Nine Mile Creek Photo by: R. Gottsleben

Nine Mile Creek Watershed District
2017 Annual Report

Prepared and submitted by:

Nine Mile Creek Watershed District
Nine Mile Creek Discovery Point
12800 Gerard Drive
Eden Prairie, MN 55346
(952) 835-2078

Table of Contents

2017 Nine Mile Creek Board of Managers/Officers

Steve Kloiber, President
6528 Scandia Road
Edina, MN 55439
Appointing County: Hennepin
Term Expires: 9/29/19
Resident of Edina

Grace Sheely – Secretary
14325 Grenier Road
Minnetonka, MN 55345
Appointing County: Hennepin
Term Expired: 09/29/19
Resident of Minnetonka

Erin Hunker, Manager
306 Dearborn Court
Edina, MN 55343
Appointing County: Hennepin
Term Expires: 9/29/20
Resident of Edina

Jodi Peterson – Vice-President
9508 Russell Avenue South
Bloomington, MN 55431
(651) 334-3857
Appointing County: Hennepin
Term Expires: 9/29/2020
Resident of Bloomington

Maressia Twele, Treasurer
PO Box 4209
Hopkins, MN 55343
Appointing County: Hennepin
Term Expires: 9/29/2018
Resident of Minnetonka

Citizen Advisory Committee Members
2017

Roger Bildsten
6813 Brook Drive
Edina, MN 55439
rogerbildstem@gmail.com

Bob Prince – **CAC Chair**
13190 Beehive Court
Eden Prairie, MN 55346
robertfprince@comcast.net

John Helland
5720 McGuire Road
Edina, MN 55439
Johnhelland3@gmail.com

Jenifer Prince
13190 Beehive Court
Eden Prairie, MN 55346
princehive@comcast.net

Cal Johnson
12905 Jorissen Rd
Minnetonka, MN 55343
calajohnson@hotmail.com

Eric Strobel
5840 Creek Valley Rd
Edina, MN 55439
estrobel@comcast.net

Scott Jordan
10810 Upton Avenue South
Bloomington, MN 55348
sjordan@braunintertec.com

Craig Trenary
9629 Upton Avenue
Bloomington, MN 55431
craig@terraformadesign.com

Ember Kapitan
12838 Gerard Dr
Eden Prairie, MN 55346
ember.kapitan@yahoo.com

Maressia Twele
Board Liaison to CAC
PO Box 4209
Hopkins, MN 55343

Charlotte Lefebvre
6412 Aspen Road
Edina, MN 55436
charandpete@gmail.com

Roger Willette
9901 Penn Ave S, #219
Bloomington, MN 55431
rfwmaroco@aol.com

Technical Advisory Committee Members

Bryan Gruidl	City of Bloomington Water Resources Engineer	1700 West 98th Street Bloomington, MN 55431 952-563-4557
Jim Gates	City of Bloomington Deputy Director of Public Works	1700 West 98th Street Bloomington, MN 55431 952-563-8700
Leslie Stovring	City of Eden Prairie Environmental Coordinator	8080 Mitchell Road Eden Prairie, MN 55434 952-949-8327
Ross Bintner	City of Edina Engineering Services Manager	4801 West 50th Street Edina, MN 55424 952-903-5713
Drew McGovern	Hennepin County Public Works	Hennepin County Public Works 1600 Prairie Drive Hamel, MN 55340
Nate Stanley	City of Hopkins City Engineer	1010 South 1st Street Hopkins, MN 55343 952-548-6350
Will Manchester	City of Minnetonka City Engineer	14600 Minnetonka Blvd. Minnetonka, MN 55343 952-939-8239
Tom Dietrich	City of Minnetonka Water Resources Coordinator	14600 Minnetonka Blvd. Minnetonka, MN 55343 952-939-8233
Kristin Asher	City of Richfield Public Works Director	6700 Portland Avenue So. Richfield, MN 55423 612-861-9700

Joe Mulchay	Metropolitan Council	390 Robert Street N St. Paul, MN 55101
Jason Spiegel	MN Department of Natural Resources Area Hydrologist	1200 Warner Road St. Paul, MN 55155
Chris Zadak	MN Pollution Control Agency	520 Lafayette Road St. Paul, MN 55155
Nick Teideken	MN Department of Transportation Metro District Water Resources Engineer	1500 W. County Rd B-2 Roseville, MN 55113
Steve Christopher	Board of Water & Soil Resources	520 Lafayette Road St. Paul, MN 55155
Jessica Vanderwerff Wilson	City of Edina Water Resources Coordinator	4801 West 50th Street Edina, MN 55424 952-826-0445

Employees and Consultants

The Nine Mile Creek Watershed District (District) employs three full-time employees. The District hired its first full-time administrator in 2005. The administrator oversees daily operations of the District and represents the District on numerous state-wide committees. In 2009, the District hired a full-time education and outreach coordinator to develop and implement the District's education/outreach programs. In 2016, the District hired a full-time education and outreach specialist to assist with the implementation of the District's education and outreach programs. Due to expanding workloads to meet goals and objectives of the District's Water Management Plan, job descriptions and tasks have evolved over time. The District retains the services of an engineering consultant, a legal advisor, and an accountant to assist with District activities. The District contracts with another accounting firm to perform its annual financial audit.

District Administrator:
Randy Anhorn
Nine Mile Creek Watershed District
12800 Gerard Drive
Eden Prairie, MN 55346
ranhorn@ninemilecreek.org
(952) 835-2078

Engineering Advisor:
Robert Obermeyer
Barr Engineering Co.
4300 MarketPointe Drive, Ste. 200
Minneapolis, MN 55435
(952) 832-2600
bobermeyer@barr.com

Legal Advisor:
Louis Smith
Smith Partners, PLLP
400 2nd Avenue South, Ste. 1200
Minneapolis, MN 55401
(612) 344-1400
smith@smithpartners.com

Program and Project Manager:
Erica Sniegowski
Nine Mile Creek Watershed District
12800 Gerard Drive
Eden Prairie, MN 55346
esniegowski@ninemilecreek.org
(952) 358-2276

Education and Outreach Coordinator:
Gael Zembal
Nine Mile Creek Watershed District
12800 Gerard Drive
Eden Prairie, MN 55346
gzembal@ninemilecreek.org
(952) 204-9691

Accountant:
Dan Cavanaugh
JMSC Futurity
5000 West 36th Street, #240
St. Louis Park, MN 55401
(952) 697-4522

Auditor:
Redpath and Company, Ltd.
4810 White Bear Parkway
White Bear Lake, MN 55110

Introduction

Established in 1959, the Nine Mile Creek Watershed District was the state's first urban watershed district. Despite its name, Nine Mile Creek's main branch travels 15.5 miles from its headwaters to its confluence with the Minnesota River. The Creek's name came from the fact that it is nine (9) miles from Fort Snelling following an early cart path that is now Old Shakopee Road. The Creek winds though the southwestern suburbs of the Twin Cities, with a 50-square mile watershed consisting of a largely developed urban landscape, and encompassing portions of Bloomington, Edina, Minnetonka, Eden Prairie, Hopkins, and Richfield. Appointed by the Hennepin County Commissioners, each of the District's five (5) Managers serve three-year terms.

Consistent with its statutory and regulatory obligations under Minn. Stat. § 103D.351 and Minnesota Rules § 8410.0150, the Board of Managers has prepared this Annual Report of the Nine Mile Creek Watershed District's financial status, its yearly activities and projects, its 2017 permitting and enforcement program, and its 2018 goals and objectives. The Managers invite comments and suggestions concerning this report. The 2017 Annual Report is available on the Nine Mile Creek Watershed District website – www.ninemilecreek.org. Copies are also available by contacting Randy Anhorn, District Administrator, Nine Mile Creek Watershed District, Nine Mile Creek Discovery Point, 12800 Gerard Drive, Eden Prairie, MN 55346, (952) 835-2078.

Highlights and Accomplishments of 2017

2017 highlights include:

- Welcomed two new Board Managers, Erin Hunker and Grace Sheely

- Implementation of the District's Regulatory Program and Rules
    - Initiate a revision to the District's Rules

- Adoption of Fifth Generation Water Management Plan (2017-2027)

- Adopted an employee policy manual

- Worked with partner cities in regional flood area studies
    - Pentagon Park/Border Basin Area in the cities of Bloomington and Edina
    - Chamberlain-Cherokee Area in the City of Eden Prairie

- Nine Mile Creek Discovery Point Management & Site Restoration Planning

- Continue UAA/Lake/Creek Studies
    - Completed the *Evaluation of Management Measures to Improve the Water Quality and Ecology of Normandale Lake* study that led to the Board directing staff to prepare an Engineers Report on the resulting projects from the study for them to eventually act on.

- Cost Share Grant Program

- Citizen-Assisted Monitoring Program (CAMP)

- Advisory Committees

- Implementation of Education & Outreach Programming

- Capital Project Implementation
    - Initiate Phase One of the Edina Streambank Restoration/Stabilization Project
        - The project will stabilize streambanks along a 3.5 mile stretch in Edina and enhance the overall health of the creek.

- The District Received the Bush Lake Izaak Walton Leagues "Public Good" award

2017 was a busy and exciting year for the Nine Mile Creek Watershed District (District). The District started the first phase of the Edina Streambank Restoration/Stabilization Project to stabilize stream banks and enhance the overall health of Nine Mile Creek. The project involves work at numerous project areas along Nine Mile Creek totaling roughly 3.5 miles of stream. The Edina Streambank Stabilization project will result in improved stream health, stabilized stream banks, improved habitat, and the protection of property from erosion. Up-to-date information on the progress of the project will be maintained on the NMCWD website at www.ninemilecreek.org/whats-happening/current-projects/edina-streambank/.

In addition, the District continued work on the restoration of the Discovery Point grounds by clearing roughly 2.6 acres of buckthorn on our property and working to increase plant diversity and create healthy habitat through the replanting of roughly 250 more desirable and disease and climate change resistant species of shrubs and trees.

The District continued the growth and implementation of its education and outreach programs, with ongoing focus on chloride reduction efforts as well as citizen engagement through the District's Citizen Advisory Committee, the Cost Share Grant Program and summer education series. In addition to these established education programs, the District continued to implement programming at Discovery Point- its office and educational facility.

Assessment of the 2017 Work Plan

In its 2016 Annual Report, the District identified several broad goals and objectives for 2017, including:

1. Implementation of District Regulatory Program and Rules
2. Water Management Plan Update
3. Nine Mile Creek Discovery Point Management and Site Restoration

4. Continue UAA/Lake/Creek Studies
5. Cost Share Grant Program
6. Citizen Assisted Lake Monitoring Programs (CAMP)
7. Citizen Advisory Committee
8. Technical Advisory Committee
9. Education and Outreach Program Activities
10. Capital Project Implementation

In 2017, the District completed or made substantial progress toward these goals and objectives, as described below.

1. **Implementation of Watershed District Regulatory Program & Rules**

In March 2008, the Nine Mile Creek Watershed adopted new District rules and amended them in August 2015. The rules have been well received and the District has not had any significant issues implementing the rules. In 2017, the NMCWD continued to review projects and permit applications under the rules adopted in 2008 and amended in 2015. Of the 132 permits issued in 2017, 39 triggered the District's stormwater rule and as a result, required stormwater management BMPs are projected to reduce stormwater runoff volume by 133,826 cubic feet per year, and reduce phosphorus and suspended solid loading by 65.1 and 12,117.1 pounds per year respectively.

In 2017, the District initiated a new permit tracking program and has been propagated with all issued District's from 2014 through 2017. During this time period, the District has issued 524 permits of which 197 triggered the District's stormwater rule and as a result, required stormwater management BMPs are projected to reduce stormwater runoff volume by

727,133cubic feet per year, and reduce phosphorus and suspended solid loading by 371.4 and 68,061.9 pounds per year respectively.

The District first adopted rules in March 2008 and then amended them in August 2015. The rules have been well received and the District has not had any significant issues implementing the rules.

In 2017, the District undertook a rule review and revision process and anticipates the revised rules to be adopted and executed in the first or second quarter of 2018.

2. **Water Management Plan Update**

In 2017, the District completed a year-and-a-half planning process that resulted in the adoption of the District's 5th generation Water Management Plan in October 2017. The Plan sets the vision, guidelines and proposed tasks and projects for managing and protecting surface waters within the District's boundaries. As part of this stakeholder input process in 2016, the District collected feedback from citizens through an online survey (receiving 719 responses) and hosted a citizen's input forum to solicit feedback regarding citizen issues and concerns. In addition, the District held five (5) Technical Advisory Committee meetings and eight (8) Board workshops and submitted the Plan for two different public review and comment periods and held a public hearing.

3. **Nine Mile Creek Discovery Point Management and Site Restoration Planning**

The District has developed an Ecological Master Plan (www.ninemilecreek.org/resource-library/?rt=&rs=master+plan) to guide its landscape restoration project on the 5.3 acre Discovery Point property. Components of the landscape restoration master plan include management of invasive species, habitat restoration, and ongoing management of the stormwater management features (including four rain gardens, permeable paver parking lot, a reinforced turf overflow

parking area, permeable paver sidewalk, and a cistern). The first phase of implementation of the restoration plan was initiated in 2016 through a volunteer buckthorn bust on the property, and the release of an RFQ for restoration work for Phase 1.

In 2017 the District completed Phase 1 of the restoration (although restoration maintenance will continue). Phase 1 included invasive buckthorn and tree removal, along with replanting half the Phase 1 area in a fescue mix and half the area in a high diversity native seed mix. Trees and shrubs were planted, as well. Phase 2 of the restoration plan was initiated in the last part of 2017, with buckthorn and tree removal taking place. Native seeding, plug planting, and tree and shrub planting will occur in 2018.

To date, Phase 1 and Phase 2 has included the removal of 2.6 acres of buckthorn and removal of disease prone and invasive or dead trees (e.g., ash and elm). In the end, roughly 250 more desirable and disease and climate change resistant species of shrubs and trees will be replanted on the site.

The goals of the Discovery Point restoration are to restore a more diverse, healthy habitat in the face of aggressive invasive plant species like buckthorn, and to demonstrate for property owners within the District how to stabilize soil, control invasive species, and increase plant diversity in an urban setting. The ultimate vision is for the District to create a ecologically diverse site that is a public amenity with improved access to the landscape for educational and recreational opportunities.

4. **Use Attainability Analyses & Lake and Creek studies**

In 2017, the District entered the fourteenth year of its Watershed Outlet Monitoring Program (WOMP). Since 2004, the Nine Mile Creek has been on the Minnesota Pollution Control Agency's "Impaired Water" lists for turbidity, chloride and fish community Index of

Biotic Integrity (IBI). In response to this listing, the District undertook an enhanced monitoring program, which includes additional water quality monitoring at three (3) WOMP stations on the creek, and ecological health monitoring of the Creek (see Figure 33 on page 65). The District began working with the MPCA in 2007 to get funding for Total Maximum Daily Load (TMDL) studies for chlorides and fish IBI. The District initiated the TMDL studies for chlorides and fish IBI in 2008 and continued to develop the TMDL Reports for these impairments in 2009. In 2010, the Chloride TMDL Report was approved by the MPCA and the Environmental Protection Agency. The District continued its implementation and education efforts to reduce chlorides in 2016. The District is working with the Minnesota Pollution Control Agency on the possible reclassification or delisting of the fish IBI impairment.

The District, in partnership with the City of Bloomington, evaluated how to improve the health of Normandale Lake in 2017. Four lake management options were identified as potential solutions to water quality and nuisance biota issues though this study. Because the Army Corp of Engineers Section 404 permit that was issued in 1979 for the construction of the dam that created the lake, the District and City of Bloomington are currently working with the Corps to determine which management options are allowable under the permit, or if permit modifications would be needed or allowed. The District intends to undertake project(s) on Normandale Lake in 2018.

The District continued to partner with the Metropolitan Council to monitor continuous turbidity at the Metropolitan Council WOMP station. Continuous turbidity monitoring began at this station in 2008 and continued in 2017.

In addition, the District partnered with the MPCA in 2017 to kick off the Lower Minnesota River Watershed Restoration and Protection Strategy (WRAPS) and Riley Purgatory

Bluff Creek and Nine Mile Creek Watersheds TMDL (including nutrient impaired lakes and E. *coli* in streams).

Also, in 2017 the District partnered with three (3) of its partner cities to undertake two (2) separate studies to better understand localized and regional draining and flooding issues within the Pentagon Park/Border Basin area within the cities of Bloomington and Edina, and Cherokee/Chamberlain area in the City of Eden Prairie.

5. **Cost Share Grant Program**

In 2017, the District solicited applications and awarded 17 cost share grants and two master water steward capstone projects totaling $159,000. Awarded grants by applicant type:

- 9 Residential
- 3 Association
- 4 Nonprofit
- 1 Business
- 2 City

The Cost Share Program is a successful way for the District to implement stormwater runoff reduction projects, shoreline stabilization, and habitat restoration projects throughout the watershed. The program also provides awareness of the District's mission and goals of protecting and restoring our water resources.

