BROWN'S CREEK WATERSHED DISTRICT
2025 WATER MONITORING SUMMARY

Prepared for:

Brown's Creek Watershed District
Preserving the integrity of the watershed for future generations

Prepared by:

Washington Conservation District

This page intentionally left blank.

ACKNOWLEDGMENTS

Several agencies and individuals were directly involved in many aspects of this project including data collection and analysis, as well as technical and administrative assistance.

Brown's Creek Watershed District (BCWD) Board of Managers
Klayton Eckles, President
Charles LeRoux, Vice President
Larry Odebrecht, 2nd Vice President
Celia Wirth, Treasurer
Debra Sahulka, Secretary
Griffin Brod, Manager

Brown's Creek Watershed District
Karen Kill, BCWD Administrator

Watershed Engineer
Emmons and Olivier Resources, Inc.

Watershed Legal Council
Smith Partners, P.L.L.P.

Metropolitan Council
Cassie Champion
Brian Johnson
Dan Henley
Mallory Vanous

Minnesota Department of Natural Resources (MN DNR)
Nick Hayes
Mark Nemeth

Stillwater Area High School
Pete Stenross
Katie Crowley
SAHS Students

Minnesota Trout Unlimited- Trout in the Classroom
Evan Griggs
Amber Taylor

Washington Conservation District
The BCWD and WCD would also like to thank those volunteers and landowners who assist with data collection and allow property access.

ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Bi-weekly	Every two weeks
CaCO3	Calcium Carbonate
CAMP	Citizen-Assisted Lake Monitoring Program
cfs	cubic feet per second
Chl-α	Chlorophyll-α
BCWD	Brown's Creek Watershed District
DO	Dissolved Oxygen
EIMS	Environmental Information Management System
E. coli	*Escherichia coli*
FAV	Final Acute Value
IESF	Iron Enhanced Sand Filter
lbs	pounds
lbs/ac	pounds per acre
m	meters
MCES	Metropolitan Council Environmental Services
mg/L	milligrams per liter
MN DNR	Minnesota Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
MPN	most probable number
NTU	nephelometric turbidity units
OHWL	Ordinary High Water Level
Ortho-P	Ortho-phosphorus
THPP	Trout Habitat Preservation Project
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSI	Trophic State Index
TSMP	Trout Stream Mitigation Project/Diversion Structure
TSS	Total Suspended Solids
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
VSS	Volatile Suspended Solids
WCD	Washington Conservation District

2025 Brown's Creek Watershed District Baseline Water Quality Monitoring

MONITORING SUMMARY

This report focuses on the summary of lake and stream water quality data collected by the Washington Conservation District (WCD) in 2025. References will also be made to the Brown's Creek and Long Lake 2020 Trend Analysis completed by Brown's Creek Watershed District's engineer, Emmons & Olivier Resources, Inc. (EOR). Additional information on the natural and cultural resources, improvement projects, and challenges related to water resources within the Brown's Creek Watershed District (BCWD) can be found in the BCWD 2017-2026 Watershed Management Plan, the 2010 Brown's Creek Biota TMDL, and past monitoring summaries.

Similar to 2024, very low snow totals were present at the end of winter. With the exception of a heavy snowstorm at the beginning of March, which fully melted after a few days, snowpack was less than five inches for most of January and February, and was entirely gone by March 11 according to the National Weather Service in Stillwater. Spring conditions were warmer than average, with overnight freezing temperatures largely ending by late March while daytime temperatures reached as high as the mid-seventies in mid-March. Most lakes in the area lost their ice around two weeks earlier than median ice-out dates. Contrary to most years, due to the lack of snow cover and a dry fall in 2024, water levels in streams and lakes in the District were at their lowest immediately after ice-out with minimal recharge from snowmelt. Spring moisture conditions were near normal, while June and July were very wet with 2.91 inches and 1.24 inches of rain, respectively, above the 30 year average for those months. Much of that precipitation came in several severe storms, which led to high runoff events. According to recorded precipitation, there were four storm events during the year that exceeded two inches of rain, with the greatest being approximately 3.2 inches. Similar to 2024, September and October were drier than usual. Overall, annual precipitation was 1.42 inches greater than the thirty year average of 33.9 inches. Warm air temperatures impacted water conditions, with six days over 90 ºF as recorded by the National Weather Service. A beaver dam on Brown's Creek downstream of Highway 15 appears to have caused significant warming of the water at all downstream monitoring stations, with some of the warmest stream temperatures recorded in the twenty years of monitoring. The stream restoration activities around Neal Avenue also likely contributed to the warming of the creek, as there is not yet enough vegetation re-established to shade and cool the stream. Ice-in was much earlier than recent years, with most lakes in the area being fully ice covered by the end of November. The wet and warm conditions in 2025 are generally reflected by poorer water quality conditions than previous years.

Lake Monitoring

BCWD monitored eighteen basins for nutrients, chlorophyll-α, Secchi disk transparency, temperature and dissolved oxygen profiles, elevation, and user perception rankings. Bass Lake East, Bass Lake West, Benz Lake, Goggins Lake, Jackson WMA (Sinnits) Pond, Kismet Basin, Long Lake, Lynch Lake South, Masterman Lake, Plaisted Lake, South School Section Lake, and Woodpile Lake were monitored every other week, while Brewer's Pond, Heifort's Pond, July Avenue Wetland, Lynch Lake North, North School Section Lake, and Pat Lake were monitored every four weeks by WCD staff. Volunteers also monitored Brewer's Pond and Heifort's Pond every four weeks on an offset schedule with WCD, such that samples were collected every other week. A summer and fall alkalinity and hardness sample was also collected on all eighteen basins, and spring and summer chloride samples were collected on all three basins of Long Lake and Jackson WMA (Sinnits) Pond.

Four lakes experienced an improvement in lake grade; Bass Lake West, Goggins Lake, Pat Lake, and South School Section Lake. Heifort's Pond, July Avenue Wetland, Kismet Basin, Lynch Lake South, Masterman Lake, and North School Section Lake declined in grade from the year prior, and all other lakes maintained their lake grade.

Of the eighteen lakes monitored, Heifort's Pond, July Ave Wetland and Lynch Lake North summer averages exceeded (were poorer than) state impairment thresholds for total phosphorus, chlorophyll-α, and Secchi disk transparency. South School Section Lake exceeded the impairment threshold for chlorophyll-α, and Brewer's Pond exceeded the impairment threshold for chlorophyll-α and Secchi disk transparency.

Peak elevation for the year on most lakes occurred in mid to late August. In 2025 five basins had elevations above their Ordinary High Water (OHW) level, for part or all of the monitoring season.

Stream and Stormwater Monitoring

Brown's Creek

Consistent with past years, Brown's Creek was monitored at four locations; Highway 15, McKusick Road, Stonebridge, and the Outlet. Automated storm composite and manual grab samples during storm and base flow conditions were collected at all sites and analyzed for nutrients, sediment, metals, and *Escherichia coli* (*E.coli*). Continuous (15 minute) stage, discharge, temperature, dissolved oxygen (DO), turbidity, pH, and specific conductivity were collected at all four stations.

Nutrients & Discharge

The total discharge to the St. Croix River in 2025 was 268,491,496 cubic feet of water, as recorded at the Outlet. The total phosphorus (TP) and total suspended solids (TSS) loads to the St. Croix River at the Outlet were 2,893 pounds of phosphorus (0.626 lbs/ac) and 648,136 pounds of sediment (140.17 lbs/ac), as calculated by Metropolitan Council Environmental Services (MCES). These were near the long term median load since load calculations began in 2000. The sampling strategy at the Outlet was changed by MCES in 2017 to a manual grab collected on the same weekday every other week, and composite samples collected in major storm events. This change in sampling method has resulted in an apparent shift to lower annual loads, as the strategy is not biased towards runoff events as it was in the past, and the method used to calculate annual loads was altered to comply with MCES standard operating procedures. The creek exceeded the state standard of 0.100 mg/L of TP for 12 of 27 applicable samples. The creek met the TMDL goal of 23 mg/L of TSS during base flow, but exceeded the state standard of 10 mg/L (between April 1 to September 30) from May through August for a total of nine of 14 applicable samples. TSS loading was greater than the TMDL goal of 74 pounds per acre, primarily due to the wet spring conditions. Additionally, remnant sediment from in-water construction work as part of the 2024 streambank and floodplain restoration project along Neal Avenue contributed to the higher TP and TSS loads. Loading and conditions at individual sites are discussed in greater detail later in this summary.

Metals

No metals exceedances were recorded at the Outlet. A small number of chronic level exceedances of lead and copper were recorded at the upstream monitoring stations, primarily at McKusick Road where metals exceedances seem to be related to high sediment concentrations.

Bacteria

Samples taken during base flow at each station were above state standards for *E.coli*. Based on long term monitoring, bacteria concentrations at all stations are above the standard June through September. Sufficient data has not been collected at Highway 15, McKusick Road, or Stonebridge to compare to the standard in April.

Temperature & Dissolved Oxygen

Temperature and dissolved oxygen regimes were most suitable for trout and coldwater community survival at the Outlet. The threat level threshold of 18.3 ºC was exceeded at McKusick Road, Stonebridge, and the Outlet for the most or second most number of days since temperature monitoring began in 2006. The critical level threshold at which trout could not survive of 23.9 ºC was exceeded at Highway 15, McKusick, and Stonebridge on June 22, which was the first instance of this occurring since 2013. This is likely due to a large beaver dam slowing and allowing heating of the water between Highway 15 and McKusick Road, temporary lack of stream shading in the Neal Avenue restoration area, and warm water inputs all summer

long from the McKusick Wetland Outlet tributary. Dissolved oxygen concentrations were better than the state standard of 7 mg/L as a daily minimum for the entire season at the Outlet. Dissolved oxygen concentrations were poorer than the standard 27 and 24 days, respectively, at McKusick Road and Stonebridge, partially due to the warm water conditions. Highway 15 is not suitable for trout during summer months due to low dissolved oxygen and warm temperatures. The upper reaches of the creek around Highway 15 have been found to contain invasive curly-leaf pondweed, which will further hinder trout suitability by slowing the water, allowing for warmer temperatures and sediment deposition over spawning gravel.

Turbidity

Continuous turbidity and specific conductivity were monitored at each of the four stations on the creek. Average daily turbidity exceeding the TMDL goal of 10 NTU ranged from 10.1% to 27.6% of the days monitored across the four monitoring stations. In 2025 the Outlet was the most turbid site, with 27.6% of the days monitored exceeding the 10 NTU goal. Turbidity conditions were influenced by the in-water restoration work around Neal Avenue in the summer of 2024, which had not fully stabilized in early 2025, and had not had a major runoff event to flush remnant sediment out of the channel since the work finished. Specific conductivity data are not discussed, but are available upon request.

Biology

The MN DNR has a management plan to stock 1,000 yearling rainbow trout in the creek each spring. Due to difficulties of raising brown trout at state hatcheries to target size, the agency shifted to stocking rainbow trout in 2019. Stillwater Area High School (SAHS) and the Minnesota Trout Unlimited – Trout in the Classroom program also raised and released several hundred fingerling rainbow trout into the creek. The rainbow trout thrive in similar conditions as brown trout, but grow faster and will provide better recreational opportunities to anglers. In May of 2025 SAHS students observed stonefly larvae, which require very clean and well oxygenated water to survive, already inhabiting the newly constructed rock riffles in the stream restoration area around Neal Avenue.

Diversion Drainage

The diversion drainage was again monitored at the Trout Stream Mitigation Project (TSMP) Diversion Structure for nutrients, sediment, and metals, as well as continuous stage, velocity, discharge, and temperature. Total discharge to McKusick Lake was 60,305,225 cubic feet of water; the fifth highest volume recorded since monitoring began in 2006. The TP load was 416 pounds (0.108 lbs/ac) and the TSS load was 73,469 pounds (19.06 lbs/ac). In spite of wetter than average conditions, the TP and TSS loads were the sixth and second lowest, respectively, recorded since monitoring began in 2006. The site largely met the state standard for 2B waters for TP and TSS, but has historically shown an extremely high storm loading rate. Erosional head cuts in the drainage tributaries had been identified as the source of the excessive loading rates

through drone flights and surveys conducted by the District's engineer. Rock vanes and stabilization projects have since been implemented by the District to reduce erosion and restore floodplain connectivity. Beginning in 2024 beavers also constructed a series of dams upstream of the site, further trapping sediment and phosphorus by reducing flow rate, allowing settling of sediments, and improving floodplain connectivity. The high total discharge and very low nutrient loads provide evidence the restoration projects and natural processes resulting from beaver activity may be improving water quality conditions in the drainage. Only one chronic standard exceedance of lead was recorded, which is tied for the lowest number of metal exceedances ever recorded at the station. Continuous temperature monitoring was added to the site in 2024 to provide further data on how restoration and beaver activities are affecting habitat and water quality conditions in the drainage.

Long Lake Drainages

The Tributary to Long Lake at Marketplace Pond was monitored for nutrients, sediment, metals, and continuous stage and discharge. Grab sampling resumed at the Tributary to Long Lake at 62nd Street, in addition to continuous stage monitoring. The total discharge to Long Lake at Marketplace Pond was 17,069,510 cubic feet, while the discharge at 62nd Street was 2,166,546 cubic feet. These were near the long term average discharge for these sites. The tributary at Marketplace Pond contributed 130 pounds of phosphorus (0.316 lbs/ac) and 10,449 pounds of sediment (25.49 lbs/ac). The tributary at 62nd Street contributed 50 pounds of phosphorus (0.087 lbs/ac) and 6,265 pounds of sediment (10.90 lbs/ac). Although not classified as 2B waters, both sites exceeded state standards for TP for nearly every sample collected, and the tributary at 62nd Street exceeded state TSS standards for the majority of samples collected. Storm events at the tributary at Marketplace Pond exceeded the maximum standard for copper once, the chronic standard for copper once, and the chronic standard for lead three times. The tributary at 62nd Street exceeded the chronic standard for lead once.

McKusick Wetland Outlet

McKusick Wetland Outlet was added to the monitoring network in 2017. The outlet was monitored at its discharge point to Brown's Creek 100 feet upstream of the McKusick Road site for continuous stage, discharge, and temperature, as well as nutrients, sediment, and metals. Discharge to Brown's Creek during the period of monitoring (April 23 to September 8) was calculated at 23,349,104 cubic feet. The TP load for this period contributed 403.8 pounds of phosphorus, while the TSS load contributed 11,354 pounds of sediment. Although not a 2B water, when compared to state standards for TP and TSS the site meets the standard for TSS, but was above the TP standard for 10 of 11 samples collected. Contrary to recent years, the outlet was observed flowing the entire summer, which likely negatively impacted temperature conditions in Brown's Creek.

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

I. INTRODUCTION

Knowledge of the changes to water quality and quantity of our water resources through monitoring guides when, where, and how management activities should be implemented to protect or restore those resources. The Brown's Creek Watershed District (BCWD) utilizes monitoring and the data collected to make such decisions as outlined in its watershed management plan. In 2025 BCWD monitored 23 basins (lakes), four stations on Brown's Creek, a tributary to Brown's Creek, two stations in the Long Lake subwatershed, and one station in the diversion drainage at the Diversion Structure. A summary of monitoring locations and monitored parameters can be found in Table 1 and Figure 1.

The Washington Conservation District (WCD) also conducted special project and maintenance monitoring at several locations including the Iron Enhanced Sand Filter (IESF) on Morgan Avenue, Brown's Creek Park Rock Crib, Countryside Auto sediment chamber, McKusick Road sediment chambers, the Oak Glen Golf Course Irrigation Reuse project, alkalinity and hardness sampling on 18 basins (lakes), and chloride samples on six Stillwater stormwater ponds. Comparable levels of data collection versus baseline sites occurred at each project, such as collection of continuous stage, discharge, and temperature, and measurement of sediment depths in complex monitoring situations. As this summary focuses on baseline monitoring data, special project monitoring will not specifically be discussed, although the locations of several projects are described. Individual monitoring summaries for each project will be prepared and made available in separate reports.

Table 1. Monitoring Site Location, Description, and Parameter(s) Monitored

Site Description	Map Site ID#	Site Name	General Site Location	Monitored Parameters
Stream Monitoring	1	Brown's Creek at Hwy 15	Hwy 15	Continuous Water Quality and Discharge; Water Quality Composite/Grab Samples
Stream Monitoring	2	Brown's Creek at McKusick Road	McKusick Road	Continuous Water Quality and Discharge; Water Quality Composite/Grab Samples
Stream Monitoring	3	Brown's Creek at Stonebridge Trail	Stonebridge Trail	Continuous Water Quality and Discharge; Water Quality Composite/Grab Samples
Stream Monitoring	4	Brown's Creek Outlet	Hwy 95 & 96	Continuous Water Quality and Discharge; Water Quality Composite/Grab Samples
Stream Monitoring	5	Brown's Creek Diversion	Neal Ave.	Discharge, Temperature, and Water Quality Composite/Grab Samples
Stream Monitoring	6	Tributary to Long Lake at 62nd St.	62nd St.	Stage and Water Quality Grab Samples
Stream Monitoring	7	Tributary to Long Lake at Marketplace Pond	Market Dr.	Discharge and Water Quality Composite/Grab Samples
BMP Effectiveness	8	Iron Enhanced Sand Filter (IESF)-1 Outlet	Morgan Ave. N.	Discharge and Water Quality Composite/Grab Samples
Stream Monitoring	9	McKusick Wetland Outlet	McKusick Road	Discharge, Temperature, and Water Quality Grab Samples
BMP Effectiveness	10	Brown's Creek Park Rock Crib (5 In-Crib Temperature Loggers, 2 In-Stream Temperature Loggers, and Outlet Discharge)	Neal Ave.	Discharge, Temperature, Sediment Depth and Maintenance Requirements
BMP Maintenance	11	McKusick Road and Countryside Auto Sediment Chambers	McKusick Road	Sediment Depth and Maintenance Requirements
BMP Effectiveness	12	Oak Glen Pond Water Reuse	McKusick Road	Stage
			DNR ID	
Lake Monitoring	13	Kismet Basin	82-033400	Water Quality Samples, Elevation
Lake Monitoring	14	Long Lake (North Basin)	82-002100	Water Quality Samples, Elevation
Lake Monitoring	15	Goggins Lake	82-007700	Water Quality Samples, Elevation
Lake Monitoring	16	South School Section Lake	82-015100	Water Quality Samples, Elevation
Lake Monitoring	17	Benz Lake	82-012000	Water Quality Samples, Elevation
Lake Monitoring	18	Masterman Lake	82-012600	Water Quality Samples, Elevation
Lake Monitoring	19	Woodpile Lake	82-013200	Water Quality Samples, Elevation
Lake Monitoring	20	Lynch Lake (North Basin)	82-004200	Water Quality Samples, Elevation
Lake Monitoring	21	Lynch Lake (South Basin)	82-004202	Water Quality Samples, Elevation
Lake Monitoring	22	Bass Lake (West)	82-012300	Water Quality Samples, Elevation
Lake Monitoring	23	Bass Lake (East)	82-012400	Water Quality Samples, Elevation
Lake Monitoring	24	July Avenue Pond	82-031800	Water Quality Samples, Elevation
Lake Monitoring	25	Pat Lake	82-012500	Water Quality Samples, Elevation
Lake Monitoring	26	Plaisted Lake	82-014800	Water Quality Samples, Elevation
Lake Monitoring	27	Jackson Wildlife Management Area Pond (Sinnits Pond)	82-030500	Water Quality Samples, Elevation
Lake Monitoring	28	Brewer's Pond	82-002200	Water Quality Samples, Elevation
Lake Monitoring	29	Heifort's Pond	82-048500	Water Quality Samples, Elevation
Lake Monitoring	30	North School Section	82-014900	Water Quality Samples, Elevation
Lake Monitoring	31	Highway 12 & Kimbro Pond	82-034900	Elevation
Lake Monitoring	32	Brown's Creek at Gateway Trail	82-030300	Elevation
Lake Monitoring	33	55th St. Pond	82-031600	Elevation
Lake Monitoring	34	Vanzwol Pond	82-012800	Elevation
Lake Monitoring	35	75th St. Wetland	N/A	Elevation
Lake Monitoring	36	Marketplace Pond	N/A	Surface and Hypolimnion Chloride Samples
Lake Monitoring	37	62nd St. Pond	N/A	Surface and Hypolimnion Chloride Samples
Lake Monitoring	38	Wildwood Pines Pond	N/A	Surface and Hypolimnion Chloride Samples
Lake Monitoring	39	Washington Ave Pond	N/A	Surface and Hypolimnion Chloride Samples
Lake Monitoring	40	Clinic Pond 2	N/A	Surface and Hypolimnion Chloride Samples
Lake Monitoring	41	Tower Dr. Pond	N/A	Surface and Hypolimnion Chloride Samples

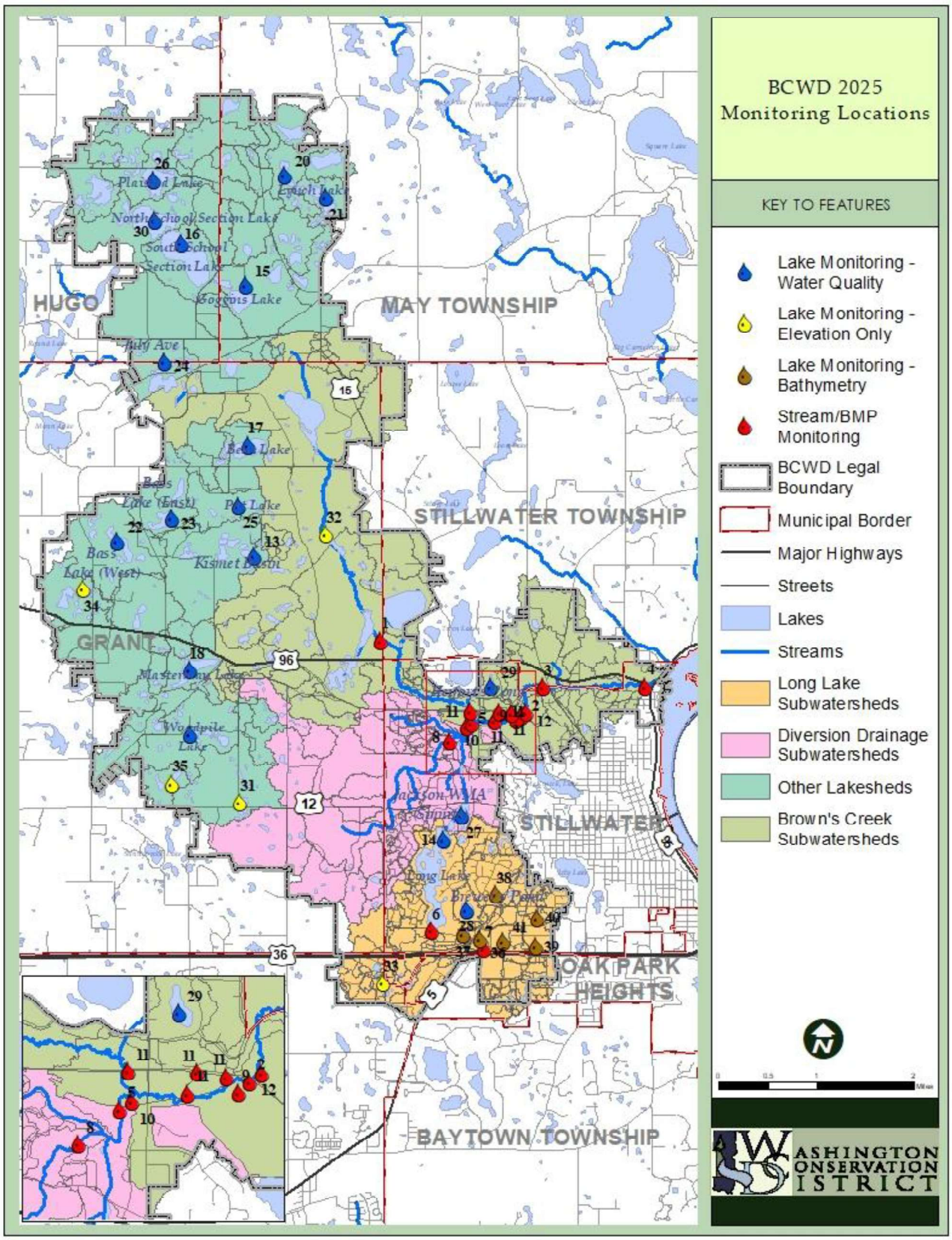


Figure 1. Brown's Creek Watershed District 2025 Sampling Locations

II. PURPOSE AND GOALS

BCWD uses a monitoring network to assess the quality of its water resources and maintains partnerships with the Minnesota Department of Natural Resources (MN DNR), Metropolitan Council, WCD, Stillwater Area High School, and volunteers to collect and manage data. The general purpose of the baseline water monitoring program is to collect long term data to identify issues within the watershed and track changes towards meeting water quality goals described in the 2017-2026 Watershed Management Plan and the Brown's Creek TMDL Implementation Plan. The goals specific to this monitoring summary include the collection of useful data about the water resources of the District, production of an annual assessment of monitoring data, and the use of those data to determine the performance of District programs and regulations. Additional policies, goals, and implementation strategies related to monitoring data are more fully described in the watershed management plan.

