



Minnesota
Pollution
Control
Agency

Shingle Creek

TMDL: Excess Nutrients – Twin and Ryan Lakes

• September 2007

Four lakes in the Twin Lake chain of lakes in the urbanized Shingle Creek watershed are impaired waters under section 303(d) of the federal Clean Water Act. Water quality monitoring on these lakes indicate excessive levels of phosphorus, a nutrient that can cause nuisance to severe algae blooms that inhibit recreation activities such as swimming, boating, and fishing. The four lakes are North (also known as Upper), Middle, and South (also known as Lower) Twin Lake and Ryan Lake.

The Shingle Creek watershed drains about 44.5 square miles of urban and suburban land in the northwestern part of the Minneapolis-St. Paul metropolitan region. It is part of the larger upper Mississippi River basin. Stormwater from a 5,550 acre sub watershed drains through the four lake chain to Shingle Creek and ultimately 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.

The problem

Water quality in North and South Twin Lakes are poor, with summer total phosphorus concentrations of 140 µg/L in North and 67 µg/L in South, resulting in severe algae blooms that limit recreation and kill fish. Water quality is better in Middle Twin Lake at 50 µg/L and Ryan Lake at 44 µg/L, but those lakes, too, exceed the state standard of 40 µg/L total phosphorus. The Twin Lake chain of lakes is a regional water resource located in the cities of Brooklyn Center, Crystal, Minneapolis and Robbinsdale. Fishing and swimming are popular activities. The chain includes several boat launches, a swimming beach, and a fishing pier. Poor water quality limits the use and enjoyment of these water resources.

Nutrient sources

The TMDL revealed three primary sources of phosphorus to the lakes. Much of the watershed was developed prior to the creation of stormwater treatment regulations, so stormwater from the large, developed watershed is conveyed directly through storm sewers to the lakes. Diffuse “nonpoint sources” of phosphorus in stormwater such as runoff from lawns, nutrients from fertilizer use, sediment, and pet and animal waste are the source of between one-third and one-half the phosphorus load to the lakes.

A second source is a large, degraded wetland to the north of North Twin Lake. Twin Creek flows through Wetland 639W to North Twin Lake. Monitoring data shows that this



Wq-iv8-05a

wetland discharges a significant amount of phosphorus and contributes about one-third of the phosphorus to the lake. Finally, sources within the lakes themselves, including phosphorus released from sediment and from the invasive aquatic plant curly-leaf pondweed, are about 15 percent of the overall load.

These lakes are connected by channels, and the water quality in the upstream lakes influences the water quality in the downstream lakes. The phosphorus concentration in North Twin Lake is so high that the water that it discharges into Middle Twin Lake is the greatest source of phosphorus to that lake. The same is true between the other lakes.

Reductions needed

The amount of phosphorus reduction necessary to meet state standards varies based on the amount of precipitation received. Currently North Twin Lake has the worst water quality in the chain, and would require between a 16 percent and 76 percent reduction in phosphorus to bring the lake to current water quality standards. Middle Twin would require between zero and 33 percent; South Twin Lake between zero and 65 percent; and Ryan Lake, between zero and 54 percent. If North Twin Lake met the water quality standard, then the amount of phosphorus it discharges downstream would be significantly reduced and under most conditions the other lakes would also meet the state standard with little or no other reduction necessary.

Implementation plan

Reducing phosphorus in the chain of lakes requires a variety of activities. Clean-up activities will range from a few to many years to implement. The Shingle Creek Watershed Management Commission (SCWMC) joint powers organization was created by the cities in the watershed in 1984. The SCWMC is coordinating the TMDL Implementation Plan development and implementation for its member cities. Hennepin County and the Minnesota Department of Transportation (MnDOT) cooperated in the development of the TMDL and implementation plan. Five of the nine cities have land that drains to the Twin Lake chain. These cities, Hennepin County and MnDOT have agreed to work together to jointly reduce phosphorus loading to the lakes.

About 40 percent of the phosphorus coming into North Twin Lake comes from Wetland 639W, thus the restoration of that wetland to reduce the amount of phosphorus it exports is a high priority activity. Activities under consideration include aquatic plant management, rough fish control, and chemical treatment. Finally, best management practices such as ponds, rain gardens, and underground treatment devices in the watershed will be retrofitted as opportunities arise, such as through redevelopment or city street reconstruction projects.

Stormwater management

The nine cities in the Shingle Creek Watershed, Hennepin County, and MnDOT are permitted municipal separate storm sewer systems (MS4s) under the Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) Stormwater Program. These MS4s are regulated through state issued permits. The MS4s have Stormwater Pollution Prevention Program (SWPPP) plans as part of their permit requirements. The SWPPPs for the MS4s draining to the chain of lakes include measures for controlling nutrient loading to the four lakes.

For more information

Contact Tim Larson at 651-282-5559 or <mailto:timothy.larson@pca.state.mn.us> for more information on the Twin and Ryan Lakes TMDL project.

General information about TMDLs is available online.

MPCA - www.pca.state.mn.us/water/tmdl

EPA - www.epa.gov/owow/tmdl

America's Clean Water Foundation and the Association of State and Interstate Water Pollution Control Administrators - www.tmdls.org