6. **Citizen-Assisted Monitoring Program (CAMP)**

The District partnered with the Metropolitan Council in 2017 to support the Citizen-Assisted Monitoring Program on five lakes in the District. Dedicated volunteers with a strong interest in the health of local water bodies collect water quality data on several District lakes bi-weekly from April through October. The lakes included in the citizen monitoring program were:

Lake Minnetoga & Wing Lake in Minnetonka, Lower Penn Lake & Bush Lake in Bloomington, and Hawkes Lake in Edina.

7. **Citizen Advisory Committee**

In 2017, the CAC assisted staff in the Water Management Plan update process and on developing new education and outreach opportunities, including organizing and hosting the annual Summer Education Series and watershed tour held in October 2017. In addition, the CAC reviewed residential Cost Share grants. The CAC review, along with staff review, was used to make grant funding recommendations to the Nine Mile Creek Watershed District Board of Managers. The CAC meets quarterly at Nine Mile Creek Discovery Point (the District office). Meeting dates and times are posted on the District's webpage and meetings are open to the public.

8. **Technical Advisory Committee**

In 2017, the District's Technical Advisory Committee met three (3) times as part of the District's Water Management Plan update and Rule review revision planning process.

9. **Education and Outreach Program Activities**

Communications

The District used its electronic newsletter as a main form of communication in 2017 to keep residents and the public informed about District projects and events. The newsletter also featured natural resources information about the District and provided clean water tips. The number of people subscribed to the newsletter continued to grow in 2017. The District also used the social media platforms Facebook, Instagram, Pinterest, and Nextdoor to engage with residents. The District continued to use its website to communicate information. The site has tips

for clean water, program information and event registration, along with water quality data, and access to reports and records.

The District printed 1,750 copies of the annual communication and distributed them throughout the watershed, along with mailing approximately 350 copies to District residents and elected officials. The annual communication was also posted on the District's website and emailed through the electronic newsletter.

Education and Outreach

Summer Education Series

The District again hosted its Summer Education Series (SES). The SES is designed to encourage adults and children to explore and experience the natural resources in the District. SES programs also provide residents with hands-on learning opportunities about ways to protect and enhance the District's water and natural resources. In 2017, the SES included a family fishing event, an edible plants hike, a seminar given by a Master Water Steward on dragonflies, and a workshop on buckthorn removal. This program strengthened partnerships with local organizations like the Let's Go Fishing Eden Prairie and the City of Minnetonka. Summer Education Series events reached 140 people.

K-12 Education

District staff presented English and Spanish language programs at seven schools around the watershed in 2017. Topics ranged from nature exploration with preschoolers, to water cycle lessons and creek water quality investigations with fourth graders. The District also implemented a pilot program with Hennepin County Riverwatch to monitor creek health with two high schools. Staff also gave a water cycle presentation to a local Boy Scout troop. Over 1,100 students were reached in 2017.

Trainings/Workshops

The District hosted one Winter Road Maintenance workshop in 2016. These workshops provide training for MNDOT, Hennepin County, and city and private plow drivers. The workshops train participants in practices that will result in reduced chloride application, while maximizing safety. The District also sponsored a Level II Winter Maintenance training, which is targeted at Winter Maintenance supervisors. The training allows supervisors to review their past, present and future winter maintenance practices and generate a report from the data, allowing them to look for ways to reduce chloride use at an organizational level. The District also partnered with Riley Purgatory Bluff Creek Watershed District and Minnehaha Creek Watershed District to promote their winter maintenance trainings.

The District partnered with the Riley Purgatory Bluff Creek Watershed District to host a Project Water Education for Teachers (Project WET) workshop. This workshop provides teachers with effective water lessons that can be incorporated into their existing curricula.

NEMO (Nonpoint Education for Municipal Officials)

The District was a member of Northland NEMO in 2017. Unfortunately, the NEMO program was not active with the District in 2017. Instead, District staff reached out to elected officials through presentations at city commission meetings.

Discovery Point Programming

The opportunity for outreach at Discovery Point continued to improve in 2017. Visitors checked out the bug and bird bags, and there were many stop-in visitors. The District put on several education programs at Discovery Point, including a buckthorn removal workshop, an edible plants hike, and a birding class. We also hosted professional workshops, site tours for city

commissions, and various neighborhood meetings. Discovery Point also hosted the annual Night to Unite gathering for the Topview neighborhood.

Public Good Award

At its Annual Member Meeting and 80th Anniversary Celebration on October 8, 2017, the Bush Lake Chapter of the Izaak Walton League awarded the Nine Mile Creek Watershed District with its first ever "Public Good Award." This award is given to city or public staff for their contributions to water quality, conservation, and/or the environment. The Bush Lake Chapter chose the District to receive the award for our work as a partner in the Chapter's restoration work.The Chapter also partnered with the District on the forming of the Bush Lake Aquatic Invasive Species team. Finally, the award recognizes the District's education and outreach activities, around Bush Lake and throughout the watershed.

Outreach

The Nine Mile Creek Watershed District staff and managers attended and participated in several community events hosted by cities in 2017. At these events, information was distributed about the District, its events, chloride reduction, and our cost share grant program. These events provided an opportunity for the District to meet with residents of the District and discuss their concerns about the water quality and overall health of the watershed.

As part of its education and outreach program in 2017, District staff gave presentations to multiple groups, organizations, and schools. Presentation topics included the District's efforts to improve and protect the water resources of the Nine Mile Creek Watershed and alternative landscaping options to protect water quality.

All the education and outreach activities in 2017 allowed the District to reach over 3,800 people with water quality and protection messaging.

Volunteer Program

Master Water Stewards

The District continued participation in the Master Water Stewards program in 2017, with five stewards being certified in 2017. The stewards partner to install a stormwater best management practice. The Stewards began two raingarden capstone projects, which will be completed in 2018. The District has recruited another five stewards to go through the training in 2017/2018.

Volunteer Programs and Equipment Rental

The District hosted three large group volunteer events in 2017. Volunteers cleaned trash out of Nine Mile Creek in Hopkins, installed native plants at Discovery Point, and cleared buckthorn at Discovery Point. The District also made equipment and educational materials available to the public to check out and use. Many residents made use of buckthorn removal equipment. The stormdrain stenciling kits also proved popular: city groups, schoolchildren, and residents all contributed to marking over 150 drains with “No Dumping” stickers in 2017.

Grants

Hennepin County Aquatic Invasive Species Prevention Grant

The District, in partnership with the City of Bloomington, received an Aquatic Invasive Species (AIS) Prevention Grant from Hennepin County to teach about preventing the spread of AIS. To accomplish this goal, the District contracted with local artists to design and fabricate a Popup Education Cart. The cart was used at eight different parks and events around Bloomington. These events helped the District reach over 400 people.

The District also received, with the City of Edina, a second Aquatic Invasive Species (AIS) Prevention Grant from Hennepin County to develop AIS teaching aids to use at public events and training. The work on this grant will continue in 2018.

Clean Water Fund Grant

The District received a grant from the Minnesota Board of Water and Soil Resources through the Clean Water, Land and Legacy Amendment in 2017. The grant, titled *Targeting Best Management Practices on Lands Owned by Nonprofits*, will identify priority locations for best management practices (BMPs) in the watershed on nonprofit sites. These sites typically have significant amounts of hard surfaces that contribute large volumes of polluted runoff to local lakes and creeks. After prioritizing sites, the District will have conversations with nonprofits to identify partnership opportunities that will allow the District and nonprofit to work together to plan and design stormwater management practices on their site. The District will offer educational and technical assistance to the nonprofits. After completing 58 site visits in 2017 to nonprofits, 15 sites were prioritized as being good locations for best management practices (BMPs). Outreach began to these sites in 2017 and will continue in 2018, with the hopes of constructing BMPs in 2019.

MPCA Community Resilience Grant

The Freshwater Society, Riley Purgatory Bluff Creek Watershed District and the Nine Mile Creek Watershed District received a grant from the Minnesota Pollution Control Agency to host a series of facilitated planning workshops. The Metropolitan Council and Barr Engineering participated in the planning and facilitation of the workshops. The workshops were designed to educate and engage a broad spectrum of stakeholders (decision-makers, municipal staff, community groups, local businesses, citizens etc.) from communities located within the two

watershed's boundaries on climate change impacts (both current and future) and develop stakeholder-driven ways to increase community resilience for the future. Bloomington, Edina, Hopkins, Chanhassen, and Riley Purgatory Bluff Creek Watershed District participated in the process. Following the workshops, the participating communities received a handout with recommendations for building resilience specific to their community. A wrap-up was held with the core participants from the communities and a presentation was given to the city of Bloomington.

10. **Capital Project Implementation**

Edina Creek Restoration Project

The District continued to work throughout 2017 on the Edina Creek Restoration Project. The project involves the stabilization of the streambank at 15 different project areas along roughly 3.5 miles of Nine Mile Creek as it flows through the City of Edina. Because of the size of the project, staff turnover and difficulties contacting affected landowners and securing the needed access licenses and easements, it was divided into two phases with work on the first 11 of sections of the creek (totaling roughly 2.2 miles) currently underway and the work on the remaining four sections planned for mid-summer 2018 through spring 2019. The project will result in improved stream health, stabilized streambanks, improved habitat, and the protection of property from erosion.

The project was put out for bid in early 2017, and work on the first phase began in the fall of 2017. Six of the 11 sections of the first phase of the project were fully completed in 2017. Work on the remaining five sections, two of which included the excavation of new re-meandered channels, will be completed by mid-2018.

Up-to-date information on the progress of the project will be maintained on the NMCWD website at www.ninemilecreek.org/whats-happening/current-projects/edina-streambank/.

Normandale Lake Water Quality Improvement Project

The District accepted a petition from the City of Bloomington to develop a water quality improvement project to address curly leaf pondweed and internal phosphorus loading in Normandale Lake and to identify watershed best management practices to reduce nutrient loading into the lake. The District started a feasibility report in 2009 and submitted options for the project to the U.S. Army Corps of Engineers (ACOE) for their preliminary review. Water quality monitoring in 2009 revealed an improvement in water quality. The District delayed implementation of the project to conduct additional water quality monitoring in 2010 and 2011.

In 2017 the District, in partnership with the City of Bloomington, completed a more detailed *Water Quality and Nuisance Biota Evaluation study* on Normandale Lake to evaluate the cause of water quality and nuisance biological issues in Normandale Lake and to evaluate potential solutions to the issues. The scope of work included use and evaluation of existing water quality and biota data, development of an in-lake water quality model to evaluate the cause of water quality and nuisance biota issues, and use of the model to identify potential solutions.

Through this analysis, four (4) lake management options were identified as potential solutions to water quality and nuisance biota issues. These options included; (1) a lake drawdown, (2) an in-lake alum treatment, (3) in-lake aeration, and (4) limited (experimental) plant harvesting on both the eastern and western sides of the lake.

Because the project was petition for by the City of Bloomington, the Board directed staff to complete an Engineer's Report for the project in the Fall of 2017. The District anticipates taking action on the resulting Normandale Lake Project Engineer's Report in early to mid-2018

and if everything goes well, hopes to initiate the first of the management options, the lake drawdown, in the fall of 2018.

Projected 2018 Work Plan

1. **Implementation of Watershed District Regulatory Program and Rules**

The District will continue implementing its rules and regulatory program in 2017. The District undertook a rule review and revision process and anticipate the revised rule to be adopted and executed in the first or second quarter of 2018.

Due to the anticipated future workloads of the District's three (3) full-time staff as a result of the continued increase in the annual number of permits, need to inspect existing regulated stormwater BMPs and ongoing efforts to meet goals and objective in its recently adopted 5th Generation Water Management Plan, the District's anticipated hiring an addition full-time staff person.

2. **Water Management Plan amendment**

The District will initiate a minor plan amendment to incorporate its revised rules into its 5th Generation Water Management Plan (Plan) in 2018.

3. **Nine Mile Creek Discovery Point Management and Site Restoration Planning**

In 2018, the District will continue to implement the Nine Mile Creek Discovery Point Landscape Restoration Plan which includes management of invasive species, habitat restoration, and ongoing management of the stormwater management features. The District will continue to develop education and outreach programming for the facility.

4. **Continue UAA /Lake /Creek Studies**

In 2017, the District will continue to monitor Nine Mile Creek with the WOMP stations. The District will continue use of the continuous turbidity monitoring transducers at each of its

WOMP stations. The District will also continue its lake monitoring program, collecting data on the three Anderson Lakes (Northwest, Southeast and Southwest), Bush Lake, Normandale Lake and Smetana Lake.

The District will also continue its stream monitoring program collecting water quality data and ecological data.

Additionally, the District plans to update existing UAAs for three lakes (Cornelia, Edina and Normandale) in 2018, as well as continue to participate in the Lower Minnesota River Watershed Restoration and Protection Strategy (WRAPS) and Riley Purgatory Bluff Creek and Nine Mile Creek Watersheds TMDL (including nutrient impaired lakes and E. *coli* in streams).

5. **Cost Share Grant Program**

The District will solicit applications for the eleventh year of its Cost Share Grant Program in 2018. The District makes over $100,000 available to residents, associations, non-profits, businesses, and local governments in the District for this grant program and $50,000 for chloride reduction projects.

6. **Citizen-Assisted Monitoring Program (CAMP)**

In 2018, the District will continue to support citizen monitoring through the Metropolitan Council's Citizen-Assisted Monitoring Program (CAMP). Trained volunteer monitoring teams will collect water quality samples from District lakes enrolled in the program.

7. **Citizen Advisory Committee**

The Nine Mile Creek Watershed District will continue to support the role of the Citizen Advisory Committee (CAC). New members will be recruited to replace members that choose not to be re-appointed in 2018. The CAC will assist with education and outreach planning and

events, reviewing residential Cost Share Grant applications, and taking a tour of cost share and District projects.

8. **Technical Advisory Committee**

In 2018, the District will continue to work with the Technical Advisory Committee during the planning and development of the District's 5th Generation Water Management Plan.

9. **Education and Outreach Events and Activities**

In 2018, the District will continue to host workshops, programs, and trainings to meet the goals of our Water Management Plan.

Communication

The District will update and add information to its website. The District will continue using its electronic newsletter to communicate with the public, along with social media and press releases.

Education and Outreach

The District will offer opportunities to engage residents (adults, families, K12 students, and teachers) in learning about and connecting with District natural resources, stormwater management, habitat restoration, and other topics related to the mission of the District and guided by the District's Water Management Plan.

Planned events include collaborating with the Citizen Advisory Committee to host the Summer Education Series, offering a homeowner's workshop series and hosting another fall tour. We also plan to host more Popup Education events at popular locations around the District. These events will make use of the popup cart, and a new exhibit that models watersheds with sand and augmented reality mapping technology. The District will continue to partner with cities to have displays at fairs and give presentations for groups upon request.

The development of programming for Discovery Point will continue, including hosting educational events at the facility. We will also offer volunteer events at the facility, including a planting event linked to the restoration efforts onsite.

The District will continue to incorporate educational aspects into Capital Improvement Projects. These efforts will include public information meetings, informational flyer or brochures and signage of new project sites describing project goals and activities.

The District will host workshops for winter maintenance professionals aimed at reducing the amount of chloride applied in the District. This is to address the chloride TMDL on Nine Mile Creek.

Volunteer Program

The District will once again participate in the Master Water Steward program and will recruit new residents to join the fourth cohort that will start classes in the fall of 2018. The District will continue to offer volunteer programs and streamline the volunteer process.

10. **Capital Project Implementation**

Edina Nine Mile Creek Restoration Project

In 2018, the District will complete the first phase Edina Nine Mile Creek Restoration Project and work on finalizing the necessary easements on private property for phase two of the project. Once all the needed access licenses and easements are obtained, the District will solicit bids to undertake phase two, with work anticipated to begin in the summer 2017 and be completed in the spring of 2019.

Normandale Lake Water Quality Improvement Project

In 2018 the District will complete and act on the Normandale Lake Project Engineer's Report, acquire all needed MN DNR permits for the project and continue to work with the

ACOE to distinguish allowable options to manage the lake as well as seek clarification on a possible permit modification to allow for limited (experimental) plant harvesting on both the eastern and western sides of the lake.

Following the Board review and potential adoption of the Normandale Lake Project Engineer's Report, receipt of needed MN DNR permits and confirmation from the ACOE on the allowability of the various management options, the District hopes to initiate a lake drawdown, in the fall of 2018.

Permitting Activity

1. **Summary of Permits Issued**

In 2008, the Nine Mile Creek Watershed District adopted and began implementing new rules. The Board of Managers, with the assistance from the District Engineer and District Administrator, reviews permit applications and imposes various conditions for approval as appropriate. In 2017, the District reviewed and granted 132 permits, 39 of which triggered the District's stormwater rule and as a result, required stormwater management BMPs are projected to reduce stormwater runoff volume by 122,399 cubic feet per year, and reduce phosphorus and suspended solid loading by 61.8 and 11,510.1 pounds per year respectively.

In 2017, the District initiated a new permit tracking program and the system has been updated with all issued permits from 2014 through 2017. During this time period, the District has issued 524 permits of which 197 triggered the District's stormwater rule and as a result, required stormwater management BMPs that are projected to reduce stormwater runoff volume by 715,706 cubic feet per year, and reduce phosphorus and suspended solid loading by 368.1 and 67,454.9 pounds per year respectively.

