Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Oklahoma

Installing Agricultural Best Management Practices Leads to Increased Dissolved Oxygen Levels in Beaver and Doga Creeks

Waterbodies Improved

Low dissolved oxygen (DO), attributed primarily to practices associated with cattle production, resulted in impairment of Oklahoma's Beaver and Doga creeks. As a result, Oklahoma added Beaver Creek (in 2004) and Doga Creek (in 2006) to the state's Clean Water Act (CWA) section 303(d) list of impaired waters. Implementing best management practices (BMPs) helped to reduce erosion from grazing lands and, thus, decreased sediment and nutrient runoff into the creeks. DO levels improved, prompting Oklahoma to remove Beaver and Doga creeks from the 2010 CWA section 303(d) list for low DO.

Problem

Beaver Creek (22 miles long) (Figure 1) and Doga Creek (10 miles long) are in Osage County in north central Oklahoma. Watershed land use includes mostly cattle production with some forage and wheat production. Poor management of livestock and grazing lands, as well as a lack of healthy riparian areas, contributed to excess sedimentation and nutrient runoff into the creek. Excess nutrients from runoff in the watershed can lead to the overgrowth of nuisance algae, and the subsequent breakdown of the algae can then cause DO levels to decrease. Water quality assessments in 2004 showed that 60 percent of the water samples in Beaver Creek were below (i.e., did not meet) state criteria for warm-water aquatic communities. In 2006, 21 percent of the samples from Doga Creek were below the DO criteria. A waterbody is considered impaired for DO if more than 10 percent of samples (based on no more than five years of data before the assessment year) fall below 6.0 milligrams per liter (mg/L) from April 1 through June 15 or below 5.0 mg/L during the remainder of the year. On the basis of these assessment results, Oklahoma added both creeks—Beaver Creek in 2004 and Doga Creek in 2006—to the state's CWA section 303(d) list for failing to support the fish and wildlife propagation designated use because of DO impairment.

Figure 1. Oklahoma's Beaver Creek flows through Osage County.

Project Highlights

Landowners implemented BMPs with assistance from Oklahoma's locally led cost-share program and through the local Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program, Conservation Reserve Program, Grassland Reserve Program and general technical assistance program. These projects focused on keeping livestock away from the stream, protecting riparian areas and improving grazing lands. Since 2004, landowners in the two watersheds have added 125 acres of livestock access control, built 2,590 feet of livestock exclusion fencing, and installed two new ponds to provide alternative watering sources and to keep livestock out of the creeks. Riparian areas were protected using seasonal residue management on 23 acres and establishing herbaceous cover on 64 acres. To improve the condition of pasture and rangeland, prescribed grazing was implemented on 21,541 acres and 555 acres received nutrient management plans. Producers planted range grasses and forage on 333 acres, practiced better forage harvest management on 329 acres, planted conservation cover on 189 acres, implemented critical area planting on one acre, and used integrated pest management on 9,792 acres. Brush management occurred on

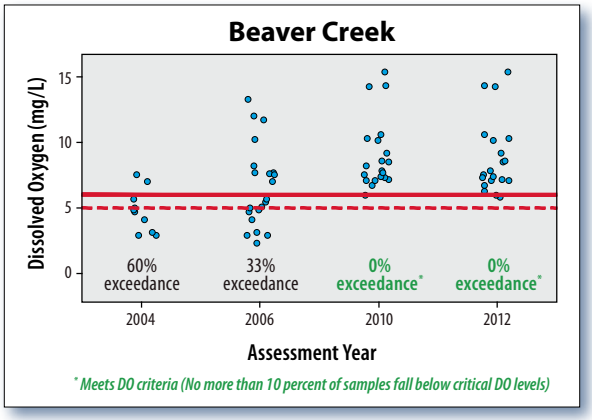

Figure 2. Data show that DO levels in Beaver Creek have met state criteria for warm-water aquatic communities since 2010.

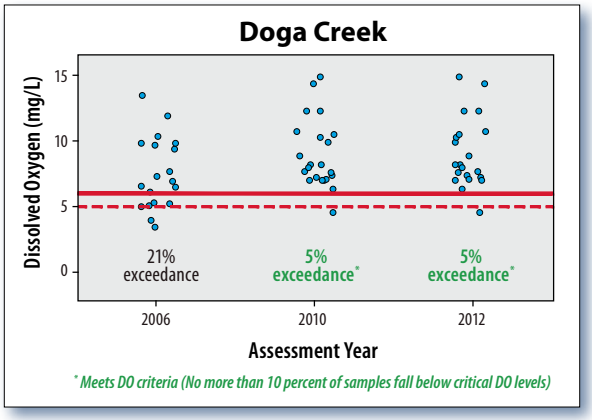

Figure 3. Data show that DO levels in Doga Creek have met state criteria for warm-water aquatic communities since 2010.

3,819 acres, and prescribed burning took place on 8,838 acres after installing 11,187 feet of firebreak. Landowners managed upland wildlife habitat on 64 acres and wetland wildlife habitat on 64 acres.

In addition, the Oklahoma Conservation Commission's (OCC) education program, Blue Thumb, actively promoted restoration efforts in the Beaver Creek and Doga Creek watersheds. Volunteer training events were held in Osage County and in neighboring Kay County. These activities provided vital education of the residents of the watersheds and helped to facilitate behavior changes. Active volunteer monitoring in the watershed is ongoing. Blue Thumb continues to work to educate watershed residents, including the Kaw and Osage nations.

Current NRCS initiatives in Kay and Osage counties include controlling the spread of Eastern red cedars, eradicating *Sericia lespedeza* (an introduced perennial legume that can have negative effects on local environmental conditions), managing waste from animal feeding operations and closing failing animal waste lagoons. All of these should continue to improve water quality in both watersheds.

Results

The OCC's Rotating Basin Monitoring Program, a statewide nonpoint source ambient monitoring program, documented improved water quality in Beaver and Doga creeks after restoration efforts. BMP implementation and accompanying education of landowners reduced nutrient and sediment runoff to Beaver and Doga creeks, thereby decreasing nuisance algal growth and improving DO levels.

To meet state DO criteria for warm-water aquatic communities, samples may not fall below critical DO levels (5.0 or 6.0 mg/L, depending on the season) more than 10 percent of the time. Data show that both creeks met the state DO criteria during the 2010 and 2010 assessments: all Beaver Creek samples remained above critical DO levels (Figure 2) and only five percent of Doga Creek samples fell below the critical DO levels (Figure 3) during both years. On the basis of these data, Oklahoma removed Beaver and Doga creeks from the 2010 CWA section 303(d) list for DO impairments. Both creeks now fully support their fish and wildlife propagation designated uses.

Partners and Funding

The Rotating Basin Monitoring Program, which includes both fixed and probabilistic components, is funded through the U.S. Environmental Protection Agency's (EPA) CWA section 319 funds at an average annual cost of $1 million. Monitoring costs include personnel, supplies and lab analysis for 19 parameters from samples collected every five weeks at about 100 sites. In-stream habitat, fish and macroinvertebrate samples are also collected. Approximately $600,000 in EPA section 319 funds support statewide education, outreach and monitoring efforts through the Blue Thumb program. Since 2004, the Oklahoma cost-share program has provided $3,060 in state funding for BMPs in these watersheds through the Kay and Osage County Conservation Districts. The NRCS has spent approximately $350,000 to implement BMPs in these watersheds from 2004 through 2012. Landowners have provided a significant percentage of the cost toward BMP implementation.

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