Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY

Kansas

Cooperative Watershed Management Improves Dissolved Oxygen Levels in the Dragoon Creek Watershed

Waterbodies Improved

Agricultural runoff from grassland and cropland led to sediment and nutrient loading, which contributed to decreased dissolved oxygen (DO) levels in the Dragoon Creek watershed. As a result, the Kansas Department of Health and Environment (KDHE) added four streams in the watershed to the state's 1998 Clean Water Act (CWA) section 303(d) list of impaired waters for low levels of DO. Watershed partners, including local, state and federal agencies as well as numerous landowners, implemented agricultural best management practices (BMPs) that reduced pollution. Data show that the four stream segments (Dragoon, Batch, Plum and Smith creeks—totaling 76.3 miles) now meet the state's DO water quality standard, prompting KDHE to remove them from the state's 2012 list of impaired waters for DO.

Problem

The 205,359-acre Dragoon Creek watershed is part of the Pomona Lake watershed in east-central Kansas. Dragoon Creek originates in the southeast portion of Wabaunsee County, and it flows southeast until it merges with Valley Brook and 110-Mile Creek to form Pomona Lake in Osage County (Figure 1). Grassland (55 percent) and cropland (26 percent) are the primary land uses in the Pomona Lake watershed; they are concentrated heavily in the headwaters of the watershed, as well as around Pomona Lake.

Between 1990 and 2000, water quality samples were collected on Dragoon Creek (see Figure 1 for monitoring location). Of 77 samples collected, eight had DO levels below the state standard of 5 milligrams per liter (mg/L), the minimum DO concentration required to support the aquatic life designated use. As a result, KDHE added four streams in the Dragoon Creek watershed—Dragoon, Batch, Plum and Smith creeks—to the state's 1998 CWA section 303(d) list of impaired waters for DO.

To address the DO impairments, KDHE developed a total maximum daily load (TMDL), which the U.S. Environmental Protection Agency (EPA) approved in 2001. External organic loading from livestock and other farming operations in the watershed and in-stream primary production of organic material were identified in the TMDL as probable causes of the low-DO problems in Dragoon Creek. In addition to monitoring DO, the state collected total phosphorus, total suspended solids and bacteria data to assess organic loading in the stream.

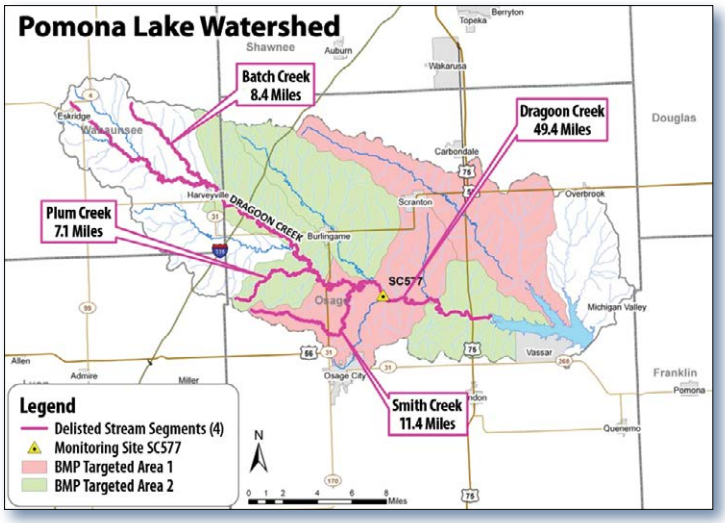

Figure 1. Dragoon Creek is in the Pomona Lake watershed.

Project Highlights

Beginning in 2001, the Osage County Conservation District; U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS); local landowners; the Pomona Lake Watershed Restoration and Protection Strategy (WRAPS) and the USDA Farm Service Agency implemented agricultural and livestock BMPs throughout the Pomona Lake watershed. Landowners installed a number of BMPs to limit livestock access to waterbodies on more than 3,200 acres (3,107 acres of access control and 103 acres of use exclusion). BMPs included 17 new or refurbished ponds used for alternative watering sources for livestock; 14 watering facilities;

Figure 2. A landowner installed this livestock exclusion fence to reduce organic loading to surface waters.