The District subjects projects to a preliminary review so that it can issue permits simultaneously, or shortly after, municipal permits.

2. **Enforcement Activity**

The District's engineer regularly inspects permitted work to ensure compliance with permit conditions. If violations are found, the District attorney typically will notify permittees and seek voluntary abatement or correction before resorting to formal legal action. In 2017, no enforcement actions were necessary.

Summary of 2017 Water Quality Monitoring Programs

The 2017 Nine Mile Creek Watershed District (NMCWD) water quality monitoring program included monitoring six lakes (Cornelia, Edina, Glen, Lone, Minnetoga, and Shady Oak) and Nine Mile Creek.

Lake Monitoring

The 2017 NMCWD lake water quality monitoring program included Lake Cornelia, Lake Edina, Glen Lake, Lone Lake, Minnetoga Lake, and Shady Oak Lake. Each lake was monitored on six occasions for selected parameters including: total phosphorus, soluble reactive phosphorus (ortho phosphorus), total nitrogen, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, pH, chlorophyll *a*, chloride, dissolved oxygen, temperature, specific conductance, turbidity, oxidation reduction potential (ORP), phytoplankton, and zooplankton. Aquatic plant (macrophyte) surveys were performed during June and August. Results of the 2017 lake monitoring program follow.

Lake Cornelia

Figure 1. In 2017, the water quality of North Lake Cornelia, pictured above, was poor

Lake Cornelia is located in the north central portion of Edina. Lake Cornelia is comprised of North (North Lake Cornelia) and South (South Lake Cornelia) basins. The two basins are connected by an equalizing 12-inch culvert under 66th Street (invert elevation (I.E.) of 859.0 MSL) on the south side of North Lake Cornelia. Ultimately the water levels in North Lake Cornelia are controlled by the outlet structure at South Lake Cornelia. The outflow from South Lake Cornelia discharges over a 14-foot long weir structure with a control elevation of 859.1 MSL. Discharges from South Lake Cornelia are conveyed to Lake Edina through an extensive storm sewer network. Due to limited stormsewer capacity downstream of Lake Cornelia, stormwater runoff backs-up into the lake during large storm events, which provides temporary storage of the flood volumes. The Minnesota Department of Natural Resources stocks the lake annually with bluegills for its Fishing in the Neighborhood Program.

North Lake Cornelia

North Lake Cornelia (Figure 1) has a water surface area of approximately 19 acres, a maximum depth of 5 feet, and a mean depth of approximately 3 feet. The lake is shallow enough for aquatic plants to grow over the entire lake bed. It is a polymictic lake, mixing many times per year.

North Lake Cornelia Water Quality—In 2017, North Lake Cornelia water quality was poor. The lake's summer average total phosphorus and chlorophyll *a* concentrations were 197 µg/L and 46 µg/L, respectively. The lake's summer average Secchi disc transparency was 0.4 meters. All three summer averages failed to meet the Minnesota State water quality standards for shallow lakes in the North Central Hardwood Forest Ecoregion which are ≤ 60 µg/L, ≤ 20 µg/L, and ≥ 1 meter, respectively.

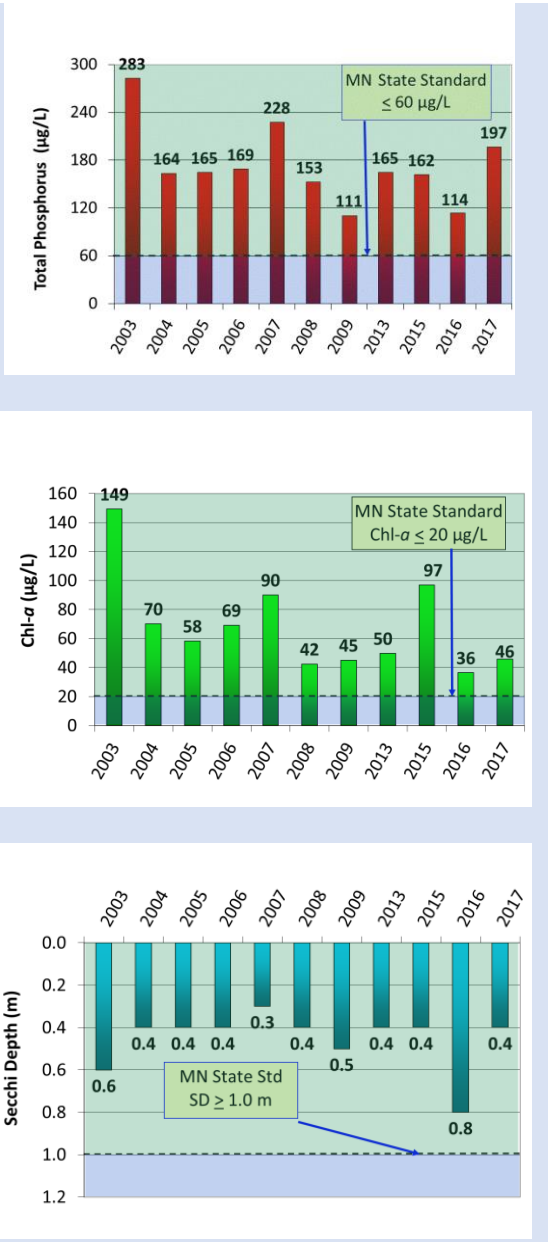


Figure 2. North Lake Cornelia summer average total phosphorus (top) , chlorophyll *a* (middle), and Secchi disc (bottom) values during 2003-2017

Poor water quality has been observed in North Lake Cornelia during the entire period of record. While summer average water quality in 2016 was generally better than previous years, summer average water quality in 2017 was poorer than 2016. Summer average total phosphorus concentration was 73 percent higher in 2017—197 µg/L in 2017

compared with 114 µg/L in 2016. Summer average chlorophyll *a* concentration was 28 percent higher in 2017—46 µg/L in 2017 compared with 36 µg/L in 2016. Summer average Secchi disc transparency was 50 percent lower in 2017 than 2016—0.4 meters in 2017 compared with 0.8 meters in 2016. Despite poorer water quality in 2017, the lake's summer average water quality was within the range observed during the period of record (Figure 2).

North Lake Cornelia Algae Toxins—In 2017, algal scum observed on North Lake Cornelia during August (Figure 3) and September was sampled and tested for algal toxins. Algal toxin levels for microcystins and anatoxin-a exceeded public health advisory levels on August 7. A microcystin concentration of 620 µg/L was observed compared with a public health advisory threshold of 6 µg/L. An anatoxin-a concentration of 6 µg/L was observed compared with a public health advisory threshold of 1 µg/L. Saxitoxin was present in the lake, but did not exceed the public health advisory level. A saxitoxin concentration of 0.05 µg/ L was observed compared with a public health advisory threshold of 0.8 µg/L. The algal toxin level for anatoxin-a exceeded the public health advisory level on August 21 when a concentration of 4.6 µg/L was observed compared with a public health advisory threshold of 1 µg/L (Figure 4). The District alerted the City of Edina (City) and the public to the high algal toxins in the lake, advising no contact with the water until the lake's algal toxin levels declined below the public health advisory threshold. In September, the lake's algal toxin levels had declined below the public health advisory threshold and this was communicated to the City and the public.

Figure 3. Algal scum in North Cornelia Lake on August 7

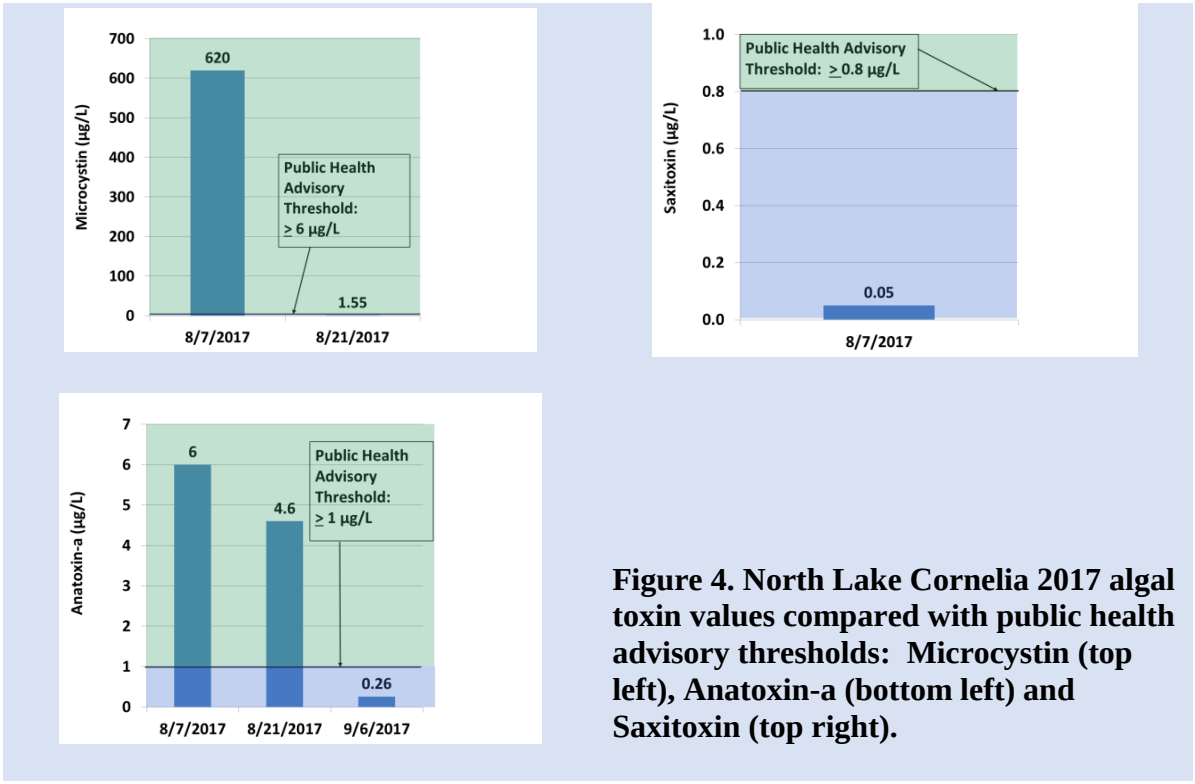


Figure 4. North Lake Cornelia 2017 algal toxin values compared with public health advisory thresholds: Microcystin (top left), Anatoxin-a (bottom left) and Saxitoxin (top right).

North Lake Cornelia Plants—Curly-leaf pondweed was problematic in North Lake Cornelia during 2015, 2016, and again in the early spring of 2017. An April 23rd plant survey completed by the City found curly-leaf pondweed forming a solid mat over the entire lake (Figure 6) with the exception of a few meters (about six feet) buffer near the immediate shoreline, usually over a pure sand substrate. The City completed a spring herbicide (endothall) treatment to manage the curly-leaf pondweed. During a June plant survey observed in North Lake Cornelia. Hence, the

herbicide treatment effectively managed the lake's curly-leaf pondweed infestation.

However, senescence of the curly-leaf pondweed controlled by the herbicide added phosphorus to the lake. The phosphorus added appears to have fueled the algal blooms in the lake, which resulted in reduced Secchi disc transparency and the high algal toxins measured in August.

North Lake Cornelia plant survey data from 2004 through 2017 were assessed to determine plant Index of Biotic Integrity (IBI) values. Figure 5 shows the number of species and Floristic Quality Index (FQI) for that period compared to the MnDNR plant IBI proposed impairment thresholds.

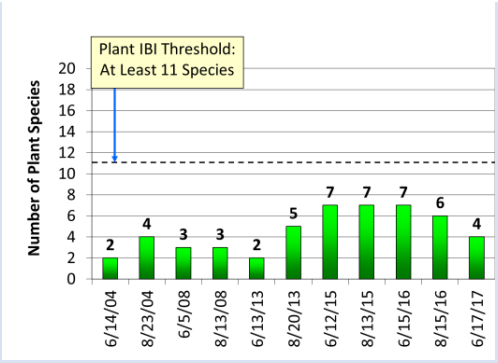


Figure 5A

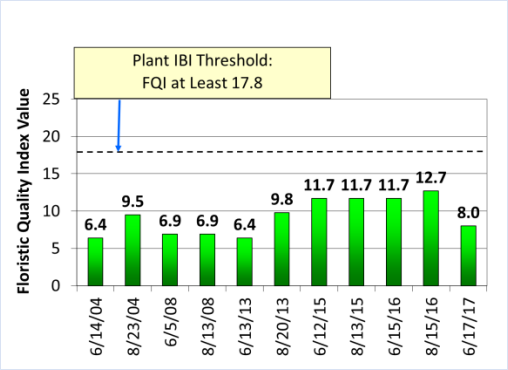


Figure 5B

Figure 5. 2004-2017 North Lake Cornelia Plant Index of Biotic Integrity (IBI) Threshold Values compared with Plant IBI Thresholds: Number of Plant Species (top) and Floristic Quality Index (FQI) Values (bottom). The City of Edina collected the 2017 plant survey data.

In 2017, the number of plant species (4) was lower than the number of species observed during 2013 through 2016 (5 to 7 —Figure 5A). Similarly, FQI was lower in 2017 (8.0) than 2013 through 2016 (9.8 to 12.7 —Figure 5B). From 2016 to 2017, the number of species declined from 7 species in June 2016 to 4 species in June 2017. In June 2017, 5 species were absent that had been observed in June 2016 while 2 duckweed species were present that had not been observed in June, 2016. The

Figure 6. Curly-leaf pondweed grew densely in North Lake Cornelia forming a solid mat over the entire lake in April.

species that were not observed between June 2016 and June 2017 include curly-leaf pondweed, targeted by the herbicide treatment, three native pondweed species (*Potamogeton foliosus, Potamogeton nodosus*, and *Stuckenia pectinata*) and bulrush (*Schoenoplectus sp*.). Pondweed species and bulrush could have been removed by the 2017 endothall treatment to control curly-leaf pondweed. For future herbicide treatments to control curly-leaf pondweed, it is recommended that the herbicide be applied before the lake's average water column temperature reaches 60°F prior to the native plant growing season. Completing the herbicide application prior to the start of the native plant growing season would protect the native plants from harm.

During 2004 through 2017, the number of plant species in North Lake Cornelia ranged from 2 to 7 compared with the proposed impairment threshold of at least 11 species for lakes shallower than 15 feet. FQI values during that period ranged from 6.4 to 12.7 compared with the proposed impairment threshold of at least 17.8 for lakes shallower than 15 feet. Because both the number of species in the lake and the FQI values were below the proposed impairment thresholds for the entire period of record, North Lake Cornelia would be considered impaired for plants. At this time, the plant IBI has not yet been used by the MPCA/MnDNR to determine impairment, however, it is expected to eventually be used to determine biological impairment.

The City will complete an aquatic plant survey of North Lake Cornelia in the spring of 2018. If the survey results indicate herbicide treatment of the curly-leaf pondweed is needed, the City plans to apply for a DNR herbicide treatment permit and, after receiving the permit, complete a spring herbicide (endothall) treatment.

South Lake Cornelia

South Lake Cornelia (Figure 8) has a water surface area of approximately 31 acres, a maximum depth of 7 feet, and a mean depth of 4.2 feet at a normal surface elevation of 859.1 MSL. The water level in the lake is controlled by the elevation of the weir structure at the south side of the lake. The lake is shallow enough for aquatic plants to grow over the entire lake bed. It is a polymictic lake, mixing many times per year.

Figure 8. In 2017, the water quality of South Lake Cornelia, pictured above was poor

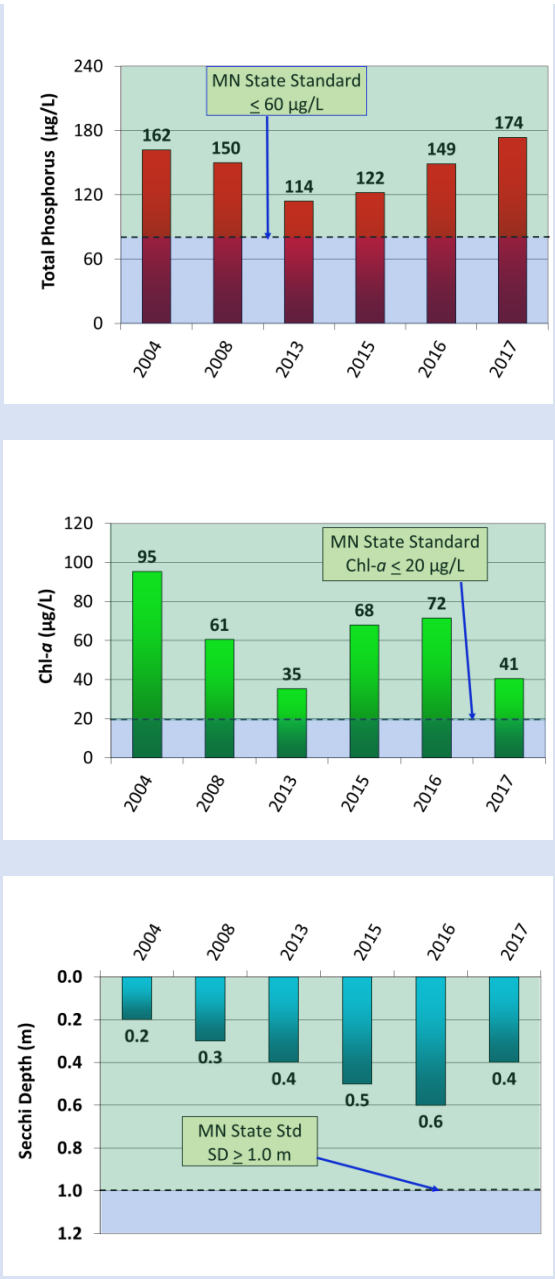


Figure 7. South Lake Cornelia summer average total phosphorus (top) , chlorophyll *a* (middle), and Secchi disc (bottom) values during 2004-2017

South Lake Cornelia Water Quality—In 2017, South Lake Cornelia water quality was poor. The lake's summer average total phosphorus and chlorophyll *a* concentrations were 174 µg/L

and 41 µg/L, respectively. The lake's summer average Secchi disc transparency was 0.4 meters. All three summer averages failed to meet the Minnesota State water quality standards for shallow lakes in the North Central Hardwood Forest Ecoregion in 2017 which are $\leq$ 60 µg/L, $\leq$ 20 µg/L, and $\geq$ 1 meter, respectively.

