



Crystal Lake

TMDL: Excess Nutrients

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The state placed Crystal Lake on the 2002 impaired waters list for aquatic recreation because it exceeds the water quality standard for nutrients. Excess nutrients such as phosphorus from stormwater runoff create poor water quality conditions causing frequent summer algal blooms, which limit recreational activities.

Crystal Lake

Crystal Lake is an 89-acre basin located in the Shingle Creek Watershed. The lake's drainage area is 1,237 acres of fully developed urban and suburban land almost entirely in the City of Robbinsdale, with some contribution from the City of Minneapolis. Crystal Lake does not have a natural outlet; a pumping station is used under high water conditions to discharge into the City of Minneapolis storm sewer system. The storm sewer discharges into Shingle Creek, which ultimately discharges into the Mississippi River.



TMDL Background

Based on the federal Clean Water Act, waters that do not meet water quality standards are “impaired.” The Clean Water Act requires states to develop a clean up plan for each impairment affecting a water body. The clean up plan and the process used to create it is a Total Maximum Daily Load (TMDL).

A TMDL must identify all sources of the pollutant causing a water body to violate standards. The TMDL also determines the amount by which each source must reduce its contribution to ensure a water body meets applicable water quality standards.

Crystal Lake Impairment

The goal of this TMDL is to quantify the pollutant reductions needed for Crystal Lake to meet state water quality standards. The numeric targets for deep lakes in the North Central Hardwood Forest Ecoregion are summer averages of ≤ 40 $\mu\text{g/L}$ (micrograms per liter) total phosphorus concentration, ≤ 14 $\mu\text{g/L}$ chlorophyll-a concentration, and ≥ 1.4 meters of Secchi depth.

- The summer average total phosphorus concentration in Crystal Lake ranges from approximately 80 $\mu\text{g/L}$ to more than 390 $\mu\text{g/L}$ for the years in which measurements were taken
- Chlorophyll-a ranged from approximately 30 $\mu\text{g/L}$ to more than 140 $\mu\text{g/L}$
- Water clarity, as measured by Secchi depth measurements ranged from approximately 0.3 meters to more than 1.5 meters

Pollution Sources

Phosphorus transported by stormwater represents approximately 60% of the total phosphorus load to Crystal Lake. Impervious surfaces in the watershed improve the efficiency of water moving to streams and lakes resulting in increased transport of phosphorus into local water bodies. Phosphorus in stormwater is a result of transporting organic material such as leaves and grass clippings, fertilizers, and sediments to the water body. In addition, phosphorus sources from Crystal Lake itself from lake sediments and the invasive aquatic plant curly-leaf pondweed are also sources.

Pollution Reductions Needed

A reduction of 72% in phosphorus loading to Crystal Lake would be required to consistently meet water quality standards under average precipitation conditions. In-lake phosphorus load management and the reduction of phosphorus from urban runoff in the watershed by retrofitting best management practices (BMP) would have the most impact on reducing phosphorus loads and improving water quality in Crystal Lake.

Implementation Strategies

The Crystal Lake watershed is fully developed with minimal existing water quality treatment, and limited opportunities are available to reduce external loading. Small, incremental reductions are possible through retrofit as redevelopment occurs and through the implementation of BMPs throughout the subwatershed. Examples of BMPs would be:

- Increase infiltration and filtration in the Crystal lakeshed through the use of rain gardens, native plantings, and reforestation
- Identify key areas for more frequent street sweeping
- Retrofit detention ponds
- Encourage shoreline restoration
- Educate property owners about proper fertilizer use and low-impact lawn care practices
- In-lake reductions of phosphorus loading through strategies such as vegetation management and hypolimnetic withdrawal

For More Information

Wenck Associates, Inc. prepared the *Crystal Lake Nutrient TMDL Report* for the Shingle Creek Watershed Management Commission and Minnesota Pollution Control Agency.

For more information about the Crystal Lake Nutrient TMDL Report, view the web pages at www.pca.state.mn.us/water/tmdl/project-crystallake-nutrients.html or contact:

Barb Peichel
TMDL Project Manager
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155
651-297-8275
barbara.peichel@pca.state.mn.us

For general TMDL information, browse MPCA's Impaired Waters web pages at www.pca.state.mn.us/water/tmdl/.

For more information about water bodies in the Shingle Creek Watershed, go to www.shinglecreek.org.