



Minnesota
Pollution
Control
Agency

Comfort Lake-Forest Lake Watershed District “Six Lake” TMDL

Study targets excess nutrients, mainly phosphorus

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Watershed

The surrounding land area that drains into a lake, river or river system.

Watershed District

Watershed districts are local units of government that work to solve and prevent water-related problems. The boundaries of the districts follow those of a natural watershed.

Reducing phosphorus levels to achieve higher water quality is the focus of a study of the “Six Lakes” group in Washington and Chisago County.

Phosphorus is a nutrient needed for plant growth. In excess amounts, however, it fuels summer algal blooms that reduce water quality and limit recreational activities.

“Non-point” pollution comes from many sources instead of a specific point. This pollution includes storm water runoff, which is rain water that drains from land and hard surfaces to lakes, rivers and streams. This runoff brings phosphorus and other pollutants with it, from farm fields, feedlots, parking lots, residential lawns and other sources.

In contrast, point sources of pollution arise from a well-defined origin, such as discharge from a wastewater treatment plant.

Six Lakes Background

All six lakes are located in the Comfort Lake-Forest Lake Watershed District, near the cities of Wyoming and Forest Lake:

- Comfort Lake
- Bone Lake
- Shields Lake
- Moody Lake
- School Lake
- Little Comfort Lake



School Lake is one of six lakes being studied for a reduction in pollutants. (Photo courtesy of Randy Anhorn CLFLWD)

From 2002 to 2008, the Minnesota Pollution Control Agency (MPCA) listed the first five lakes as “impaired” for excess nutrients, meaning their nutrient levels exceed state standards for water quality.

The state expects to list the sixth lake as impaired because new data show it also fails to meet state water quality standards.

For each impaired water body, federal law requires that individual states, such as Minnesota, determine an acceptable Total Maximum Daily Load (TMDL) for the relevant pollutant(s).

The TMDL process establishes the allowable level of pollutants for a water body based on the relationship between pollutant sources and water conditions. In developing the TMDL Report, MPCA staff and stakeholders determine how to reduce pollutants, from both point and non-point sources, to restore water quality to state standards.

Comfort Lake

Comfort Lake has a surface area of 218 acres and a total watershed area of 24,938 acres. The main tributaries to Comfort Lake are drainage from Little Comfort Lake, Forest Lake and South Branch of the Sunrise River (formerly known as Judicial Ditch 1). Comfort Lake has a public boat access and is used recreationally for swimming, fishing, and motorized and non-motorized boating.

