contributed to listing a 9.56-mile segment of the stream as impaired by turbidity when at least 32 percent of samples exceeded the turbidity standard. A stream is considered to violate the standard if more than 10 percent of baseflow samples exceed 50 nephelometric turbidity units (NTU). The stream was also listed as impaired for pH in 2002 when 11 percent of pH readings fell outside acceptable pH limits. A stream is considered impaired for pH if more than 10 percent of samples fall outside a range of 6.5 to 9 standard pH units.

Between 2000 and 2015, the city of Cushing's aging wastewater treatment plant (WWTP) experienced several permit exceedances, primarily for total suspended solids, dissolved oxygen, and fecal coliform. These issues, as well as challenges in grazing management,

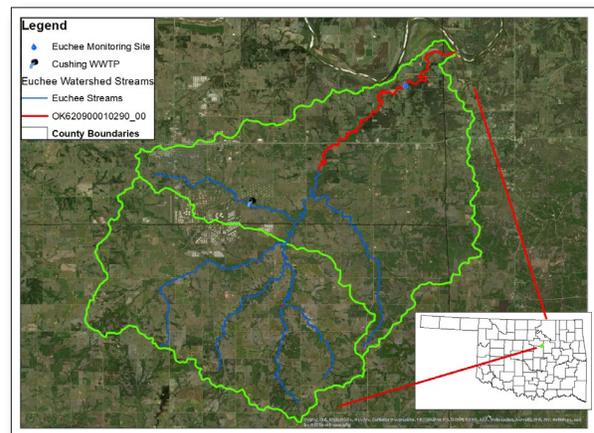


Figure 1. The Eucheek Creek Watershed, Oklahoma.

led to findings from the 2010 assessment, where the stream was determined to exceed allowable bacteria levels for *E. coli* when the geometric mean of samples collected during the recreation season was 237 colony forming units per 100 milliliters (CFU/100 mL). A stream is considered to violate the standard if the recreation season geometric mean exceeds 126 CFU/100 mL for *E. coli*. Finally, in the 2014 assessment, 18 percent of ammonia concentrations were outside acceptable limits for toxicity based on temperature and pH. A stream is considered to violate standards for ammonia if more than 10 percent of samples are outside acceptable limits. Based on these results, Oklahoma added segment OK620900010290_00 to the CWA section 303(d) lists in 2002 (for turbidity and pH), 2010 (for *E. coli*), and 2014 (for ammonia) for nonattainment of the WWAC and PBC designated beneficial uses.

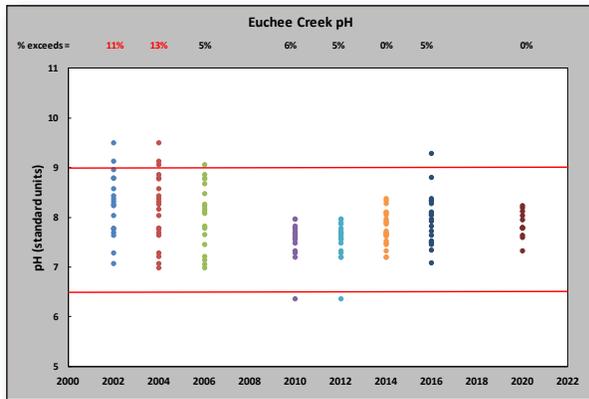


Figure 2. pH levels improved in Euchee Creek.

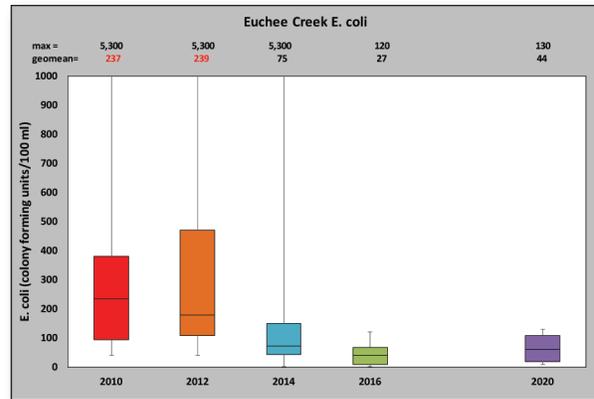


Figure 3. *E. coli* levels declined in Euchee Creek.

Story Highlights

Landowners in the watershed worked with the Payne, Lincoln, and Creek county conservation districts, the U.S. Department of Agriculture 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 through the OCC's Locally Led Cost Share Program (LLCP). From 2004 to 2018, landowners improved pasture, hay meadows, and cropland, which reduced runoff of sediment, bacteria and other pollutants by decreasing erosion and better utilizing available grazing lands. Landowners implemented upland wildlife habitat management (507 acres [ac]), prescribed burning (254 ac), invasive species/noxious weed control (1,546 ac), forage harvest management (718 ac), pasture and hayland planting (267 ac), prescribed grazing (5,330 ac), filter strips (2 ac), conservation tillage (225 ac), nutrient management (460 ac), critical area planting (6 ac), and fencing (24,304 linear feet). Partners also installed two pumping plants, two watering facilities, four water wells, 12 ponds, and 188 feet of pipeline. In addition, in October 2015, the city of Cushing completed a \$765,000 upgrade to their WWTP, which helped bring the system back into compliance.

Results

The OCC documented improved water quality in Euchee Creek due to installation of CPs through its statewide nonpoint source Rotating Basin Ambient Monitoring Program. By 2006, pH exceedances had

dropped to 5 percent and remained at similar or lower levels through the 2020 assessment period (Figure 2). By 2012, turbidity level exceedances had dropped to less than 10 percent. By 2014, geometric mean *E. coli* levels had dropped to 75 CFU/100 mL which meets the standards (Figure 3). By 2016 ammonia level exceedances had dropped under 10 percent and therefore were within allowable limits. Based on these data, Oklahoma removed Euchee Creek from the CWA section 303(d) list for pH in 2006, turbidity in 2012, *E. coli* in 2014, and ammonia in 2016. Euchee Creek now partially supports its WWAC and PBC beneficial uses. The 2015 WWTP upgrade has helped to ensure the Euchee River continues to meet standards.

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 \$236,883 of these federal and state matching funds have been devoted to Euchee Creek.

From 1991 to 2018, NRCS supplied more than \$49,000 for CP implementation in Oklahoma through EQIP. In addition, many practices were funded by landowners based on recommendations through NRCS general technical assistance. Finally, the OCC; the Payne, Lincoln and Creek county conservation districts; and landowners funded more than \$194,618 worth of CPs (at least \$105,754 of which was funded by landowners through the LLCP).



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