



NONPOINT SOURCE SUCCESS STORY

Oklahoma

Conservation Leadership and Land Stewardship Improve Caddo Creek

Waterbody Improved

Low pH and elevated *Escherichia coli* (*E. coli*) and ammonia concentrations resulted in impairment of Caddo Creek and placement on Oklahoma's Clean Water Act (CWA) section 303(d) list of impaired waters in 2006 (ammonia) and 2008 (pH and *E. coli*). Pollution from cropland and grazing lands contributed to this impairment. Implementing conservation practice systems (CPs) to promote better land management decreased runoff of nutrients, bacteria, and other pollutants and helped to improve water quality. As a result, Oklahoma removed the ammonia and pH impairments in 2010 and the *E. coli* impairment in 2018 from its CWA section 303(d) list. Caddo Creek now fully supports its Primary Body Contact (PBC) and partially supports its Warm Water Aquatic Community (WWAC) beneficial uses.

Problem

The Caddo Creek watershed covers approximately 224,297 acres (ac) of scenic hills, prairies and woodlands in Carter, Murray and Stephens counties in Oklahoma (Figure 1). Caddo Creek is located within the Chickasaw Nation and drains from headwaters in southwest Stephens County to the confluence with the Washita River northeast of Ardmore in Carter County. Land use in the watershed is about 65% grazing lands, 23% shrub land and forested and 5% developed. The primary agricultural products from the watershed are cattle, hay and pecans. Between 1900 and 2022, more than 4,500 oil and gas wells have been developed in the watershed, approximately 3,200 of which have been drilled or redrilled since 2005.

Water quality monitoring in the early 2000s determined that challenges with grazing land management contributed to a 2006 listing of the 44.08-mile stream as being impaired by ammonia when 27% of samples were outside the acceptable limits for toxicity based on temperature and pH. A stream is considered to violate standards for ammonia if more than 10% of samples are outside the acceptable limits. Oklahoma added pH as an impairment in 2008 when 15% of samples were outside acceptable limits. A stream is considered to be impaired by pH if more than 10% of samples are less than 6.5 or greater than 9. The stream was also listed for *E. coli* in 2008 when the geometric mean of samples collected during the recreational season was 208 colonies per 100 milliliters (col/100 mL). A waterbody is considered impaired for *E. coli* if the geometric mean of samples collected between May 1 and September 30 is greater than 126 col/100 mL.

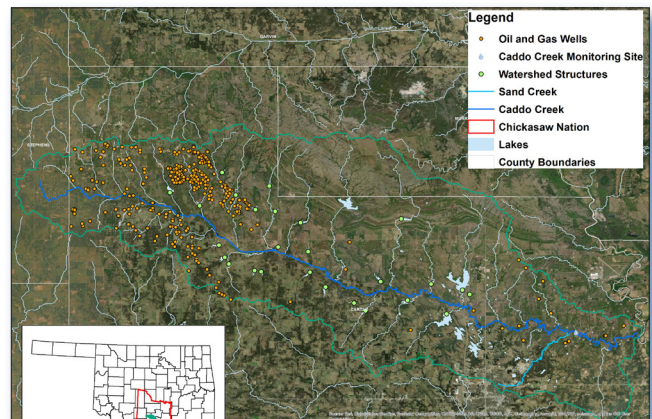


Figure 1. Caddo Creek is in southern Oklahoma.

Based on these results, Oklahoma added segment 310800030010_00 to the CWA section 303(d) lists in 2006 and 2008 for nonattainment of the WWAC and PBC beneficial uses.

Story Highlights

The Caddo Creek watershed is home to several well-known Oklahoma ranching operations, including the Double C Cattle Company and Speake Ranch. These two operations hold workshops and educational programs that promote regenerative agriculture and conservation-focused management. They have been recognized with environmental awards from the National Cattlemen's Foundation and the Sand County Foundation. These producers and more than 130 of their neighbors in the watershed worked with the Arbuckle, Murray, or Stephens county conservation districts; the Natural Resources Conservation Service

(NRCS); and the Oklahoma Conservation Commission (OCC) to implement CPs. They worked through a variety of programs, including the OCC's State Cost Share Program (SCSP) and NRCS's Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), Wetlands Reserve Program (WRP), and general conservation technical assistance program.