Bone Lake

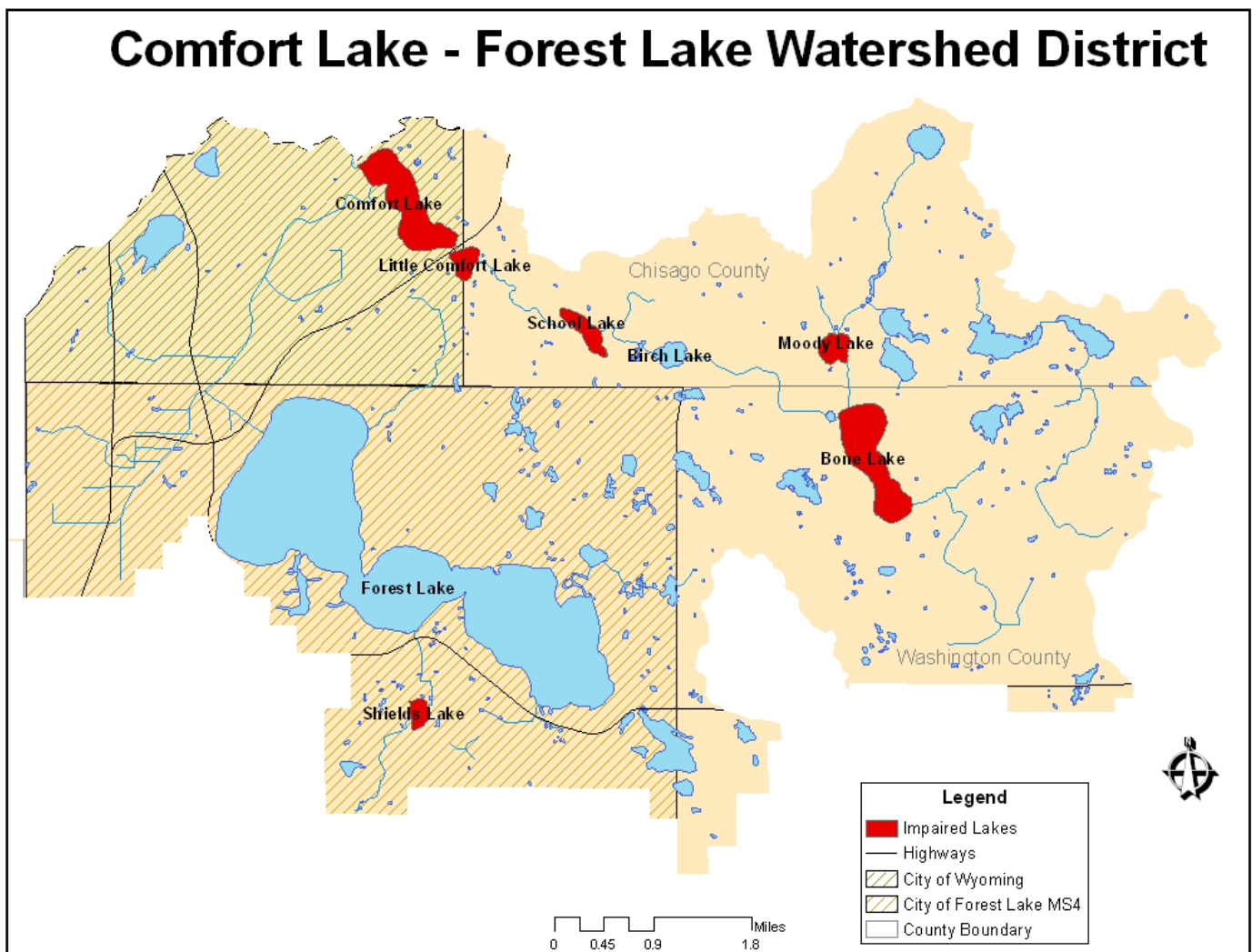
Bone Lake has a surface area of 204 acres and a watershed area of 5,760 acres. The main drainage to Bone Lake is from Moody Lake. Bone Lake has one public access and is used recreationally for swimming, fishing, and motorized and non-motorized boating.

Shields Lake

Shields Lake is a shallow lake with a surface area of 27 acres and a total watershed area of 540 acres. The only major drainage to Shields Lake is a ditch on the south side of the lake. This lake has an outlet to Forest Lake. Shields Lake has a fishing pier but no public boat access.

Moody Lake

Moody Lake is 34 acres in surface area, with a 2,435-acre watershed. The two main tributaries to Moody Lake enter the lake from the north. One tributary is an outlet from Lentdt Lake and the watershed to the north. The other tributary drains the watershed to the northwest. Moody Lake has about 12 property parcels along its lakeshore and no public boat access. It is currently used for recreation.



School Lake

School Lake has a surface area of 49 acres and a total watershed area of 8,430 acres. The main drainage to School Lake is Birch Lake. The lake has about 10 lakeshore owners and no public access.

Little Comfort Lake

Little Comfort Lake has a surface area of 35 acres and a total watershed area of 10,170 acres. The only tributary to Little Comfort is School Lake. Little Comfort has about 22 lakeshore property parcels and no public boat launch. It is used for fishing, boating, swimming, and other recreational activities.

TMDL Background

Impaired waters are those that fail to meet water quality standards. The federal and state governments establish these standards to protect specific designated uses, such as recreation, fishing, irrigation, and support of aquatic life.

Examples of pollutants or conditions that may place a lake or stream on the impaired waters list include nutrients, bacteria, sediment, high turbidity and low dissolved oxygen. Waters are sometimes impaired by multiple pollutants.

Lakes Impairment

The goal of the Six Lakes TMDL is to quantify the pollutant reductions needed for Moody Lake, Bone

Lake, School Lake, Little Comfort Lake, Shields Lake, and Comfort Lake to meet Minnesota water quality standards.

Before looking at the amounts of phosphorus in the Six Lakes group, it's important to understand the concepts of ecoregions.

