Lake Nokomis
Assessing and Addressing Blue-Green Algae Blooms

Minneapolis Park & Recreation Board

Summary of a 2022 study* commissioned by the Environmental Management Department, Minneapolis Park and Recreation Board (MPRB)

Lakes in the Minneapolis park system – and throughout the U.S. – are subject to increasingly frequent and severe blue-green algae blooms.

At Lake Nokomis, blue-green algae blooms that can produce toxins occur at all times of year, including under ice and during prime swim season. In 2020, Nokomis swimmers reported eye, ear, and respiratory symptoms consistent with exposure to blue–green algae to the Minnesota Department of Health. Data collected since 2021 at Nokomis swimming beaches indicates that the lake sometimes exceeds the Minnesota Pollution Control Agency's (MPCA) swimming-advisory standards for blue-green algae toxins.

In response, MPRB commissioned a study* in 2022 to assess the conditions driving blue-green algae blooms at both Lake Nokomis and Cedar Lake, as well as strategies to reduce the blooms.

Reflecting MPRB's mission and its Parks for All Comprehensive Plan 2021-2036, the goal is to preserve both lakes' suitability for swimming, fishing, and other recreation. Lake Nokomis is a favorite destination for swimmers, rowing, sailing, triathlons, anglers and paddling. It is part of Nokomis-Hiawatha Regional Park, visited by an estimated 2.4 million people in 2023.

Factors contributing to Harmful Blue-Green Algae Blooms

Working with a rich data set collected from the lake over 27 years, the study identified the following conditions as key factors.

1. **Phosphorus released from nutrient-rich lake bottom sediment** builds up in deep water. Blue-green algae species can travel down to nutrient-rich water to pick up phosphorus and back to the surface to use light. Weather and precipitation patterns in certain years likely exacerbate these conditions.
2. **Weakly stratified conditions with high nutrient concentrations** in deep water periodically allows nutrients from deep in the lake to mix into the surface water which fuels algae growth.
3. **A large carp population** stirs up lake bottom sediment which may be increasing phosphorus levels in the lake water.
4. **Nitrogen limitation in late summer** favors growth of certain blue-green algae types that use nitrogen forms other algae cannot, thereby creating conditions favoring blue-green algae in blooms.
5. **Conditions under ice** favor blue-green algae adapted to cold temperatures and low light. Winter temperatures do not stratify water, so phosphorus built up over summer fuels algae growth – as does increased light, due to low snow cover or snow removal for recreation.

Treatment options to eliminate or mitigate blue-green algae in Lake Nokomis

The study compared scenarios and treatment methods to control blue-green algae blooms in Lake Nokomis. It provided concept-level design options and assessed feasibility, including effectiveness, environmental safety, longevity, and cost.

Proactive Strategies: Address phosphorus in lake-bottom sediment

Alum: Alum chemically binds phosphorus within lake-bottom sediment, preventing its release to the water. This treatment is longer lasting when multiple applications and a buffering agent are used. Identified as the most cost-effective treatment option.

Oxygenated Aeration: Microscopic oxygen bubbles pumped into deep water prevent lake-bottom sediment from releasing phosphorus; alum added to the bubbles boosts effectiveness. However, due to costs for complex infrastructure, plus continuous operation, monitoring and maintenance, this option is not cost-effective.

Carp Management: Continue MPRB's current carp management plan for Lake Nokomis.

Watershed Structural Best Management Practices (BMP): BMPs treat stormwater runoff before it enters the lake, preventing additional phosphorus and other undesirable materials in the lake. This option requires significant resources for assessment, planning, design and construction, plus ongoing maintenance and upkeep.

Reactive Strategy: Address blooms in the short term

Algaecide treatments: Hydrogen peroxide and copper sulfate quickly kill blue-green algae. Unlike copper sulfate, hydrogen peroxide does not degrade habitat over time and has fewer effects on other organisms, so it merited further exploration. However, because algaecides don't change conditions that cause blooms, they are not a long-term solution: A perpetual treatment is not cost-effective.

Complementary Strategies

Structural Best Management Practices (BMPs): These reduce phosphorus entering the lake by treating stormwater runoff. Significant resources for planning, design, construction, and ongoing maintenance are required. This strategy does not address existing phosphorus recycling in the lake but could add longevity to treatments.

Aquatic Plant Management: Reduced algae blooms improve water clarity and could significantly increase aquatic plant growth, which would require control to maintain recreation. Promoting native aquatic plants and reducing invasive species in the lakes could be attempted with judicious use of herbicides following MPRB's Integrated Pest Management (IPM) policy.

What's next?

- **Engage** partners to consider proposed strategies.
- **Work** with partners to determine strategies and timelines for implementation.
- **Investigate** annual grant possibilities to support these strategies.
- **Prepare** to address changes in aquatic plant growth.
- **Continue** carp management efforts to improve water quality and preserve the lifespan of future water quality improvement projects, protecting the investment in water quality at this site.

*** Nokomis and Cedar Lakes Study: Data Review, Stressor Identification, Feasibility Study and Concept Design (2022)**