From 2002 to 2020, landowners improved grazing and animal waste management, which reduced runoff of sediment, nutrients and other pollutants by increasing vegetative cover and reducing bare soil and by protecting animal waste from runoff. Landowners implemented brush management (1,282 ac), conservation crop rotation (84 ac), cover crop (67 ac), critical area planting (156 ac), diversion (7,885 feet [ft]), fence (79,204 ft), firebreak (33,025 ft), forage harvest management (701 ac), grade stabilization structures (31), grassed waterways (0.2 ac), groundwater testing (4 wells), heavy use area protection (3 ac), herbaceous weed control (191 ac), livestock pipeline (2,000 ft), nutrient management (1,488 ac), pasture and hayland planting (873 ac), pest management (3,278 ac), ponds (163), reduced tillage (797 ac), prescribed burning (1,153 ac), prescribed grazing (38,566 ac), pumping plants (6), range planting (25 ac), one seasonal high tunnel, terrace (2,906 ft), tree planting (0.5 ac), upland wildlife habitat management (2,686 ac), water control structures (12), water wells (7), wetland wildlife habitat management (140 ac), and wetland restoration (160 ac). In addition, at least 6,670 acres were enrolled in CSP, which facilitated additional practices to improve animal waste, grazing, soil and nutrient management. The Arbuckle Rangeland Restoration Association has also been working with landowners in the watershed to use controlled burns to restore and improve rangeland habitat in the watershed by developing burn plans, overseeing prescribed fire applications, and educating landowners about the benefits of prescribed fire during all seasons.

Results

The OCC documented improved water quality in Caddo Creek due to installation of CPs through its statewide nonpoint source Rotating Basin Ambient Monitoring Program. By 2012, ammonia concentrations dropped ($\leq 8\%$ exceeded acceptable criteria) and pH values

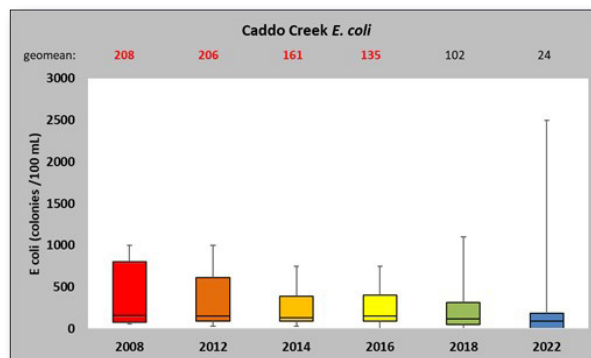


Figure 2. Caddo Creek *E. coli* levels declined after installation of CPs.

improved ($\leq 9\%$ were outside the acceptable range). By 2018, *E. coli* concentrations improved to a geometric mean of 102 colonies/100 mL (Figure 2). Caddo Creek now fully supports its PBC and partially supports its WWAC beneficial uses, and Oklahoma removed the following impairments from the CWA section 303(d) list: ammonia and pH in 2010 and *E. coli* in 2018.

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 \$627,532 of these federal and state matching funds have been devoted to Caddo Creek.

From 2002 to 2020, NRCS invested a minimum of \$593,000 for CP implementation in Oklahoma through EQIP; additional financial assistance was provided through CSP and WRP. In addition, many practices were funded by landowners based on recommendations through NRCS general technical assistance. The OCC; Arbuckle, Murray, and Stephens county conservation districts; and landowners funded more than \$274,647 worth of CPs (at least \$112,961 of which was funded by landowners through the SCSP). The Arbuckle Rangeland Restoration Association has worked with several landowners in the Caddo Creek watershed to plan and implement prescribed fire to improve rangeland quality and protect water quality.



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