III. LAKE MONITORING

III.A. Locations and Parameters

In 2025 water quality data were collected by the WCD on eighteen basins (lakes) (Table 1 and Figure 1). Each lake was sampled for total phosphorus (TP), total Kjeldahl nitrogen (TKN), chlorophyll-α, and Secchi disk transparency. A complete listing of nutrient and Secchi data by lake is available in Appendix A. One-meter increment temperature and dissolved oxygen profiles as well as a user perception ranking (physical and recreational suitability) were also recorded. A summer and fall alkalinity and hardness sample was collected on all eighteen basins, and spring and summer chloride samples were collected on all three basins of Long Lake and Jackson WMA (Sinnits) Pond. These data are available via request or on the Metropolitan Council's Environmental Information Management System (EIMS) Water Quality Database website (https://eims.metc.state.mn.us). Surface and bottom chloride samples were collected on six stormwater ponds, but results are not discussed in this summary. These data will be available upon request and in technical reports for special projects.

III.B. Methods

Each basin was sampled April through October using a two-meter (6.56 feet) integrated surface water column sampler from a watercraft, except for Brewer's Pond and Heifort's Pond, which were sampled from the surface only using a bucket to match citizen volunteer protocols. Bass Lake East, Bass Lake West, Benz Lake, Goggins Lake, Jackson WMA (Sinnits) Pond, Kismet Basin, Long Lake, Lynch Lake South, Masterman Lake, Plaisted Lake, South School Section Lake, and Woodpile Lake were monitored bi-weekly, while Brewer's Pond, Heifort's Pond, July Avenue Wetland, Lynch Lake North, North School Section Lake, and Pat Lake were monitored every four weeks. Volunteers monitored Brewer's Pond and Heifort's Pond on an offset schedule with WCD so that samples were collected every other week. Chlorophyll-α samples were obtained by filtering water from the integrated sample through a 1.5 µm fiberglass filter using a

hand pump. Samples collected for TP, TKN, chlorophyll-α, alkalinity, hardness, magnesium, calcium, and chloride were analyzed by the Metropolitan Council Environmental Services Lab. The sampling methods above were developed by and consistent with Metropolitan Council's Citizen Assisted Monitoring Program (CAMP). Measurements obtained during the sampling season were averaged to allow comparison of individual lake dynamics from year to year. Trend analysis for long term Secchi disk transparency, TP, and chlorophyll-α (corrected for pheophytin) trends were completed using a Kendall's Tau statistical test, presented in Appendix A, and only data collected by professional agencies were used to assess for trends. All other data were quality assured, quality controlled, and reviewed by WCD staff. Detailed standard operating procedures used by WCD for water sampling, monitoring, and data management are available on the WCD website (https://www.mnwcd.org/water-monitoring).

III.C. Results and Discussion

III.C.1. Lake Grades

The lake water quality grading system was developed following the 1989 sampling season by Metropolitan Council. This grading system ranks water quality characteristics by comparing summer averages to those of other lakes specific to the metro area. The grading curve represents percentile ranges for the May through September averages of total phosphorus concentration, uncorrected trichromatic chlorophyll-α concentration, and Secchi disk transparency for 119 lakes sampled from 1980 to 1988, and the ranges were re-confirmed in 2000 using more recent data. Percentile ranges for each parameter can be found in Table 2. A benefit of the lake grade system is that it was developed specifically for lakes in the metro area, and serves as a convenient way to compare water quality between lakes. Current grades for each lake can be found in Figure 2, and the latest ten years of grades for each lake can be found in Appendix A. In addition, comparison of June through September water quality averages (total phosphorus concentration, pheophytin-corrected chlorophyll-α, and Secchi disk transparency) will be made to state eutrophication standards for each lake as the Minnesota Pollution Control Agency (MPCA) uses this timeframe to assess impairment status. Beginning in 2019 volunteer data collected through the CAMP program on Brewer's Pond and Heifort's Pond were incorporated into lake grade and summer averages. June through September averages and impairment thresholds can be found in Table 3.

Table 2. Lake Grade Ranges

Grade	Percentile	TP (µg/L)	Chl-α (µg/L)	Secchi (m)
A	<10	<23	<10	>3.0
B	10 - 30	23-32	10-20	2.2-3.0
C	30-70	32-68	20-48	1.2-2.2
D	70-90	68-152	48-77	0.7-1.2
F	>90	>152	>77	<0.7

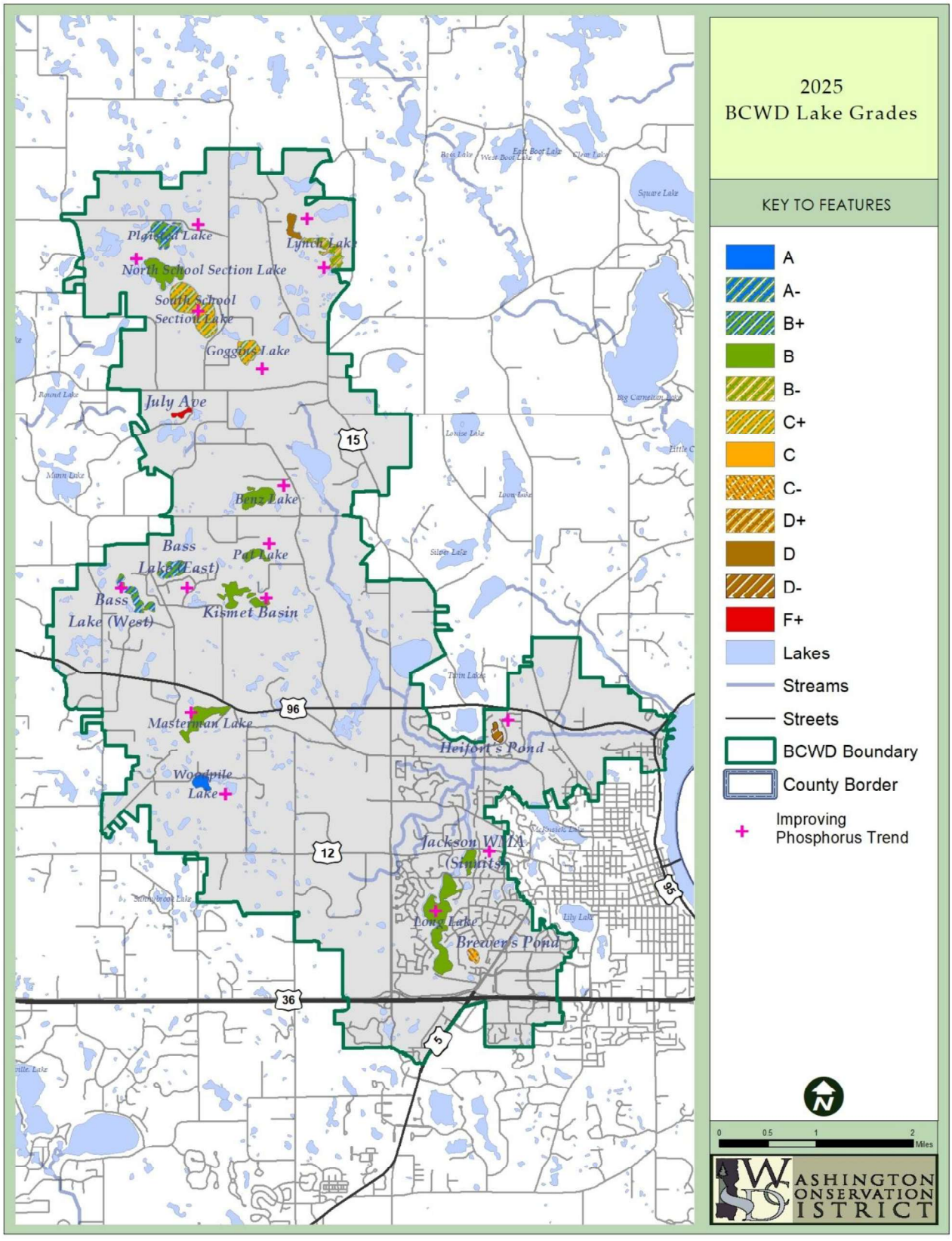


Figure 2. Brown's Creek Watershed District 2025 Lake Grades

Table 3. Impairment Thresholds and June Through September Average 2025 Parameters

Lake	Total Phosphorus (mg/L)	Pheophytin Corrected Chlorophyll-α (µg/L)	Secchi (meters)	Total Kjeldahl Nitrogen (mg/L)
Impairment Threshold- Shallow	*0.060*	*20.0*	*1.00*	*N/A*
Impairment Threshold- Deep	*0.040*	*14.0*	*1.40*	*N/A*
Eco-Region Value	*0.023-0.050*	*5.0-22.0*	*1.5-3.2*	*0.60-1.20*
Bass East	0.025	3.2	2.49	0.64
Bass West	0.024	9.1	2.27	0.80
Benz	0.027	5.9	1.61	0.58
Brewer's	0.053	34.1	0.99	1.74
Goggins	0.043	18.0	2.05	1.14
Heifort's	0.069	69.1	0.55	2.14
Jackson WMA	0.031	3.3	1.41	0.59
July Ave	0.106	87.2	0.52	2.46
Kismet	0.024	7.0	1.63	0.61
Long	0.042	9.2	2.49	0.65
Lynch North	0.113	36.4	0.70	1.44
Lynch South	0.035	8.4	2.10	0.85
Masterman	0.024	5.3	1.63	0.60
North School Section	0.033	8.7	2.65	0.79
Pat	0.030	4.9	2.29	0.61
Plaisted	0.023	3.6	2.54	0.55
South School Section*	0.039	34.9	1.68	1.20
Woodpile*	0.020	4.6	3.69	0.65

Exceeds impairment threshold

*Indicates deep lake. All others are classified as shallow.

Lake grades generally held stable or declined slightly for most lakes in the District when compared to 2024. Four lakes improved in lake grade: Bass Lake West, Goggins Lake, Pat Lake, and South School Section Lake. Heifort's Pond, July Avenue Wetland, Kismet Basin, Lynch Lake South, Masterman Lake, and North School Section Lake declined in lake grade, and all other lakes maintained their grade from the year prior. Warm temperatures, early ice-out, and severe rains can account for the declines in lake grade, but it should be noted all but two basins, July Avenue Wetland and Lynch Lake North, are equal to or better than their ten year average grade.

The most notable shift in lake grade occurred at July Avenue Wetland moving from a D in 2024 to an F+ in 2025, primarily due to increasing chlorophyll-α and phosphorus concentrations. South School Section Lake and Long Lake continue to hold high grades compared to the D and F grades observed in the mid-2010's, likely due to enhanced aquatic vegetation and invasive species management.

III.C.2. Total Phosphorus

Phosphorus is a major nutrient involved in eutrophication and is generally associated with the growth of aquatic plants and algal blooms. Common sources of phosphorus include runoff from agricultural fields, livestock areas, urban areas, lakeshore lawns and improperly operating septic systems. In most lakes in this region, phosphorus is the least available nutrient; therefore, its

abundance or scarcity controls the extent of algal growth. Algal growth in turn affects the clarity of the water and light penetration, and can control the extent of aquatic vegetation by shading out plants. The phosphorus flow path through the watershed can be found in Appendix C.

The state impairment threshold for TP is 0.060 mg/L in shallow lakes (generally greater than 50 acres and less than 15 feet deep, or more than 80% littoral area) and 0.040 mg/L in deeper lakes. In 2025 Heifort's Pond, July Avenue Wetland, and Lynch Lake North summer average TP concentrations exceeded impairment standards (Table 3).

Trend analyses were completed on lakes where eight or more years (with at least six years occurring in the last ten years) of TP measurements had been collected to determine if lakes are improving, declining, or stable in terms of average summer TP. A two-tailed Kendall's Tau statistical test was completed using a p-value of <0.05 to determine statistical significance of the trend. The same trend analysis method was applied to chlorophyll-α and Secchi depth transparency measurements. Bass Lake East, Bass Lake West, Benz Lake, Goggins Lake, Heifort's Pond, Jackson WMA (Sinnits) Pond, Kismet Basin, Long Lake, Lynch Lake North, Lynch Lake South, Masterman Lake, North School Section Lake, Pat Lake, Plaisted Lake, South School Section Lake, and Woodpile Lake have improving trends for TP, meaning the average summer TP concentration is decreasing (Figure 2 and Appendix A). No statistically significant trend exists on July Avenue Wetland or Brewer's Pond. The Brown's Creek and Long Lake 2020 Trend Analysis completed by the District's engineer, Emmons & Olivier Resources, Inc. (EOR) also show an improving short term trend from 2011-2020, and a statistically significant improving trend over the long term, from 1995-2020, on Long Lake.

III.C.3. Chlorophyll-α

Chlorophyll-α is a photosynthetic compound found in algae and aquatic plants, and is a direct indicator of algal productivity. Lakes with high chlorophyll-α concentrations are often eutrophic or hypereutrophic. These lakes tend to have excessive algal growth, shading out rooted plants. Lakes with low chlorophyll-α concentrations can be mesotrophic or even oligotrophic, and tend to have more rooted plants to take up phosphorus, rather than phosphorus being used by algae within the water column which produces more chlorophyll-α.

The impairment threshold for chlorophyll-α is 20 µg/L in shallow lakes and 14 µg/L in deeper lakes. Brewer's Pond, Heifort's Pond, July Avenue Wetland, Lynch Lake North, and South School Section Lake summer average concentrations exceeded the impairment threshold (Table 3).

Trend analyses were completed to determine if lakes are improving, declining, or stable in terms of algal productivity. Bass Lake East, Benz Lake, Goggins Lake, Jackson WMA (Sinnits) Pond, Kismet Basin, Long Lake, Lynch Lake North, Lynch Lake South, Masterman Lake, North School Section Lake, Pat Lake, Plaisted Lake, and Woodpile Lake show statistically significant

long term trends for improving chlorophyll-α concentrations, meaning less algae is being produced (Appendix A). No statistically significant trends were present on Bass Lake West, Brewer's Pond, Heifort's Pond, July Avenue Wetland, or South School Section Lake. No lakes showed an increasing trend for chlorophyll-α concentration. Heifort's Pond changed from an improving trend to no trend in 2025. EOR's trend analysis also shows a short term improving trend and a statistically significant long term improving trend on Long Lake.

III.C.4. Transparency

The measurement of depth of light penetration using a Secchi disk provides a simple measure of water transparency, or clarity. It can also serve as a proxy for turbidity in the water, as well as an indication of the trophic state of the lake. A reduction in water transparency is usually the result of turbidity composed of suspended sediments, organic matter and/or phytoplankton (algae). Several lakes in the district, such as Benz Lake and Masterman Lake, are clearer than they are deep, meaning an accurate measure of transparency cannot be achieved because the disk rests on the lake bottom or is obscured by vegetation instead of reaching a depth where it is no longer visible. This can give the false appearance of low water clarity when considering average transparency, when in reality the true Secchi depth is much higher. Lakes which experience this phenomenon are noted in the summary points sections of Appendix A.

The impairment threshold for Secchi disk transparency is 1.00 meter in shallow lakes and 1.40 meters in deep lakes. Brewer's Pond, Heifort's Pond, July Avenue Wetland, and Lynch Lake North summer average transparencies were poorer than the state standard (Table 3).

Trend analyses were completed on lakes to determine if lakes are improving, declining, or stable in terms of average summer clarity. Goggins Lake, Heifort's Pond, Long Lake, Lynch Lake North, Lynch Lake South, North School Section Lake, and Woodpile Lake show statistically significant long term trends for improving water clarity (Appendix A). No statistically significant trends have been observed on Brewer's Pond, Pat Lake or South School Section Lake. Bass Lake East, Bass Lake West, Benz Lake, Jackson WMA (Sinnits) Pond, Kismet Basin, Masterman Lake, and Plaisted Lake are too shallow to determine an accurate trend, since the lakes are often clearer than they are deep. July Avenue Wetland is the only lake exhibiting a declining trend for clarity. Heifort's Pond changed from no trend to an improving trend in 2025. EOR's trend analysis shows an improving short term trend and a statistically significant long term improving trend on Long Lake.

III.C.5. Total Kjeldahl Nitrogen

Total Kjeldahl nitrogen (TKN) measures the sum of ammonia and organic nitrogen present in the water column. An abundance of this nutrient can lead to excess plant growth and increase the rate of eutrophication, especially if it is the limiting nutrient in a lake. Sources of TKN are similar to those of TP. Although eutrophication standards do not exist at this time for TKN, June

through September averages can be compared to the North Central Hardwood Forest ecoregion to assess if lakes may have excessive amounts of nitrogen. The ecoregion range for TKN is 0.60-1.20 mg/L. Brewer's Pond, Heifort's Pond, July Avenue Wetland, and Lynch Lake North were poorer than the ecoregion range, while Bass Lake East, Bass Lake West, Goggins Lake, Kismet Basin, Long Lake, Lynch Lake South, Masterman Lake, North School Section Lake, Pat Lake, South School Section Lake, and Woodpile Lake were within the ecoregion range (Table 3). Benz Lake, Jackson WMA (Sinnits) Pond, and Plaisted Lake were better than the ecoregion range.

III.C.6. Temperature and Dissolved Oxygen

In addition to surface water measurements, temperature and dissolved oxygen data were recorded during each sampling event. Temperature and dissolved oxygen were recorded at one-meter increments from the surface to the lake bottom. The data collected from these profiles are housed by WCD and are available upon request, or are available via the MPCA website (https://webapp.pca.state.mn.us/wqd/surface-water).

These data show the extent of summer stratification and are useful in identifying the thermocline (the layer of water in which the temperature rapidly declines), if one exists. As a lake stratifies, the water column becomes more stable and mixing is less likely to occur. If mixing occurs during the growing season, benthic nutrients become available and can result in increased algal production. As a general rule of thumb, shallow lakes are constantly mixed by wind, wave action, and precipitation, while lakes deeper than 20 feet often stratify. Shallow lakes can loosely stratify if they are protected from wind, during calm weather periods, or if enough algae and aquatic plants exist near the surface to block out solar radiation near the bottom.

In 2025 Bass Lake East, Bass Lake West, Brewer's Pond, Goggins Lake, Long Lake, Lynch Lake South, Pat Lake, South School Section Lake, and Woodpile Lake stratified to some degree during the monitoring season. These lakes may have benefited from reduced internal loading due to the lack of mixing of nutrient-rich waters near the lake bottom. Details on the depth of the thermocline for each lake that stratified can be found in Appendix A. The other nine lakes in the district did not significantly stratify in 2025, meaning nutrients from internal loading were available for algal growth during the entire growing season.

III.C.7. Elevations

Lake elevations rose throughout the mid-monitoring season due to several severe precipitation events, which is contrasted by previous year's drought conditions. Peak elevation for the year on nearly every basin occurred in mid-August or early Sepember, rising after several storm events. In 2020, twelve basins maintained elevations above their regulated Ordinary High Water (OHW) level. In contrast, only five basins were above their OHW during 2025; Goggins Lake, Heifort's Pond, North School Section Lake, Plaisted Lake, and South School Section Lake. Elevation

charts for each lake monitored can be found in Appendix A or using the MN DNR's Lake Finder (http://www.dnr.state.mn.us/lakefind/index.html).

III.C.8. Alkalinity, Hardness, and Chloride

Some lakes in the watershed district have been found to support rare aquatic plant communities which only thrive in soft water conditions typically found in lakes north of St. Cloud, MN and in northern Wisconsin within specific geologic contexts. Each of the eighteen basins were sampled for alkalinity and hardness in mid-summer and early fall to determine which lakes may be suitable for rare plant species requiring these settings. It was found nearly all lakes in the District have suitable water chemistry for these species. These data will be used to help support rare plant conservation in the District.

Spring and summer chloride monitoring was also conducted on all three basins of Long Lake and Jackson WMA (Sinnits) Pond in relation to the chloride impairment on Long Lake. No results exceeded the chronic level chloride standard of 230 mg/L. Alkalinity, hardness, and chloride sampling results can be found in the table below.

Table 4. Alkalinity, Hardness, and Chloride Results

Lake	Alkalinity July Result (mg/l_CaCO3)	Alkalinity September Result (mg/l_CaCO3)	Hardness July Result (mg/l_CaCO3)	Hardness September Result (mg/l_CaCO3)	Calcium July Result (mg/L)	Calcium September Result (mg/L)	Magnesium July Result (mg/L)	Magnesium September Result (mg/L)	Spring Chloride Result (mg/L)	Summer Chloride Result (mg/L)
Bass East	22	27	32.9	30.1	7.3	6.7	3.6	3.2		
Bass West	21	31	38.7	43.0	8.5	9.5	4.2	4.7		
Benz	28	26	40.1	48.9	8.5	11.0	4.6	5.2		
Brewer's	23	22	42.7	44.6	9.1	9.2	4.8	5.2		
Goggins	24	30	46.0	47.1	10.5	10.7	4.8	5.0		
Heifort's	<15	<15	21.9	22.7	5.2	5.2	2.2	2.3		
Jackson WMA (Sinnits)	<15	29	41.6	33.2	10.7	8.3	3.6	3.0	58.1	46.5
July Ave	20	30	35.4	44.3	7.5	10.2	4.0	4.6		
Kismet	29	30	45.9	44.1	10.4	10.3	4.8	4.5		
Long (North Basin)	29	27	41.9	33.4	10.7	8.4	3.7	3.0	67.8	60.4
Long (Middle Basin)									130.0	26.8
Long (South Basin)									140.0	13.4
Lynch North	<15	<15	12.9	14.3	2.8	3.4	1.4	1.4		
Lynch South	<15	<15	11.3	11.3	2.5	2.5	1.2	1.2		
Masterman	16	16	24.6	25.0	5.2	5.5	2.8	2.7		
North School Section	25	27	46.2	44.0	10.6	10.2	4.8	4.5		
Pat	20	21	28.8	26.3	6.0	5.6	3.3	3.0		
Plaisted	16	<15	58.9	63.1	13.2	14.3	6.3	6.7		
South School Section	34	35	56.5	57.5	13.1	13.3	5.8	5.9		
Wood Pile	19	22	49.8	52.0	11.2	12.0	5.3	5.3		

IV. STREAM AND STORMWATER MONITORING

IV.A. Locations and Parameters

In 2025, BCWD monitored four stations on Brown's Creek, two stations in the Long Lake subwatershed, one station at the Diversion Structure in the diversion drainage, and one tributary to Brown's Creek (Table 1 and Figure 1). The stations on Brown's Creek were located at Manning Avenue (Highway 15), McKusick Road, Stonebridge Trail (Stonebridge), and the intersection of Minnesota State Highways 95 & 96 (the Outlet). The two tributaries to Long Lake were monitored at 62nd Street and the Marketplace Pond. The tributary to Brown's Creek (McKusick Wetland Outlet) was monitored approximately 100 feet upstream of the McKusick Road station. Parameters monitored at each location can be found in the table below.

