



NONPOINT SOURCE SUCCESS STORY

Oklahoma

Implementing Agricultural Conservation Practices Improves Turbidity Levels in Cottonwood Creek

Waterbody Improved

Elevated turbidity resulted in the impairment of Cottonwood Creek and placement on Oklahoma's Clean Water Act (CWA) section 303(d) list of impaired waters in 2006. Grazing, hay production, cropland management and urban development contributed to these impairments. Implementation of conservation practice systems (CPs) to improve agricultural land management, education and improved stormwater management decreased turbidity in the creek. As a result, the downstream segment of Cottonwood Creek was removed from Oklahoma's 2010 CWA section 303(d) list for turbidity. The delisted segment of Cottonwood Creek now fully supports its fish and wildlife protection (FWP) beneficial use.

Problem

Cottonwood Creek is a 46.4-mile stream that flows through Kingfisher, Canadian, Oklahoma, and Logan counties before discharging to the Cimarron River (Figure 1). Land use in the 243,420-acre watershed is primarily pasture and grasslands (38 percent of total). About 25 percent of the watershed is cropland (primarily wheat), 11 percent is forested, and approximately 24 percent is developed land that includes portions of the Oklahoma City metropolitan area.

Because Cottonwood Creek is historically flood-prone, an extensive network of upstream flood control structures was established to protect citizens and infrastructure (see Figure 1). These 16 structures built between 1965 and 1973 have successfully reduced flooding and also capture an estimated annual average of 100,880 tons of soil from upstream areas. These structures provide approximately \$409,000 in annual savings due to avoided flooding damages that benefits 174 farms or ranches in the watershed and protects a network of 13 bridges. Construction of these structures has created or enhanced 484 acres of wetlands. As a result of the age of the structures and downstream development, some needed eroded spillway repairs while others needed renovation to better protect new downstream development.

Grazing land and cropland management and urban and infrastructure development contributed to excess turbidity in Cottonwood Creek. It was listed as impaired for turbidity in 2006 when 26 percent of assessed baseflow turbidity samples violated water quality standards. An

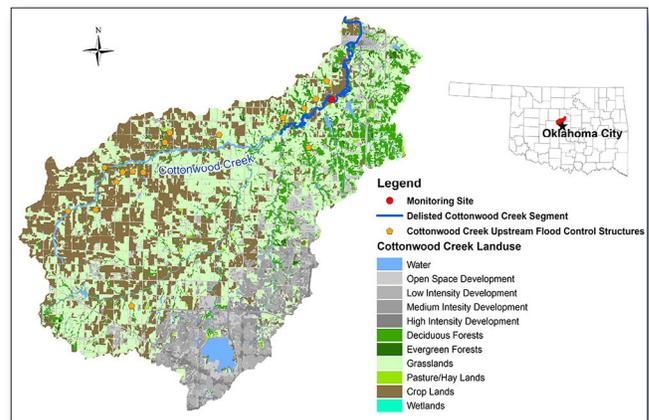


Figure 1. Cottonwood Creek is in central Oklahoma.

Oklahoma stream is considered to violate the turbidity standard when more than 10 percent of baseflow samples are higher than 50 nephelometric turbidity units (NTU). On the basis of these assessment results, Oklahoma added a 22.01-mile segment of Cottonwood Creek (OK620910040010_00) to the 2006 CWA section 303(d) list for nonattainment of its FWP beneficial use.

Project Highlights

Landowners worked with the East Canadian, Kingfisher, Oklahoma, and Logan county conservation districts, the U.S. Department of Agriculture (USDA) 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, as

well as through OCC's Locally Led Cost-Share Program (LLCP). From 2006 to 2012, landowners improved grasslands and croplands, which reduced runoff of sediment and other pollutants. CPs installed included brush management (546 acres), conservation crop rotation (35 acres), contour farming (206 acres), critical area planting (19 acres), forage and biomass planting (256 acres), grassed waterway (12 acres), one ground-water testing event, nutrient management (337 acres), prescribed grazing (470 acres), no-till (558 acres), two ponds, range seeding (75 acres), seasonal residue management (74 acres), terraces (187 feet) and one water well.

Rehabilitation of upstream flood control structures in the watershed also improved water quality in the basin. Rehabilitation on one dam was completed in January 2011; another dam was decommissioned in July 2012. A third structure will be rehabilitated in the fall of 2017. These projects reduce erosion by stabilizing structures and can also increase sediment and floodwater storage. The structure decommissioning involved dam removal and site regrading and revegetation to stabilize slopes and tie the stream channel back into natural configuration.

Blue Thumb volunteers monitor three sites in the Cottonwood Creek watershed. As part of the Oklahoma City and Edmond area efforts, Blue Thumb and participating partners also conduct frequent education events such as natural resource days, volunteer trainings, and other activities that educate citizens about water quality. Finally, Edmond and Oklahoma City have been growing their stormwater programs, resulting in increased regulation and compliance from the construction industry. Oklahoma City has a robust stream monitoring program with multiple sites in the watershed; they use data from the program to inform stormwater policies and remedial projects.

Results

The OCC documented improved water quality in Cottonwood Creek through its statewide nonpoint source Rotating Basin Ambient Monitoring Program. The management changes decreased erosion and reduced turbidity. Monitoring data compiled for the 2006 Integrated Report showed excessive turbidity in Cottonwood Creek when 26 percent of baseflow samples exceeded the state standard of 50 NTU.

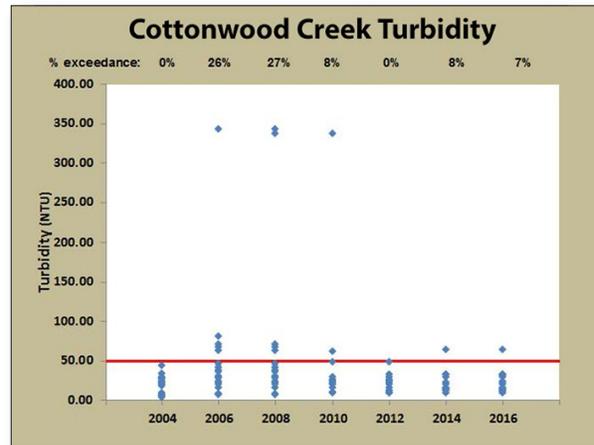


Figure 2. Turbidity levels decreased as conservation efforts increased in the watershed.

However, by 2010, turbidity values had decreased such that only eight percent of samples exceeded 50 NTU; this decreasing trend continues through the 2016 assessment (Figure 2).

On the basis of these data, the lower segment of Cottonwood Creek was removed from the Oklahoma CWA section 303(d) list for turbidity in 2010. This change resulted in full support of its FWP beneficial use. Future monitoring efforts will assess the upstream segment to determine if improvements also exist in that segment.

Partners and Funding

The OCC Rotating Basin Monitoring and Blue Thumb programs are supported by the U.S. Environmental Protection Agency's (EPA) CWA section 319 grant program, with approximately \$1.5 million invested annually. OCC invested approximately \$340,000 in monitoring and education programs in the watershed between 2006 and 2010, funded by section 319. NRCS supplied approximately \$31,000 for implementation of CPs in the watershed through NRCS EQIP. The LLCP provided \$28,398 matched by \$28,646 from landowners. A large number of practices were funded by landowners based on recommendations through NRCS general technical assistance and conservation planning. Upstream flood control structure rehabilitation and decommissioning was funded with \$997,500 in state funds and \$1,852,500 from USDA NRCS.



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