The poor water quality observed in 2017 was typical of the water quality observed in previous years. However, the 2017 summer average total phosphorus concentration was higher than the summer averages observed previously—174 µg/L in 2017 compared with a range of 114 µg/L to 162 µg/L in previous years. The 2017 summer average chlorophyll *a* concentration (41 µg/L) was lower than 2015 (68 µg/L) and 2016 (72 µg/L) averages, but within the historic range (35 µg/L to 95 µg/L). The 2017 summer average Secchi disc transparency (0.4 meters) was lower than 2015 (0.5 meters) and 2016 (0.6 meters) averages, but within the historic range (0.2 to 0.6 meters) (Figure 7).

South Lake Cornelia Algae Toxins—In 2017, algal scum observed on South Lake Cornelia during August (Figure 9) was sampled and tested for algal toxins. The algal toxin level for microcystins (3.92 µg/L) was less than the public health advisory level (6 µg/L) and neither anatoxin-a nor saxitoxin were detected (Figure 10). The test results indicated the algal blooms did not cause a health risk to the public.

Figure 9. Algal scum in South Cornelia Lake on

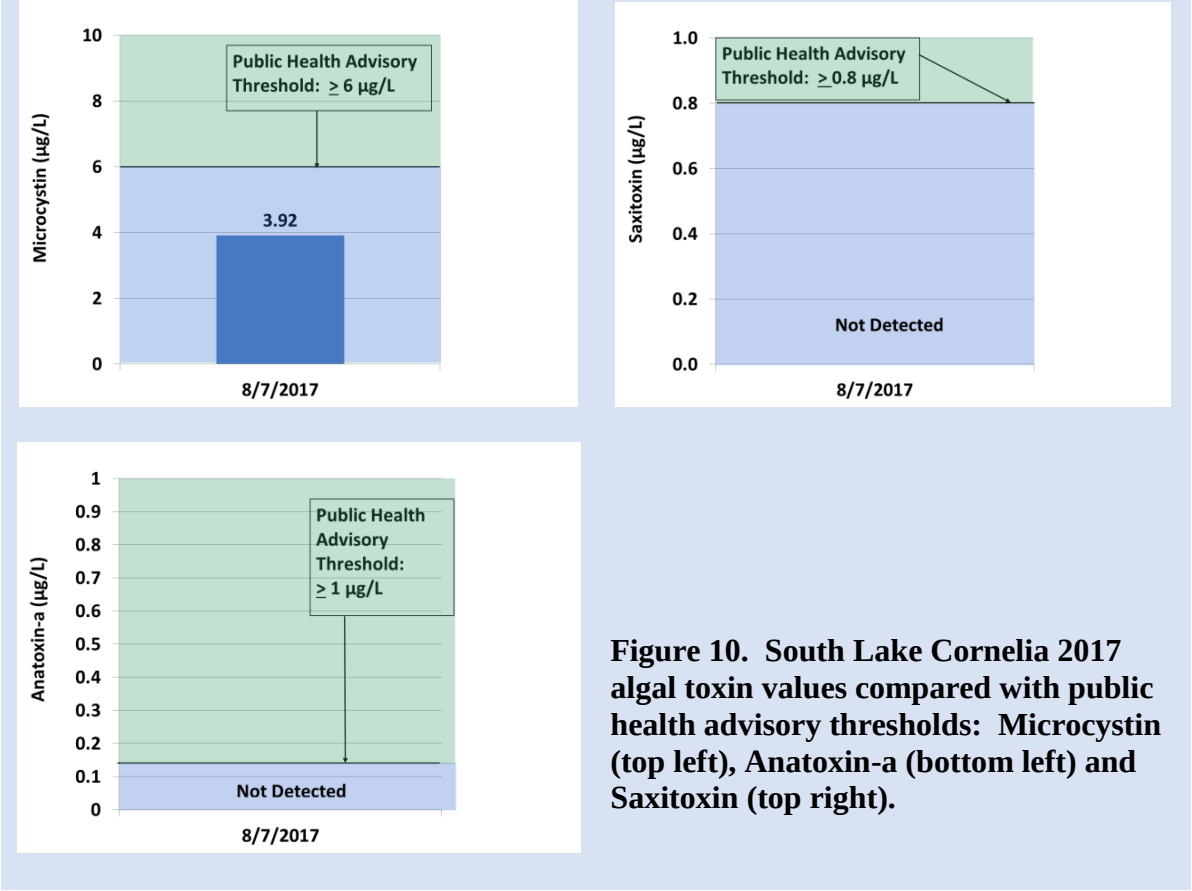


Figure 10. South Lake Cornelia 2017 algal toxin values compared with public health advisory thresholds: Microcystin (top left), Anatoxin-a (bottom left) and Saxitoxin (top right).

South Lake Cornelia Plants—Curly-leaf pondweed was problematic in South Lake Cornelia during 2015, 2016, and the early spring of 2017. A plant survey completed by the City on April 23 found curly-leaf pondweed forming a solid mat over the entire lake with the exception of a few meter buffer (about 6 feet) near the immediate shoreline, usually over a pure sand substrate. The City completed a spring herbicide (endothall) treatment to manage the curly-leaf pondweed. During a June plant survey completed by the City, curly-leaf pondweed was only observed at one location in the lake. Hence, the herbicide treatment effectively managed the lake's curly-leaf pondweed infestation . However, senescence of the curly-leaf pondweed controlled by the herbicide added phosphorus to the lake. The phosphorus added appears to have fueled the algal blooms in the lake which reduced Secchi disc transparency in 2017.

South Lake Cornelia plant survey data from 2004 through 2017 were assessed to determine plant IBI values. Figure 11 shows the number of species and FQI for that period compared to the MnDNR plant IBI proposed impairment thresholds.

In 2017, the number of plant species (4) was lower than the number of species observed during 2013 through 2016 (6 to 12 —Figure 11A). Similarly, FQI was lower in 2017 (8.0) than 2013 through 2016 (11.0 to 18.1—Figure 11B). From 2016 to 2017, the number of species declined from 11 species in June, 2016 to 4 species in June, 2017. In June, 2017, nine species were absent that had been observed in June, 2016 while two duckweed species were present that had not been observed in June, 2016. The species that were not observed between June, 2016 and June, 2017 include three native pondweed species (*Potamogeton foliosus*, *Potamogeton nodosus*, and *Stuckenia pectinata*) four bulrush species (*Bulboschoenus fluviatilis, Schoenoplectus acutus, Schoenoplectus tabernaemontani, and Schoenoplectus sp*.), muskgrass (*Chara sp*.), and coontail (*Ceratophyllum demersum*). Native plant species could have been removed by the 2017 endothall treatment of curly-leaf pondweed applied when the native plants began their growing season. As with North

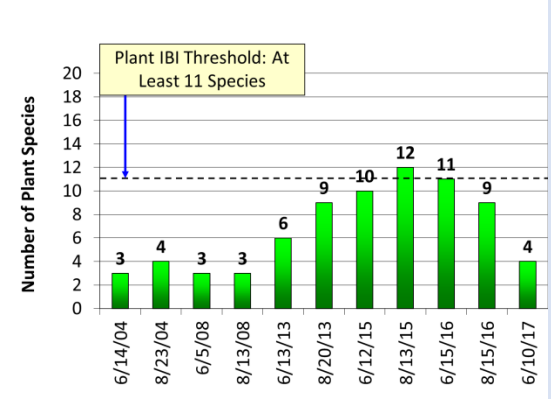


Figure 11A

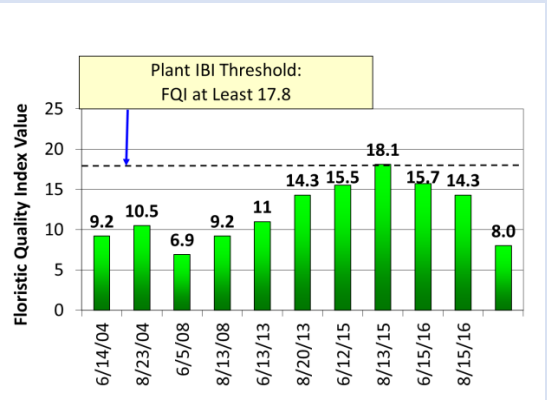


Figure 11B

Figure 11. 2004-2017 South Lake Cornelia Plant Index of Biotic Integrity (IBI) Threshold Values compared with Plant IBI Thresholds: Number of Plant Species (top) and Floristic Quality Index (FQI) Values (bottom).

Lake Cornelia, for future herbicide treatments to control curly-leaf pondweed, the herbicide should be applied before the lake's average water column temperature reaches 60°F, prior to the start of the native plant growing season.

During 2004 through 2017, the number of plant species in South Lake Cornelia ranged from 3 to 12 compared with the proposed impairment threshold of at least 11 species for lakes shallower than 15 feet. FQI values during that period ranged from 6.9 to 18.1 compared with the proposed impairment threshold of at least 17.8 for lakes shallower than 15 feet. Because both the number of species in the lake and the FQI values were below the proposed impairment thresholds for 9 of the 11 monitoring events during the period of record, including 2017, South Lake Cornelia would be considered impaired for plants. The plant IBI has not yet been used by the MPCA/MnDNR to determine impairment. As with North Lake Cornelia, it is expected to eventually be used to determine biological impairment.

The City will complete an aquatic plant survey of South Lake Cornelia in the spring of 2018. If the survey results indicate herbicide treatment of the curly-leaf pondweed is needed, the City plans to apply for a DNR herbicide treatment permit and, after receiving the permit, complete a spring herbicide (endothall) treatment.

Lake Cornelia Conclusion and Recommendations—The 2017 water quality data indicated both North Lake Cornelia and South Lake Cornelia had poor water quality that failed to meet the State's water quality standard. Algal toxin data documented high levels of algal toxins in North Lake Cornelia that exceeded the public health advisory threshold. Aquatic plant data indicated the plant community of both North Lake Cornelia and South Lake Cornelia had few species, was of poor quality, and failed to meet the MnDNR proposed plant IBI impairment thresholds.

To improve water quality, lower algal toxin levels, and improve the plant community in Lake Cornelia, the District should implement watershed and in-lake management measures. The Lake Cornelia UAA completed by the District recommended the following management measures: (1) a NURP Pond in NC-62a, (2) an alum treatment plant at the outlet of the swimming pool pond, and (3) an in-lake alum treatment. Currently, the MPCA is completing a Total Maximum Daily Load (TMDL) study of Lake Cornelia, using the District's UAA as a basis for the study. In 2018, the District will be updating the Lake Cornelia UAA, incorporating the results of the TMDL and identifying and further evaluating management measures to improve Lake Cornelia water quality, as necessary.

As noted previously, if needed, the City will complete an herbicide treatment of Lake Cornelia in 2018 to control curly-leaf pondweed. It is recommended that the District continue to support the City's efforts to manage curly-leaf pondweed in the lake. Whenever the City treats Lake Cornelia with endothall to control curly-leaf pondweed, it is recommended that the District complete a June post-treatment plant survey to assess impacts of the treatment on the native plant community. The assessment would determine whether native species were removed by the treatment.

When algal scum is observed on Lake Cornelia during the summer, algal toxin testing of the scum is recommended to determine whether or not algal toxin levels exceed the public health advisory threshold. If so, the District should alert the City and the public to the high algal toxins in the lake, advising no contact with the water until the lake's algal toxin levels decline below the public health advisory threshold.

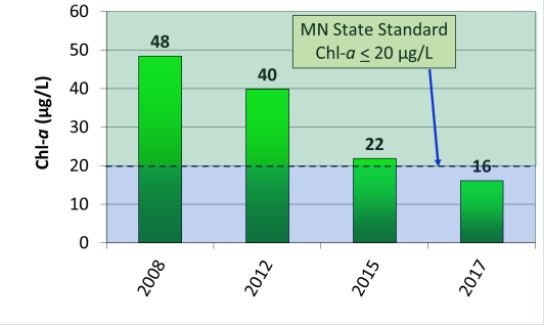
To identify significant changes in the water quality of Lake Cornelia, a trend analysis of lake water quality data is recommended each year monitoring occurs. Beginning the next year in

which Lake Cornelia is monitored by NMCWD, it is recommended that the software program WQ Stat be used to perform the Mann Kendall trend analysis on the average summer total phosphorus, chlorophyll *a*, and Secchi disc values for all historical data. The analysis would determine whether the changes in water quality over time are due to natural occurring fluctuations or whether there is greater than a 95 percent chance that the changes are a significant trend. Identifying a significant trend toward degradation in water quality will alert the District to the need to determine the cause of the degradation so that management measures can be implemented to reverse the trend. Identifying significant water quality improvements can document positive changes in lake water quality due to District management efforts.

Lake Edina

Lake Edina is a small shallow lake with a surface area of 24 acres and a maximum depth of 1.2 meters (approximately 4 feet). The lake is shallow enough for aquatic plants to grow over the entire lake bed. In addition, it is also a polymictic lake (mixing many times per year).

Lake Edina Water Quality—In 2017, the water quality of Lake Edina was poor. The lake's average summer total phosphorus and chlorophyll *a* concentrations were 77 µg/L and 16 µg/L, respectively. The lake's average summer Secchi disc transparency was 0.8 meters (Figure 12). The lake's average summer total phosphorus concentration and Secchi disc transparency both failed to meet the Minnesota State Water Quality Standards for shallow lakes in the North Central Hardwood Forest Ecoregion which are ≤ 60 µg/L and ≥ 1 meter, respectively. However, the lake's average summer chlorophyll *a* value met the State Standard, which is, ≤ 20 µg/L. The MPCA considers a lake impaired when total phosphorus and at least one of the response variables (chlorophyll *a* or



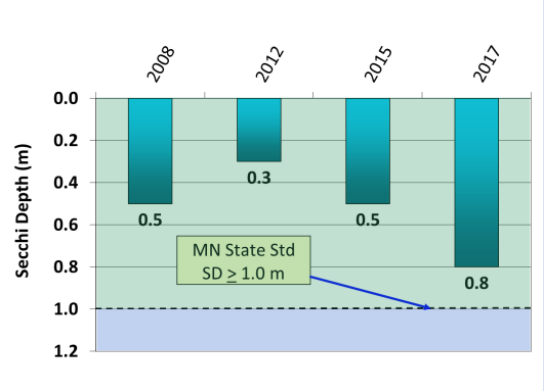
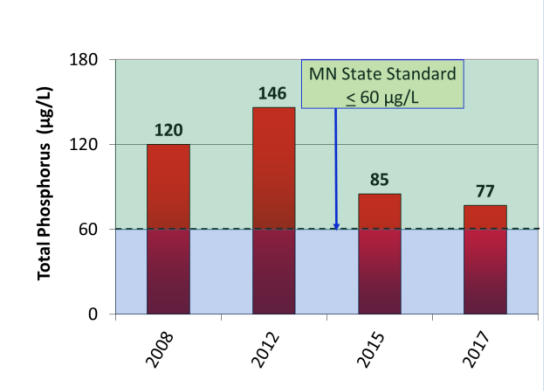


Figure 12. Lake Edina summer average total phosphorus (top) , chlorophyll *a* (middle), and Secchi disc (bottom) values during 2008-2017



Secchi disc) fail to meet water quality standards. Lake Edina would therefore be considered impaired.

Although poor water quality was observed in 2017, water quality has improved since 2012. The total phosphorus and chlorophyll concentrations were lower (better) and the Secchi disc transparency was higher (better) or the same in both 2015 and 2017. 2008 and 2012 average summer total phosphorus concentrations ranged from 120 µg/L to 146 µg/L compared with 2015 and 2017 values of 77 µg/L to 85 µg/L. 2008 and 2012 summer chlorophyll *a* concentrations ranged from 40 µg/L to 48 µg/L compared with 2015 and 2017 values of 16 µg/L to 22 µg/L. 2008 and 2012 average summer Secchi disc transparencies ranged from 0.3 to 0.5 meters compared with 2015 and 2017 0.5 meters to 0.8 meters (Figure 12).