Table 5. Parameters Monitored at Each Station

	Continuous (15 Minute)									Discrete																								
	Stage	Velocity	Discharge	Precipitation	Temperature	Dissolved Oxygen	Specific Conducivity	Turbidity	pH	Temperature	Dissolved Oxygen	Specific Conducivity	pH	Total Phosphorus (TP)	Dissolved Phosphorus	Total Kjeldahl Nitrogen (TKN)	Total Suspended Solids (TSS)	Volatile Suspended Solids (VSS)	Copper	Nickel	Lead	Zinc	Cadmium	Chromium	Chloride	Calcium	Magnesium	Nitrate plus Nitrite	Ammonia	Hardness	E. Coli	Sulfate	Alkalinity	Ortho Phosphorus
Brown's Creek at Hwy 15	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X			
Brown's Creek at McKusick Road	X	X	X		X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X			
Brown's Creek at Stonebridge Trail	X	X	X		X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X			
Brown's Creek Outlet	X	X	X		X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	X
Brown's Creek Diversion	X	X	X		X					X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O				
Tributary to Long Lake at 62nd St.	X		X							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
Tributary to Long Lake at Marketplace Pond	X	X	X	X										O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O				
McKusick Wetland Outlet	X	X	X		X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				

X= Monitored and/or grab samples only

O= Grab and composite samples

IV.B. Methods

The Highway 15, McKusick Road, Stonebridge, Outlet, Marketplace Pond, and Diversion Structure monitoring stations utilized automated water quality samplers consisting of a stage/velocity sensor, data logger, bottle carousel containing 24 sample bottles, strainer, intake tubing, solar panel, deep cycle marine battery, and steel enclosure. Discharge was calculated using a rating curve based on permanent staff gauges at Highway 15, McKusick Road, Stonebridge, and the Outlet, while discharge at Marketplace Pond and the Diversion Structure was calculated using an area-velocity relationship. Continuous precipitation data were collected at Highway 15 and Marketplace Pond using tipping bucket rain gauges to assist in loading calculations, but are not discussed in this summary. The samplers were programmed to collect automated flow weighted storm composite samples triggered by a rise in stage. Manual grab samples were taken during storm conditions if it was determined the automated sampler had malfunctioned or had not yet been installed. Monthly manual grab samples during base flow

conditions were attempted at these sites, although the Tributary to Long Lake at Marketplace Pond is often dry or stagnant during non-event periods. *E.coli* samples were collected at the same time as the base grab samples when possible. Continuous temperature, dissolved oxygen, specific conductivity, pH, and turbidity at the four stations on Brown's Creek were collected using long term deployed sondes, and secondary temperature loggers were deployed to fill data gaps created by malfunctions of the primary sonde. Sondes were also used to collect continuous pH at McKusick Road, Stonebridge and the Outlet. Stand-alone temperature loggers were used to collect temperature data at the Diversion Structure and McKusick Wetland Outlet.

It must be noted the sampling strategy at the Outlet, at the direction of Metropolitan Council Environmental Services's (MCES) Watershed Outlet Monitoring Program (WOMP), was changed to a manual grab sample on the same day every other week regardless of flow conditions, and the composite sampler was to be programmed to capture only major events. MCES installed a new data logger and refrigerated sampler in 2019, and five storm composite samples were collected in 2025. Some analytes such as metals, sulfate, ortho phosphorus, alkalinity, and hardness were changed to be analyzed quarterly. The goal of this strategy is to create a more robust dataset that is better suited for long term statistical trend analysis and impairment assessment. However, the change in sampling methods causes an apparent shift to lower nutrient loading totals due to differences in load calculation methods, as well as the timing of samples with respect to precipitation events. A limitation of grab sampling is the sample occurs at a discrete point in time and often misses the peak load which is most likely to occur on the rising limb or at the peak flow of a storm. This can lead to artificially low loading estimates, whereas composite sampling captures multiple samples throughout the storm and can provide more accurate data for loading calculations but is less appropriate for trend analysis due to bias and variation in each storm event.

The Tributary to Long Lake at 62nd Street station was monitored using a stage sensor only, and discharge during the monitoring period was estimated based on stage and discharge data collected in previous years. The McKusick Wetland Outlet station was monitored using a stage/velocity sensor, and discharge was calculated using an area-velocity relationship. Similar to other stations, monthly manual grab samples were collected during base flow conditions, and grab samples were attempted during storm events.

All samples collected were analyzed by the MCES Lab and reviewed by WCD staff. All continuous data were quality assured, quality controlled, and analyzed by WCD staff, with the exception of the Outlet stage, discharge, and loading, which were reviewed and analyzed by MCES. More detailed standard operating procedures used by WCD and MCES for water sampling, monitoring, and data management are available upon request.

IV.C. Results and Discussion

IV.C.1. Brown's Creek

Brown's Creek is classified as a 2A water by the State of Minnesota, meaning it is designated for aquatic life and recreation, and should support a cold water fishery, aquatic life, and their habitats. The creek is listed as impaired by the MPCA due to a lack of cold water fish assemblages and low scores for indices of biological integrity (IBI) as described in the 2010 Brown's Creek Biota TMDL, and two reaches are impaired for *E.coli*. The stressors identified which contribute to these conditions are high total suspended solids (TSS), high temperature, low dissolved oxygen, high copper concentrations, and high nitrate-nitrite concentrations. The lower reaches of the creek where groundwater inputs help to cool the stream do support a trout fishery with some natural reproduction, and is annually stocked by the MN DNR. The following sections will make comparisons between the parameters monitored and state standards for 2A waters as described in the Minnesota Administrative Rules Part 7050.0222, as well as recommendations and goals set forth in the TMDL study. A summary of the standards and goals can be found in Table 6**.**

Table 6. State Standards for 2A and 2B Waters and Brown's Creek Biota TMDL Goals

Parameter	Class 2A Waters	Class 2B Waters	TMDL Goal
Total Phosphorus (TP)	0.100 mg/L	0.100 mg/L	N/A
Total Suspended Solids (TSS)	10 mg/L (Apr 1 to Sept 30)	30 mg/L (Apr 1 to Sept 30)	23 mg/L (10 NTU equivalent)
Chloride (Chronic)	>230 mg/L	>230 mg/L	N/A
Dissolved Oxygen (Daily Minimum)	7 mg/L	5 mg/L	7 mg/L
pH	<6.5 or >8.5	<6.5 or >8.5	N/A
Temperature	N/A	N/A	18.3 ºC (Threat), 23.9 ºC (Critical)

1a. Discharge

Total discharge was slightly higher than the year prior at each station on Brown's Creek. The total amount of water discharged to the St. Croix River as measured at the Outlet was 268,491,496 cubic feet, and was slightly lower than the ten year average. Calculated discharge for each site can be seen in Table 11. The Brown's Creek and Long Lake 2020 Trend Analysis completed by EOR shows there is a statistically significant increasing trend in overall streamflow at all stations except the Outlet, after construction of the Diversion Structure. Base flow also shows a statistically significant increasing trend at all sites except the Outlet. Increased base flow is considered beneficial for cooling the stream and maintaining dissolved oxygen concentrations.

According to the National Weather Service (NWS) station in Stillwater the total precipitation for 2025 was 35.27 inches; 1.42 inches above the thirty year average. Precipitation was well above average in March, June, and July, with a combined departure of +5.61 inches during these months. This was followed by a dry late summer and fall, with a combined departure for September through November of -2.71 inches. Several

intense storms produced significant runoff events, with four storms exceeding two inches of rain observed. The most significant precipitation event occurred May 20-22, where a storm total of 3.18 inches of precipitation was recorded.

1b. Phosphorus & Sediment

The total phosphorus (TP) and total suspended solids (TSS) loads increased at all sites when compared to 2024 (Table 11, Figure 3, and Figure **4**). The TP load discharged to the St. Croix River at the Outlet was 2,893 pounds, which equates to 0.626 pounds per acre of watershed land. For reference, the load at the Outlet was near the median value since calculations began in 2000. The state standard for TP is 0.100 mg/L; manual grab samples exceeded the standard for sites in February, March, and May through September due to the wet conditions. Nutrient water chemistry results for each site and sample can be found in Table 7-Table 10. TP flow weighted mean concentrations show a statistically significant decreasing trend over the most recent ten year period at Stonebridge and the Outlet according to EOR's trend analysis. There are no statistically significant long term trends, although the overall pattern for TP concentrations appears to be improving in the lower reaches of the creek. Short term trends show statistically significant improving conditions at Stonebridge and the Outlet.

The TSS load exported to the St. Croix River was 648,136 pounds, or 140.17 pounds per acre of watershed land. For reference, the TMDL goal for the creek is 74 pounds per acre. This is a departure from conditions observed during the droughts from 2021-2023, when the creek did meet the TMDL goal. It is important to note that in-stream construction activities as part of the streambank and floodplain restoration project on Neal Avenue in 2024 very likely contributed to high TSS concentrations as sediment from the work flushes through the creek. For reference, the McKusick Road monitoring station exhibited the highest sediment load recorded since 2016, since it is closest to the restoration area and sediment washed through the site during each storm event. Increased sediment loads were not as dramatic at Stonebridge or the Outlet, but were elevated compared to previous years under similar flow conditions. The impact to the creek is temporary and the long term benefits of the project are expected to outweigh these impacts.

While the state standard for TSS is 10 mg/L from April 1 to September 30, the target concentration identified in the TMDL is 23 mg/L. The target concentration specific to Brown's Creek of 23 mg/L correlates to the former state standard for turbidity of 10 NTU, but has since been replaced by the river eutrophication standards which use TSS concentration to assess impairment status. The state TSS standard was exceeded at the Outlet for May through September. The TMDL goal of 23 mg/L was met at all sites under base flow conditions, but the annual flow weighted mean concentration (annual load divided by annual discharge) at the Outlet was 38.7 mg/L. Site and sample specific results

can be found in Table 7-Table 10. No statistically significant long term trends in TSS exist at any station according to EOR's trend analysis. However, the most recent ten year period does show significant trends for decreasing flow weighted mean concentrations for TSS at McKusick Road, Stonebridge, and the Outlet.

A summary of site specific total loads and loading per acre of watershed area can be found in Table 11 and detailed loading tables describing hourly intervals for the year can be found in Appendix B. Discrete measurements of dissolved oxygen, temperature, pH, and specific conductivity can also be found in Appendix B. TP concentrations and loads moving on flow paths through the watershed can be seen in Appendix C.

Table 7. Brown's Creek at Highway 15 2025 Chemistry Results

Sample Type	Start	End	TSS (mg/L)	VSS (mg/L)	TKN (mg/L)	TP (mg/L)	Dissolved P (mg/L)	*E. coli* (mpn/100 mL)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chloride (mg/L)	Nitrite + Nitrate N (mg/L)	Ammonia Nitrogen (mg/L)	Hardness (mg/L _CaCO3)
Storm Composite	5/20/2025 10:19	5/21/2025 13:16	169	97	3.76	0.407	0.053		3.680	1.940	2.170	11.500	0.159	2.840	12.4	<0.20	<0.06	109
Storm Composite	6/13/2025 7:55	6/14/2025 10:14	294	174	4.57	0.218	0.066		5.120	3.920	5.690	22.900	0.184	6.850	10.7	<0.20	<0.06	156
Storm Composite	6/25/2025 15:23	6/26/2025 13:03	165	99	3.27	0.449	0.086		2.440	1.660	2.240	11.200	0.224	2.890	8.9	<0.20	<0.06	113
Storm Composite	7/27/2025 20:58	7/28/2025 7:38	331	161	3.98	0.699	0.082		2.750	2.090	3.190	13.700	0.110	3.630	8.2	<0.20	<0.06	110
Storm Composite	8/9/2025 14:13	8/10/2025 12:59	168	92	4.20	0.797	0.072		2.610	1.950	2.880	13.100	0.122	2.980	12.3	<0.20	<0.06	166
Storm Composite	8/16/2025 11:01	8/17/2025 2:36	702	410	13.50	1.630	0.065		10.000	6.180	10.500	36.700	0.274	11.800	10.8	<0.20	<0.06	175
Base Grab	4/29/2025 8:21	4/29/2025 8:21	4	3	0.60	0.069	0.021								18.8	0.32	0.06	
Base Grab	5/14/2025 14:09	5/14/2025 14:09	9	6	0.59	0.102	0.031	56							16.5	0.41	<0.06	
Base Grab	6/11/2025 8:10	6/11/2025 8:10	5	3	0.54	0.119	0.042	167							14.4	0.25	0.09	
Base Grab	7/10/2025 10:26	7/10/2025 10:26	8	6	0.69	0.189	0.071	162								0.22	<0.06	198
Base Grab	8/5/2025 9:11	8/5/2025 9:11	5	3	0.58	0.122	0.039	64							13.7	0.33	<0.06	
Base Grab	9/8/2025 14:26	9/8/2025 14:26	6	4	0.41	0.080	0.022	118	<1.000	<0.500	<0.500	<5.000	<0.100	<2.500	15.0	0.46	<0.06	216
Base Grab	10/8/2025 10:28	10/8/2025 10:28	6	4	0.47	0.088	0.024	86							16.0	0.44	<0.06	

Exceeds Water Quality Standard
No Exceedance Determinable
Exceeds Chronic Standard
Exceeds Max Standard
Exceeds Final Acute Standard

Table 8. Brown's Creek at McKusick Road 2025 Chemistry Results

Sample Type	Start	End	TSS (mg/L)	VSS (mg/L)	TKN (mg/L)	TP (mg/L)	Dissolved P (mg/L)	*E. coli* (mpn/100 mL)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chloride (mg/L)	Nitrite + Nitrate N (mg/L)	Ammonia Nitrogen (mg/L)	Hardness (mg/L _CaCO3)
Storm Composite	4/21/2025 3:50	4/21/2025 11:05	3,470	632	10.30	1.650	0.042		10.500	8.300	8.300	38.000	0.259	12.700	23.4	0.42	0.11	182
Storm Composite	5/19/2025 23:11	5/21/2025 3:51	1,220	256	7.97	1.460	0.063		14.000	10.700	11.000	49.200	0.539	17.100	19.4	0.23	<0.06	153
Storm Composite	6/13/2025 0:57	6/13/2025 9:32	1,500	327	9.38	1.290	0.064								21.4	0.52	0.10	
Storm Composite	6/25/2025 12:25	6/25/2025 18:01	3,220	916	15.50	2.060	0.057		20.200	15.000	17.500	75.700	0.461	23.900	17.2	0.38	<0.06	192
Storm Composite	7/27/2025 20:35	7/28/2025 1:17	867	145	4.46	0.791	0.087		8.470	6.410	6.520	28.600	0.159	8.850	13.4	0.30	0.08	112
Storm Composite	8/9/2025 5:06	8/9/2025 12:56	172	51	2.23	0.490	0.089		4.280	3.100	2.670	14.300	0.155	3.900	23.7	0.30	<0.06	169
Storm Composite	8/15/2025 19:12	8/17/2025 10:26	61	24	1.20	0.256	0.083		1.280	1.120	0.729	5.320	<0.100	<2.500	19.6	<0.20	<0.06	140
Base Grab	4/29/2025 8:48	4/29/2025 8:48	4	3	0.68	0.072	0.035								23.8	0.34	<0.06	
Base Grab	5/14/2025 14:22	5/14/2025 14:22	6	3	0.61	0.093	0.042	79							24.5	0.31	<0.06	
Base Grab	6/11/2025 8:24	6/11/2025 8:24	10	4	0.66	0.132	0.056	98							24.1	0.28	<0.06	
Base Grab	7/10/2025 9:46	7/10/2025 9:46	11	7	0.78	0.234	0.097	326								0.24	0.07	212
Base Grab	8/5/2025 8:19	8/5/2025 8:19	8	4	0.65	0.203	0.055	260							29.1	0.28	<0.06	
Base Grab	9/8/2025 15:08	9/8/2025 15:08	7	4	0.40	0.074	0.028	818	<1.000	0.866	<0.500	<5.000	<0.100	<2.500	24.4	0.40	<0.06	227
Base Grab	10/8/2025 10:06	10/8/2025 10:06	6	3	0.43	0.081	0.031	231							24.1	0.45	<0.06	

Exceeds Water Quality Standard
No Exceedance Determinable
Exceeds Chronic Standard
Exceeds Max Standard
Exceeds Final Acute Standard

Table 9. Brown's Creek at Stonebridge 2025 Chemistry Results

Sample Type	Start	End	TSS (mg/L)	VSS (mg/L)	TKN (mg/L)	TP (mg/L)	Dissolved P (mg/L)	*E. coli* (mpn/100 mL)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chloride (mg/L)	Nitrite + Nitrate N (mg/L)	Ammonia Nitrogen (mg/L)	Hardness (mg/L _CaCO3)
Storm Composite	4/21/2025 3:59	4/21/2025 5:58	85	34	1.69	0.248	0.032		2.400	1.810	1.290	9.680	<0.100	2.980	22.9	0.38	0.08	156
Storm Composite	5/19/2025 23:21	5/20/2025 11:52	183	51	2.71	0.422	0.046		4.080	2.970	2.610	15.200	<0.100	4.320	21.9	0.24	<0.06	166
Unknown Event Grab	7/10/2025 9:24	7/10/2025 9:24	113	20	1.21	0.406	0.080	308								0.28	0.08	211
Storm Composite	7/27/2025 20:50	7/28/2025 1:01	626	124	4.03	0.866	0.080		8.100	5.740	5.360	30.400	0.159	7.960	12.1	0.28	0.08	95
Base Grab	4/29/2025 8:36	4/29/2025 8:36	4	3	0.70	0.071	0.035								24.1	0.32	<0.06	
Base Grab	5/14/2025 14:42	5/14/2025 14:42	9	4	0.67	0.098	0.043	75							25.1	0.34	0.06	
Base Grab	6/11/2025 8:38	6/11/2025 8:38	3	<3	0.51	0.078	0.045	140							58.4	<0.20	<0.06	
Base Grab	8/5/2025 9:12	8/5/2025 9:12	6	3	0.61	0.178	0.079	261							28.1	0.26	<0.06	
Base Grab	9/8/2025 14:52	9/8/2025 14:52	8	4	0.37	0.085	0.030	326							24.7	0.41	<0.06	
Base Grab	10/8/2025 9:46	10/8/2025 9:46	8	4	0.44	0.086	0.032	162							24.3	0.44	<0.06	

Exceeds Water Quality Standard
No Exceedance Determinable
Exceeds Chronic Standard
Exceeds Max Standard
Exceeds Final Acute Standard

Table 10. Brown's Creek Outlet 2025 Primary Chemistry Results

Sample Type	Start	End	TSS (mg/L)	VSS (mg/L)	TKN (mg/L)	TP (mg/L)	Dissolved P (mg/L)	Sulfate (mg/L)	Ortho P (mg/L as P)	Alkalinity (mg/L_CaCO3)	*E. coli* (mpn/100 mL)
Scheduled Grab	1/15/2025 15:15	1/15/2025 15:15	20	3	0.23	0.059	0.022		0.020		6
Scheduled Grab	1/29/2025 11:20	1/29/2025 11:20	5	<3	0.21	0.045	0.022		0.019		38
Scheduled Grab	2/13/2025 11:26	2/13/2025 11:26	3	<3	<0.20	0.042	0.022		0.019		15
Scheduled Grab	2/25/2025 10:35	2/25/2025 10:35	10	4	0.83	0.119	0.066		0.052		122
Duplicate Grab	2/25/2025 11:08	2/25/2025 11:08	7	3	0.76	0.116	0.066		0.059		248
Scheduled Grab	3/12/2025 10:10	3/12/2025 10:10	6	<3	0.67	0.305	0.151	6.52	0.038	146	37
Scheduled Grab	3/25/2025 9:55	3/25/2025 9:55	3	<3	0.28	0.044	0.024		0.013		10
Scheduled Grab	4/9/2025 10:40	4/9/2025 10:40	9	3	0.40	0.053	0.023		0.011		13
Storm Composite	4/21/2025 3:10	4/21/2025 12:58	74	22	1.31	0.200	0.034				
Scheduled Grab	4/23/2025 9:12	4/23/2025 9:12	5	<3	0.66	0.066	0.033		0.014		19
Scheduled Grab	5/6/2025 9:47	5/6/2025 9:47	6	3	0.54	0.062	0.030		0.018		108
Storm Composite	5/20/2025 7:48	5/20/2025 16:19	271	75	3.52		0.055				
Scheduled Grab	5/21/2025 14:02	5/21/2025 14:02	95	22	1.54	0.207	0.052		0.038		488
Scheduled Grab	6/4/2025 13:48	6/4/2025 13:48	30	11	0.90	0.140	0.056	3.78	0.044	169	285
Storm Composite	6/13/2025 7:17	6/13/2025 21:38	88	36	1.83	0.280	0.057				
Scheduled Grab	6/18/2025 9:28	6/18/2025 9:28	14	6	0.62	0.126	0.067		0.054		326
Storm Composite	6/25/2025 14:26	6/26/2025 0:59	259	85	3.36	0.596	0.094				
Scheduled Grab	7/2/2025 9:43	7/2/2025 9:43	22	8	0.97	0.430	0.177		0.151		261
Scheduled Grab	7/16/2025 10:10	7/16/2025 10:10	85	28	1.02	0.369	0.072		0.067		1,733
Scheduled Grab	7/30/2025 8:46	7/30/2025 8:46	25	8	1.03	0.294	0.136		0.102		770
Scheduled Grab	8/13/2025 9:29	8/13/2025 9:29	6	<3	0.52	0.158	0.071		0.059		214
Storm Grab	8/18/2025 10:46	8/18/2025 10:46	31	10	1.02	0.220	0.091		0.074		
Scheduled Grab	8/27/2025 9:07	8/27/2025 9:07	16	5	0.50	0.128	0.045		0.036		119
Scheduled Grab	9/10/2025 8:32	9/10/2025 8:32	5	3	0.32	0.080	0.037	6.67	0.030	121	124
Storm Composite	9/20/2025 3:45	9/22/2025 8:03	120	45	2.28	0.426	0.083		0.064		
Scheduled Grab	9/24/2025 8:46	9/24/2025 8:46	11	5	0.63	0.109	0.055		0.041		201
Scheduled Grab	10/7/2025 14:23	10/7/2025 14:23	5	<3	0.34	0.074	0.042		0.037		119
Scheduled Grab	10/22/2025 9:10	10/22/2025 9:10	5	3	0.28	0.066	0.034		0.138		107
Scheduled Grab	11/5/2025 12:20	11/5/2025 12:20	<3	<3	0.24	0.051	0.032		0.018		26
Scheduled Grab	11/19/2025 12:21	11/19/2025 12:21	3	<3	0.23	0.044	0.024		0.021		18
Scheduled Grab	12/3/2025 10:25	12/3/2025 10:25	16	<3	0.24	0.046	0.021	8.79	0.020	186	131
Scheduled Grab	12/17/2025 11:20	12/17/2025 11:20	17	3	0.31	0.058	0.021		0.014		34
Scheduled Grab	12/31/2025 11:02	12/31/2025 11:02	19	5	0.36	0.070	0.020		0.010		18

