Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
North Dakota

Implementing Best Management Practices and Targeting Technical Assistance Improve Powers Lake

Waterbody Improved

Elevated nutrient levels caused frequent algae blooms in North Dakota's Powers Lake. As a result, the North Dakota Department of Health (NDDH) added Powers Lake to its 2002 Clean Water Act (CWA) section 303(d) list as fully supporting, but threatened, for the lake's recreation and aquatic life designated uses. Stakeholders developed a watershed plan and implemented numerous best management practices (BMPs) on agricultural lands. Data show that water quality has improved significantly and some water quality targets are being met. The lake, however, will remain listed as impaired (threatened) while watershed partners work to remove phosphorus-rich lake bottom sediments.

Problem

Powers Lake, a 1,616-acre natural freshwater lake in northwestern North Dakota, is an important recreational resource (Figure 1). The lake drains approximately 44,458 acres of primarily agricultural lands (crops and livestock). In the mid-1990s local residents became increasingly concerned about deteriorating water quality and reduced recreational opportunities as the lake experienced frequent blue-green algae blooms in mid- to late summer and fish kills in both the summer and winter. In response, watershed stakeholders partnered to form the Powers Lake Advisory Committee (PLAC) in 1998.

In 1999, with assistance from the NDDH's Division of Water Quality, PLAC initiated a water quality assessment project to monitor water quality, inventory current land use practices, and generate pollution estimates using the Agricultural NonPoint Source (AGNPS) model. Modeling results indicated that Powers Lake received an annual phosphorus load of 11,564 pounds (lb)—6,339 lb from external sources and 5,225 lb from internal sources (nutrient cycling).

North Dakota relies on Carlson's Trophic State Index (TSI) as the primary indicator for assessing beneficial uses of lakes. Carlson's TSI is derived from several measures of water quality, including turbidity (using Secchi disk depth recordings), chlorophyll *a* concentrations (algal biomass), and total phosphorus levels. A high TSI score indicates a more productive lake. Based on Carlson's TSI and water quality data collected between March 2001 and October 2001, NDDH and PLAC determined that Powers Lake was a nitrogen-limited hypereutrophic lake. On the basis of these data, NDDH added the lake to the 2002 CWA section 303(d) list as fully supporting, but threatened, for its recreation and aquatic life designated uses.

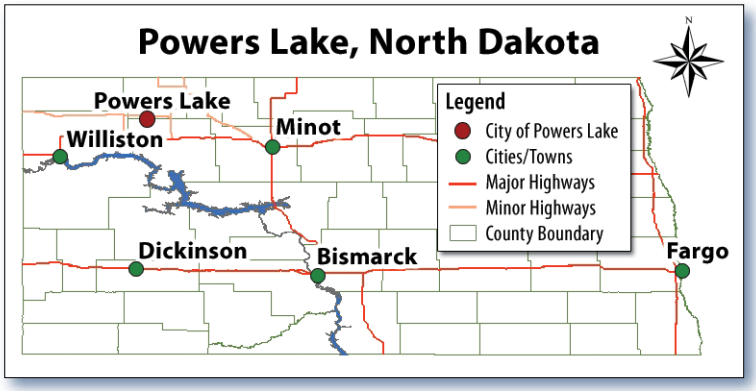

Figure 1. Powers Lake extends southward from the City of Powers Lake in northwestern North Dakota.

In 2008 NDDH developed a total maximum daily load (TMDL), which indicated that the recreational use impairments in Powers Lake were associated primarily with nonpoint source pollutants from agricultural lands, including nutrients (phosphorus) and suspended sediments. Potential pollutant sources included tilled croplands, overgrazed rangeland, and livestock winter feeding areas. According to the TMDL models, nutrient loading to Powers Lake must be reduced by 75 percent from external sources and 50 percent from internal sources to restore the lake to the target trophic state of eutrophic (between 50 and 70 TSI) rather than hypereutrophic (TSI of greater than 70). Because chlorophyll *a* is the TSI variable most accurate at predicting algal biomass, the TMDL identified a chlorophyll *a* TSI of 55.02 as the TMDL target needed to achieve the water quality improvement goal.