Lake Edina Algal Mats—In 2017, algal mats were observed on Lake Edina during both the June 13 plant survey and the August 21 water quality monitoring event (Figure 13). Samples from the algal mats were collected and analyzed in the laboratory to determine whether they were harmful blue-greens or harmless greens—only blue-greens are capable of producing algal toxins which can be harmful to lake users. The algal species comprising the mats in the lake were green algal species—*Rhizoclonium* in June (Figure 14A) and *Spirogrya* in both June and August (Figure 14B).

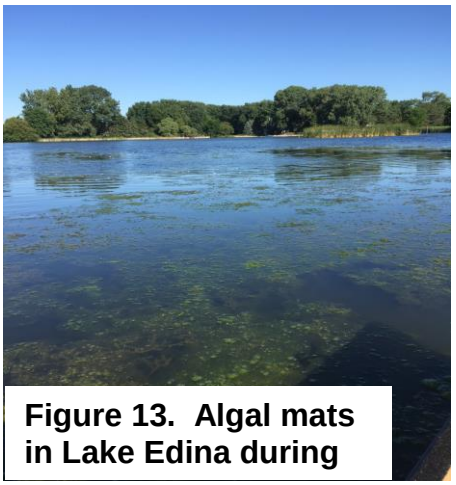


Figure 13. Algal mats in Lake Edina during

Blue-green algae were not found in the algal mats, but were present in the lake (Figure 15). Because of the lake's poor water quality and presence of blue-green algae, the numbers of blue-green algae in the lake were compared with World Health Organization criteria for assessing the risk posed to lake users by exposure to blue-green algae. The blue green algal numbers were low throughout 2017 and, according to World

Health Organization (WHO) criteria, pose no risk to lake users—blue-green numbers were consistently in the "no risk of adverse health effects" category (Figure 16).

Figure 14A. Mats of *Rhizoclonium hieroglyphicum*,a green algae species pictured above, were found in Lake Edina during the June 13 plant survey.

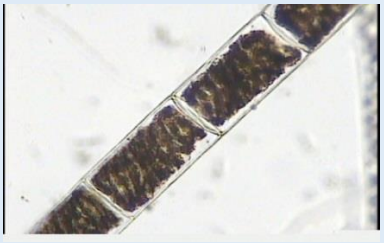


Figure 14B. Mats of Spirogyra sp., a green algal species pictured above, were found in Lake Edina during the June 13 plant survey and the August 21 water quality monitoring event.

Figure 15. In 2017, blue-green algae, including Aphanizomenon flos-aquae, pictured above, were present in Lake Edina, but in such low numbers that they did not present a risk to public health.

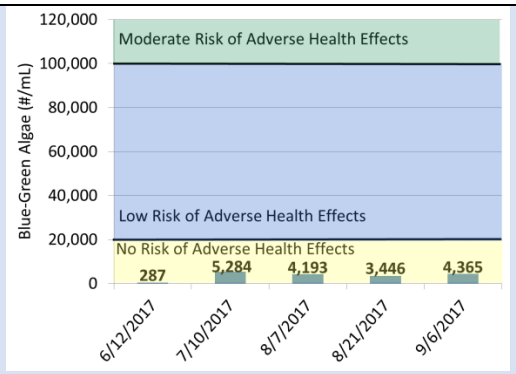


Figure 16. Lake Edina 2017 blue-green algae numbers compared with WHO guidelines for assessing the risk posed to the lake users by exposure to blue-green algae.

Lake Edina Plants—Lake Edina plant survey data from 2008 through 2017 were assessed to determine plant IBI values. Figure 17 shows the number of species and FQI for that period compared to the MnDNR plant IBI proposed impairment thresholds.

The 2017 plant community in Lake Edina was poor, but had improved from previous years. The number of plant species observed in 2017 was higher than the number of species observed during 2008 through 2015—6 to 8 in 2017 compared with 3 to 4 in previous years (Figure 17A). Similarly, FQI was higher (better) in 2017 than 2008 through 2015—11.1 through 13.4 in 2017 compared with 6.9 to 10.5 in previous years (Figure 17B). During 2008 through 2017, the number of plant species in Lake Edina ranged from 3 to 8 compared with the proposed impairment threshold of at least 11 species for lakes shallower than 15 feet. FQI values during that period ranged from 6.9 to 13.4 compared with the proposed impairment threshold of at least 17.8 for lakes shallower than 15 feet. Because both the number of species in the lake and the FQI values were below the proposed impairment thresholds during the

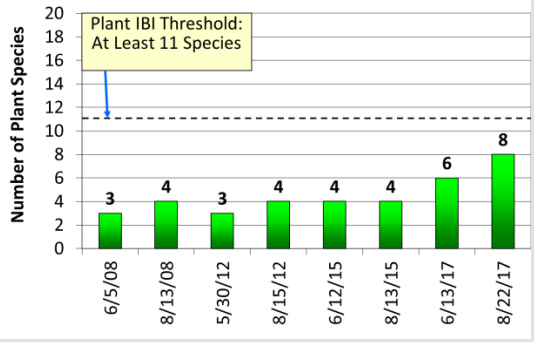


Figure 17A

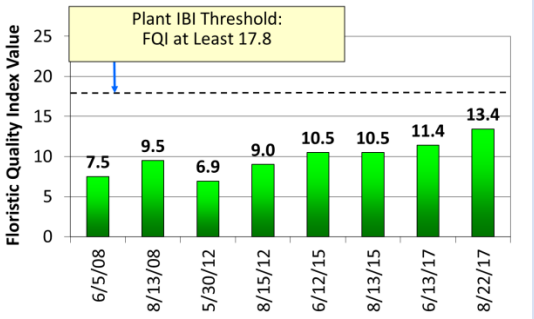


Figure 17B

Figure 17. 2008-2017 Lake Edina Plant Index of Biotic Integrity (IBI) Threshold Values compared with Plant IBI Thresholds: Number of Plant Species (top) and Floristic Quality Index (FQI) Values (bottom).

entire period of record, Lake Edina would be considered impaired for plants. The plant IBI has not yet been used by the MPCA/MnDNR to determine impairment. However, it is expected to eventually be used to determine biological impairment.

Lake Edina Conclusion and Recommendations— The 2017 water quality data indicated Lake Edina had poor water quality that failed to meet the State's water quality standard. Aquatic plant data indicated the plant community had few species, was of poor quality, and failed to meet the MnDNR proposed plant IBI impairment thresholds.

Currently, the MPCA is completing a Total Maximum Daily Load (TMDL) study of Lake Edina. In 2018, the District will be developing a UAA for Lake Edina, incorporating the results of the TMDL and identifying watershed and/or in-lake management measures to improve the lake's water quality.

As noted previously, water quality since 2012 has improved. However, it is not known if the improvement is a significant trend or a natural fluctuation. To determine whether changes in lake water quality are significant, a trend analysis of lake water quality data is recommended each time monitoring occurs. It is recommended that the software program WQ Stat be used to perform the Mann Kendall trend analysis on the average summer total phosphorus, chlorophyll *a*, and Secchi disc values for all historical data. As noted for Lake Cornelia, the analysis would determine whether the changes in water quality over time are due to natural occurring fluctuations or whether there is greater than a 95 percent chance that the changes are due to a significant trend.

Glen Lake

Glen Lake is located in the City of Minnetonka. The lake has a surface area of 104 acres, a maximum depth of 23 feet, and a mean depth of 7.8 feet.

Glen Lake Water Quality—In 2017, Glen Lake's water quality was good. The lake's summer average total phosphorus and chlorophyll *a* concentrations were 22 µg/L and 2 µg/L, respectively, and the lake's summer average Secchi disc transparency was 2.9 meters (approximately 9.5 feet). As shown on Figure 18, all three 2017 summer averages met the Minnesota State water quality standards for lakes in the North Central Hardwood Forest Ecoregion.

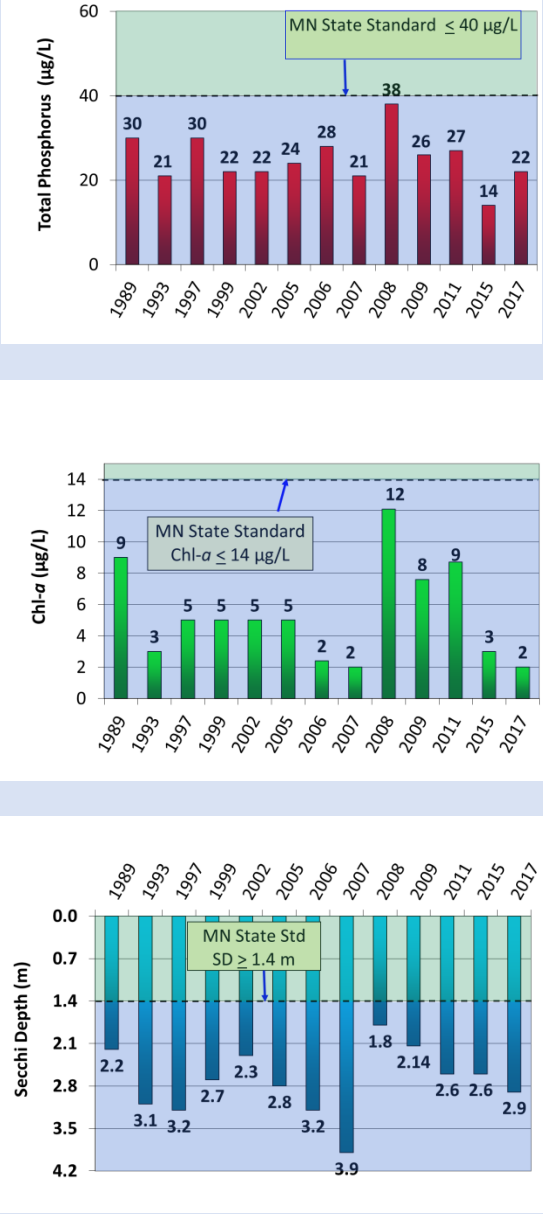


Figure 18. Glen Lake summer average total phosphorus, chlorophyll *a*, and Secchi disc values during 1989-2017.

Glen Lake water quality has met the State's water quality standards throughout the period of record. The good water quality observed in 2017 was typical of the water quality observed in previous years. Previous summer average total phosphorus concentrations ranged from 14 µg/L to 38 µg/L compared with 22 µg/L in 2017. Previous summer average chlorophyll *a* concentrations ranged from 2 µg/L to 12 µg/L

compared with 2 µg/L in 2017. Previous Secchi disc transparencies ranged from 1.8 meters to 3.9 meters compared with 2.9 meters in 2017. Summer averages for total phosphorus, chlorophyll *a*, and Secchi disc transparency met the Minnesota State water quality standard for lakes in the North Central Hardwood Forest Ecoregion during the entire period of record.

Glen Lake Algal Mats—In July, the District received a report that near shore algal mats were present in Glen Lake (Figure 19). The District investigated the algal bloom and samples were collected on August 7. The species causing the algal mats was identified as *Planktothrix Agardhii*, a blue-green species which can produce algal toxins. Given the presence of algal scum and the confirmation that the species observed in the algal scum has the potential to produce algal toxins, samples were submitted for algal toxin testing. Testing results are shown in Figure 20. The levels of all algal toxins measured in Glen Lake were below public health advisory levels.

A possible cause of the algal bloom is that nutrients added to the lake by watershed runoff from above average precipitation were used up by near-shore algae. As noted previously, lake water quality samples collected from the mid-lake location in 2017 indicated water quality in Glen Lake was good and similar to previous years, despite the increased precipitation and associated increase in nutrient loading from watershed runoff in 2017.

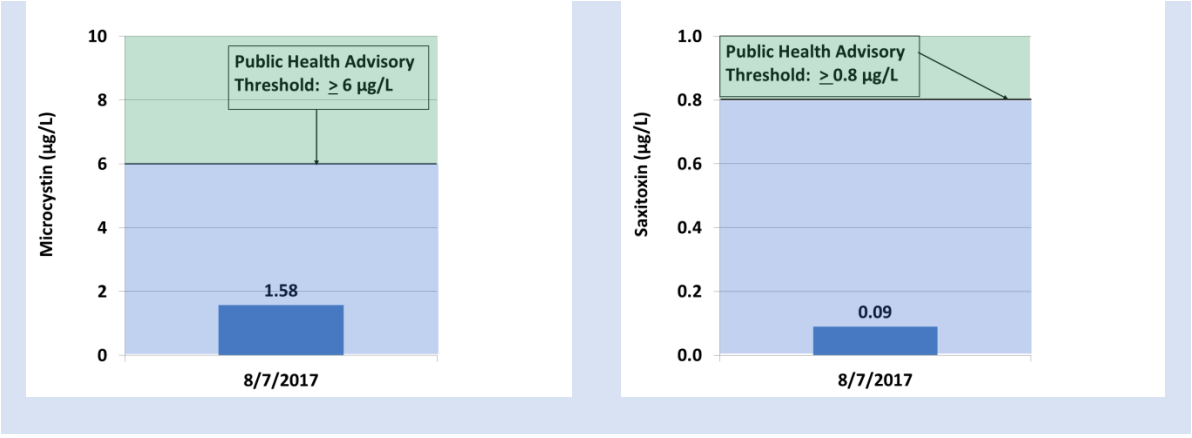


Figure 19. A resident reported the presence of algal mats near shore in Glen Lake.

Glen Lake Plants—Glen Lake plant survey data from 1997, 2006, 2009, and 2017 were assessed to determine plant IBI values. Figure 21 shows the number of species and FQI for that period compared to the MnDNR plant IBI proposed impairment thresholds.

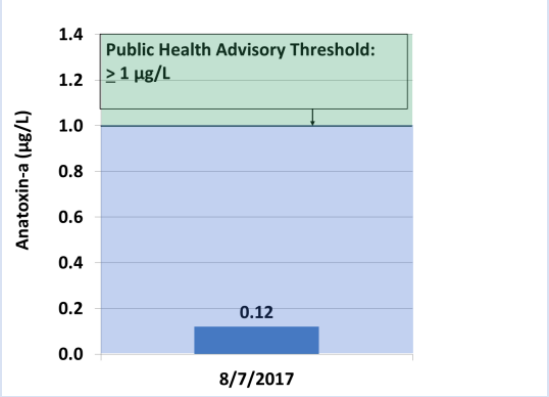


Figure 20. Glen Lake 2017 algal toxin values compared with public health advisory thresholds: Microcystin (top left), Anatoxin-a (bottom left) and Saxitoxin (top right).

During 1997 through 2017, the number of plant species in Glen Lake ranged from 12 to 18 compared with the proposed impairment threshold of at least 12 species for lakes at least 15-feet deep (Figure 21A). FQI values during that period ranged from 19.3 to 26.2 compared with the proposed impairment threshold of at least 18.6 for lakes at least 15-feet deep (Figure 21B). Both the number of species in the lake and the FQI values met the proposed impairment thresholds during the entire period of record, therefore, Glen Lake would not be considered impaired for plants. The plant IBI has not yet been used by the MPCA/MnDNR to determine impairment. However, it is expected to eventually be used to determine biological impairment.

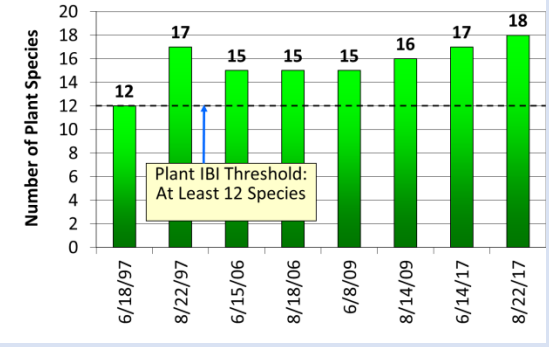


Figure 21A

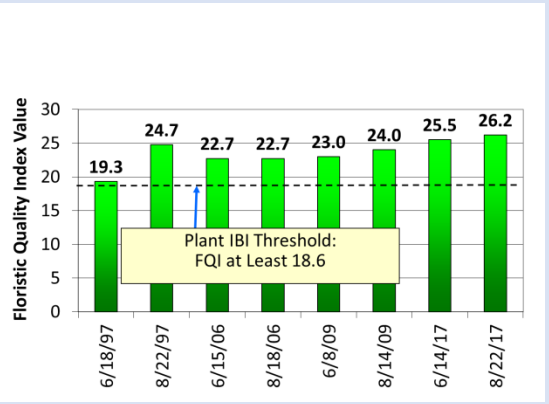


Figure 21B

Figure 21. 1997-2017 Glen Lake Plant Index of Biotic Integrity (IBI) Threshold Values compared with Plant IBI Thresholds: Number of Plant Species (top) and Floristic Quality Index (FQI) Values (bottom).

Glen Lake Conclusion and Recommendations— The 2017 water quality data indicated Glen Lake has good water quality that met the State's water quality standards. The plant data indicated the lake has a healthy plant community that met the MnDNR's proposed plant IBI thresholds.