Exceeds Water Quality Standard

Table 11. Brown's Creek Historic Loading- Latest Ten Years

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Brown's Creek at Highway 15										
Discharge (cf)	152,081,358	135,660,983	129,764,024	201,962,562	148,727,410	117,049,943	98,760,517	94,107,164	100,591,203	119,368,127
Total pounds of Phosphorus exported	1,736	831	1,182	1,406	1,072	690	567	659	838	1,279
TP (lbs/ac/yr)	0.492	0.235	0.335	0.398	0.303	0.195	0.161	0.187	0.237	0.362
Total pounds of TSS exported	239,237	105,900	132,765	136,203	128,722	46,409	59,093	52,665	91,374	288,988
TSS (lbs/ac/yr)	67.73	29.98	37.59	38.56	36.44	13.14	16.73	14.94	25.87	81.82
Brown's Creek at McKusick Road										
Discharge (cf)	229,482,654	192,485,489	179,429,476	340,391,004	234,134,803	196,267,817	163,409,449	163,853,967	158,481,122	191,931,114
Total pounds of Phosphorus exported	3,059	1,766	1,602	4,062	2,204	1,386	1,282	1,432	1,803	2,474
TP (lbs/ac/yr)	0.765	0.442	0.401	1.016	0.551	0.347	0.321	0.358	0.451	0.619
Total pounds of TSS exported	1,646,798	638,650	404,296	978,014	471,464	234,226	172,292	189,377	508,266	1,072,318
TSS (lbs/ac/yr)	411.80	159.70	101.10	244.56	117.90	58.57	43.08	47.36	127.10	268.15
Brown's Creek at Stonebridge										
Discharge (cf)	224,138,246	232,701,338	225,604,711	368,848,809	235,850,584	192,272,282	168,072,167	164,126,900	173,826,291	208,855,854
Total pounds of Phosphorus exported	2,778	2,229	1,946	3,948	2,186	1,556	1,363	1,372	1,781	1,966
TP (lbs/ac/yr)	0.663	0.532	0.465	0.942	0.522	0.371	0.325	0.327	0.425	0.469
Total pounds of TSS exported	1,187,547	718,290	515,386	825,635	437,876	256,270	241,966	173,619	488,806	477,596
TSS (lbs/ac/yr)	283.49	171.47	123.03	197.10	104.53	61.18	57.76	41.45	116.69	114.01
Brown's Creek Outlet										
Discharge (cf)	284,583,206	278,020,037	267,105,859	447,411,048	386,269,467	249,448,143	220,440,000	219,500,000	261,552,581	268,491,496
Total pounds of Phosphorus exported	3,514	2,275*	2,315*	4,833*	4,289*	1,566*	1,219*	1,494*	2,563*	2,893*
TP (lbs/ac/yr)	0.760	0.492	0.501	1.045	0.928	0.339	0.264	0.323	0.554	0.626
Total pounds of TSS exported	1,114,674	498,032*	400,729*	1,286,424*	1,137,017*	317,962*	172,589*	251,417*	507,151*	648,136*
TSS (lbs/ac/yr)	241.06	107.71	86.66	278.21	245.89	68.76	37.32	54.37	109.68	140.17
	*Sampling regime and load estimation method changed									

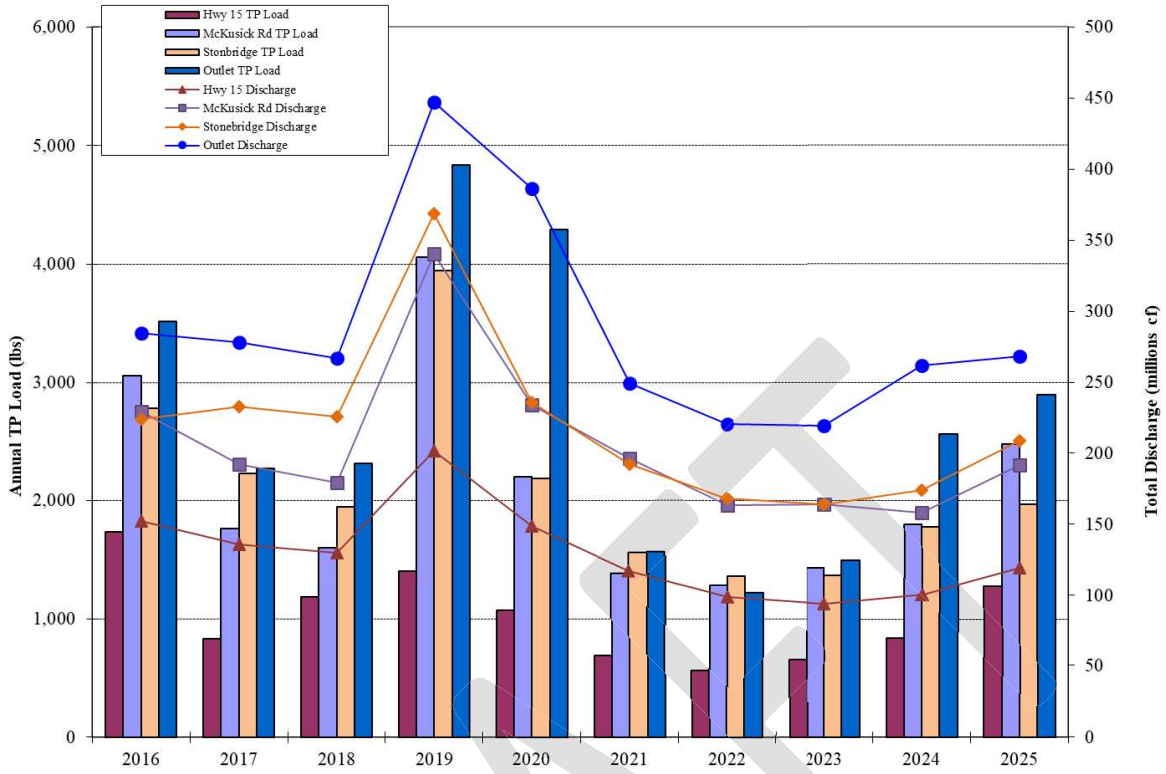


Figure 3. Brown's Creek Phosphorus Loading- Latest Ten Years

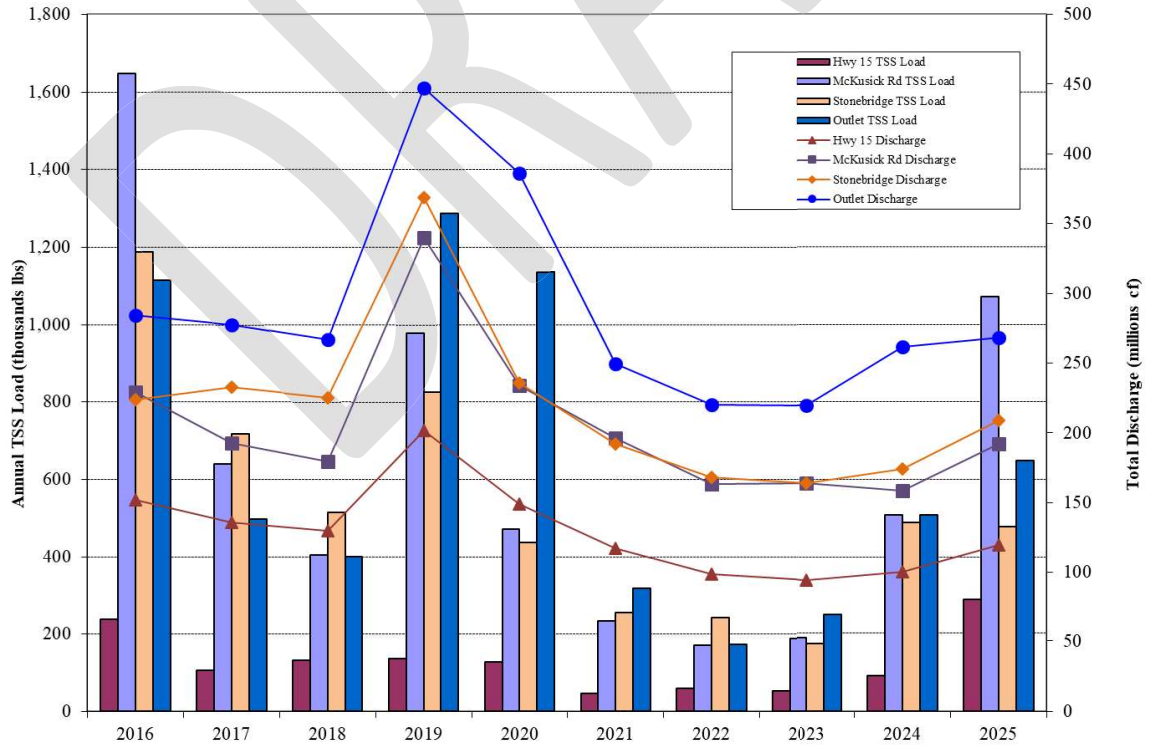


Figure 4. Brown's Creek Sediment Loading- Latest Ten Years

1c. Metals

One of the stressors identified in the TMDL study is high concentrations of copper, which are harmful to aquatic life. Additionally, other metals such as lead and zinc can be toxic to aquatic organisms. Standards for such metals are variable based on the hardness of the water which affects the level of toxicity a given concentration has. Under soft water conditions (low hardness) metals are more readily taken up by aquatic organisms, increasing the toxicity of the concentrations of metals in the water. Calculation of metals standards are described in the Minnesota Administrative Rules Part 7050.0222 and are divided into three categories of toxicity; chronic, maximum, and final acute value (FAV). The chronic standard protects organisms from long term exposure to a pollutant with minimal effects, the maximum standard from short term exposure with no or little mortality, and the FAV is the concentration at which mortality can be expected.

Heavy metals exceedances for each site and sample can be found in Table 7-Table 9, and Table 12. A small number of chronic level exceedances of lead were detected at Highway 15 and Stonebridge. Four chronic level exceedances of lead and two chronic level exceedances of copper were recorded at McKusick Road, which are the most since 2016. This is likely due to the restoration work around Neal Avenue and the high sediment load moving through the site. Sediments in this area often have heavy metals bound to them, and high TSS concentrations tend to be correlated with metals exceedances, possibly due to legacy pollution from pesticides and debris along the former rail line that was converted to the state trail that parallels McKusick Road. No exceedances were detected at the Outlet.

Chloride concentrations have not exceeded the state standard for chronic exposure of 230 mg/L, but the trend analysis completed by EOR shows there are statistically significant increasing loads for chloride at all monitoring stations. For reference, the highest chloride concentration recorded on the creek occurred at the Outlet on July 2 at 49.6 mg/L. Unlike many other pollutants, chloride has no natural attenuation once it is in water, and there are no known cost-effective ways to treat water contaminated with chloride. The District should continue to investigate ways to promote reductions in salt use and smart salt management, especially for water softener and road de-icing applications.

Table 12. Brown's Creek Outlet 2025 Secondary Chemistry Results

Sample Type	Start	End	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chloride (mg/L)	Nitrate N (mg/L)	Nitrite N (mg/L)	Ammonia Nitrogen (mg/L)	Hardness (mg/L_CaCO3)
Scheduled Grab	1/15/2025 15:15	1/15/2025 15:15							31.0	0.35	<0.06	<0.06	
Scheduled Grab	1/29/2025 11:20	1/29/2025 11:20							30.2	1.18	<0.06	0.06	
Scheduled Grab	2/13/2025 11:26	2/13/2025 11:26							29.7	1.38	<0.06	<0.06	
Scheduled Grab	2/25/2025 10:35	2/25/2025 10:35							35.4	1.15	<0.06	0.32	
Duplicate Grab	2/25/2025 11:08	2/25/2025 11:08							34.6	1.26	<0.06	0.26	
Scheduled Grab	3/12/2025 10:10	3/12/2025 10:10	<1.000	<0.500	<0.500	<5.000	<0.100	<3.000	25.1	0.78	<0.06	0.20	182
Scheduled Grab	3/25/2025 9:55	3/25/2025 9:55							27.2	0.96	<0.06	<0.06	
Scheduled Grab	4/9/2025 10:40	4/9/2025 10:40							29.0	0.66	<0.06	<0.06	
Storm Composite	4/21/2025 3:10	4/21/2025 12:58	2.370	1.600	0.940	15.900	<0.100	<3.000		0.43	<0.06	<0.06	173
Scheduled Grab	4/23/2025 9:12	4/23/2025 9:12							25.4	0.40	<0.06	<0.06	
Scheduled Grab	5/6/2025 9:47	5/6/2025 9:47							28.2	0.33	<0.06	<0.06	
Storm Composite	5/20/2025 7:48	5/20/2025 16:19	8.180	4.630	3.850	23.900	0.110	7.000		0.25	<0.06	<0.06	156
Scheduled Grab	5/21/2025 14:02	5/21/2025 14:02							18.8	<0.20	<0.06	<0.06	
Scheduled Grab	6/4/2025 13:48	6/4/2025 13:48	<1.000	0.990	<0.500	<5.000	<0.100	<3.000	22.9	0.35	<0.06	<0.06	187
Storm Composite	6/13/2025 7:17	6/13/2025 21:38	2.500	1.890	1.510	14.500	<0.100	<3.000		0.27	<0.06	<0.06	162
Scheduled Grab	6/18/2025 9:28	6/18/2025 9:28							29.4	0.64	<0.06	<0.06	
Storm Composite	6/25/2025 14:26	6/26/2025 0:59	6.010	4.230	3.550	20.100	0.150	6.000		0.24	<0.06	0.09	137
Scheduled Grab	7/2/2025 9:43	7/2/2025 9:43							49.6	<0.20	<0.06	<0.06	
Scheduled Grab	7/16/2025 10:10	7/16/2025 10:10							27.8	0.52	<0.06	<0.06	
Scheduled Grab	7/30/2025 8:46	7/30/2025 8:46							28.2	<0.20	<0.06	<0.06	
Scheduled Grab	8/13/2025 9:29	8/13/2025 9:29							41.0	0.51	<0.06	<0.06	
Storm Grab	8/18/2025 10:46	8/18/2025 10:46	1.280	1.000	0.620	<5.000	<0.100	<3.000	25.9	<0.20	<0.06	<0.06	131
Scheduled Grab	8/27/2025 9:07	8/27/2025 9:07							29.2	0.60	<0.06	<0.06	
Scheduled Grab	9/10/2025 8:32	9/10/2025 8:32	<1.000	<0.500	<0.500	<5.000	<0.100	<3.000	29.4	0.69	<0.06	<0.06	237
Storm Composite	9/20/2025 3:45	9/22/2025 8:03	4.030	2.560	2.220	40.000	<0.100	4.000	25.8	0.34	<0.06	0.15	190
Scheduled Grab	9/24/2025 8:46	9/24/2025 8:46							27.4	0.51	<0.06	<0.06	
Scheduled Grab	10/7/2025 14:23	10/7/2025 14:23							29.9	0.74	<0.06	<0.06	
Scheduled Grab	10/22/2025 9:10	10/22/2025 9:10							30.0	0.66	<0.06	<0.06	
Scheduled Grab	11/5/2025 12:20	11/5/2025 12:20							30.5	0.76	<0.06	<0.06	
Scheduled Grab	11/19/2025 12:21	11/19/2025 12:21							31.0	0.93	<0.06	<0.06	
Scheduled Grab	12/3/2025 10:25	12/3/2025 10:25	<1.000	<0.500	<0.500	<5.000	<0.100	<3.000	31.3	1.01	<0.06	<0.06	236
Scheduled Grab	12/17/2025 11:20	12/17/2025 11:20							29.8	1.04	<0.06	<0.06	
Scheduled Grab	12/31/2025 11:02	12/31/2025 11:02							29.2	1.00	<0.06	<0.06	

No Exceedance Determinable
Exceeds Chronic Standard
Exceeds Max Standard
Exceeds Final Acute Standard

1d. Bacteria (*E.coli*)

The sites on Brown's Creek are not meeting the state standard for *E.coli* for nearly all months regulated by the standard, and two reaches of the creek have been listed as impaired for bacteria. A summary table by month and site can be found in Table 13. The standard is defined as follows, and is based on the latest ten years of data as per MPCA protocol:

"*Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies only between April 1 and October 31.*"

Table 13. Monthly Geometric Means of *E.coli*- Latest Ten Years

Site	April	May	June	July	August	September	October
Highway 15	Insufficient Data	91	301	233	303	244	91
McKusick Road	Insufficient Data	121	364	659	416	258	109
Stonebridge	Insufficient Data	103	268	508	361	206	115
Brown's Creek Outlet	18	112	385	400	179	219	87

Exceeds geometric mean of 126 #/100mL from not less than 5 samples in a calendar month

10% of samples taken in the last 10 years exceed 1,260 #/100mL (Doesn't necessarily exceed geometric mean standard)

Previous studies have excluded human borne *E.coli* as a significant source of bacteria, indicating failing septic systems and illegal straight pipes are not contributing to the high levels of bacteria. Likely sources of bacteria include large congregations of geese around the McKusick Road area, beavers and muskrat in the upper reaches of the creek, and nearby livestock operations. Further studies will focus on species of wildlife and livestock to determine sources of bacteria. The trend analysis completed by EOR has shown statistically significant long term trends for decreasing *E.coli* concentrations at McKusick Road and Stonebridge, and an increasing trend at the Outlet over the most recent ten year period.

1e. Temperature & Dissolved Oxygen

The 2010 Brown's Creek Biota TMDL indicates a threat level temperature of 18.3 ºC and a critical level temperature of 23.9 ºC for trout survivability. The threat level impact as defined as physiological stress, reduced growth, and egg mortality. The critical level impact is defined as the point at which direct mortality can be expected. For the purposes of this summary, daily average temperatures are used to determine if impact levels have been reached.

Consistent with previous years, multi-parameter sondes were deployed at all four stations on the creek. Due to battery and logger malfunctions in years prior, secondary temperature loggers were deployed to minimize gaps in the temperature data created by the primary

loggers. However, these gaps will still exist in the dissolved oxygen period of record, as no secondary dissolved oxygen sensors were available. Metrics on the completeness of the dissolved oxygen record at each site in terms of the percentage of days that were logged vs the number of days the logger was physically deployed can be found in Table 15.

The number of daily average threat level temperature exceedances in the creek in 2025 was the highest in the latest ten years at McKusick Road, Stonebridge, and the Outlet, and the highest since temperature monitoring began in 2006 at McKusick Road and the Outlet (Table 14). The critical level was exceeded one day (June 22) at Highway 15, McKusick Road, and Stonebridge, which is the first time the daily average temperature has exceeded this threshold at any site since 2013. According to the NWS station in Stillwater air temperatures were in excess of 90 ºF six days of the season.

The higher than normal temperatures observed in the creek are likely due to a combination of factors. Most notably, a significant beaver dam has been constructed downstream of Manning Trail, between the Highway 15 and McKusick Road stations. Water levels around the Highway 15 station have risen and velocity has slowed dramatically, allowing the sun to heat the slow moving water. Second, the restoration work around Neal Avenue has removed buckthorn and other vegetation that provided stream shading. The planted native shrubs and grasses as part of the restoration have not yet matured to provide shading of the creek, and will allow some temporary warming of the creek for several years until the vegetation has grown enough to provide shading. Third, the McKusick Wetland Outlet tributary upstream of McKusick Road flowed all year instead of being offline for part of the summer. This tributary is known to contribute water that is around 2.5 ºC on average warmer than Brown's Creek. These factors have combined to produce some of the warmest temperatures ever recorded, and are likely having a negative impact on the coldwater biological community in the creek. The District should consider options to remove or alter the beaver dam in the upper reaches of the creek, as this appears to be having the most dramatic impact on stream temperature.

The warm temperatures in 2025 are a stark contrast to conditions recorded in 2022 and 2023 when some of the coolest temperatures ever recorded in the creek were observed in spite of warm, dry summers. This was especially encouraging given the conditions, and may indicate other thermal load reduction practices including riparian shade restorations, the Brown's Creek Park Rock Crib, and surface water diversions such as the Diversion Drainage and the Oak Glen Golf Course Irrigation Reuse projects were positively impacting the creek.

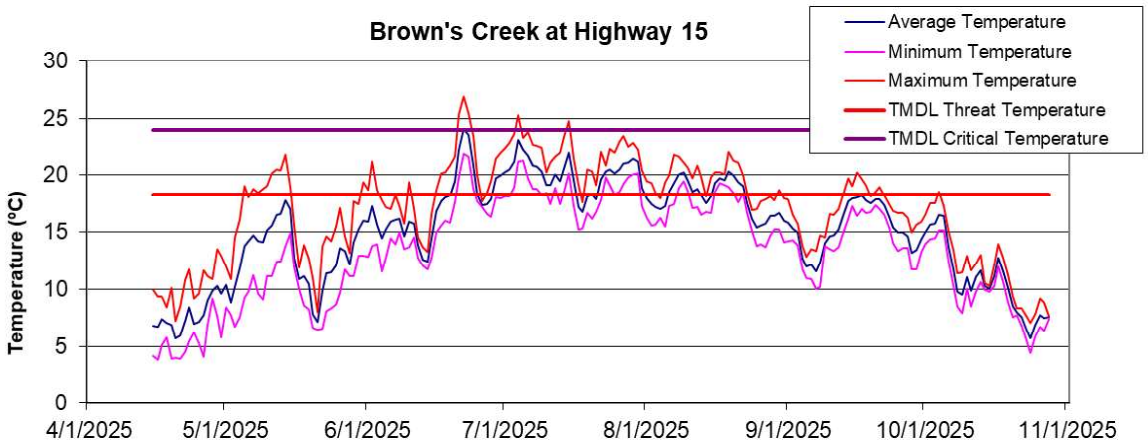


Figure 5. Brown's Creek at Highway 15 2025 Daily Temperature Summary

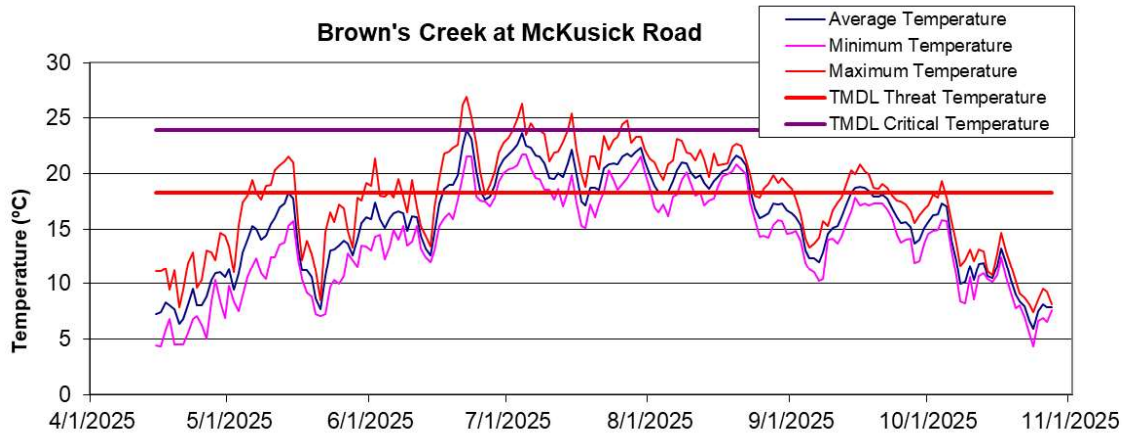


Figure 6. Brown's Creek at McKusick Road 2025 Daily Temperature Summary

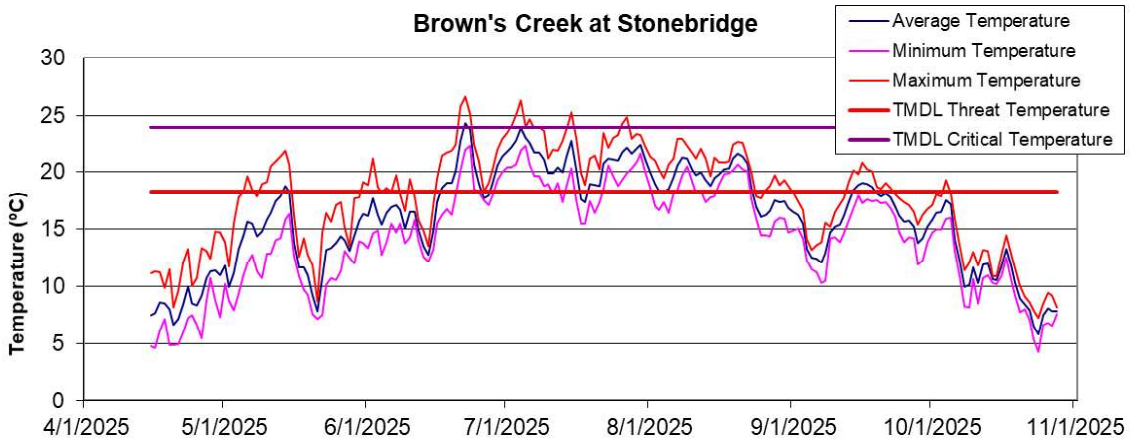


Figure 7. Brown's Creek at Stonebridge 2025 Daily Temperature Summary

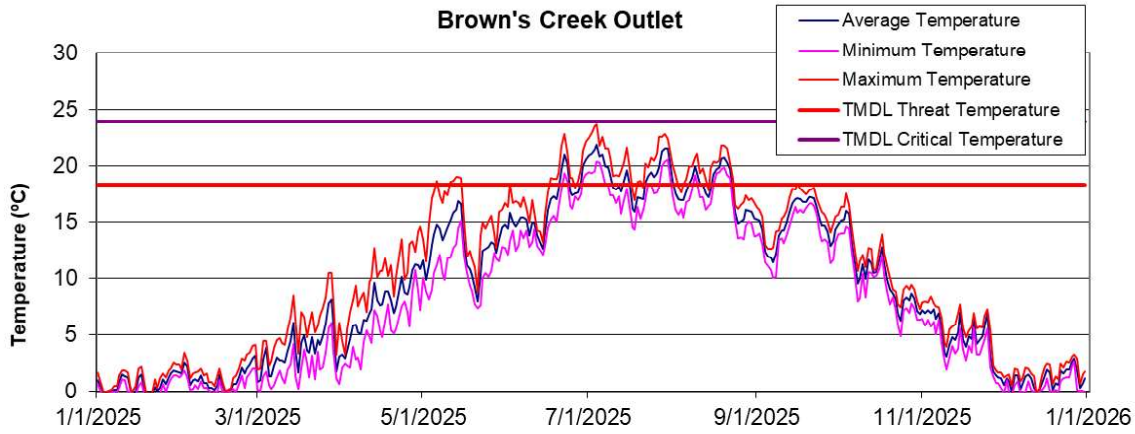


Figure 8. Brown's Creek Outlet 2025 Daily Temperature Summary

Table 14. Annual Occurrences of Brown's Creek Daily Average Temperature Greater than Threat and Critical Level Thresholds

