Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Kansas

Implementing Agricultural Best Management Practices Improves Dissolved Oxygen Levels in Walnut and West Creeks

Waterbodies Improved

Nonpoint source pollution from poor pasture management and livestock negatively affected water quality in approximately 19 miles of Walnut Creek and 11.7 miles of West Creek. As a result, the Kansas Department of Health and Environment (KDHE) added both creeks to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 1998 for dissolved oxygen (DO). Several organizations worked collaboratively with local landowners to implement agricultural best management practices (BMPs). Water quality monitoring data collected since 2002 show that both creeks now meet the water quality standard for DO. As a result, KDHE removed both creeks from the state's 2010 list of impaired waters for DO impairment.

Problem

Walnut and West creeks are in the Toronto Reservoir watershed, a 458,395-acre area in southeastern Kansas that is part of the larger Verdigris River watershed. Walnut Creek drains 166.7 square miles and flows directly into the Toronto Reservoir; West Creek drains 123.2 square miles and flows into the Verdigris River, which then drains into the Toronto Reservoir (Figure 1). The combined drainage areas of both creeks represent 25 percent of Greenwood County.

The major land use in the Toronto watershed is grassland (85 percent), much of which is used for livestock grazing. Cropland (7 percent of land use in the watershed) is the primary land use along the main stems and respective tributaries of both Walnut and West creeks.

Between 1990 and 2001, KDHE collected 67 Walnut Creek samples, nine of which had DO levels below 5 milligrams per liter (mg/L), the minimum DO concentration required to protect the aquatic life designated use. Similarly, of the 135 West Creek water samples collected between 1985 and 2001, 15 showed DO levels below 5 mg/L. As a result, KDHE added Walnut and West creeks to the state's 1998 CWA section 303(d) list for DO impairment.

In 2002, EPA approved KDHE's total maximum daily loads (TMDL) for West Creek and Walnut Creek, which addressed the DO impairments. The primary suspected contributor to low DO levels in both waterbodies was nonpoint source pollution, specifically, nutrients from poor pasture management and livestock areas.

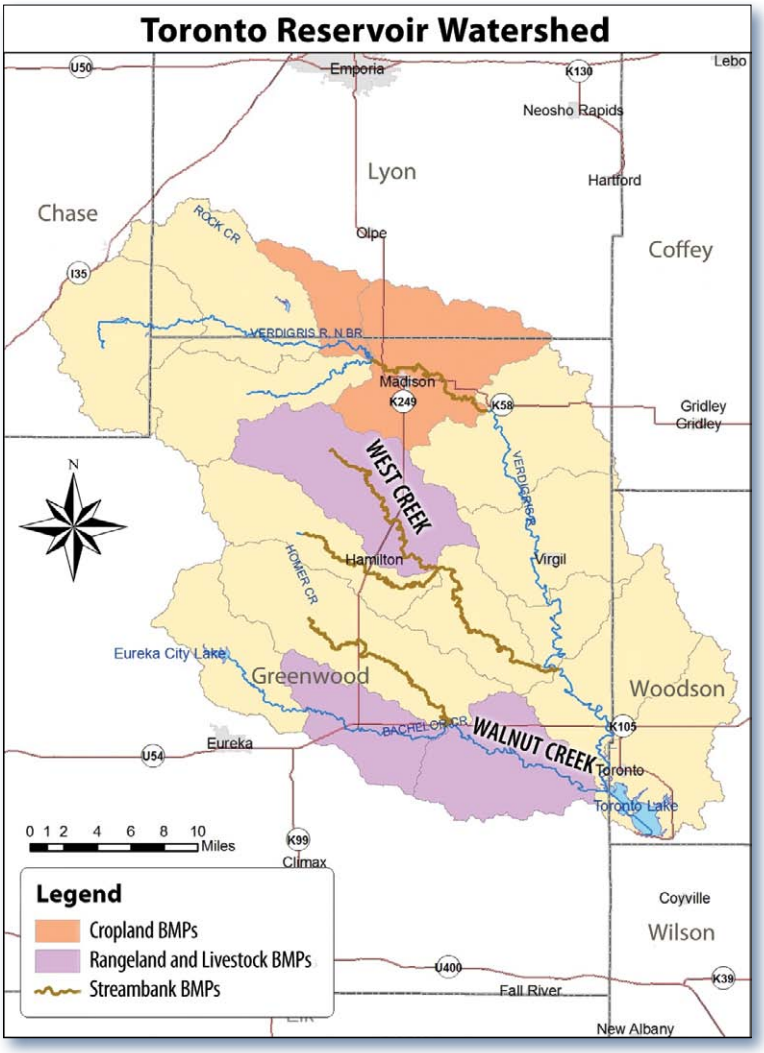

Figure 1. Toronto Reservoir watershed and BMP locations.