The City of Minnetonka monitors the quality of Glen Lake on a rotating three-year cycle and conducts trend analyses to detect significant degradation or improvement. The most recent trend analysis performed by the city on the historic water quality data for Glen Lake (through 2015) indicates that there are no statistically significant trends, suggesting the water quality is stable (neither improving nor declining). It is recommended that the District continue to coordinate water quality monitoring with the city, including analysis for water quality trends. In addition, the District may want to consider conducting more frequent aquatic communities monitoring (aquatic plants, phytoplankton, and zooplankton). The aquatic communities monitoring is included as part of the NMCWD's typical rotating lake monitoring program, but not part of the City of Minnetonka's monitoring program.

Figure 22. Glen Lake during the August 22 monitoring event.

.

Lone Lake

Lone Lake is located in the City of Minnetonka. The lake has a surface area of 17.3 acres, an approximate maximum depth of 28 feet, and a mean depth of 7.1 feet. Lone Lake has two relatively deep portions (23- and 28-feet deep according to the 1964 MnDNR lake map) and a large littoral (shallow) area. Lone Lake is "landlocked" meaning the lake does not have a low level piped outlet.

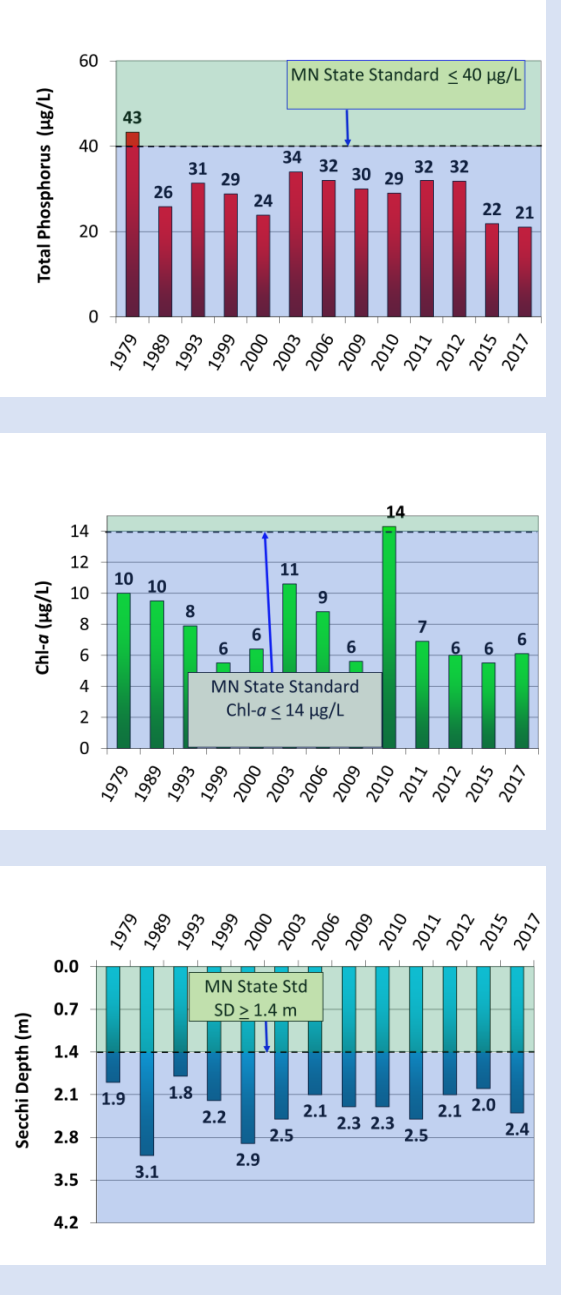


Figure 23. Lone Lake summer average total phosphorus, chlorophyll *a*, and Secchi disc values during 1979-2017.

Lone Lake Water Quality—In 2017, Lone Lake water quality was good. The lake's summer average total phosphorus and chlorophyll *a* concentrations were 21 µg/L and 6 µg/L, respectively, and the lake's summer average Secchi disc transparency was 2.4 meters (approximately 8 feet). As shown on Figure 23, all three 2017 summer averages met the Minnesota State water quality standards for lakes in the North Central Hardwood Forest Ecoregion.

Lone Lake water quality has generally met the State's water quality standards during the period of record. Values not meeting the State's water

quality standards include a total phosphorus concentration of 43 µg/L in 1979 and a chlorophyll *a* concentration of 14.3 µg/L in 2010. All other values measured during the period of record met the State's water quality standards. The good water quality observed in 2017 was typical of the water quality that has generally been observed in previous years. The 2017 summer average total phosphorus concentration was lower than previous values. Previous summer average total phosphorus concentrations ranged from 22 µg/L to 43 µg/L compared with 21 µg/L in 2017. Chlorophyll *a* and Secchi disc transparency values were within the range observed in previous years. Previous summer average chlorophyll *a* concentrations ranged from 6 µg/L to 14 µg/L compared with 6 µg/L in 2017. Previous Secchi disc transparencies ranged from 1.8 meters to 3.1 meters compared with 2.4 meters in 2017.

Lone Lake Plants—Lone Lake plant survey data from 1999 and 2017 were assessed to determine plant IBI values. Figure 24 shows the number of species and FQI for that period compared to the MnDNR plant IBI proposed impairment thresholds.

During 1999 and 2017, the number of plant species in Lone Lake ranged from 9 to 13 species

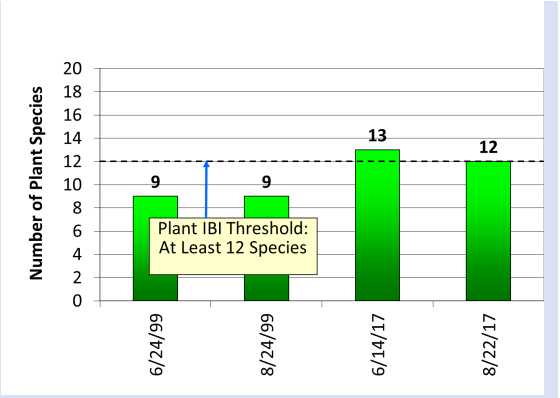


Figure 24A

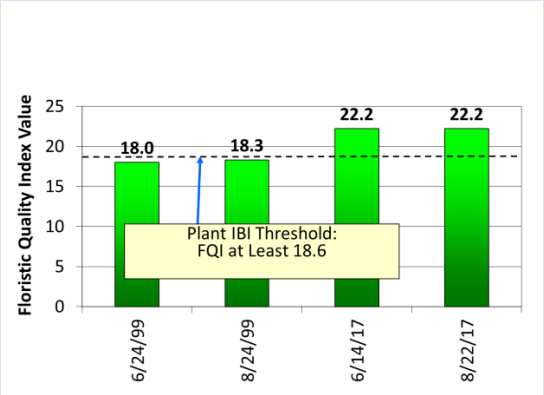


Figure 24B

Figure 24. 1999 and 2017 Lone Lake Plant Index of Biotic Integrity (IBI) Threshold Values compared with Plant IBI Thresholds: Number of Plant Species (top) and Floristic Quality Index (FQI) Values (bottom).

compared with the proposed impairment threshold of at least 12 species for lakes at least 15-feet deep (Figure 24A). FQI values during that period ranged from 18.0 to 22.2 compared with the proposed impairment threshold of at least 18.6 for lakes at least 15-feet deep (Figure 24B). Both the number of species in the lake and the FQI values failed to meet the

Lone Lake Conclusion and Recommendations— The 2017 water quality data indicated Lone Lake has good water quality that met the State's water quality standards. The plant data indicated the lake has a healthy plant community that met the MnDNR's proposed plant IBI thresholds.

Figure 25. Lone Lake

The City of Minnetonka monitors the quality of Lone Lake on a rotating three-year cycle and conducts trend analyses to detect significant degradation or improvement. The most recent trend analysis performed by the city on the historic water quality data for Lone Lake (through 2015) indicates that there are no statistically significant trends, suggesting the water quality is stable (neither improving nor declining). It is recommended that the District continue to coordinate water quality monitoring with the city, including analysis for water quality trends. In addition, the District may want to consider conducting more frequent aquatic communities monitoring (aquatic plants, phytoplankton, and zooplankton). The aquatic communities monitoring is included as part of the NMCWD's typical rotating lake monitoring program, but not part of the City of Minnetonka's monitoring program.

Lake Minnetoga

Lake Minnetoga is located in the City of Minnetonka. The lake has a surface area of 15 acres, an approximate maximum depth of 27 feet, and a mean depth of 12.8 feet. **Lake Minnetoga water quality—**In 2017, Lake Minnetoga water quality was good. The lake's summer average total phosphorus and chlorophyll *a* concentrations were 29 µg/L and 6 µg/L, respectively, and the lake's summer average Secchi disc transparency was 2.1 meters (approximately 7 feet). As shown on Figure 27, all three 2017 summer averages met the Minnesota State water quality standards for lakes in the North Central Hardwood Forest Ecoregion.

Figure 26. Lake Minnetoga in August 2017

Lake Minnetoga water quality has generally met the Minnesota State water quality standards during the period of record. Values not meeting Minnesota State water quality standards include:

- Total phosphorus concentrations of 41 µg/L in 1993 and 44 µg/L in 1999;
- Chlorophyll a concentrations of 17 µg/L in 2002, 20 µg/L in 2011, and 23 µg/L in 2013;
- Secchi disc transparencies of 1.1 meters in 1999 and 2002.

All other values measured during the period of record met the Minnesota State water quality standards. The good water quality observed in 2017 was typical of the good water quality that has generally been observed in previous years. The 2017 summer average total phosphorus concentration was 29 µg/L compared with summer averages of 22 µg/L to 44 µg/L in previous years. The 2017 summer average chlorophyll *a* concentration was 6 µg/L compared with

summer averages of 4 µg/L to 23 µg/L in previous years. The 2017 Secchi disc summer average was 2.1 meters compared with summer averages of 1.1 meters to 2.9 meters in previous years.

Lake Minnetoga Plants—Lake Minnetoga plant survey data from 1998 and 2017 were assessed to determine plant IBI values. Figure 28 shows the number of species and FQI for that period compared to the MnDNR plant IBI proposed impairment thresholds. The number of plant species in Lake Minnetoga increased from 11 in June 1998 to 12 in August 1998 to 13 in both June and August 2017. The MnDNR proposed impairment threshold is at least 12 species for lakes at least 15-feet deep. Lake Minnetoga met the proposed impairment threshold in August 1998 and during both June and August 2017 (Figure 28A). FQI values during 1998 ranged from 19.0 to 20.2 compared to 20.3 in 2017. All FQI values from 1998 and 2017 met the proposed impairment threshold of at least 18.6 for lakes at least 15-feet deep (Figure 28B). Since both the number of species in the lake and the FQI values met the proposed impairment thresholds during 2017, Lake Minnetoga would not be considered impaired for

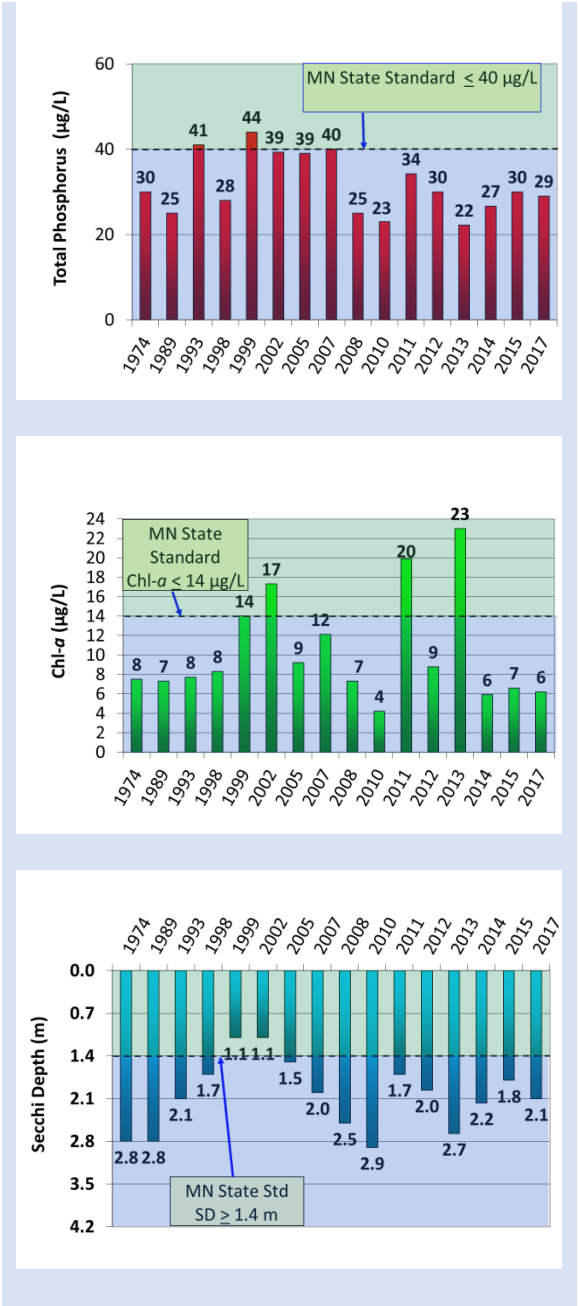


Figure 27. Lake Minnetoga summer average total phosphorus, chlorophyll *a*, and Secchi disc values during 1974-2017.

plants. The plant IBI has not yet been used by the MPCA/MnDNR to determine impairment. However, it is expected to eventually be used to determine biological impairment.

Lake Minnetoga Conclusion and Recommendations— The 2017 water quality data indicated Lake Minnetoga has good water quality that met the State's water quality standards. The plant data indicated the lake has a healthy plant community that met the MnDNR's proposed plant IBI thresholds.

The City of Minnetonka monitors the quality of Lake Minnetoga on a rotating three-year cycle and conducts trend analyses to detect significant degradation or improvement. The most recent trend analysis performed by the city on the historic water quality data for Lake Minnetoga (through 2015) indicates that there are no statistically significant trends, suggesting the water quality is stable (neither improving nor declining). It is recommended that the District continue to coordinate water quality monitoring with the city, including analysis for water quality trends. In addition, the District may want to consider conducting more frequent aquatic

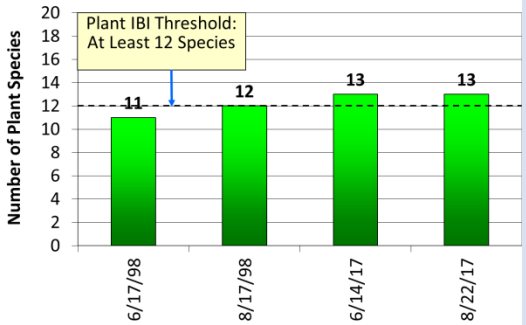


Figure 28A

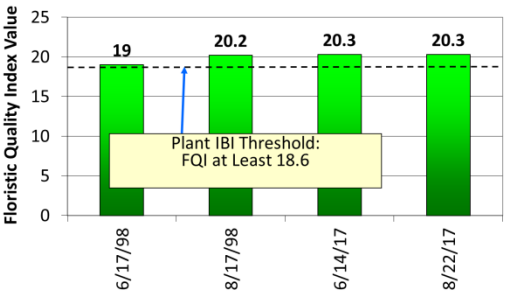


Figure 28B

Figure 28. 1998 and 2017 Lake Minnetoga Plant Index of Biotic Integrity (IBI) Threshold Values compared with Plant IBI Thresholds: Number of Plant Species (top) and Floristic Quality Index (FQI) Values (bottom).

communities monitoring (aquatic plants, phytoplankton, and zooplankton). The aquatic communities monitoring is included as part of the NMCWD's typical rotating lake monitoring program, but not part of the City of Minnetonka's monitoring program.

Shady Oak Lake

Shady Oak Lake is located in the City of Minnetonka. The lake has a surface area of 85 acres, a maximum depth of 35 feet, and a mean depth of 11.3 feet.

Shady Oak Water Quality—In 2017, Shady Oak Lake water quality was good. The lake's summer average total phosphorus and chlorophyll *a* concentrations were 16 µg/L and 4 µg/L, respectively, and the lake's summer average Secchi disc transparency was 3.2 meters (approximately 10.5 feet). As shown on Figure 29, all three 2017 summer averages met the Minnesota State water quality standards for lakes in the North Central Hardwood Forest Ecoregion.

Shady Oak Lake water quality has met the State's water quality standards throughout the period of record. The good water quality observed in 2017 was typical of the water quality observed in previous years. Previous summer average total phosphorus concentrations ranged from 11 µg/L to 30 µg/L compared with 16 µg/L in 2017. Previous summer average chlorophyll *a* concentrations ranged from 3 µg/L to 5 µg/L compared with

Figure 29. Shady Oak Lake summer average total phosphorus, chlorophyll *a*, and Secchi disc values during 1971-2017.

4 µg/L in 2017. Previous Secchi disc transparencies ranged from 2.7 meters to 5.3 meters compared with 3.2 meters in 2017. Summer averages for total phosphorus, chlorophyll *a*, and Secchi disc transparency met the State's water quality standard for lakes in the North Central Hardwood Forest Ecoregion during the entire period of record.