	Exceedances at Highway 15		Exceedances at McKusick		Exceedances at Stonebridge		Exceedances at Outlet	
Year	18.3°C	23.9°C	18.3°C	23.9°C	18.3°C	23.9°C	18.3°C	23.9°C
2016	14*	0*	17*	0*	71	0	35	0
2017	54	0	43	0	48	0	8	0
2018	61	0	54	0	66	0	19	0
2019	31	0	36	0	42	0	20	0
2020	38	0	42	0	48	0	23	0
2021	47	0	39	0	54	0	11	0
2022	28	0	31	0	37	0	6	0
2023	34	0	35	0	49	0	4	0
2024	33	0	40	0	49	0	15	0
2025	47	1	67	1	71	1	42	0

* Based on severely limited period of record

The state standard for dissolved oxygen in 2A waters is 7 mg/L as a daily minimum. Logger malfunctions and sensor fouling limited the period of record at Highway 15, McKusick Road, and Stonebridge. Oxygen concentrations at Highway 15 were below the state standard 98.5% of the days monitored, likely due to the stream damming, and are unsuitable for trout survival (Table 15, Figure 9). The data collected show daily swings high above 7 mg/L at Highway 15 due to intense macrophyte growth, but drops well below the threshold at night.

Dissolved oxygen levels at McKusick Road were poorer than previous years, with 27 days being worse than the state standard. Again, this is likely influenced by the in-stream restoration work around Neal Avenue and stream damming.

Stonebridge continues to exhibit better conditions for trout survival, with 24 days monitored below the dissolved oxygen standard. However, temperatures at Stonebridge were above the threat level temperature threshold four days more than McKusick Road, indicating a slightly higher level of temperature stress as the creek flows through the golf course (Table 14 and Figure 7). Increased shading in the Oak Glen Golf Course buffer area and restoration project around Neal Avenue are expected to cool the water between the McKusick Road and Stonebridge sites, as well as increase oxygen levels.

Table 15. Daily Minimum Dissolved Oxygen Exceedances

Site	Days Monitored	Dissolved Oxygen Daily Minimum Below 7 mg/L	Percent of Days Exceeded	Record Completeness
Highway 15	136	134	98.5%	69.4%
McKusick Road	153	27	17.6%	78.1%
Stonebridge	152	24	15.8%	77.6%
Outlet	196	0	0.0%	100.0%

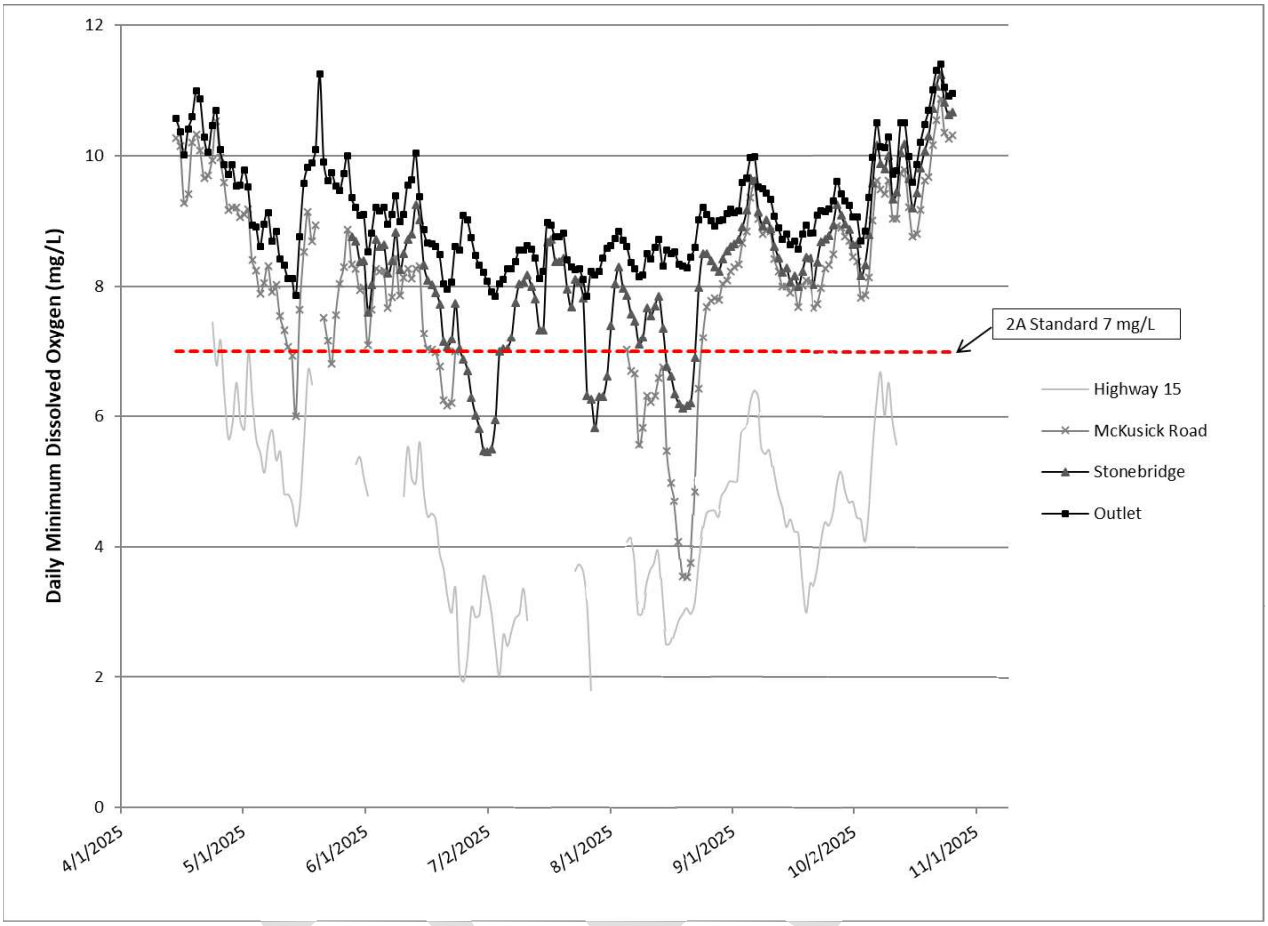


Figure 9. Daily Minimum Dissolved Oxygen in Brown's Creek

The Outlet continues to be the best location on Brown's Creek for trout survival. The average daily temperature exceeded the threat level threshold 42 days during the season, but was the only station without a critical level exceedance in 2025 (Table 14). This is due to cold groundwater inputs in the gorge upstream of the Outlet and a robust tree canopy to shade the stream. Daily minimum oxygen concentrations were suitable for trout for the entire season (Figure 9 and Appendix B).

The trend analysis completed by EOR shows there is a statistically significant long term cooling trend at the Outlet, and a long term cooling pattern at Stonebridge that is not statistically significant. The study also shows a long term statistically significant warming trend at McKusick Road. Dissolved oxygen concentrations show no statistically significant trends at any site, except the Outlet since construction of the Diversion Structure.

1f. Turbidity & Specific Conductivity

Turbidity and specific conductivity can be helpful for determining the amount of particles and dissolved materials in a stream. Turbidity measures the amount of light scattered by particles such as suspended sediment, phytoplankton, and bacteria while specific

conductivity measures electrical conductance of the water and is influenced by the amount of dissolved ions in the water. Excess turbidity can be detrimental to trout, since they are primarily sight feeders. It also typically indicates a high sediment load which can clog gills and cover spawning areas.

Continuous turbidity and specific conductivity were monitored at all four stations on Brown's Creek. Turbidity sensors on the multi-parameter sondes have the tendency to be covered by bedload sediment during storm events and can be fouled by algae growth on the sensor itself, leading to gaps in the record at some sites. To account for fouling, continuous turbidity data were converted to a daily average where at least three quarters of a day was successfully logged for comparison to a 10 NTU threshold, which correlates to the TMDL goal of 23 mg/L of TSS. Specific conductivity data are not discussed in this report as they do not directly apply to state standards or TMDL goals, but are available upon request. Turbidity data is also used to help determine storm and base flow periods for the TP and TSS load calculations in Appendix B. A summary of days successfully monitored for turbidity at each site can be found in Table 16 and average daily turbidity can be viewed in Figure 10.

Table 16. Brown's Creek Turbidity Standard Exceedances

Site	Days Monitored	Days Over 10 NTU	Percent of Days Exceeded	Record Completeness
Highway 15	129	13	10.1%	65.8%
McKusick Road	195	36	18.5%	99.5%
Stonebridge	150	28	18.7%	76.5%
Outlet	196	54	27.6%	100.0%

It is worth noting the creek tends to meet the 10 NTU goal during nearly all periods of base flow, indicating the majority of sediment and other sources of turbidity are being contributed during storm events (Figure 10). Turbidity was also significantly influenced by the recent in-stream restoration work around Neal Avenue. Due to dry conditions in the fall of 2024 and spring of 2025, a high amount of remnant sediment from the restoration work was present in the stream channel around Neal Avenue, which created significant bedload that sometimes caused sensor fouling at the downstream sites and appeared to contribute to higher than normal turbidity measurements at the Outlet. The turbidity sensor at Highway 15 was also frequently fouled by biofilms that the sensor wiper could not remove, which grew on the sensor due to the stagnant water conditions created by the beaver dams downstream of Highway 15. The Stonebridge logger was not able to be deployed for significant portion of the spring due to an internal battery failure that required manufacturer repair. The highest daily average turbidity at Highway 15, McKusick Road,

Stonebridge, and the Outlet were recorded during storms on September 20 (31 NTU), May 20 (47 NTU), June 25 (42 NTU), and May 20 (68 NTU), respectively.

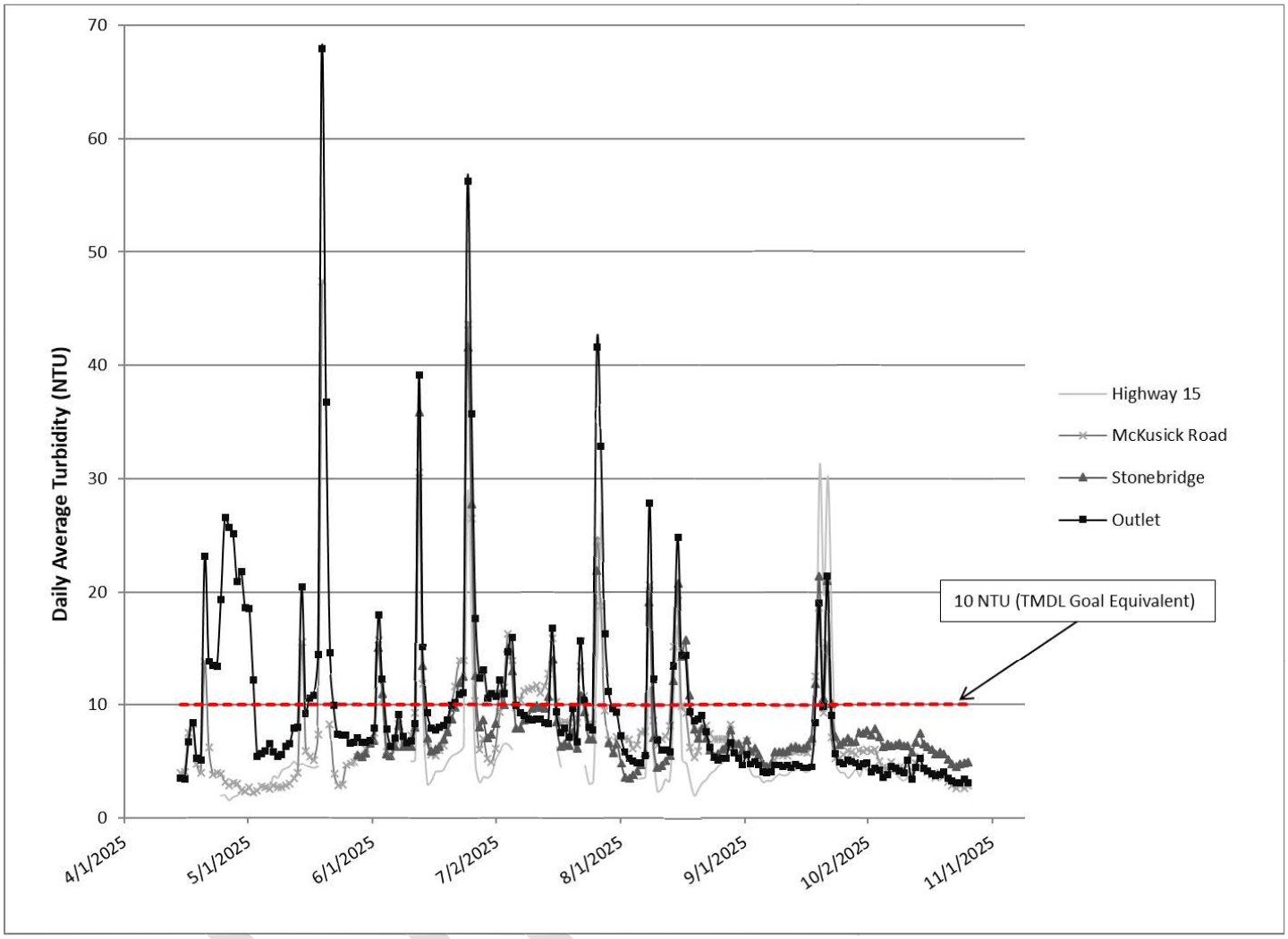


Figure 10. Brown's Creek Daily Average Turbidity

1g. Fisheries & Aquatic Invasive Species

Brown's Creek currently supports a brown and rainbow trout fishery dependent upon stocking in the lower reaches of the creek. Brown trout have been shown to have a limited amount of natural reproduction, and rainbow trout rely on stocking efforts. In 2020 the MN DNR switched from stocking brown trout to rainbow trout because they are easier to produce, grow larger and faster, and are stocked at a size that provides better recreational opportunity to anglers. Additionally, neither species is native to Minnesota, but they are considered naturalized and provide ecosystem and recreational benefits where native brook trout cannot survive at this time. MN DNR has a management plan to stock 1,000 yearling rainbows at the Outlet annually. Stillwater Area High School (SAHS) and the Minnesota

Trout Unlimited – Trout in the Classroom program also reared and stocked several hundred fingerling rainbow trout into the stream.

Fish and macroinvertebrate sampling conducted by the District's engineer and SAHS have identified many varieties of organisms present in the creek that need high quality, well oxygenated water to survive, such as rainbow darters. In May of 2025, SAHS students in Brown's Creek Park observed stonefly larvae, which also require very clean, well oxygenated water, already inhabiting the newly constructed rock riffles in the stream restoration area around Neal Avenue. Results of fish and macroinvertebrate samplings can be found on the District's website or are available upon request.

Field staff continue to observe heavy growth of invasive curly-leaf pondweed in the upper reaches of the creek at Highway 15 and above McKusick Road. Dense mats of vegetation can alter flow rates, nutrient transport in the stream, hinder efforts to make stream improvements by slowing the water, and create conditions for warmer temperatures and increased sediment deposition on potential spawning areas. The BCWD should continue to work with partners to limit, prevent, or manage the spread of curly-leaf pondweed downstream.

IV.C.2. Diversion Drainage

The Trout Stream Mitigation Project (TSMP), also known as the Diversion Structure, has been functioning since 2003 to divert warm water flows away from Brown's Creek through McKusick Lake to the St. Croix River (Table 1 and Figure 1). Diverting the water away from the creek protects it from additional thermal and sediment loads, improving conditions for trout and other cold water organisms. However, the water diverted away from the creek impacts its receiving waters: McKusick Lake and the wetland complex at the inlet to the lake. Therefore, monitoring is important to determine the load of pollutants discharged to the lake.

2a. Discharge

Discharge decreased slightly from the year prior to 60,305,225 cubic feet exported to McKusick Lake (Table 18). This volume of water is the fifth highest recorded since monitoring began in 2006. No water overtopped the Diversion Structure in 2025. The structure was designed to divert events up to the 1.5-year storm event under fully developed conditions. Since 2014 there have been five known events during which water has overtopped the structure and discharged directly to Brown's Creek, ranging from a few hours to a half-day. Although noteworthy, the volume of direct discharges has been minimal and have only occurred during major storm events, and likely have little impact on thermal and nutrient loads in the creek when the creek is already high with runoff. More importantly, the structure diverts the significantly warmer base flow and all moderate and minor runoff events in the drainage away from the creek, reducing thermal loads to Brown's Creek.

2b. Phosphorus & Sediment

The TP load to McKusick Lake was 416 pounds, or 0.108 pounds of phosphorus per acre of watershed land (Table 18). Despite the wetter than average year, the TP load was the sixth lowest recorded since monitoring began in 2006. Water flowing through the site met the 2B phosphorus standard at base flow for all but one samples collected, while storm event concentrations were much higher (Table 17). However, the trend analysis study shows statistically significant increasing concentrations of TP over both the short and long term in the drainage.

The TSS load was 73,469 pounds of sediment, equating to 19.06 pounds per acre of watershed land (Table 18). The state standard for 2B waters is 30 mg/L of TSS from April 1 to September 30. Water flowing through the site during this period met the standard during base flow conditions, and storm concentrations remain much lower than prior wet years when concentrations sometimes exceeded 2,000 mg/L (Table 17). Despite the wet conditions, the TSS load was second lowest recorded since monitoring began in 2006. No statistically significant trends exist for TSS in the drainage.

The District has worked since 2018 to repair erosional head cuts and increase floodplain connectivity through the installation of rock vanes on the drainage tributaries. The practices are estimated to reduce the TP load by 76 pounds per year, and the sediment load by 70 tons per year. Additionally, beavers remain active in the drainage, and have created a series of dams between the IESF harvest pond and the monitoring site. The dams enhance floodplain connectivity and promote settling of sediments and nutrients while improving habitat, and it appears a reduction in TP and TSS is evident in the annual loads. The relatively low TP and TSS loads paired with an annual total discharge falling within the highest quantile all recorded annual discharges indicates the restoration efforts by the District and natural processes from beaver activity are having positive impacts on water quality in the drainage. This is an interesting contrast to conditions in Brown's Creek, where dams tend to have negative impacts on conditions needed for coldwater biological communities to thrive. The IESF upstream of the monitoring site also continues to operate to reduce TP loads in the drainage. Monitoring data from the IESF is analyzed by EOR and summarized in an annual maintenance memo for the filter.