Project Highlights

Since the approval of the Walnut and West Creek TMDLs in 2002, the Greenwood County Conservation District, Greenwood County Natural Resources Conservation Service (NRCS) office, and local landowners have implemented agricultural BMPs throughout the Toronto watershed (see Figure 1).

In 2006, project partners developed the Toronto Watershed Restoration and Protection Strategy (WRAPS) watershed plan, which was aimed at addressing both the DO impairments in Walnut and West creeks and the nutrient, DO and siltation impairments in Toronto Reservoir. The Toronto WRAPS identified a number of measures to prevent phosphorus contributions (a suspected cause of the DO impairment) from livestock, cropland, rangeland and streambank erosion.

Over the past several years, project partners have implemented the following BMPs in West Creek: 32.75 acres of pasture and hay land planting; repair/installation of six agricultural ponds, which serve as alternative watering sources for livestock; installation of 18,542 linear feet of livestock fencing; installation of seven watering facility units (Figure 2); installation of 4,674 linear feet of pipeline to facilitate alternative livestock watering systems; and 2.1 acres of critical area planting to reduce runoff into the waterbody.

Figure 2. A landowner installed this alternative watering tank for livestock.

Similarly, project partners implemented the following BMPs in Walnut Creek: 77.95 acres of pasture and hay land planting; repair/installation of 24 agricultural ponds; installation of 23,932 linear feet of livestock fencing; installation of 13 watering facility units; installation of 5,390 linear feet of watering facility pipeline; and 5.3 acres of critical area planting to reduce runoff into the waterbody.

Results

Water quality monitoring data collected since 2002 show that both creeks now meet the DO criterion required to protect their aquatic life designated uses.

Table 1. Monitoring Data from West and Walnut Creeks, 1985–2011

	Sample Period	Number of DO Samples < 5 mg/L	Average Total Phosphorus (parts per billion)	Average Total Suspended Solids (parts per million)
West Creek	1985–2001	15	67	27
	2002–2006	1	58	17
	2006–2011	0	48	16
Walnut Creek	1990–2001	9	65	23
	2002–2006	0	57	13
	2006–2011	0	47	12

No DO violations have been recorded in Walnut Creek and West Creek since 2002 and 2006, respectively (Table 1). To assess whether flow rate affected DO concentrations, KDHE calculated the long-term median flow for both creeks and plotted DO sample points against the percent of median flow during the month each sample was taken. Despite reduced flow between 2006 and 2011, water quality (as measured by DO concentrations) improved. On the basis of these data, KDHE removed both creeks from the state's 2010 list of impaired waters for DO impairment. Water quality data also show a notable decrease in ambient total phosphorus and total suspended solids, further indicating overall water quality improvement in both creeks.

Partners and Funding

The success of this project can be attributed to a number of local, state and federal partners, including Greenwood County Conservation District; Greenwood County NRCS office; Kansas Water Office; Flint Hills Resource Conservation and Development Council; Kansas Forest Service; Kansas Department of Agriculture, Division of Conservation; Kansas State University; U.S. Environmental Protection Agency; Kansas Rural Center; Kansas Alliance for Wetlands and Streams; U.S. Army Corps of Engineers; Kansas Department of Wildlife and Parks; and participating landowners.

The project was supported by CWA section 319 funds, specifically a 2006 Toronto WRAPS Development grant ($31,041), a 2007 Toronto WRAPS Assessment and Planning grant ($112,076), and two Toronto WRAPS Implementation grants in 2009 and 2010 (totaling $134,318). Additional support was provided by the Kansas Department of Agriculture's Division of Conservation, USDA NRCS and local landowners.

U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-12-001l
April 2012

For additional information contact:

Ann D'Alfonso
Environmental Scientist
Kansas Bureau of Water
785-296-3015 • AD'Alfonso@kdheks.gov