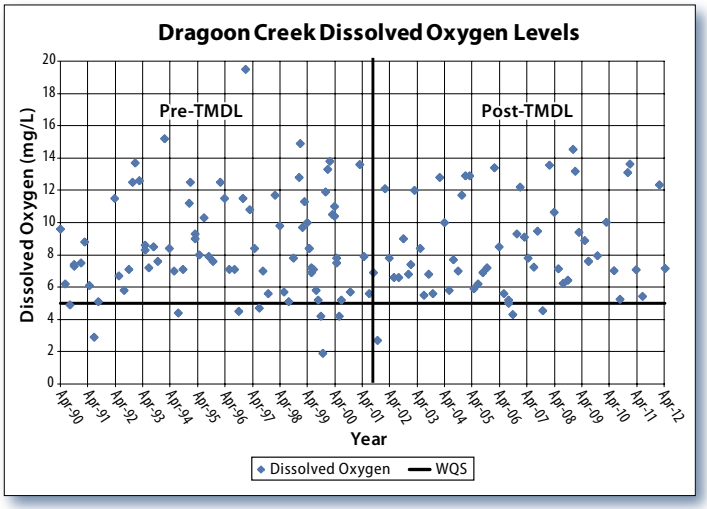

Figure 3. BMPs installed as part of the TMDL implementation effort led to improved DO levels in Dragoon Creek.

4,606 linear feet of pipeline to support the alternative watering systems; and 44,574 linear feet of livestock exclusion fencing (Figure 2).

Project partners also implemented a number of BMPs to reduce agricultural runoff, including 4,279 acres of prescribed grazing; 5,617 linear feet of diversion methods to redirect runoff; 17,660 linear feet of field borders (bands or strips of perennial vegetation established on the edges of cropland fields); 254 acres of filter strips (areas of grass or other permanent vegetation); 296 acres of grassed waterways (grass strips planted along cropland drainage areas); 6,458 acres of conservation crop rotation; 265 acres of pasture and hay planting; 556 acres of cover crops; 6,362 acres of residue and tillage management; 167,846 linear feet of terraces; 975 acres of contour farming; 11 water and sediment control basins; and 6,042 acres of nutrient management. Additional BMPs included 32 acres of riparian forest buffers, 676 acres of forest harvest management, and installation of four onsite wastewater systems.

Results

KDHE has collected 63 water samples in Dragoon Creek since the TMDL went into effect in 2001. Fourteen samples collected between 2001 and 2012 under conditions of high temperature and low flow did not indicate low DO. Average flow conditions for the periods of low DO during 2001–2012 were lower (24 percent of median flow) than those for such periods before 2001 (33 percent of median flow). Therefore, the improvement in water quality does not appear to be an artifact of improved flow conditions or moderate water temperatures during the past decade. In addition, monitoring conducted after 2001 shows less phosphorus and organic material in the waterbody, contributing to decreased oxygen demand on the stream in recent years. All samples collected since 2008 have met Kansas's DO criterion of 5 mg/L, the DO level necessary to support the aquatic life designated use (Figure 3). Based on these data, KDHE removed Dragoon, Batch, Plum and Smith creeks (76.3 total stream miles) from its list of impaired waters in 2012 for DO impairment. KDHE indicates that BMPs to abate nutrient, sediment and organic matter loads to the stream likely contributed to improving DO levels in the Dragoon Creek watershed.

Partners and Funding

The success of this project can be attributed to several local, state and federal partners, including Osage County Conservation District; Kansas Department of Agriculture (KDA), Division of Conservation; EPA Region 7; Pomona Lake WRAPS; NRCS; Farm Service Agency; Ecotone Forestry; Kansas State University; and Kansas Rural Center.

The project was supported by CWA section 319 funds, specifically a 2006 Pomona WRAPS Assessment grant ($85,000), a 2007 Pomona WRAPS Planning grant ($50,000) and two Pomona WRAPS implementation grants (totaling $85,000). KDA's Division of Conservation, NRCS, and local landowners provided additional support.

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For additional information contact:

Sheryl Ervin
Kansas Department of Health and Environment
785-296-8038
servin@kdheks.gov