Table 17. Brown's Creek Diversion 2025 Chemistry Results

Sample Type	Start	End	TSS (mg/L)	VSS (mg/L)	TKN (mg/L)	TP (mg/L)	Dissolved P (mg/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chloride (mg/L)	Nitrite + Nitrate N (mg/L)	Ammonia Nitrogen (mg/L)	Hardness (mg/L _CaCO3)
Storm Composite	5/20/2025 6:52	5/21/2025 0:40	94	24	1.64	0.280	0.061	3.640	2.910	1.570	10.100	0.130	<2.500	31.4	0.31	<0.06	121
Storm Composite	6/13/2025 0:52	6/13/2025 8:32	30	8	1.10	0.176	0.041	1.800	1.710	0.774	5.450	0.117	<2.500	39.8	0.28	<0.06	147
Storm Composite	6/25/2025 13:29	6/25/2025 22:20	70	24	1.47	0.281	0.076	2.820	2.300	1.130	7.840	0.117	<2.500	26.0	0.34	<0.06	94
Storm Composite	7/27/2025 20:46	7/28/2025 4:47	161	41	2.11	0.470	0.074	3.850	3.580	2.270	14.700	0.128	3.270	24.8	0.37	<0.06	92
Storm Composite	8/9/2025 5:30	8/9/2025 9:20	283	68	3.00	0.546	0.065	5.520	5.020	5.000	22.100	0.166	4.590	37.9	0.40	<0.06	132
Storm Composite	8/16/2025 7:29	8/17/2025 23:58	166	61	2.11	0.361	0.067	3.970	3.660	2.310	12.900	0.148	2.920	36.6	<0.20	<0.06	98
Base Grab	5/1/2025 14:09	5/1/2025 14:09	<3	<3	0.47	0.051	0.023	<1.000	0.715	<0.500	6.040	<0.100	<2.500	46.4	<0.20	<0.06	155
Base Grab	5/12/2025 14:28	5/12/2025 14:28	<3	<3	0.60	0.074	0.032	1.840	1.890	<0.500	<5.000	<0.100	<2.500	52.8	<0.20	0.06	210
Base Grab	6/10/2025 13:32	6/10/2025 13:32	10	5	0.65	0.128	0.059	<1.000	0.642	<0.500	<5.000	<0.100	<2.500	24.4	0.28	0.07	209
Base Grab	7/10/2025 10:03	7/10/2025 10:03	3	<3	0.53	0.084	0.054	<1.000	0.573	<0.500	<5.000	<0.100	<2.500	70.6	<0.20	0.08	107
Base Grab	8/4/2025 14:36	8/4/2025 14:36	<3	<3	0.58	0.064	0.040	<1.000	0.540	<0.500	<5.000	<0.100	<2.500	62.4	<0.20	0.06	108
Base Grab	9/4/2025 10:38	9/4/2025 10:38	3	<3	0.47	0.057	0.026	<1.000	0.505	<0.500	<5.000	<0.100	<2.500	47.8	0.24	<0.06	152
Base Grab	10/8/2025 9:33	10/8/2025 9:33	5	3	0.54	0.078	0.018	<1.000	0.708	<0.500	<5.000	<0.100	<2.500	48.2	0.31	<0.06	205

Exceeds Water Quality Standard
No Exceedance Determinable
Exceeds Chronic Standard
Exceeds Max Standard
Exceeds Final Acute Standard

Table 18. Brown's Creek Diversion Historic Loading- Latest Ten Years

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Brown's Creek Diversion Structure										
Discharge (cf)	70,780,581	39,625,672	45,453,990	112,468,888	68,165,935	46,792,341	41,610,620	35,622,586	72,832,083	60,305,225
Total pounds of Phosphorus exported	1,574	784	964	3,598	760	446	389	367	573	416
TP (lbs/ac/yr)	0.408	0.203	0.250	0.933	0.197	0.116	0.101	0.095	0.149	0.108
Total pounds of TSS exported	1,533,496	596,382	505,314	2,707,186	246,238	401,069	75,429	74,875	230,855	73,469
TSS (lbs/ac/yr)	397.79	154.70	131.08	702.25	63.87	104.01	19.57	19.42	59.88	19.06

2c. Metals

Heavy metals exceedances at the Diversion site can be seen in Table 17. The export of water high in metals to McKusick Lake and its wetland complex are particularly concerning due to the potential to destroy aquatic life in a short period of time, as opposed to nutrient or sediment loading which typically degrades habitat and populations of aquatic life over time. The chronic standard for lead was exceeded once, and no other exceedances of any metals standards were observed. The number and severity of exceedances of metals standards in the drainage were tied with two other years, 2022 and 2014, for the lowest number observed since metals analysis began in 2007. Improvements made to reduce erosion and allow the natural settling of sediments that may have metals bound to them in beaver impoundments are the most likely drivers of this. In most cases, severe exceedances of metals are associated with extreme TSS concentrations in this drainage. Sources of metals in the drainage may include historically improperly disposed wastes, such as deep cycle batteries, and legacy contamination from pesticide/herbicide applications along the former rail line that was later converted to a state trail. The combination and concentration of metals observed over time appear to point to this as a possible source. The District's engineer identified the North Branch of the drainage as a possible source of metals contamination through soil borings and review of previously collected data.

2d. Temperature

A stand-alone temperature logger was added to the monitoring site in 2024 to provide additional characterization of habitat and water quality conditions in the drainage. The drainage tends to be much warmer than Brown's Creek, and further collection of these data may provide insights on how restoration practices and beaver activity affect conditions in the drainage. Recorded daily average temperatures can be found in Figure 11. Although the drainage is effectively disconnected from Brown's Creek as a receiving water, daily average temperatures at McKusick Road are included for reference.

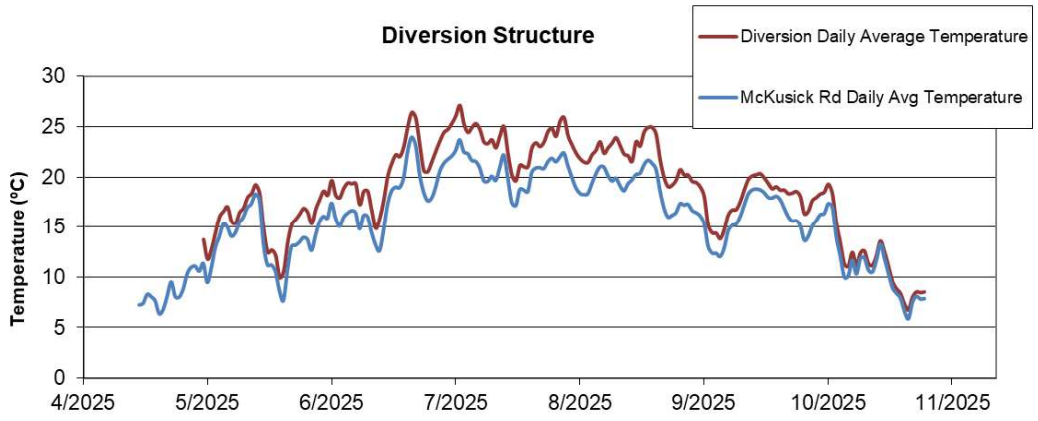


Figure 11. Diversion Drainage 2025 Daily Average Temperature

IV.C.3. Long Lake Drainage

The tributaries to Long Lake at 62nd St. and Marketplace Pond drain a high percentage of impervious surface and developed areas upstream of Long Lake (Table 1 and Figure 1). For the purposes of this report, the Tributary to Long Lake at Marketplace Pond will be compared to 2B water quality standards. The Tributary at Marketplace Pond is not classified as a 2B water, although its receiving water, Long Lake, is. Grab sampling at the Tributary at 62nd Street resumed in 2025 due to concerns with construction activity in the drainage, after sampling ceased in 2016. The water discharged to Long Lake directly affects the quality of the lake, which has had significant issues caused by excess nutrients. Water from Long Lake makes its way downstream to Jackson WMA (Sinnits) Pond, the diversion drainage, McKusick Lake and its wetland complex, and eventually to the St. Croix River. Monitoring subwatershed contributions to Long Lake can help determine locations for targeted management, as well as track improvements made upstream.

3a. Discharge

Annual discharge to Long Lake from the tributary at Marketplace Pond was 17,069,510 cubic feet, and estimated discharge at the tributary at 62nd Street was 2,166,546 cubic feet. Discharge at the tributary at 62nd Street was estimated based on stage data only, which was compared to stage and discharge data collected in 2014. Data from 2014 was used because it covered the widest range of observed stages and was representative of the average of other years of data collection. Historic discharge for each site can be found in Table 21. Flow in both systems is almost entirely event based, and flow often ceases during dry or winter conditions.

3b. Phosphorus & Sediment

The TP load at Marketplace Pond was 0.316 pounds per acre for a total of 130 pounds of phosphorus, and the TSS load was 25.49 pounds per acre for a total of 10,449 pounds of sediment (Table 21). It appears the tributary at Marketplace Pond is meeting the standard of 30 mg/L of TSS at base flow, but was above the 0.100 mg/L TP standard for both base flow samples collected (Table 19). Although storm composite samples are generally not compared to state standards, the concentrations of TSS were often below the standard, and the TP concentrations were well above the standard. The tributary at Marketplace Pond flows through several small settling ponds before discharging to Long Lake, and some additional settling of sediment and uptake of nutrients likely occurs.

The TP load at the tributary at 62nd Street was estimated based on grab sampling only to be 0.087 pounds per acre for a total of 50 pounds of phosphorus, while the TSS load was 10.90 pounds per acre for a total of 6,265 pounds of sediment (Table 21). TP concentrations were above the state standard for every sample collected, and TSS

concentrations were above the state standard for seven of the eleven applicable samples collected (Table 20).

3c. Metals

Heavy metal exceedances for the tributaries at Marketplace Pond and 62nd Street can be found in Table 19 and Table 20. The tributary at Marketplace Pond showed three chronic level exceedances of lead, and one chronic level and one max level exceedance of copper. The tributary at 62nd Street showed one chronic level exceedance of lead. The amount of heavy metals in the subwatershed is influenced by development and impervious surfaces, such as parking lots and Highway 36 where materials from vehicle leaks and brake dust tend to collect. The hardness of water in the subwatershed also tends to be very low, increasing the toxicity of metals. Metals contributed from this subwatershed have the potential to degrade aquatic life near the point of discharge to Long Lake before the water is fully integrated into the lake.

Table 19. Tributary to Long Lake at Marketplace Pond 2025 Chemistry Results

Sample Type	Start	End	TSS (mg/L)	VSS (mg/L)	TKN (mg/L)	TP (mg/L)	Dissolved P (mg/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chloride (mg/L)	Nitrite + Nitrate N (mg/L)	Ammonia Nitrogen (mg/L)	Hardness (mg/L _CaCO3)
Storm Composite	6/3/2025 8:55	6/3/2025 14:51	17	5	0.85	0.120	0.037	4.360	0.946	0.521	13.100	<0.100	<2.500	87.2	<0.20	0.10	32.0
Storm Composite	6/12/2025 23:28	6/13/2025 2:11	14	6	0.88	0.132	0.026	3.620	0.930	0.583	18.200	<0.100	<2.500	41.2	<0.20	0.16	25.9
Storm Composite	6/25/2025 11:55	6/25/2025 15:25	28	8	0.96	0.138	0.046	4.210	1.110	0.693	23.800	0.123	<2.500	26.3	0.30	0.10	23.0
Storm Composite	7/16/2025 7:46	7/16/2025 14:13	14	7	1.12	0.150	0.029	3.990	0.801	<0.500	11.600	<0.100	<2.500	30.8	0.21	<0.06	30.2
Storm Composite	7/23/2025 14:22	7/23/2025 17:45	19	8	0.94	0.121	0.019	3.490	0.963	0.560	14.900	<0.100	<2.500	25.0	<0.20	0.20	29.0
Storm Composite	7/27/2025 20:37	7/27/2025 21:58	28	10	0.86	0.178	0.050	4.010	1.300	0.771	24.200	<0.100	<2.500	8.9	<0.20	0.19	19.0
Storm Composite	8/9/2025 4:51	8/9/2025 7:34	17	7	0.87	0.104	0.050	3.510	0.793	<0.500	15.100	<0.100	<2.500	9.3	0.25	0.22	21.5
Storm Composite	8/15/2025 12:11	8/15/2025 21:49	14	6	1.06	0.093	0.023	3.050	0.666	<0.500	15.400	<0.100	<2.500	8.9	0.24	0.18	20.4
Base Grab	7/9/2025 9:50	7/9/2025 9:50	3	<3	0.59	0.104	0.069	3.600	0.624	<0.500	<5.000	<0.100	<2.500	36.2	<0.20	<0.06	30.8
Base Grab	8/4/2025 13:48	8/4/2025 13:48	5	<3	0.77	0.129	0.090	3.580	0.609	<0.500	5.510	<0.100	<2.500	25.7	0.70	0.14	37.7

Exceeds Water Quality Standard
No Exceedance Determinable
Exceeds Chronic Standard
Exceeds Max Standard
Exceeds Final Acute Standard

Table 20. Tributary to Long Lake at 62nd Street 2025 Chemistry Results

Sample Type	Start	End	TSS (mg/L)	VSS (mg/L)	TKN (mg/L)	TP (mg/L)	Dissolved P (mg/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chloride (mg/L)	Nitrite + Nitrate N (mg/L)	Ammonia Nitrogen (mg/L)	Hardness (mg/L _CaCO3)
Storm Grab	6/3/2025 10:17	6/3/2025 10:17	25	7	1.06	0.300	0.059	2.560	1.820	0.612	12.200	<0.100	<2.500	113.0	<0.20	0.15	142
Storm Grab	6/13/2025 8:05	6/13/2025 8:05	36	6	1.18	0.324	0.133	5.210	2.880	1.470	15.100	<0.100	<2.500	42.5	0.58	0.07	72
Storm Grab	6/25/2025 13:50	6/25/2025 13:50	86	15	1.54	0.620	0.096	5.200	2.570	2.100	22.500	<0.100	<2.500	124.0	<0.20	0.12	81
Storm Grab	7/16/2025 8:57	7/16/2025 8:57	178	33	1.64	1.050	0.099	5.910	4.110	4.000	38.700	<0.100	3.630	98.0	<0.20	0.11	153
Storm Grab	7/29/2025 14:30	7/29/2025 14:30	43	7	0.97	0.269	0.114	5.330	4.120	2.370	13.200	0.626	3.540	48.8	<0.20	<0.06	79
Base Grab	5/21/2025 13:36	5/21/2025 13:36	14	<3	0.86	0.191	0.052	3.860	2.350	0.796	17.600	<0.100	<2.500	134.0	0.25	<0.06	114
Base Grab*	6/10/2025 13:05	6/10/2025 13:05	201	30	1.65	1.040	0.017	4.500	4.460	3.620	26.900	<0.100	3.400	221.0	<0.20	0.30	271
Base Grab	7/9/2025 9:32	7/9/2025 9:32	54	12	1.03	0.486	0.015	2.160	2.400	1.160	15.300	<0.100	<2.500	129.0	<0.20	0.23	212
Base Grab	8/4/2025 14:12	8/4/2025 14:12	34	7	0.78	0.324	0.012	1.480	1.830	0.672	7.370	<0.100	<2.500	156.0	<0.20	0.17	220
Base Grab	8/18/2025 9:39	8/18/2025 9:39	16	9	1.14	0.181	0.039	1.540	1.090	<0.500	9.590	<0.100	<2.500	28.2	<0.20	<0.06	44
Base Grab	9/4/2025 9:46	9/4/2025 9:46	18	4	0.75	0.191	0.006	1.160	1.650	0.553	5.060	<0.100	<2.500	185.0	<0.20	0.23	289
Base Grab	10/6/2025 13:44	10/6/2025 13:44	7	<3	0.50	0.150	0.017	<1.000	1.170	<0.500	<5.000	<0.100	<2.500	57.7	<0.20	0.07	149

Exceeds Water Quality Standard
No Exceedance Determinable
Exceeds Chronic Standard
Exceeds Max Standard
Exceeds Final Acute Standard

* Results excluded from average sample concentration calculations

Table 21. Long Lake Drainage Historic Loading- Latest Ten Years

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tributary to Long Lake at Marketplace Pond										
Discharge (cf)	23,534,188	15,250,645	16,492,464	28,970,261	14,353,605	13,899,568	7,753,526	12,052,262	24,319,915	17,069,510
Total pounds of Phosphorus exported	137	77	70	150	83	121	79	121	157	130
TP (lbs/ac/yr)	0.333	0.187	0.170	0.367	0.202	0.296	0.192	0.294	0.383	0.316
Total pounds of TSS exported	18,278	15,162	16,473	15,882	10,645	9,593	7,112	12,870	18,320	10,449
TSS (lbs/ac/yr)	44.58	36.98	40.18	38.74	25.96	23.40	17.35	31.39	44.68	25.49
Tributary to Long Lake at 62nd Street										
Discharge (cf)	2,824,017	1,811,811*	957,234*	3,403,761*	2,842,101*	584,566*	274,469*	628,588*	3,294,857*	2,166,546
Total pounds of Phosphorus exported	49	NA	NA	NA	NA	NA	NA	NA	NA	50^
TP (lbs/ac/yr)	0.086	NA	NA	NA	NA	NA	NA	NA	NA	0.087
Total pounds of TSS exported	20,956	NA	NA	NA	NA	NA	NA	NA	NA	6,265^
TSS (lbs/ac/yr)	36.45	NA	NA	NA	NA	NA	NA	NA	NA	10.90
	*Flow not estimated outside of logged data ^Load estimated using grab samples only									

IV.C.4. McKusick Wetland Outlet

The tributary to Brown's Creek at McKusick Wetland Outlet discharges water through a pipe approximately 100 feet upstream of the McKusick Road monitoring station from a wetland complex at the headwaters of McKusick Lake. Based on aerial photo evidence it may also provide a "short circuit" for warm, nutrient rich water diverted by the Diversion Structure to be introduced into Brown's Creek after flowing through the wetland complex at the headwaters of McKusick Lake. In 2021 the Oak Glen Golf Course Irrigation Reuse Project was completed, which redirects water from the outlet to a holding pond. This reduces warm, nutrient rich and oxygen poor inputs of water to Brown's Creek. Although not classified as a 2B water, for the purposes of this summary, the data collected will be compared to 2B TP and TSS standards.

4a. Discharge

Discharge at McKusick Wetland Outlet was calculated using an area velocity relationship during the period of recorded data. Periods of flow outside of recorded data were not estimated due to the site freezing during winter months. The recorded discharge to Brown's Creek was 23,349,104 cubic feet (Table 23). High water levels in Brown's Creek occasionally created backwater conditions at the site, making discharge calculations difficult during some periods. The outlet appeared to be flowing the entire monitoring period except for short periods in May and July. A significant portion of the stage and discharge data was lost after early September due to failure of the stage and velocity sensor.

4b. Phosphorus & Sediment

The TP load during recorded data was estimated at 403.8 pounds of phosphorus, while the estimated TSS load was 11,354 pounds of sediment (Table 23). The concentrations of TSS and TP were not precipitation or stage dependent, indicating the wetland complex "pulses" nutrients depending on factors other than storm events. As such, TP and TSS loads were calculated by averaging samples with similar concentrations based on seasonality, and applying the average concentration to the recorded discharge for the time period, which is consistent with past years. One TSS sample on July 16 was excluded as an outlier. It is important to note the characteristics of the site and sampling strategy do not allow for load calculations as precise as other monitored strategies, i.e. composite sampling.

Samples collected show the site nearly always meets the 2B standard of 30 mg/L of TSS, but exceeded the standard of 0.100 mg/L of TP for all but one sample collected (Table 22). The water discharging from the wetland is generally low in suspended sediment and other materials, but quite high in phosphorus, a large fraction of which is often dissolved phosphorus. This is typical of wetlands, which break down organic materials while filtering particulate matter, but can have negative effects on receiving waters by contributing nutrients that are readily available to organisms like algae.

Table 22. McKusick Wetland Outlet 2025 Chemistry Results

Sample Type	Start	End	TSS (mg/L)	VSS (mg/L)	TKN (mg/L)	TP (mg/L)	Dissolved P (mg/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chloride (mg/L)	Nitrite + Nitrate N (mg/L)	Ammonia Nitrogen (mg/L)	Hardness (mg/L _CaCO3)
Grab Sample	4/29/2025 8:52	4/29/2025 8:52	7	3	0.77	0.101	0.025	<1.000	0.708	<0.500	5.970	<0.100	<2.500	30.0	<0.20	<0.06	178
Grab Sample	5/21/2025 14:50	5/21/2025 14:50	6	<3	0.81	0.151	0.064	<1.000	0.716	<0.500	<5.000	<0.100	<2.500	27.1	<0.20	<0.06	138
Grab Sample	6/26/2025 14:25	6/26/2025 14:25	7	<5	0.94	0.248	0.127	<1.000	0.724	<0.500	<5.000	<0.100	<2.500	21.6	<0.20	<0.06	106
Grab Sample*	7/16/2025 9:15	7/16/2025 9:15	37	17	1.03	0.927	0.128	<1.000	<0.500	<0.500	5.590	<0.100	<2.500	41.7	<0.20	<0.06	156
Grab Sample	7/24/2025 9:29	7/24/2025 9:29	8	<4	0.66	0.238	0.068	<1.000	<0.500	<0.500	<5.000	<0.100	<2.500	41.4	<0.20	<0.06	151
Grab Sample	7/28/2025 13:30	7/28/2025 13:30	6	<6	0.90	0.274	0.092	<1.000	0.706	<0.500	<5.000	<0.100	<2.500	26.3	<0.20	<0.06	96
Grab Sample	8/5/2025 8:31	8/5/2025 8:31	12	<10	0.78	0.516	0.238	<1.000	<0.500	<0.500	<5.000	<0.100	<2.500	56.3	<0.20	<0.06	121
Grab Sample	8/18/2025 9:21	8/18/2025 9:21	7	<5	0.68	0.286	0.102	<1.000	<0.500	<0.500	<5.000	<0.100	<2.500	41.5	<0.20	<0.06	89
Grab Sample	9/8/2025 15:21	9/8/2025 15:21	<3	<3	0.38	0.083	0.024	<1.000	<0.500	<0.500	<5.000	<0.100	<2.500	37.2	<0.20	<0.06	154
Grab Sample	10/8/2025 10:16	10/8/2025 10:16	7	3	0.44	0.131	0.023	<1.000	<0.500	<0.500	<5.000	<0.100	<2.500	34.0	<0.20	<0.06	178

Exceeds Water Quality Standard
No Exceedance Determinable
Exceeds Chronic Standard
Exceeds Max Standard
Exceeds Final Acute Standard

* Results excluded from average sample concentration calculations

Table 23. McKusick Wetland Outlet 2025 Discharge and Loading Estimates

Site	Period	Total Flow (cf)	Total Flow (ac-ft)	Average TP Concentration (mg/L)	TP Range (mg/L)	Average TSS Concentration (mg/L)	TSS Range (mg/L)	TP Load (lbs.)	TSS Load (lbs.)
McKusick Wetland Outlet	4/23-6/25	4,079,820	93.71	0.126	0.101-0.151	7	6-7	32.1	1,783
McKusick Wetland Outlet	6/25-9/1	18,990,000	436.18	0.312	0.238-0.516	8	6-12	369.9	9,484
McKusick Wetland Outlet	9/1-9/8	279,284	6.41	0.107	0.083-0.131	5	3-7	1.9	87
Total		**23,349,104**	**536.30**					**403.8**	**11,354**

Table 24. McKusick Wetland Outlet Historic Loading Data

	2017	2018	2019	2020	2021	2022	2023	2024	2025
McKusick Wetland Outlet									
Discharge (cf)	18,610,746	8,319,145	43,988,560	18,179,910	5,072,806	5,153,850	5,834,490	9,588,210	23,349,104
Total pounds of Phosphorus exported	298.2	138.5	453.1	284.6	68.3	69.1	115.1	165.5	403.8
Total pounds of TSS exported	9,055	5,072	13,275	10,927	2,327	2,868	3,870	4,788	11,354
	Values reported are totals during the monitoring period only.								

4c. Temperature

Historic thermal data recorded at McKusick Wetland Outlet show temperatures roughly 2.5 ºC higher, on average, than those recorded at McKusick Road during similar time periods. The wetland is warmed by solar radiation and frequently reaches high temperatures. Although the wetland outlet is not intended to be suitable for trout, when compared to TMDL thresholds of 18.3 ºC (threat level) and 23.9 ºC (critical level), water temperatures exceeded the thresholds 54.7% and 9.1%, respectively, of the monitoring period when flow was present. It is important to compare temperatures to these thresholds because they directly influence temperatures in Brown's Creek when discharged upstream of the McKusick Road site. Trout have been observed and stocked in the reach of Brown's Creek the wetland outlet discharges to, but only during spring and fall when water temperatures are cooler. Continuous temperature data excluding data during periods of zero flow can be seen in Figure 11, alongside the daily average temperature at McKusick Road.

