



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Nebraska

Reservoir Restoration and Watershed Treatment Efforts Improve Water Quality

Waterbody Improved

Urban and construction site runoff carried phosphorus, sediment and associated pollutants to Nebraska's Holmes Lake. These pollutant loadings created eutrophic conditions characterized by turbid water, high nutrients, low dissolved oxygen, excessive algae growth and shallow water depths. Nebraska Department of Environmental Quality (NDEQ) added the lake to the state's 1998 Clean Water Act section 303(d) list because of aquatic life use impairments. In 2000 the city of Lincoln initiated a Community Based Planning process, with the goal of developing a locally led Lake and Watershed Management Plan that would address water quality issues. The primary components of the plan included watershed treatment, extensive education and lake rehabilitation. The project was a success, and water quality improved. As a result, NDEQ first removed dissolved oxygen from the list of impairments in 2002 and then removed sedimentation and nutrients from the list of impairments in 2008. Holmes Lake now fully supports all its assigned beneficial uses.

Problem

Holmes Lake is in southeastern Nebraska in Lincoln and falls within the Lower Platte River Basin. The U.S. Army Corp of Engineers completed the construction of the 123-acre lake in 1962. It serves as a recreational resource for local citizens and is managed by Lincoln's Department of Parks and Recreation. NDEQ added the lake to the state's 1998 Section 303(d) impaired waters list for atrazine, arsenic, nutrients, dissolved oxygen and sedimentation. Nebraska revised its surface water quality standards for atrazine and arsenic in 1999. Because of the changes, atrazine and arsenic levels in Holmes Lake no longer violated standards, and NDEQ removed these two pollutants from the 2000 303(d) list for Holmes Lake.

Data collected between 1995 and 1998 show that average concentrations of dissolved oxygen in the water column fell below the water quality standard of 5.0 milligrams per liter (mg/L) for 5 of the 21 surface-to-bottom profiles. Nutrient listings are partially based on growing season mean chlorophyll *a* concentrations exceeding 44 milligrams per cubic meter (mg/m³). The pre-project (1976–2001) chlorophyll *a* growing season average value was 46.52 mg/m³. NDEQ added sedimentation to the list of pollutants because of the violation of two assessment criteria. The first criterion is the annual sedimentation rate. From 1984 to 1993, the average annual loss of original lake



Figure 1. Pre-project condition of a stream draining to Holmes Lake. Severe stream-bank erosion contributed sediment and nutrients to Holmes Lake.

volume was 1.31 percent, which exceeded the criteria of 0.75 percent. The second criterion is the total lake volume lost. As of 1993, Holmes Lake had lost 27 percent of the original volume, which exceeded the 25 percent total volume loss criterion (Figure 1).

NDEQ developed a total maximum daily load (TMDL) for sediment and phosphorus in 2003. The TMDL identified annual loading reductions of 53 percent for sediment and 97 percent for phosphorus to achieve a full-support status in the lake.

Project Highlights

The Community Based Planning process encouraged extensive public input. Through this process, various community members representing lake users, educators and watershed residents came together to form a Watershed Advisory Committee (WAC). The WAC drove the development of project goals,

objectives and specific action items. While the lake restoration was completed in 2005, watershed treatment and educational activities are ongoing. Since watershed build-out was nearly completed in the 1990s, on-the-ground controls were limited to rain gardens (20), wetland development (10 acres), and drainage network stabilization (Figure 2). Primary in-lake efforts included removing 321,000 cubic yards of sediment, stabilizing 2.4 miles of shoreline and restoring fish habitat.

The WAC implemented an extensive educational program that continues today. While educational efforts cover a broad range of issues, the focus is on lawn fertilizers and pet waste. According to surveys conducted in the watershed, approximately 63 percent of the homeowners now use either low phosphorus or non-phosphorus fertilizer. During the course of the project, the Lincoln-Lancaster County Health Department and city of Lincoln worked together to adopt a citywide pet waste ordinance.

Results

Of the nine water quality profiles measured from 1999 through 2001, no violations of the state's dissolved oxygen standard were observed (Figure 3). As a result, NDEQ removed dissolved oxygen from the state's 2002 303(d) of impaired waters. Post-project (2006–2007) chlorophyll *a* values of 17.30 mg/m³ met standards and prompted NDEQ to remove the chlorophyll *a* impairment from the 2008 303(d) list. Sedimentation also declined. The average annual lake volume loss fell to 0.13 percent, and sediment removal efforts in the lake reduced the loss of original volume to 14 percent. Consequently, NDEQ removed the sedimentation impairment from the state's 303(d) list in 2008. As a result of the in-lake and watershed improvements, Holmes Lake now fully supports all beneficial uses.



Figure 2. Post-project condition of a stream draining to Holmes Lake. The revegetated stream channel includes rock piles that serve as check dams to slow water flow to the lake.

Partners and Funding

The project was made possible through a strong partnership between Lincoln, Nebraska Environmental Trust, Nebraska Game and Parks Commission, Lincoln-Lancaster County Health Department, EPA, NDEQ and the Holmes Lake Watershed Council. Section 319 funding supported water quality planning and demonstrations (\$95,119), information and education (\$34,934), sediment removal (\$2,084,409), engineering design (\$311,588) and drainage network rehabilitation (\$163,616). Additional sources of project funding include the city of Lincoln (\$1,275,099), Nebraska Game and Parks Commission (\$1,777,000), Nebraska Environmental Trust (\$620,000) and the Lower Platte South Natural Resources District (\$67,483).

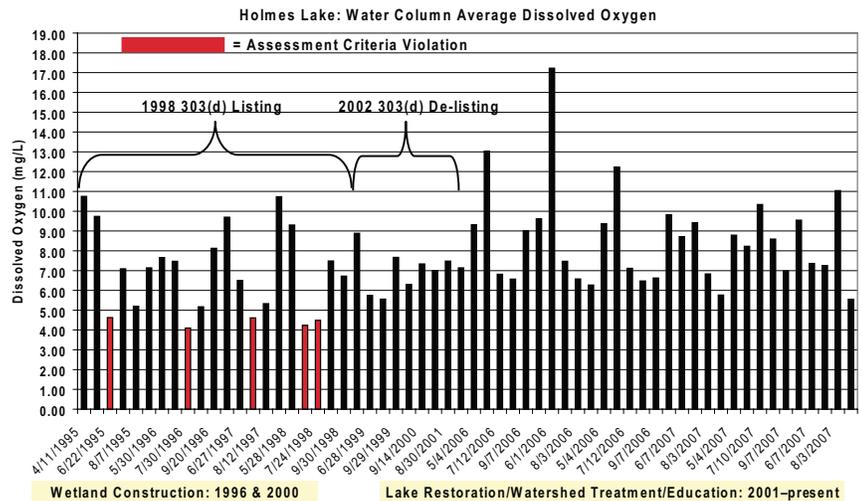


Figure 3. Bar graph noting water column average dissolved oxygen measurements by sampling date. Red bars indicate a violation of assessment criteria. Data show no violations since 1998.



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