Ecoregions are geographic areas that are relatively the same in terms of land use, soils, topography and potential natural vegetation. Minnesota has seven such ecoregions.

Federal water quality standards vary by ecoregion, taking into account that a shallow lake in a highly agricultural area will differ from a deep lake in a highly forested area.

The table below outlines the water quality standards for the North Central Hardwood Forest Ecoregion, where the Six Lakes are located, and the levels present in the lakes. In this study only five of the lakes are classified as deep lakes, while Shields Lake is classified as a shallow, and therefore has different numeric targets.

Pollution Sources

Phosphorus sources within the six impaired lakes' watersheds vary upon water body and how people use the land. One major source of phosphorus for each lake is the lake(s) above it (except for Shields). This is an issue because each lake flows into the other within the watershed.

Measurement of Water Quality	Ecoregion Deep Lake Numeric Targets	Range of Levels for the Five Deep Lakes*	Ecoregion Shallow Lake Numeric Targets	Levels for the One Shallow Lake (Shields Lake)
Total Phosphorus: Includes the amount of phosphorus in the water and attached to particles.	≤ 40 micrograms per liter or parts per billion	37 to 167 micrograms per liter or parts per billion	≤ 60 micrograms per liter or parts per billion	234 micrograms per liter or parts per billion
Chlorophyll-a: Photosynthetic pigment found in all green plants, and the main pigment in algae. Used to estimate the amount of algae in surface water.	≤ 14 micrograms per liter or parts per billion	16 to 65 micrograms per liter or parts per billion	≤ 20 micrograms per liter or parts per billion	47 micrograms per liter or parts per billion
Secchi disk depth: Used to measure water clarity.	≥ 1.4 meters or 4.49 feet	0.67 to + 1.4 meters or 2.2 to 4.49 feet	≥ 1.0 meter or 3.28 feet	1.4 meters or 4.49 feet
* Comfort Lake, Little Comfort Lake, Bone Lake, Moody Lake and School Lake				

Other sources of phosphorus include:

- Urban storm water runoff:
 - § Construction sites
 - § Industrial areas
 - § Communities that require a Municipal Separate Storm Sewer System (MS4) general permit from the state because they discharge storm water to a lake, river or wetland
- Agriculture
- Groundwater
- Internal loadings though lake bottom sediment
- Atmospheric loadings in the form of rain

Pollution Reductions Needed

Each of the six lakes will need to achieve different total phosphorus reductions in order to consistently meet its water quality standard, along with helping downstream lakes meet their water quality goals. The table below shows the reductions needed for each lake.

Lake	Reduction in Total Phosphorus Needed to Achieve Standards (%)
Comfort Lake	5
Bone Lake	46
Shields Lake	83
Moody	86
School	51
Little Comfort	54

Achieving those reductions will require a two-pronged approach:

- Managing the amount of phosphorus within the lake.
- Reducing the amount of phosphorus from urban and rural runoff in the watershed.

The latter strategy will include retrofitting or establishing Best Management Practices (BMPs), which will have the most impact on phosphorus loads and improving water quality in the Comfort Lake – Forest Lake Watershed District (CLFLWD).

Implementation Strategies

The watershed district contains both developed and non-developed areas. The MPCA will work with local partners to implement a wide assortment of BMPs to control phosphorus sources throughout the watershed.

Examples of BMPs to increase infiltration and filtration include:

- Rain gardens
- Native plantings
- Reforestation
- More frequent street sweeping in key areas
- Storm water detention ponds
- Shoreline restoration
- Proper fertilizer use and low-impact lawn care
- Wetland restorations
- Regional storm water management facilities
- Vegetation management
- Agricultural practices

A number of the BMPs have been identified in the watershed district's publication, "Watershed and Lake Water Quality Modeling Investigation for the Development of a Watershed Capital Improvement Plan," which can be viewed on the CLFLWD's website at www.clflwd.org/.

For More Information

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- CLDLWD Six Lakes TMDL Report was prepared for the watershed district and MPCA by Emmons & Olivier Resources, Inc. For details, go to: www.pca.state.mn.us/water/tmdl/project-clflwd.html
- General TMDL information is available at: www.pca.state.mn.us/water/tmdl/