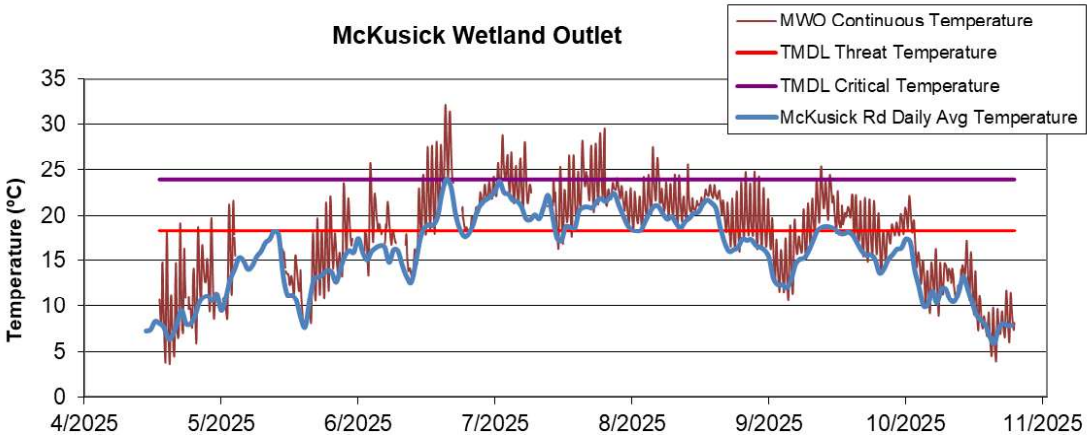


Figure 12. McKusick Wetland Outlet 2025 Continuous Temperature

V. RECOMMENDATIONS

- Consider options to remove, lower, or modify the beaver dam on Brown's Creek between Highway 15 and McKusick Road to protect coldwater biological communities.
- Continue monitoring of beaver activity in the Diversion Drainage, where their presence appears to be beneficial to improving phosphorus, sediment, and erosion conditions.
- Continue chloride monitoring on lakes likely to be impacted by salt use.
- Continue performing macrophyte surveys on lakes that are lacking data.
- Continue collecting water quality and continuous discharge data at existing monitoring stations to track changes in the watershed and provide baseline data for modeling and other uses.
- Continue identifying salt use reduction strategies to limit chloride loading.
- Continue identifying cooperative opportunities with landowners to implement stream shading projects.
- Continue monitoring repairs to erosion issues in the Diversion Drainage to prevent degradation of McKusick Lake.
- Consider modifying sampling on Brown's Creek to match Metropolitan Council's WOMP program using unbiased sampling regimes as opposed to storm/event based sampling to allow for more rigorous statistical trend analysis.
- For the 2027-2036 Watershed Management Plan Update, consider which monitoring activities may be reduced where water quality conditions are stable, improving, or data collection is more challenging than the benefits provided. Examples include reducing monitoring frequency on some lakes to monthly and pausing monitoring on McKusick Wetland Outlet and the Iron Enhanced Sand Filter where conditions don't appear to be changing and beaver activity has made monitoring largely infeasible, respectively.

APPENDIX A - WATER QUALITY DATA – BY LAKE

Brown's Creek Watershed Lakes: Bass East, Bass West, Benz, Brewer's Pond, Goggins, Heifort's Pond, Jackson WMA (Sinnits Pond), July Avenue, Kismet, Long (North Basin), Lynch North, Lynch South, Masterman, North School Section, Pat, Plaisted, South School Section, and Woodpile

Lake grades are assessed using the Metropolitan Council's lake grade system. Grades are determined based on May through September averages of total phosphorus concentration, uncorrected trichromatic chlorophyll-α concentration, and Secchi disk transparency.

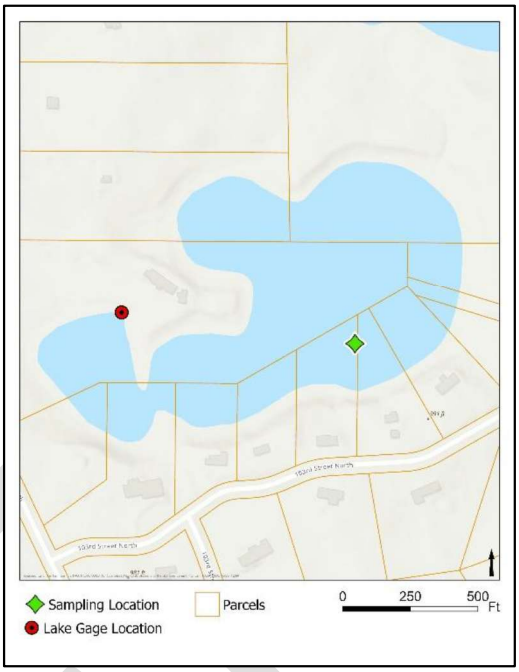
The Minnesota Pollution Control Agency (MPCA) uses the June through September average to assess impairment status of a lake based on total phosphorus concentration, pheophytin-corrected chlorophyll-α concentration, and Secchi disk transparency. The MPCA sets lake eutrophication standards for aquatic life and recreation. The standard for TP is 0.040 mg/L for deep lakes and 0.060 mg/L for shallow lakes. In general, shallow lakes are defined as less than 15 feet deep, with greater than 80% littoral area, and less than 10 acres.

This page intentionally left blank.

Bass Lake (East)

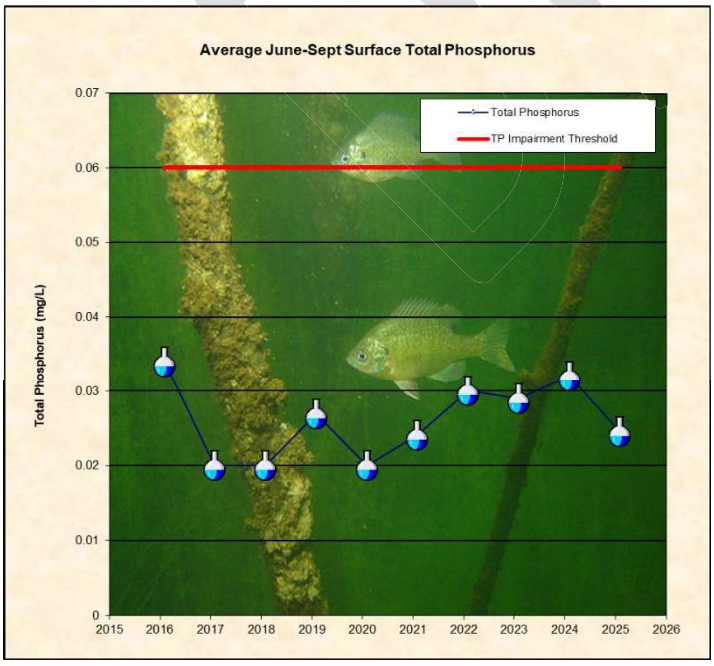
2025 Lake Grade: B+

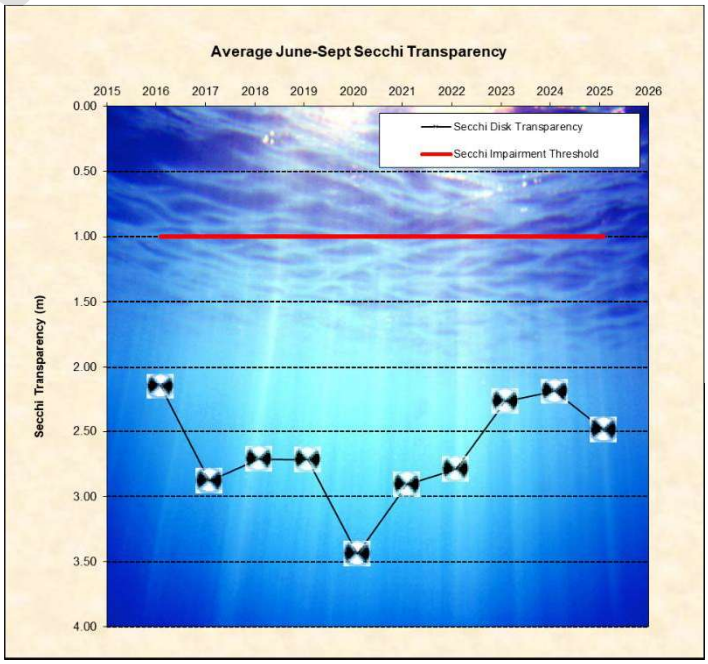
- DNR ID #: 820124
- Municipality: City of Grant
- Location: Section 10, T30N-R21W
- Lake Size: 29 Acres
- Maximum Depth (2025): 16 ft.
- Ordinary High Water Mark: 960.20 ft.
- 100-Year High Water Level: 963.80 ft.
- 99% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as mesotrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for average total phosphorus and average chlorophyll-α, and the trend for the average Secchi transparency is skewed due to vegetation limiting the transparency.
- The major land use is rural/agricultural.
- The lake stratified in 2025 with a thermocline between 2 and 3 meters.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





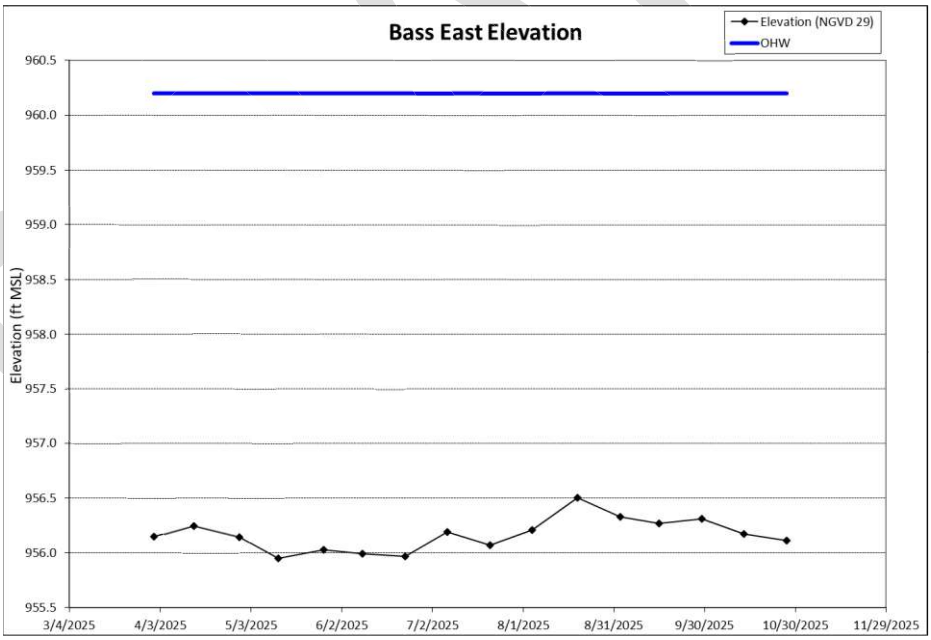
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/2025 11:12	0.025	5.8	5.6	0.64	2.29	11.1	11.71
4/29/2025 10:03	0.026	4.6	3.7	0.58	3.05	13.8	8.87
5/12/2025 10:17	0.029	1.8	1.9	0.79	3.20	21.4	9.01
5/27/2025 9:45	0.031	3.4	3.2	0.65	3.66	18.6	11.09
6/9/2025 13:21	0.027	3.5	3.2	0.80	2.74	20.5	8.58
6/23/2025 13:48	0.050	6.2	5.3	0.81	2.44	27.9	7.95
7/7/2025 12:44	0.030	3.7	3.2	0.73	2.44	29.2	7.69
7/21/2025 13:15	0.025	4.4	3.5	0.66	1.83	24.9	7.16
8/4/2025 12:48	0.018	2.8	2.1	0.57	2.74	25.6	7.35
8/19/2025 8:56	0.016	4.5	4.0	0.62	2.44	24.2	6.45
9/2/2025 13:15	0.020	2.7	1.0	0.56	2.29	23.3	7.51
9/15/2025 10:37	0.019	4.5	4.0	0.52	2.59	22.7	9.52
9/29/2025 11:01	0.016	3.0	2.7	0.53	2.90	20.7	7.42
10/13/2025 9:59	0.013	2.8	1.9	0.57	3.66	15.3	6.30
2025 Average	0.025	3.8	3.2	0.65	2.73	21.4	8.33
2025 Summer Average	0.025	3.9	3.2	0.64	2.49	24.3	7.74

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	956.50	8/19/2025	955.95	5/12/2025	956.17

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

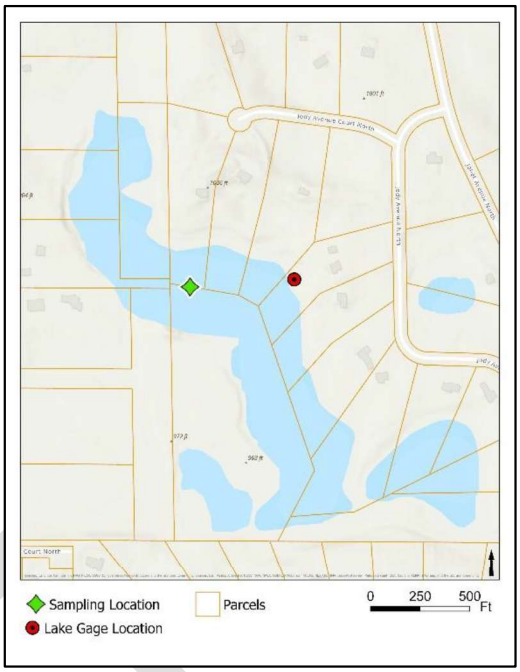


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	B	B	B	B	A	A	B	A	A	C
Chlorophyll-*a* (ug/l)	A	A	A	A	A	A	A	A	A	A
Secchi depth (ft)	B	B	B	B	B	A	B	B	B	B
Overall	**B+**	**B+**	**B+**	**B+**	**A-**	**A**	**B+**	**A-**	**A-**	**B**

Bass Lake (West)

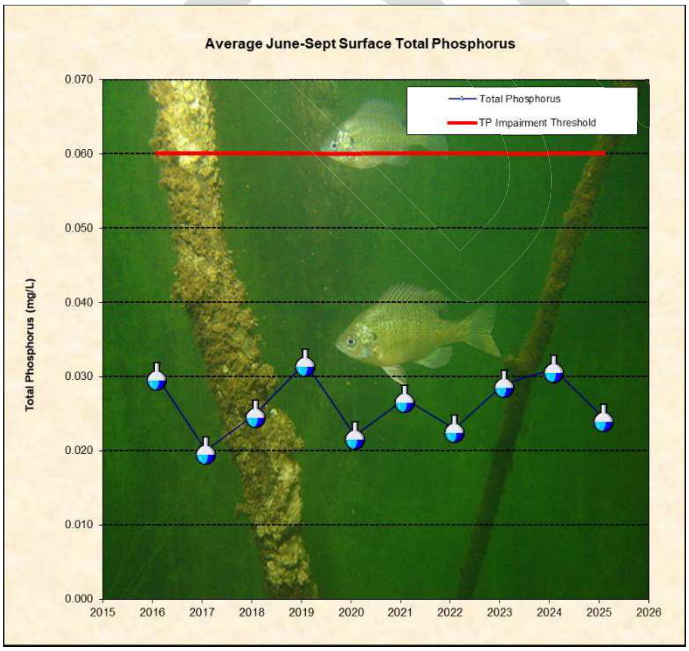
2025 Lake Grade: B+

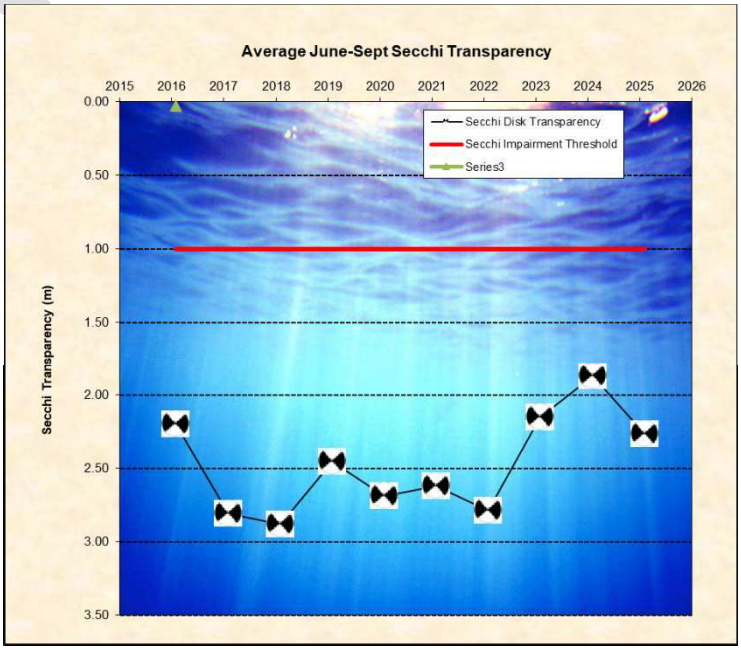
- DNR ID #: 820123
- Municipality: City of Grant
- Location: Section 10, T30N-R21W
- Lake Size: 72 Acres
- Maximum Depth (2025): 14 ft.
- Ordinary High Water Mark: 952.60 ft.
- 100-Year High Water Level: 957.00 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for average total phosphorus, no trend for average chlorophyll-α, and the trend for the average Secchi transparency is skewed due to vegetation limiting the transparency.
- The major land use is rural/agricultural.
- The lake stratified in 2025 with a thermocline of 3 meters.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





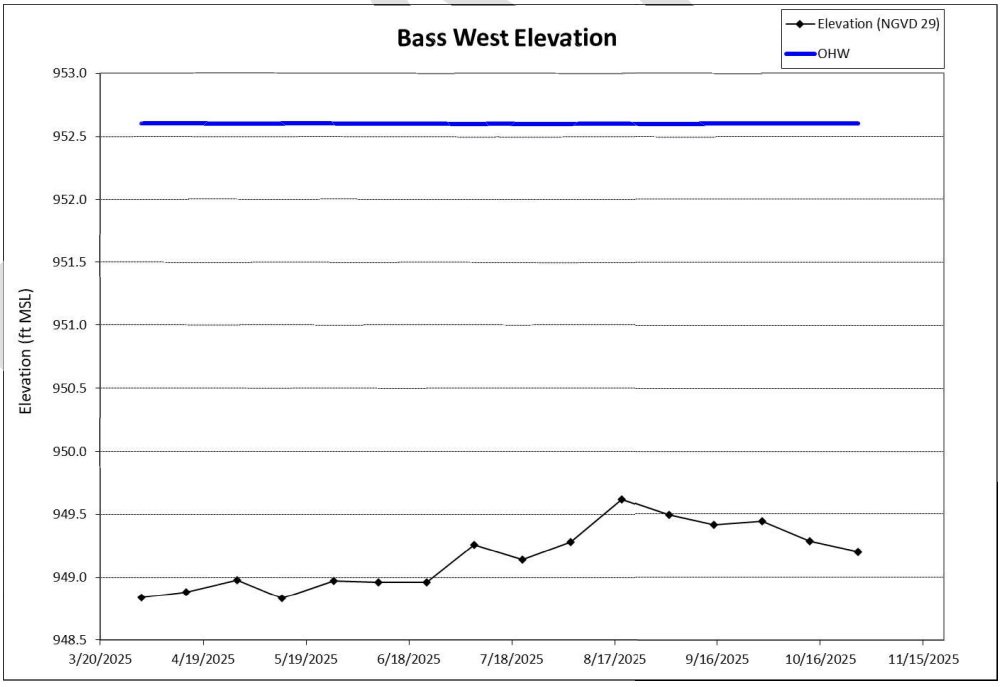
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/2025 10:33	0.023	6.8	6.1	0.72	2.13	10.4	12.15
4/29/2025 9:31	0.021	5.1	5.1	0.68	2.90	13.5	9.14
5/12/2025 10:51	0.030	2.5	1.9	0.79	3.66	20.4	9.79
5/27/2025 9:12	0.027	2.5	1.6	0.78	3.96	18.4	11.30
6/9/2025 12:39	0.025	3.3	2.7	0.75	3.20	20.1	8.88
6/23/2025 14:17	0.020	2.9	2.1	0.80	3.35	27.7	7.30
7/7/2025 12:13	0.019	4.2	3.7	0.64	2.74	28.5	7.81
7/21/2025 13:43	0.032	15.0	14.0	0.92	1.52	24.5	7.60
8/4/2025 12:16	0.026	11.0	9.6	0.78	2.13	25.3	6.70
8/19/2025 9:21	0.024	16.0	16.0	0.78	1.83	24.2	6.77
9/2/2025 13:50	0.028	13.0	14.0	0.95	1.52	23.2	8.71
9/15/2025 10:11	0.022	11.0	10.0	0.76	2.29	22.7	9.08
9/29/2025 11:28	0.024	11.0	10.0	0.83	1.83	20.8	8.12
10/13/2025 9:33	0.017	6.4	5.6	0.69	3.20	15.2	8.01
2025 Average	0.024	7.9	7.3	0.78	2.59	21.1	8.67
2025 Summer Average	0.024	9.7	9.1	0.80	2.27	24.1	7.89

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	949.62	8/19/2025	948.83	5/12/2025	949.16

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

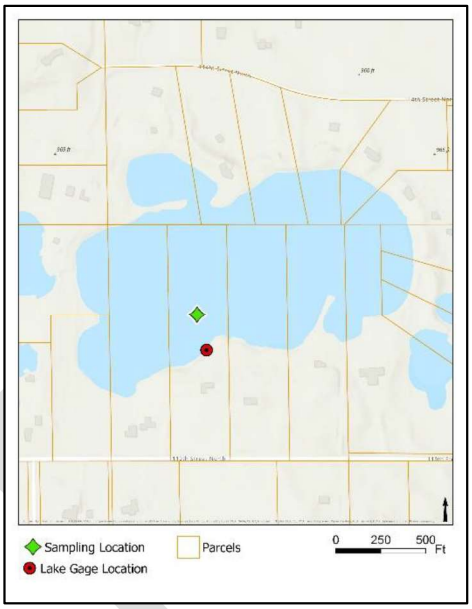


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	B	B	B	A	B	A	B	B	A	B
Chlorophyll-*a* (ug/l)	A	B	A	A	A	A	A	A	A	A
Secchi depth (ft)	B	C	B	B	B	A	B	B	B	B
Overall	**B+**	**B-**	**B+**	**A-**	**B+**	**A**	**B+**	**B+**	**A-**	**B+**

Benz Lake

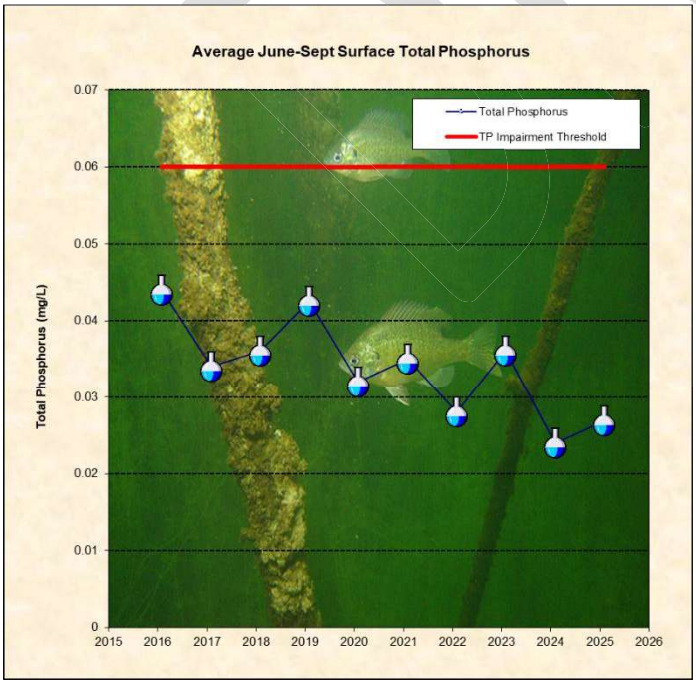
2025 Lake Grade: B

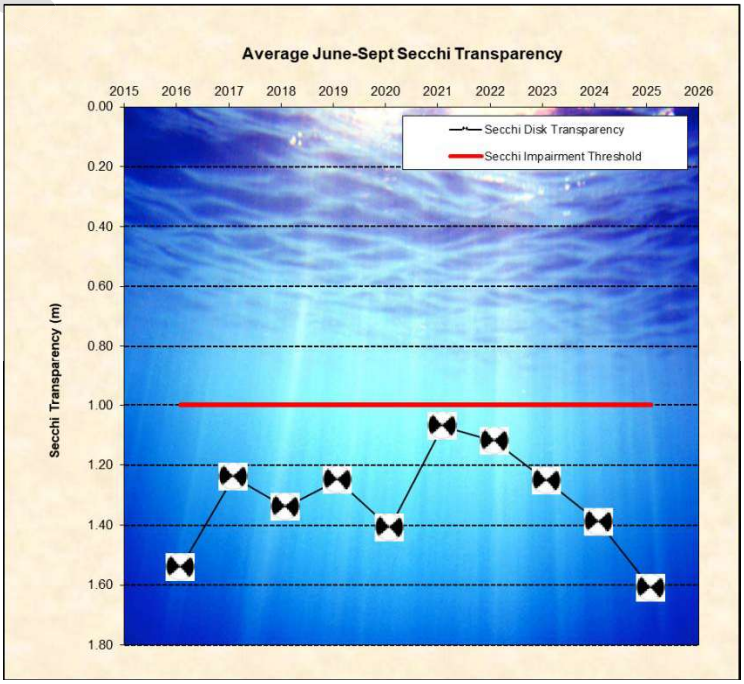
- DNR ID #: 820120
- Municipality: City of Grant
- Location: SE$^{1/4}$ Section 2, T30N-R21W
- Lake Size: 40 Acres
- Maximum Depth (2025): 7 ft.
- Ordinary High Water Mark: 958.90 ft.
- 100-Year High Water Level: 956.51 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for average total phosphorus and average chlorophyll-α, and the trend for the average Secchi transparency is skewed due to vegetation limiting the transparency.
- The major land use is rural/agricultural.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Benz Lake is listed as impaired for nutrients on the Minnesota Pollution Control Agency's Impaired Waters List.