Figure 30. Shady Oak Lake in August 2017

Shady Oak Lake Plants—Shady Oak Lake plant survey data from 1995, 1999, and 2017 were assessed to determine plant IBI values. Figure 31 shows the number of species and FQI for that period compared to the MnDNR plant IBI proposed impairment thresholds.

During 1995, 1999, and 2017, the number of plant species in Shady Oak Lake ranged from 15 to 22 compared with the proposed impairment threshold of at least 12 species for lakes at least 15-feet deep (Figure 31A). FQI values during that period ranged from 20.9 to 27.9 compared with the proposed impairment threshold of at least 18.6 for lakes at least 15-feet deep (Figure 31B). Both the number of species in the lake and the FQI values met the proposed impairment thresholds during the entire period of record. Shady Oak Lake would therefore not be considered impaired for plants. The plant IBI has not yet been used by the MPCA/MnDNR to determine impairment. However, it is expected to eventually be used to determine biological impairment.

Shady Oak Lake Conclusion and Recommendations— The 2017 water quality data indicated Shady Oak Lake has good water quality that met the State's water quality standards. The plant

data indicated the lake has a healthy plant community that met the MnDNR's proposed plant IBI thresholds.

The City of Minnetonka monitors the quality of Shady Oak Lake on a rotating three-year cycle and conducts trend analyses to detect significant degradation or improvement. The most recent trend analysis performed by the city on the historic water quality data for Shady Oak Lake (through 2015) indicates that there are no statistically significant trends, suggesting the water quality is stable (neither improving nor declining). It is recommended that the District continue to coordinate water quality monitoring with the city, including analysis for water quality trends. In addition, the District may want to consider conducting more frequent aquatic communities monitoring (aquatic plants, phytoplankton, and zooplankton). The aquatic communities monitoring is included as part of the NMCWD's typical rotating lake monitoring program, but not part of the City of Minnetonka's monitoring program.

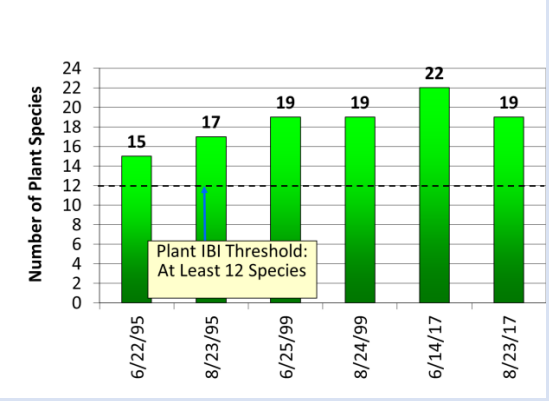


Figure 31A

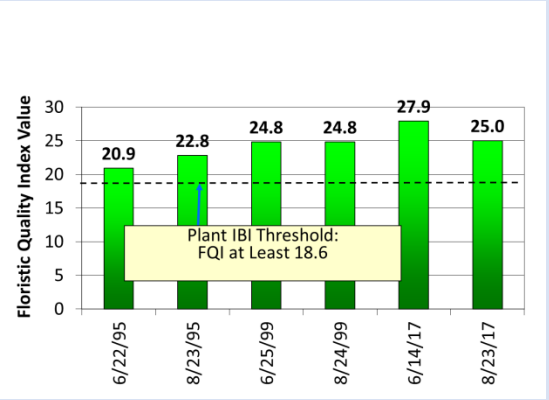


Figure 31B

Figure 31. 1995, 1999, and 2017 Shady Oak Lake Plant Index of Biotic Integrity (IBI) Threshold Values compared with Plant IBI Thresholds: Number of Plant Species (top) and Floristic Quality Index (FQI) Values (bottom).

Nine Mile Creek

Because the primary use of Nine Mile Creek is ecological – a place for fish and aquatic life to live – the focus of the Nine Mile Creek monitoring program is evaluation of the stream's fish and aquatic life community as well as the ecosystem components essential for the survival of fish and aquatic life (Figure 32). The 2017 Nine Mile Creek monitoring program included:

Figure 32. The primary use of Nine Mile Creek is a place for fish and aquatic life to live, such as the shorthead redhorse fish swimming in the Main Stem of Nine Mile Creek at Station ECU-7C, pictured above

- Annual monitoring of the fish community during summer.
- Annual macroinvertebrate monitoring during October.
- Annual habitat monitoring during summer (i.e., stream substrate type, depth of fine sediment, percent embeddedness, and length of eroded streambank).
- March through October monthly measurements of specific conductance, dissolved oxygen, pH, temperature, turbidity, and flow.

Monitoring locations are shown on Figure 33.

Data collected during 2017 were evaluated to determine whether:

- Specific conductance, dissolved oxygen, pH, temperature, and turbidity levels met Minnesota Pollution Control Agency (MPCA) standards for Class 2B waters published in Minnesota Rules 7050.
- Flow and water quality data were consistent with historical values.

- 2017 fish and aquatic life communities were consistent with the stream's ecological use determined from assessments completed in 1997 and 2003.
- The 2017 fish community met the MPCA Fish Index of Biological Integrity (IBI) standard for Nine Mile Creek.
- 2017 macroinvertebrate communities, assessed by biological indices, were consistent with historical data.

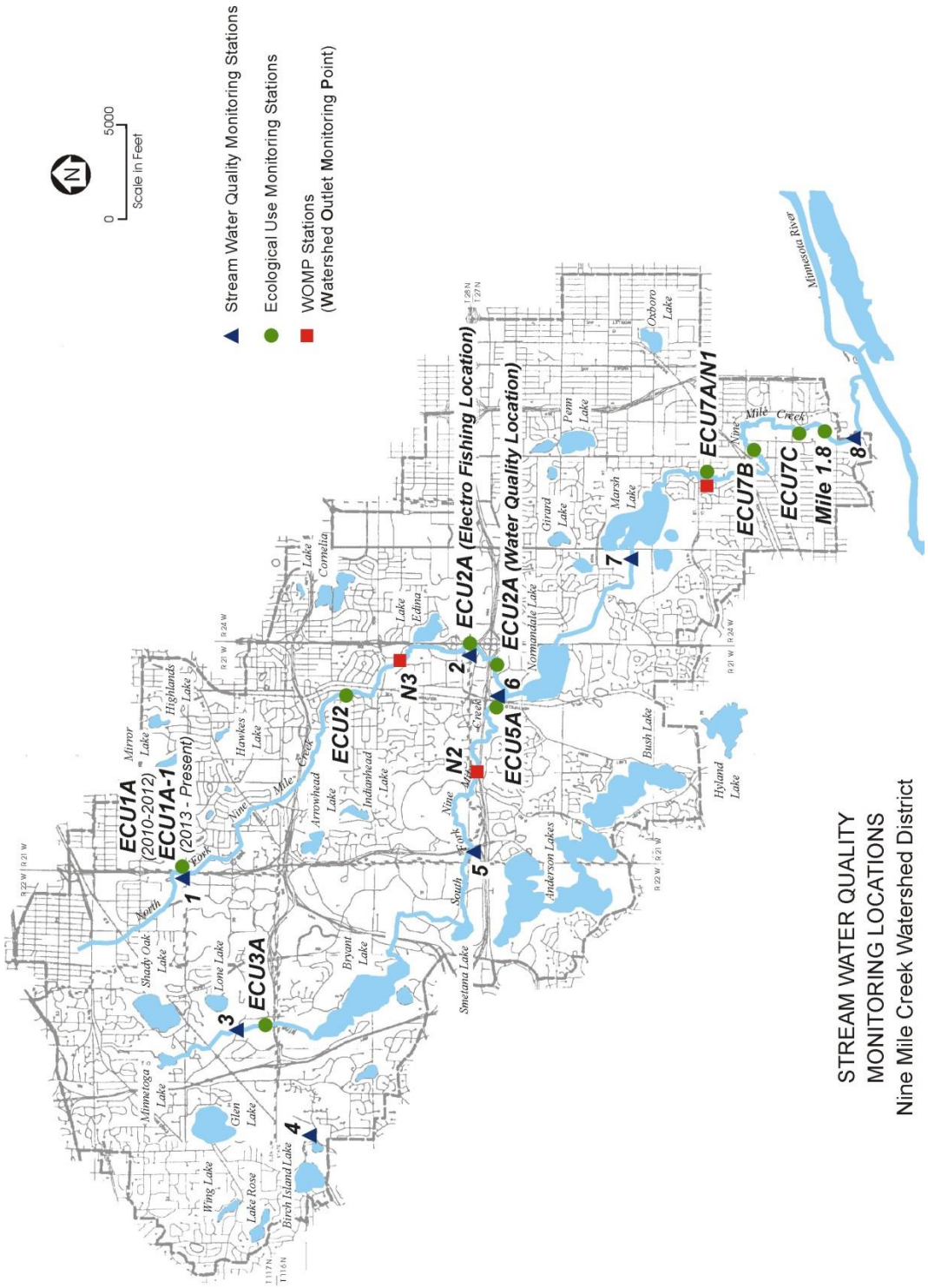


Figure 33.
Nine Mile Creek stream water quality monitoring stations

Nine Mile Creek Water Quality—In 2017, the levels of specific conductance, dissolved oxygen, pH, temperature, and turbidity in Nine Mile Creek generally met MPCA standards for Minnesota Class 2B waters (MPCA Standard). Overall, the 2017 values were within MPCA standards 91 percent of the time. The South Fork met MPCA standards most frequently (96 percent) followed by the Main Stem (94 percent) and North Fork (81 percent).

In 2017, the specific conductance criterion was met less frequently than other MPCA standards. All Nine Mile Creek temperature and pH measurements, 96 percent of the dissolved oxygen measurements, and 64 percent of the specific conductance measurements met MPCA standards.

Figure 34. In 2017, a tolerant forage fish assemblage, an indicator of average to poor water quality, was observed at the most upstream North Fork location, ECU-1A/1A-1, pictured above.

As in previous years, the North Fork locations met the MPCA standard for specific conductance less frequently than other sampling locations (e.g., 38 percent of the North Fork measurements met the MPCA specific conductance standard in 2017 compared with 75 percent of Main Stem and 88 percent of South Fork measurements).

Figure 35. In 2017, a tolerant forage fish assemblage, an indicator of average to poor water

The North Fork of Nine Mile Creek met the MPCA dissolved oxygen standard for Minnesota Class 2B waters more frequently than the Main Stem and South Fork locations in 2017 – 100 percent of North Fork dissolved oxygen measurements met the

MPCA standard compared with 96 percent of South Fork and 92 percent of Main Stem measurements.

Water quality data collected from Nine Mile Creek in 2017 indicate the stream's water quality generally remained stable and almost all values (99 percent) were within the range of historical values.

Ecological use—Ecological use is a term used to describe the fish assemblage/aquatic life use that the stream has the capacity to support per the stream's flow, water quality, and habitat characteristics. The 2017 fish data indicate Nine Mile Creek is currently supporting the ecological use determined from past assessments completed during 1997 and 2003. In 2017, a tolerant forage (grazing) fish assemblage (e.g., creek chub—an indicator of average to poorer water quality) was found at half of sample locations—ECU-1A/1A-1 (Figure 34), ECU-2 (Figure 46), and ECU-2A (Figure 35) on the North Fork and the most upstream Main Stem location, ECU-7A/N1 (Figure 36). An intolerant forage fish assemblage (e.g., western blacknose dace– an indicator of better water quality) was found at both South Fork locations—ECU-3A (Figure 44) and ECU-5A (Figure 37) and the middle Main Stem location, ECU-7B (Figure 38). A warm water sport fish assemblage (e.g., green sunfish, largemouth bass) was found at the most downstream Main Stem location, ECU-7C (Figure 36).

A comparison of 2017 data with historical data indicates the current fish assemblage is generally similar to or better than the stream's average long-term fish assemblage. Main Stem monitoring location ECU-7B and both South Fork locations (ECU-3A and ECU-5A) observed a higher quality fish assemblage in 2017 than had, on average, been observed at these locations historically. A tolerant forage fish community has historically been observed at these locations compared to an intolerant forage fish community observed in 2017. An intolerant forage fish

community is of better quality than a tolerant forage fish community. Intolerant forage fish require better water quality, flow, and habitat conditions than tolerant forage fish. The change from a tolerant forage fish community to an intolerant forage fish community at these locations is a positive change for the stream.

Figure 36. In 2017, four of the six Nine Mile Creek monitoring locations with a watershed area greater than 5 miles met the MPCA biological standard for fish, including the most downstream Main Stem location, ECU-7C (left) and the most upstream Main Stem location, ECU-7A/N1 (right).

The most downstream Main Stem location, ECU-7C, also observed a higher quality fish assemblage in 2017 than had, on average, been observed at this location historically. An intolerant forage fish community has historically been observed at ECU-7C compared to a warm water sport fish community observed in 2017. A warm water sport fish community is of better quality than an intolerant forage fish community. Sport fish require better water quality, flow, and habitat conditions than forage fish. Hence, the change to a sport fish community is a positive change for the stream.

The 2017 fish assemblage found at the North Fork locations in 2017 was similar to its long-term fish assemblage. A tolerant forage fish community has historically been observed at ECU-1A-1, ECU-2, and ECU-2A and was again observed in 2017.

Fish IBI—Fish collected from Nine Mile Creek in 2017 were assessed to determine whether the stream met the MPCA biological standard for fish. In 2017, biological impairment for fish in streams tributary to the Minnesota River, including Nine Mile Creek, is defined as failing to meet the Minnesota River Assessment Project (MRAP) Index of Biotic Integrity (IBI) impairment threshold score of 30 or greater out of a possible score of 60. Only streams with a watershed area of at least 5 square miles were obligated to comply with the IBI impairment threshold.

In 2017, four of the six Nine Mile Creek monitoring locations with a watershed area greater than 5 square miles met the MPCA biological standard for fish –the South Fork location ECU-5A (Figure 37) and all Main Stem locations ECU-7A (Figure 36), ECU-7B (Figure 38), and ECU-7C (Figure 36). Both North Fork locations with a watershed area greater than 5 square miles (ECU-2 and ECU-2A) failed to meet the MPCA fish biological standard in 2017 (Figure 39).

The most downstream location of Nine Mile Creek, ECU-7C, has met the MPCA biological standard for fish annually during 2003 through 2017. All other locations have fluctuated between meeting or sometimes failing the standard during this time period. In 2006 and 2012, all Nine Mile Creek locations met the MPCA biological standard for fish. During the 15 years of monitoring, 2003 through 2017:

- Upstream North Fork location, ECU-2, met the standard 53 percent of the time
- Downstream North Fork location, ECU-2A, met the standard 60 percent of the time
- Downstream South Fork location, ECU-5A, met the standard 33 percent of the time
- Upstream Main Stem location, ECU-7A, met the standard 60 percent of the time
- Middle Main Stem location, ECU-7B, met the standard 53 percent of the time

- Downstream Main Stem location, ECU-7C, met the standard 100 percent of the time.

Figure 38. During 2003 through 2017, the most downstream South Fork location, ECU-5A, pictured above, met the Fish IBI standard 33 percent of the time.

Figure 37. During 2003 through 2017, the middle Main Stem location, ECU-7B, pictured above, met the Fish IBI standard 53 percent of the time.