Figure 2. Some farmers implemented no-till management in the Powers Lake watershed.

Project Highlights

The 1999 watershed assessment and AGNPS modeling allowed PLAC to develop a watershed restoration action strategy that identified beneficial use improvement and pollutant reduction goals, outlined specific activities for accomplishing the goals and established a method for evaluating progress. Thanks to these efforts, PLAC began targeting conservation planning assistance and voluntary implementation of BMPs in high-priority subwatersheds as early as 2003, including:

- Implementing 12,013 acres of nutrient management and an additional 15,476 acres of no-till management (Figure 2)
- Improving grazing management on 4,790 acres
- Converting 978 acres of cropland to hayland
- Installing 72,876 feet of livestock fencing
- Installing nine sediment dams and grass buffers and protecting 3,940 feet of riparian area.

PLAC project staff also worked closely with the North Dakota Game & Fish Department, the North Dakota Natural Resources Trust, and the U.S. Fish and Wildlife Service, which provided technical and financial assistance to create or restore 11 wetlands, seed 176 acres in grass, and protect 167 feet of shoreline and riparian areas. In addition, local Soil Conservation District (SCD) staff worked cooperatively with local Natural Resources Conservation Service (NRCS) personnel to identify and tap all available funding assistance programs.

Results

Monitoring data collected between 2001 and 2009 indicate that TSI scores for Secchi disk transparency and chlorophyll *a* are improving (Figure 3). The average TSI score for chlorophyll *a* in 2009 was 53.24, which meets the TMDL target of 55.02. The phosphorus TSI scores, however, are high and holding steady at around 85 (in the hypereutrophic range), likely because in-lake phosphorus is continually recycled from the lake's bottom sediments. A 2009 feasibility study found that selectively removing lake sediments would best reduce the internal phosphorus cycling. In 2011 PLAC received CWA section 319 funding to conduct the sediment removal, which is expected to be completed by the end of 2015. Although the TMDL target was met by 2009, Powers Lake will remain listed as impaired until the high phosphorus levels are also addressed.

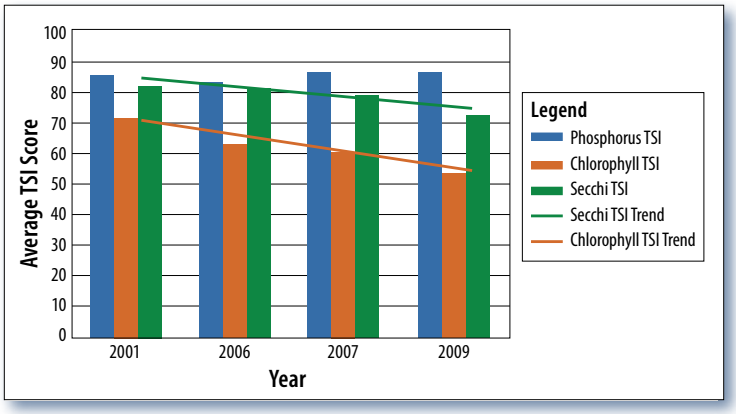

Figure 3. Average TSI scores show improving trends for chlorophyll and Secchi disk transparency in Powers Lake, 2001–2009.

Partners and Funding

PLAC was formed by local educators; local citizens; and representatives from the City of Powers Lake, Mountrail and Burke counties (including SCD and NRCS offices), and local townships. The Mountrail County SCD served as the fiscal agent for the project. PLAC hired staff to develop BMP contracts for agricultural producers and deliver technical assistance. Project staff worked closely with partners at the federal, state and local level to support the project.

In 2003 the U.S. Environmental Protection Agency awarded $418,349 in CWA section 319 funds to support the project; these funds were matched by $278,900 in local funds (cash and in-kind services) from agricultural producers, PLAC, and state and local stakeholders. PLAC received $282,350 in CWA section 319 funds in 2011 (with $188,233 in matching funds) to support the removal of phosphorus-rich lake sediments.

NDDH provided oversight for project management, developed the quality assurance project plan, conducted water quality monitoring training, and helped to develop and implement information and education activities.

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