Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Nebraska

Land Treatment Efforts Improve Water Quality

Waterbody Improved

Nebraska's Kirkmans Cove Reservoir had severe dissolved oxygen problems through the mid-1990s. High levels of sedimentation and nutrients also impaired the reservoir. The Nebraska Department of Environmental Quality (DEQ) added this waterbody to the state's 1998 Clean Water Act section 303(d) list of impaired waters. In 2000 the Nemaha Natural Resources District partnered with several local, state and federal agencies to initiate a Community Based Planning process. Through this locally led process, the partners developed a Watershed Management Plan that incorporated a unique mix of cost share and incentives to encourage farmers to implement a host of agricultural management practices. The plan paid off, and water quality improved. DEQ removed the dissolved oxygen impairment for Kirkmans Cove Reservoir from Nebraska's 2002 303(d) list.

Problem

Kirkmans Cove Reservoir is in southeast Nebraska's Richardson County. It was designed and developed as a multipurpose, flood control/public use area (Figure 1). Part of the Nemaha River Basin, the 160-acre reservoir has a watershed of 4,896 acres of which 2,590 acres (53 percent) are used for crop production. The reservoir had dissolved oxygen problems linked to excessive nutrient loading and organic enrichment. Data collected in 1997 and 1998 showed that the water column average dissolved oxygen concentrations fell below 5.0 milligrams per liter (mg/L) for six of the eight water quality profiles. From a sample size of eight, regulations would allow only two violations of the assessment criteria. Therefore, DEQ added the reservoir to the 1998 303(d) list because low dissolved oxygen concentrations impaired the reservoir's beneficial uses for aquatic life.

In 2002 DEQ developed a TMDL for total phosphorus to address dissolved oxygen problems. The TMDL indicated that a phosphorus loading reduction of 92 percent would be needed to increase dissolved oxygen concentrations above impairment levels.

Figure 1. One of several water quality basins constructed in the watershed to complement land treatment measures. These basins are effective at controlling steep grades and trapping pollutants that are mobilized during larger storm events. Each structure is fenced to exclude livestock and alternate livestock water is provided below the structure.

Project Highlights

Participation in the watershed project was good—21 of the 36 landowners implemented controls. Overall, project partners treated 1,911 acres of cropland with terraces, rehabilitated seven existing water quality basins to increase

sediment and water storage, built four grade-stabilization structures, converted 147 acres of cropland to grass and cleaned out an existing water quality basin (built in 1996) on the primary reservoir inflow that provides additional sediment storage.

Results

Data have shown that water quality has steadily improved. Reservoir data collected from 1999 through 2001 showed that of eight profiles taken, only two violated the assessment criteria. Consequently, DEQ removed Kirkmans Cove Reservoir from the 2002 303(d) list for dissolved oxygen impairment (Figure 2).

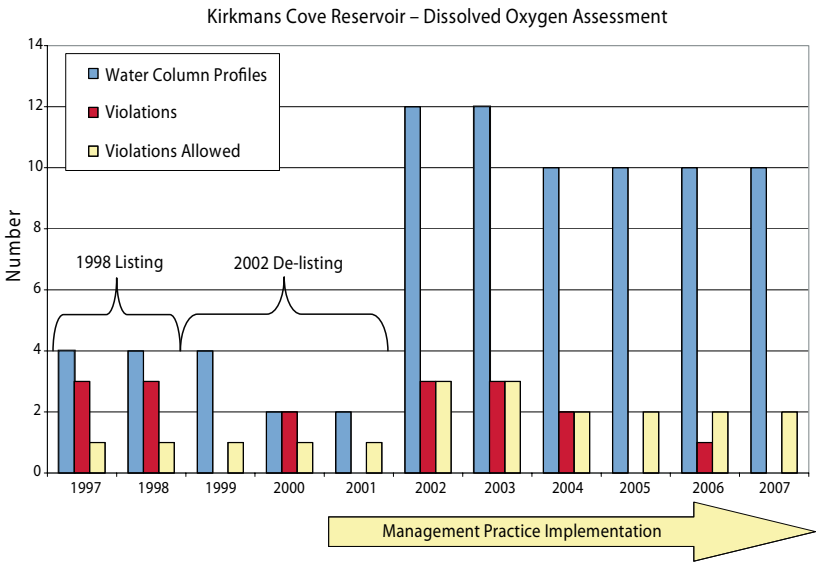

Figure 2. Water quality profile data showing water quality improvement.

Dissolved oxygen conditions have continued to improve through the course of the project. From 2004 through 2007, only three of 40 profiles were found to violate the assessment criteria. Although the TMDL identified a phosphorus loading reduction target of 92 percent, the achieved reduction of 48 percent improved oxygen conditions sufficiently to meet the dissolved oxygen standard.

Loadings of other targeted pollutants such as sediment, phosphorus, nitrogen and atrazine (a herbicide) have also decreased. Land treatment measures in the watershed reduced annual sediment loading by 54 percent, phosphorus loading by 48 percent and nitrogen loading by 39 percent. Additionally, data show that atrazine concentrations in the reservoir exhibited a significant decreasing trend ($\alpha = .05$) from 1997 through 2007; overall, the pre-project median atrazine concentration declined by 59 percent.

Partners and Funding

The project was made possible through a strong partnership of the Nemaha Natural Resources District, U.S. Department of Agriculture (USDA) Natural Resources Conservation Service, Nebraska Environmental Trust, Nebraska DEQ, U.S. Environmental Protection Agency, Nebraska Game and Parks Commission, Kirkmans Cove Watershed Council and watershed landowners/operators. Section 319 funds supported land treatment technical assistance ($48,437), engineering design ($34,528), management practice cost share and incentives ($566,301) and information/education ($3,453). Additional sources of practice cost share and incentive funds include the USDA Environmental Quality Incentive Program ($115,699), Nebraska Environmental Trust ($200,000) and Nemaha Natural Resources District ($147,574). Project partners implemented the majority of land treatment measures from 2001 through 2007. However, maintaining a high-quality reservoir will continue to be a priority for the resource management agencies, so they will continue to maintain and implement traditional and nontraditional practices as needed.

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

EPA 841-F-08-001T
September 2008

For additional information contact:

Paul Brakhage
Nebraska Department of Environmental Quality
402-471-4224 • paul.brakhage@nebraska.gov
Shawn Kreienhop
Nemaha Natural Resources District
402-335-3325 • skreienhop@nemahanrd.org