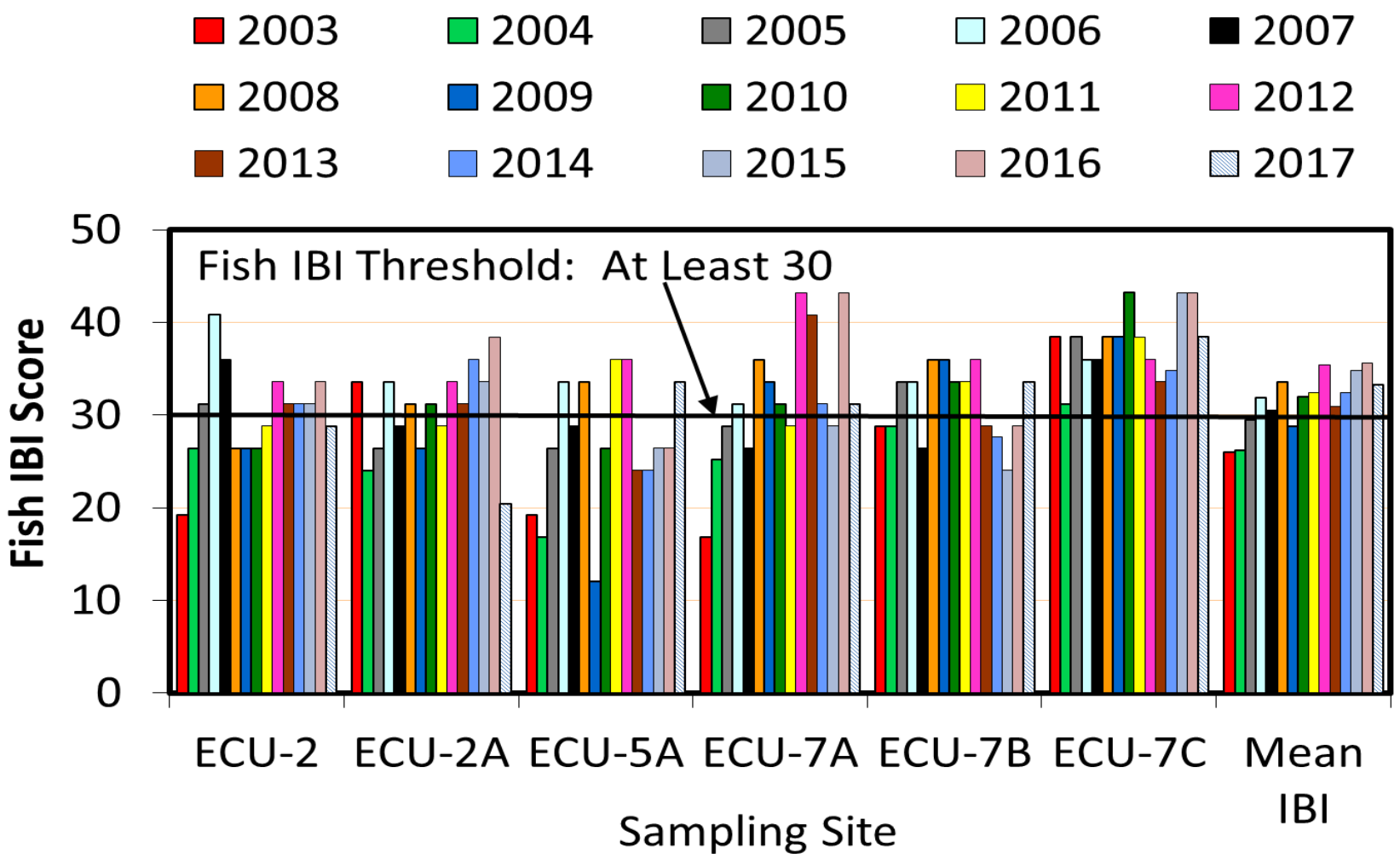


Figure 39. 2003-2017 Nine Mile Creek Fish IBI Scores

Habitat and water quality improvements from the North Fork stream stabilization project (Hopkins) have improved fish IBI scores at North Fork location ECU-1A/1A-1. The pre-project Fish IBI score from ECU-1A/1A-1 was 26.4, which did not meet the MPCA standard of at least 30. Following completion of the North Fork stream stabilization project, Fish IBI scores from ECU-1A/1A-1 have consistently met the MPCA standard even though not required since the tributary watershed to this reach is less than 5 square miles. Scores continue to improve annually—from 33.6 in 2014 to 36.0 in 2015 to 38.4 in 2016 to 40.8 in 2017 (Figure 40).

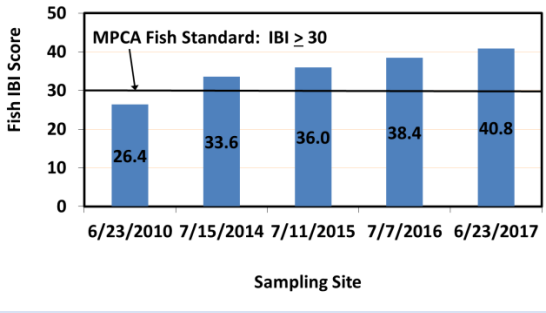


Figure 40. Fish IBI Scores for Nine Mile Creek Station ECU-1A/1A-a during 2010 and 2014-2017

Since 2011, ECU-3A, the most upstream location on the South Fork, has annually met the MPCA biological standard for fish. Fish IBI scores from ECU-3A have ranged from 31.2 to 55.2 during the 2011 through 2017 period (Figure 41). Prior to 2011, this location met the standard only 38 percent of the time. However, since the watershed tributary to ECU-3A is less than 5 square miles, the MPCA biological standard is not required to be met.

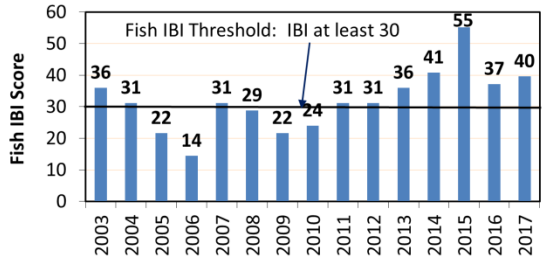


Figure 41. Fish IBI Scores for Nine Mile Creek Station ECU-3A during 2003-2017

Macroinvertebrates—Nine Mile Creek macroinvertebrates (bugs that can be seen with the naked eye) were assessed using two biotic indices to evaluate the water quality of Nine Mile Creek. The Hilsenhoff Biotic Index (HBI) was used to assess the long-term oxygen content of

the stream. HBI assesses stream oxygen by determining the average tolerance of the macroinvertebrate community to low oxygen conditions. A second index, the Invertebrate Community Index (ICI), provides a broader view of the stream's water quality than the HBI, determining the average tolerance of the macroinvertebrate community to a wide range of pollutants.

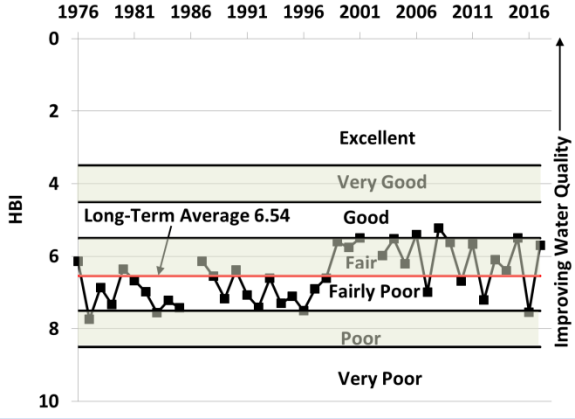


Figure 42. 1976-2017 Nine Mile Creek HBI: Main Stem Station ECU-7A/N1

In 2017, the HBI and ICI values from the two downstream locations on the Main Stem of Nine Mile Creek (ECU-7B and ECU-7C), the most upstream North Fork Location (ECU-1A/1A-1), and the most downstream South Fork location (ECU-5A) were similar to past values, indicating stream water quality, including oxygen conditions, have remained stable.

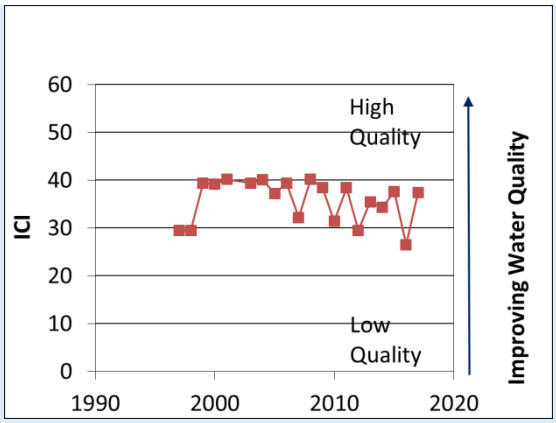


Figure 43. 1997-2017 Nine Mile Creek ICI: Main Stem Station ECU-7A/N1

The HBI and ICI values from the most upstream location on the Main Stem of Nine Mile Creek (ECU-7A) indicated a significant improvement in 2017. This improvement was preceded by a significant decline in 2016. Frequent fluctuations in both HBI and ICI values have occurred at this location during the period of record (Figure 42 and Figure 43). This fluctuation is primarily due to the influence of Marsh Lake on the oxygen concentrations of downstream waters. Oxygen levels within Marsh Lake fluctuate due to biological activity within the marsh – plant

photosynthesis during the day raises oxygen levels and at night plant respiration lowers oxygen levels. Water exiting the marsh may have either lower or higher oxygen levels than downstream locations, depending upon biological processes occurring within the marsh. The fluctuations in stream oxygen levels downstream from Marsh Lake cause changes in the macroinvertebrate assemblage, reflected by fluctuating HBI and ICI values. A rapid decline in caddisflies at North Fork locations ECU-2 (upstream) and ECU-2A (downstream) in 2013 resulted in the poorest biological index (i.e., HBI and ICI) values since monitoring began. The decline is likely due to sediment in the stream. Increases in caddisflies since 2013 have improved both HBI and ICI values. In 2017, the number of caddisflies at North Fork locations increased by more than three-fold at the upstream location—from 552 in 2016 to 1,840 in 2017 and nearly seven fold at the downstream location—from 368 in 2016 to 2,544 at 2017 at ECU-2A. The caddisfly recovery indicates the District's completed and on-going stream stabilization projects have reduced sediment levels in the stream. The numbers of caddisflies (Tricoptera) collected during 1975 through 2017 are shown in

Figure 44. In 2017, ECU-*3A, pictured above, continued a trend toward improving fish I*BI scores.

Figure 45. In 2017, the most downstream Main Stem location, ECU-7C continued a trend toward increasing oxygen levels (lower scores) that began in 2015 (Figure 47). Lower HBI scores indicate the macroinvertebrate community is comprised of species that require higher concentrations of oxygen to survive, an indication of improving water quality. In 2017, the HBI score at ECU-7C was lower than all previous HBI scores - 3.95 in 2017 compared with HBI scores of 4.15 to 6.14 during 1976 through 2016. The lower score is an indication of increased oxygen levels and improved water quality at this location.

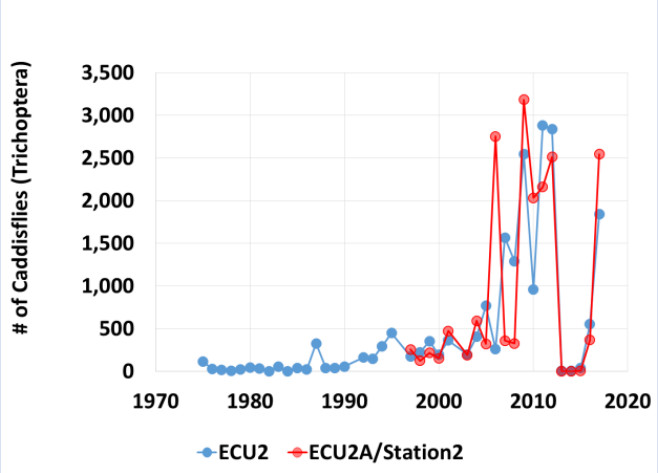


Figure 45. Number of Caddisflies at North Fork Stations ECU-2 and ECU-2A during 1975 through 2017

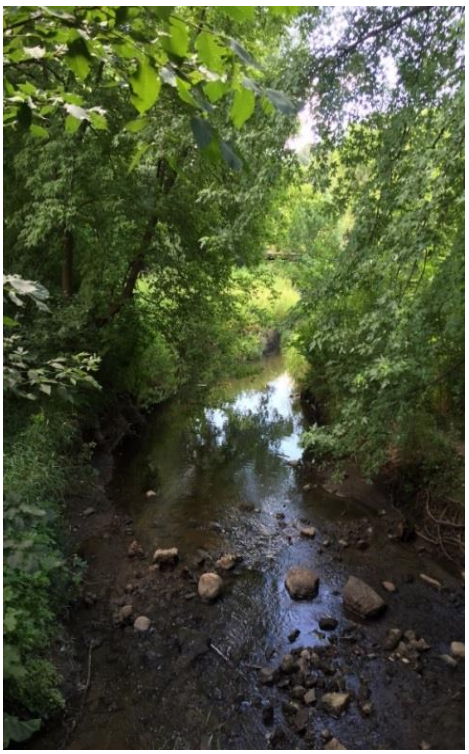


Figure 46. In 2017, North Fork location ECU-2, pictured above, continued a trend toward increasing numbers of caddisflies.

Nine Mile Creek Conclusion and Recommendations— The 2017 water quality, fish, and macroinvertebrate data indicate that despite urbanization impacts, water quality conditions in Nine Mile Creek during 1968 through 2017 have generally remained relatively stable over time. The continued stream stabilization projects completed and currently on-going have contributed to the improvements of fish numbers, quality of the fish

community, and intolerant macroinvertebrates found in the creek.

Continued monitoring at the annual stream monitoring stations is recommended to maintain this long-term record of water quality and biota in Nine Mile Creek and to assess the biological community to determine changes in stream habitat or water quality that warrant further investigation or management measures.

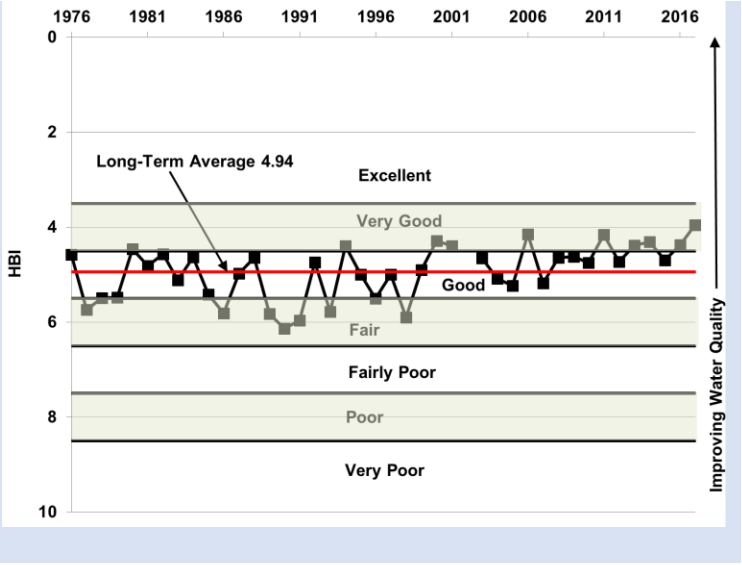


Figure 47. 1976-2017 Nine Mile Creek HBI: Main Stem Station ECU-7C

Minnesota has adopted changes to its water quality standards that establish biological water quality standards for all Minnesota streams and rivers, including Nine Mile Creek. Although the MPCA has assessed streams for biological impairment in the past, the MPCA water quality standards (Minn. Rule Chapters 7050 and 7052) did not previously contain biological standards. The fish IBI selected for the biological water quality standards is different from the fish IBI that was previously used to assess Nine Mile Creek for biological impairment. In addition, the MPCA has added a macroinvertebrate IBI to its biological water quality standards. The changes to MPCA standards became effective October 23, 2017. Beginning in 2018, it is recommended that the NMCWD apply the MPCA fish IBI and macroinvertebrate IBI to the biological data collected from the stream to determine whether or not the stream is biologically impaired for fish and/or macroinvertebrates. It is further recommended that the fish IBI and macroinvertebrate IBI be applied to past fish and

macroinvertebrate data from Nine Mile Creek to determine whether or not the stream has met the standards over time. In addition, the IBI values will help identify long-term trends in the biological community and may help the NMCWD with its continued efforts to delist the stream from Minnesota's list of impaired waters.

Status of Local Plan Adoption and Implementation

The District monitors the plans of watershed districts and water management organizations that affect the District's cities and that have been approved by the Board of Soil and Water Resources. The District also reviews and approves the Comprehensive Surface Water Management Plans of each of the cities in the District. Currently, the cities of Bloomington, Eden Prairie, Edina, Hopkins, Minnetonka, and Richfield have approved local water plans. All six of the cities, however are in the process of updating their Plans, and will need to heve them approved by December 31, 2018.

Biennial Solicitation of Interest Proposals

Under M.S.A. 103B.227, subd. 5, the District must issue a biennial solicitation for legal, technical, and other professional services. The District issued a formal solicitation for accounting, engineering, and legal services in early 2016. The District selected Cavanaugh and Associates as its accountant, Barr Engineering as its engineer and Smith Partners, PLLP as its legal counsel in May 2016. The District selected Redpath and Company Ltd, to conduct the District's annual financial audit. New proposals for engineering, legal, and other professional services will be solicited in 2018.

Fund Balances for Specific Program Elements

The District's fund balances and financial status are included in the District's annual audit. The annual audit is included as an appendix to this report.

Status of any Locally Adopted Wetland Banking Program

Because of the inherent limitations of a fully urbanized watershed, the District has not developed a wetland-banking program. Instead, to date, it uses the state wetland bank administered by the Minnesota Board of Water and Soil Resources. The District is, however participating in wetland restoration/bank creation process with Hennepin County Environment and Energy on a large wetland complex at the County Home School site in Minnetonka.

Annual Written Communication to the Public

As required by Minn. R. 8410.0100, subp.4, the District prepared and disseminated its annual communication to the public that identified the Board members, contact information, and public meeting information. In 2017, the District combined its 2017 Annual Communication report with the development of a general overview/mini calendar that provided a general overview of the watershed and some of its programs. A copy of the Annual Communication is included in the Appendix.

Annual Audited Financial Report and Audit Report

The District's audited annual financial report was prepared by Redpath and Company, Ltd., a certified public accounting firm. As required by Minn. R. 8410.0150, subp. 2, the Audited Financial Report includes classification and reporting of revenues and expenditures, a balance sheet, an analysis of changes in final balances, and all additional statements necessary for full financial disclosure. The 2017 Audited Financial Report may be found in the appendix to this Annual Report.

2018 Annual Budget

The District adopted its 2018 Annual Budget in September 2018. The 2018 Budget may be found in the appendix to this Annual Report.

Appendix

1. **2017 Annual Financial Audit**
2. **2018 Approved Annual Budget**
3. **2017 Annual Communication**