NONPOINT SOURCE SUCCESS STORY

Minnesota

Controlling Sediment and Phosphorus Sources Restores Lake George

Waterbody Improved

Lake George has long been a centerpiece and gathering place for many community events and recreation in the St. Cloud. However, ongoing elevated phosphorus levels and subsequent low water clarity resulted in the lake being placed on Minnesota's list of impaired waters in 2012 for failing the state's aquatic recreation standards due to excessive nutrients. Through strategically focused pollution reduction efforts by the City of St. Cloud and its partners, the lake's phosphorus levels have been significantly reduced. Lake George now meets water quality standards; as a result, the Minnesota Pollution Control Agency (MPCA) removed the lake from Minnesota's list of impaired waters in 2022.

Problem

The north inlet to Lake George includes 76.5 acres of residential, institutional, commercial, and State Highway 23 corridor land uses (Figure 1). The south inlet includes 58.5 acres of primary residential land use with some park space. In 2009–2010, as part of a new statewide watershed approach, the MPCA intensively monitored and assessed select surface waters within the Mississippi River – St. Cloud (MRSC) watershed. Through this effort, the MPCA identified several resources that failed to meet state water quality standards, including Lake George. This determination was based on Minnesota's lake eutrophication water quality standards for aquatic recreation use within the state's North Central Hardwood Forest Ecoregion.

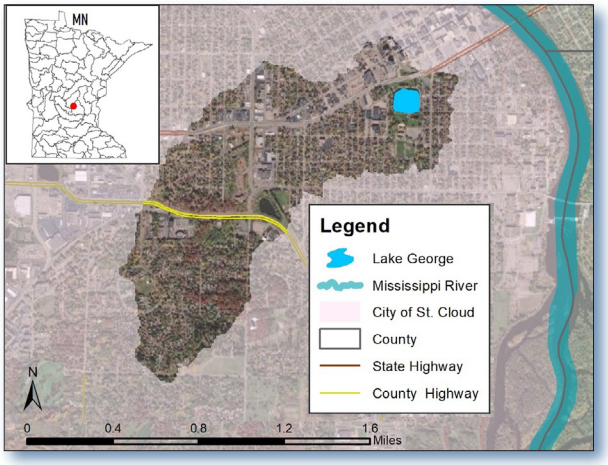

Figure 1. Lake George is in central Minnesota.

Story Highlights

Strongly committed to improving this situation, the City initiated a comprehensive and collaborative water quality restoration effort by conducting a thorough analysis of the 125-acre subwatershed surrounding Lake George to determine the cause of the water quality problems, find solutions, and implement restoration and protection strategies. Upon completing the analysis in 2017, the City and its partners took strategic action the following year by designing and implementing several important projects to restore the health of the lake.

A stormwater treatment pond just south of Lake George, affectionately known as Little George, was constructed in 1998 to capture sediment and pollutants before they reach the lake. Under the direction of the City, Little George was dredged for the first time in November 2018 to restore treatment capacity. More than 900 tons of sediment—about 50 semi-truck loads—were removed from the pond and disposed of at a landfill. The City also added iron filings to the pond as part of a partnership study project with the University of Minnesota, with assistance from the Minnesota Conservation Corps. The iron filings are intended to trap phosphorus and reduce its release from the pond into Lake George.

Lake George also received four alum treatments in 2018. When applied to water, alum forms a fluffy aluminum hydroxide precipitate called a floc. As the floc settles to the bottom, it removes phosphorus and particulates (including algae). The floc settles on the lake-bottom sediment where it forms a layer that acts as barrier to phosphorus, which is then no longer available to fuel algae growth. Further alum treatments were completed in 2019 and 2020, in an effort to reach water quality goals. For some lakes, alum

Figure 2. Installing the underground stormwater retention and filtration treatment facility in 2020.

treatments are a safe, relatively low-cost, effective, and long-term method for controlling phosphorus, minimizing algae growth, and improving water quality.

To address stormwater runoff before it enters Lake George, an underground stormwater retention and filtration treatment facility was installed in 2020 under an adjacent parking lot (Figure 2). The combination of settling chambers and filtration captures sediment and removes phosphorus. Each year, the system prevents an estimated 29.7 pounds of phosphorus and 23,600 pounds of sediment from entering the lake.

Results

When the lake was added to the 2012 impaired waters list, phosphorus levels were at 45 parts per billion (ppb). After the restoration work, phosphorus levels in 2021 were holding at 18 ppb (Figure 3). Water clarity has increased from a depth of 5.8 feet in 2010 to nearly 10 feet in 2021 (Figure 4). A reduced clarity measurement in 2020, which still met the state standard, was thought to be caused by significant weather swings (early drought, wet summer). Lake George now meets state water quality standards and was removed from Minnesota's list of impaired waters in 2022. City staff will continue to monitor lake conditions and implement improvements to meet water quality goals.

The City of St. Cloud serves as an important municipal leader and partner in the ongoing restoration and protection of the surface water resources within the MRSC watershed. As the first in the nation to obtain its drinking water supply from the Mississippi River, the City of St. Cloud realizes the critical need for proactive water quality measures firsthand.

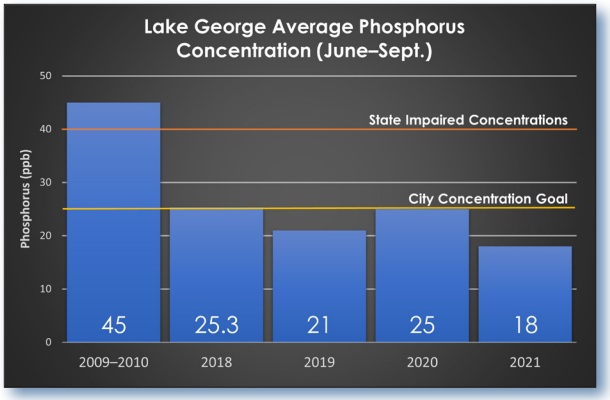

Figure 3 . Lake George average phosphorus levels, 2009–2021.

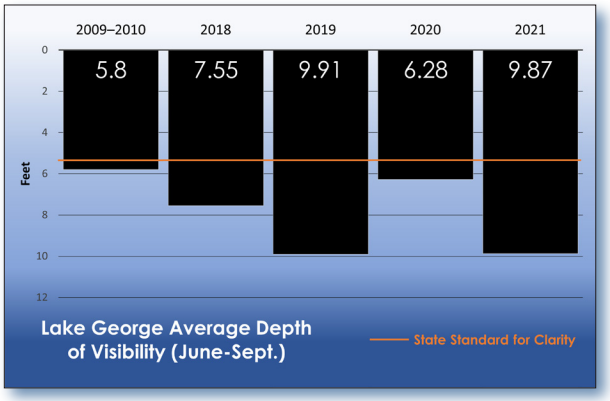

Figure 4. Lake George average depth of visibility, 2009–2021.

Partners and Funding

This restoration effort was supported by a collaborative network, which included financial contributions from state and local sources. The underground stormwater retention and filtration treatment facility project cost $846,000 ($771,000 construction; $75,000 technical assistance), which was funded by the City of St. Cloud using stormwater utility funds and a $697,000 Minnesota Clean Water Land and Legacy Grant received in partnership with Stearns County Soil and Water Conservation District. Partners provided $9,400 in staff support (in-kind funding). The City provided another $328,300 in stormwater utility funding to support the remaining projects and actions described in this story. Other project partners included the Minnesota Board of Water and Soil Resources, University of Minnesota, Minnesota Conservation Corps, and several local construction and engineering companies.

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