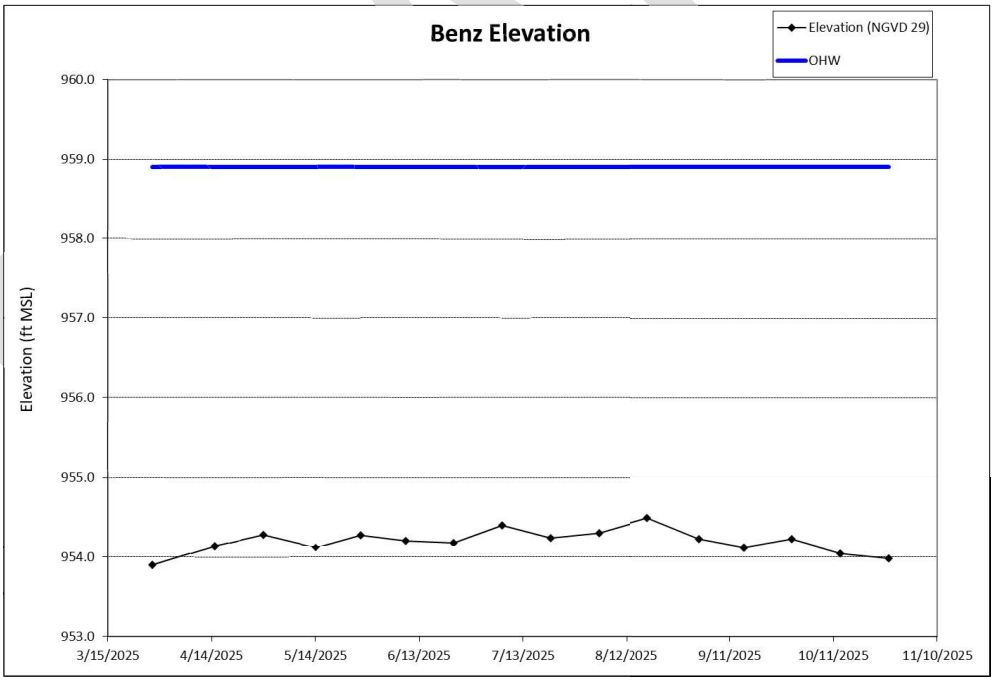
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 13:38	0.028	4.6	4.3	0.53	1.83	10.5	12.08
4/29/2025 10:40	0.030	2.9	2.1	0.65	1.68	14.0	9.02
5/14/2025 10:15	0.031	4.7	5.9	0.66	1.52	23.3	10.19
5/27/2025 10:18	0.027	3.4	2.7	0.56	1.52	18.8	12.90
6/9/2025 10:50	0.028	5.5	4.5	0.56	1.68	19.6	9.10
6/23/2025 13:11	0.032	3.5	2.9	0.64	1.22	27.8	9.82
7/7/2025 10:49	0.026	4.3	2.9	0.61	1.68	27.8	9.86
7/21/2025 12:43	0.029	6.0	5.3	0.64	1.52	24.1	8.90
8/4/2025 10:53	0.028	5.8	4.8	0.58	1.37	24.8	7.84
8/18/2025 12:54	0.024	4.5	4.3	0.58	1.83	23.6	5.93
9/2/2025 12:40	0.025	25.0	25.0	0.54	1.83	23.1	9.59
9/15/2025 11:08	0.018	2.4	2.4	0.55	1.68	23.1	10.08
9/29/2025 10:33	0.032	1.3	1.3	0.54	1.68	20.3	7.90
10/13/2025 10:33	0.033	12.0	12.0	0.65	1.37	14.8	6.68
2025 Average	0.028	6.1	5.7	0.59	1.60	21.1	9.28
2025 Summer Average	0.027	6.5	5.9	0.58	1.61	23.8	8.78

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	954.48	8/18/2025	953.90	3/28/2025	954.19

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

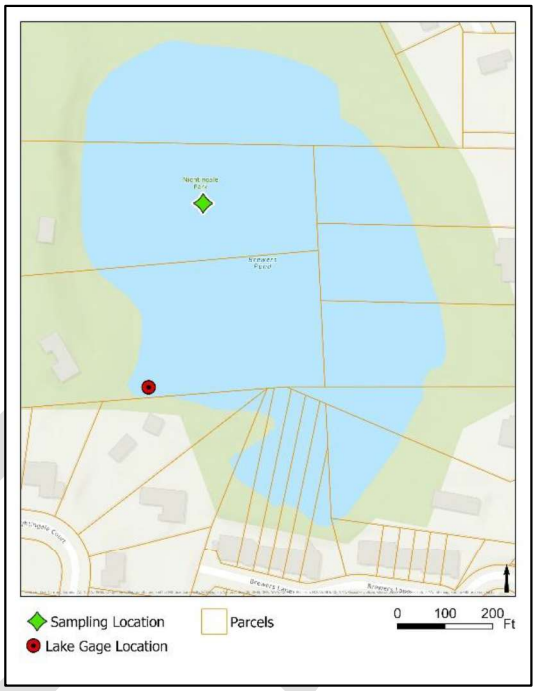


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	B	B	C	B	C	B	C	C	C	C
Chlorophyll-*a* (ug/l)	A	A	A	A	A	A	C	A	A	A
Secchi depth (ft)	C	C	C	D	D	C	C	C	D	C
Overall	**B**	**B**	**B-**	**B-**	**C+**	**B**	**C**	**B-**	**C+**	**B-**

Brewer's Pond

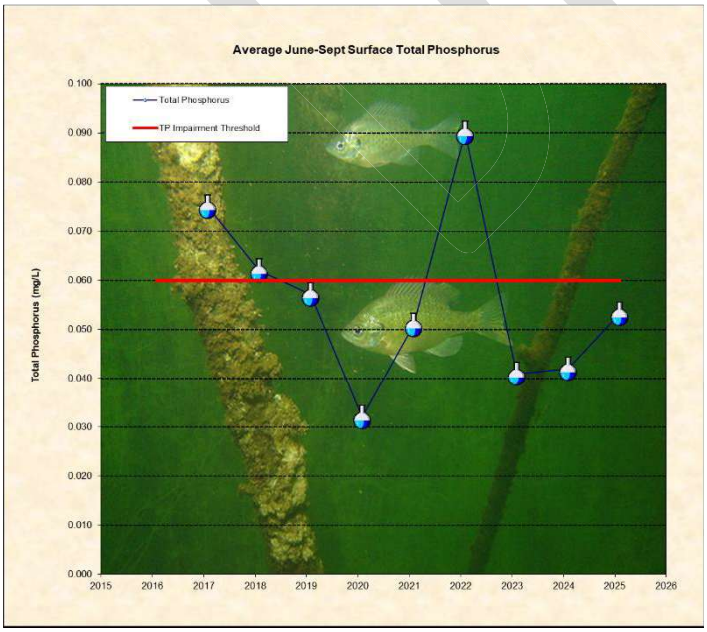
2025 Lake Grade: C-

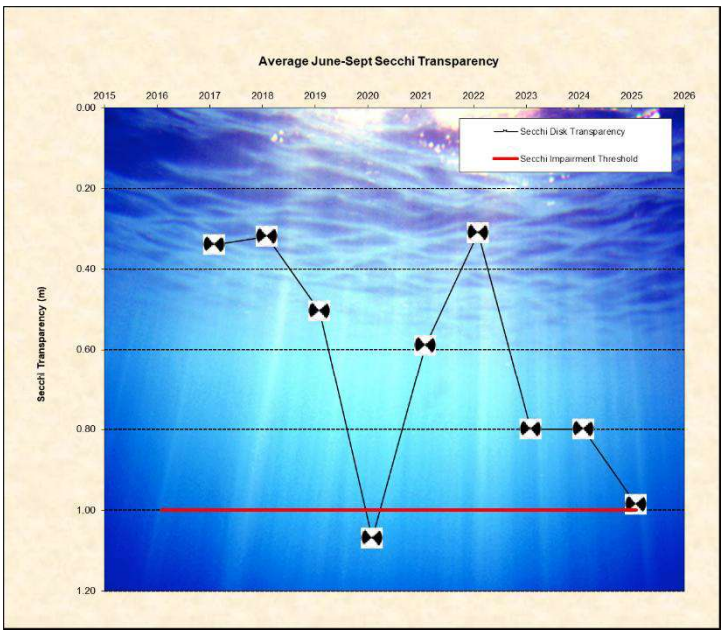
- DNR ID #: 820022
- Municipality: City of Stillwater
- Location: SE$^{1/4}$ Section 31, T30N-R20W
- Lake Size: 9 Acres
- Maximum Depth (2025): 13 ft.
- Ordinary High Water Mark: 891.90 ft.
- 100-Year High Water Level: 894.10 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is currently no trend for the average total phosphorus, average chlorophyll-α, and average Secchi transparency.
- The major land use is urban/residential.
- The lake stratified in 2025 with a thermocline around 3 meters.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.





Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/2025 14:14	0.052	14.0	13.0	1.45	1.68	10.6	12.95
4/29/2025 19:30	0.042	10.0	8.2	1.37	1.90	15.7	NA
5/14/2025 13:08	0.047	11.0	11.0	1.47	1.83	23.8	11.09
5/26/2025 8:00	0.052	7.8	6.9	1.29	1.80	18.2	NA
6/9/2025 14:45	0.066	11.0	9.6	1.51	1.98	21.1	9.33
6/23/2025 20:00	0.038	6.6	5.9	1.24	2.00	28.6	NA
7/8/2025 13:10	0.045	19.0	18.0	1.38	1.52	29.0	11.34
7/21/2025 13:45	0.048	64.0	61.0	1.87	0.70	24.2	NA
8/4/2025 14:32	0.064	38.0	35.0	1.87	0.61	25.6	9.79
8/20/2025 7:00	0.043	41.0	41.0	1.43	0.70	25.1	NA
9/2/2025 14:33	0.063	5.0	3.6	2.17	0.46	23.3	10.88
9/15/2025 19:00	0.048	59.0	57.0	1.96	0.60	24.4	NA
9/29/2025 14:07	0.064	79.0	76.0	2.19	0.30	23.0	10.52
10/14/2025 11:30	0.056	75.0	76.0	2.44	0.50	15.7	NA
2025 Average	0.052	31.5	30.2	1.69	1.18	22.0	10.84
2025 Summer Average	0.053	35.8	34.1	1.74	0.99	24.9	10.37

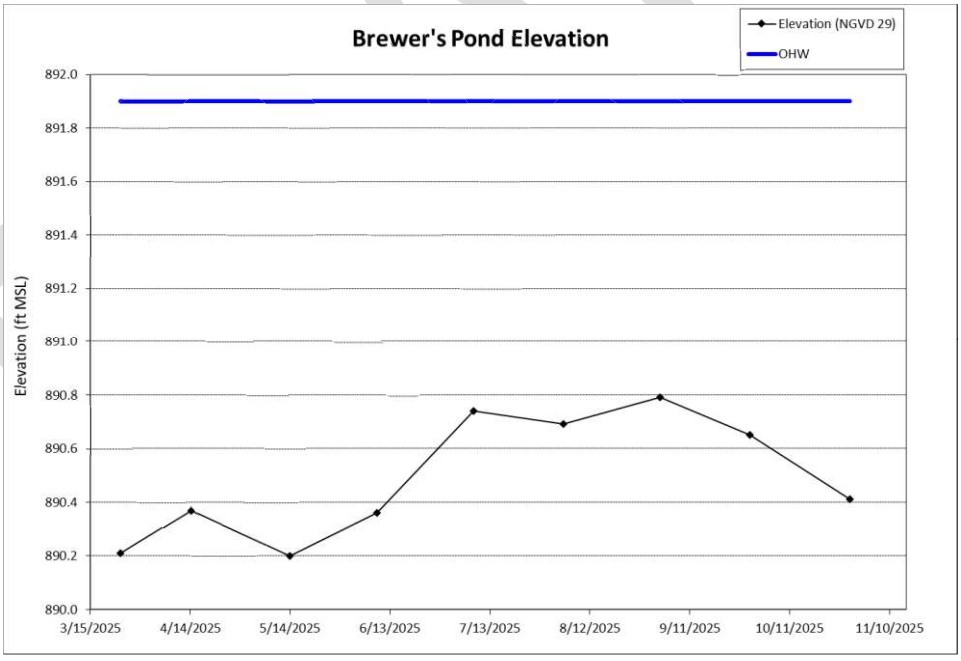
Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

Samples collected by a volunteer

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	890.79	9/2/2025	890.20	5/14/2025	890.49

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

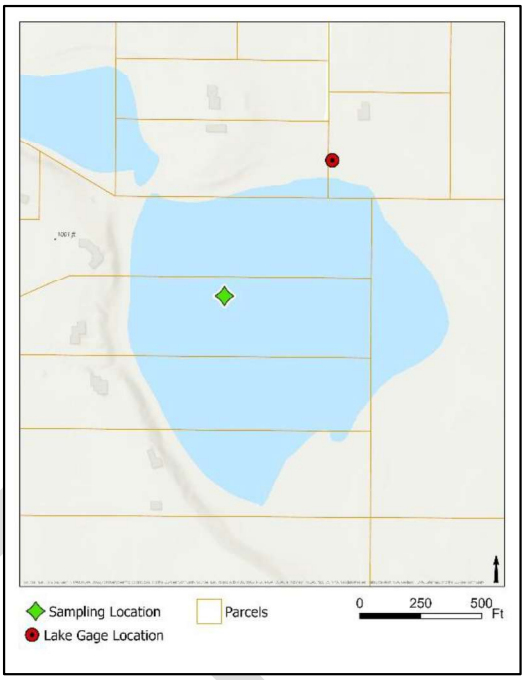


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	C	C	C	D	C	C	C	C	D	NA
Chlorophyll-*a* (ug/l)	C	C	C	F	C	C	C	D	D	NA
Secchi depth (ft)	D	D	D	F	F	D	F	F	F	NA
Overall	**C-**	**C-**	**C-**	**F+**	**D+**	**C-**	**D+**	**D**	**D-**	**NA**

Goggins Lake

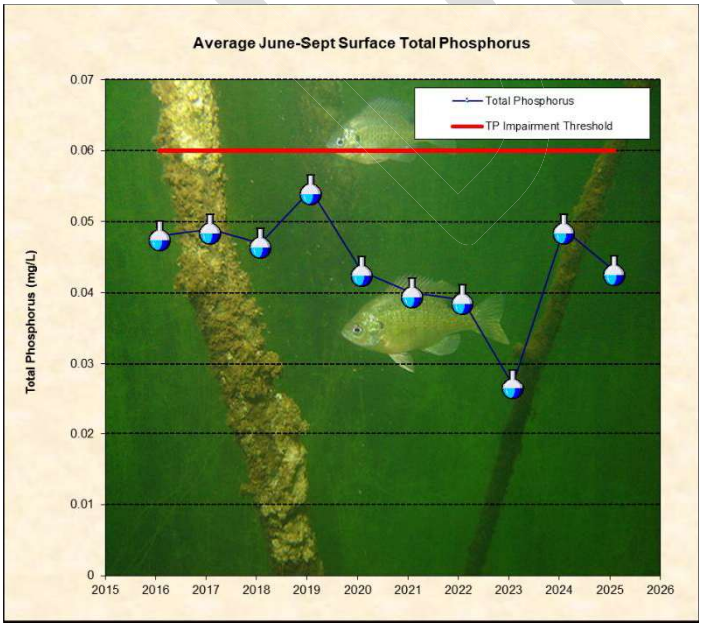
2025 Lake Grade: C+

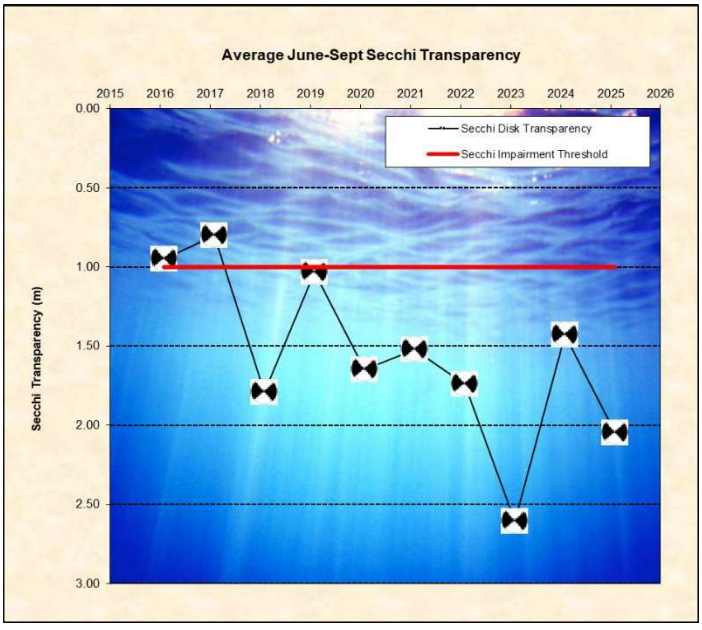
- DNR ID #: 820077
- Municipality: May Township
- Location: NW$^{1/4}$ Section 31, T31N-R20W
- Lake Size: 85 Acres
- Maximum Depth (2025): 13 ft.
- Ordinary High Water Mark: 966.50 ft.
- 100-Year High Water Level: 974.50 ft.
- 99% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average total phosphorus, average chlorophyll-α, and average Secchi transparency.
- The major land use is rural/agricultural.
- The lake stratified in 2025 with a thermocline around 3 meters.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Goggins Lake is listed as impaired for nutrients on the Minnesota Pollution Control Agency's Impaired Waters List.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





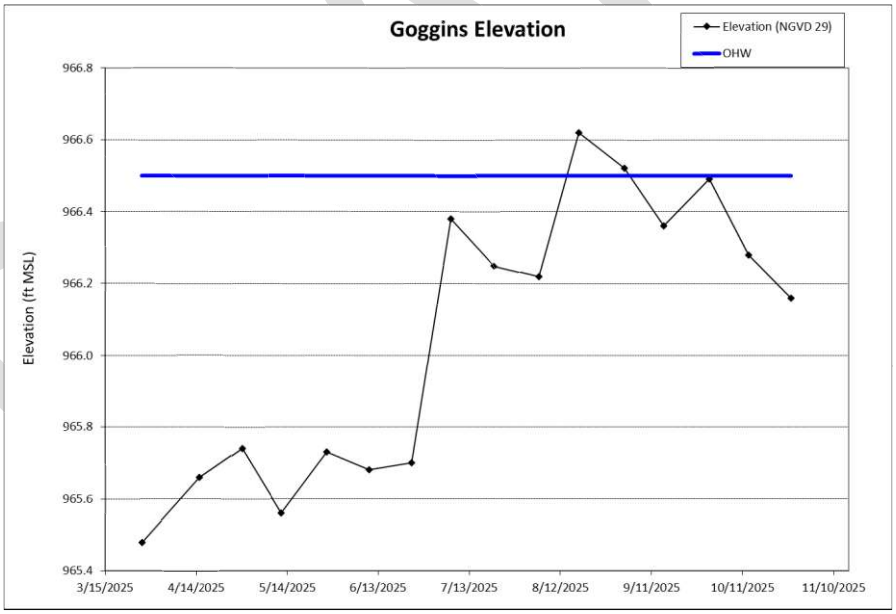
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 13:05	0.039	7.0	6.1	0.88	2.44	9.5	11.78
4/29/2025 14:33	0.040	7.1	5.9	1.12	2.13	13.9	9.83
5/12/2025 15:20	0.047	4.4	4.5	1.11	2.90	21.1	10.06
5/27/2025 14:05	0.053	11.0	11.0	1.13	2.44	18.8	11.71
6/10/2025 10:36	0.047	13.0	12.0	1.05	2.44	19.3	9.60
6/24/2025 11:44	0.046	15.0	14.0	1.35	2.44	26.0	7.86
7/7/2025 14:50	0.044	20.0	18.0	1.15	1.98	29.7	9.98
7/21/2025 14:53	0.034	12.0	11.0	1.00	1.98	24.5	8.24
8/5/2025 11:44	0.035	11.0	9.3	0.89	2.29	25.0	7.45
8/18/2025 14:38	0.042	13.0	13.0	1.02	2.90	24.0	6.27
9/2/2025 16:00	0.039	28.0	38.0	1.31	1.22	23.7	10.07
9/15/2025 14:35	0.054	34.0	36.0	1.43	1.22	22.9	11.33
9/30/2025 11:49	0.047	12.0	11.0	1.06	1.98	21.2	8.91
10/13/2025 14:19	0.044	12.0	9.9	1.02	2.59	15.8	8.49
2025 Average	0.044	14.25	14.26	1.11	2.21	21.1	9.40
2025 Summer Average	0.043	17.56	18.03	1.14	2.05	24.0	8.86

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	966.62	8/18/2025	965.48	3/27/2025	966.05

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

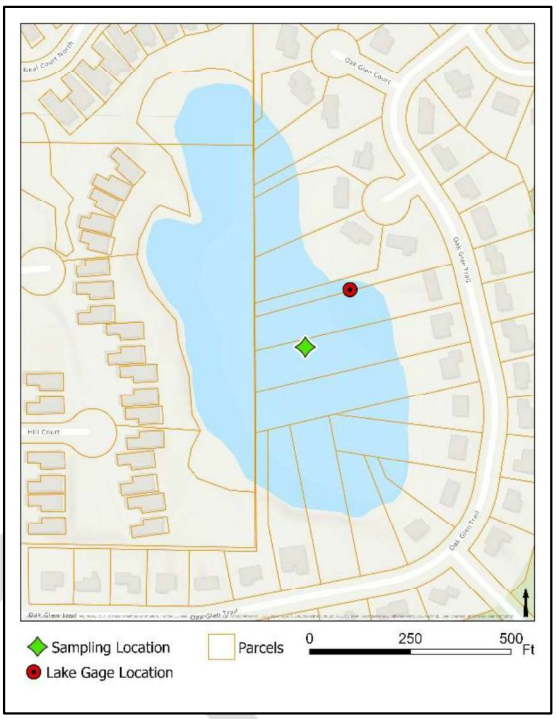


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	C	C	C	C	C	C	C	C	C	C
Chlorophyll-*a* (ug/l)	B	C	A	B	B	B	C	B	C	C
Secchi depth (ft)	C	C	B	C	C	C	C	C	D	D
Overall	**C+**	**C**	**B**	**C+**	**C+**	**C+**	**C**	**C+**	**C-**	**C-**

Heifort's Pond

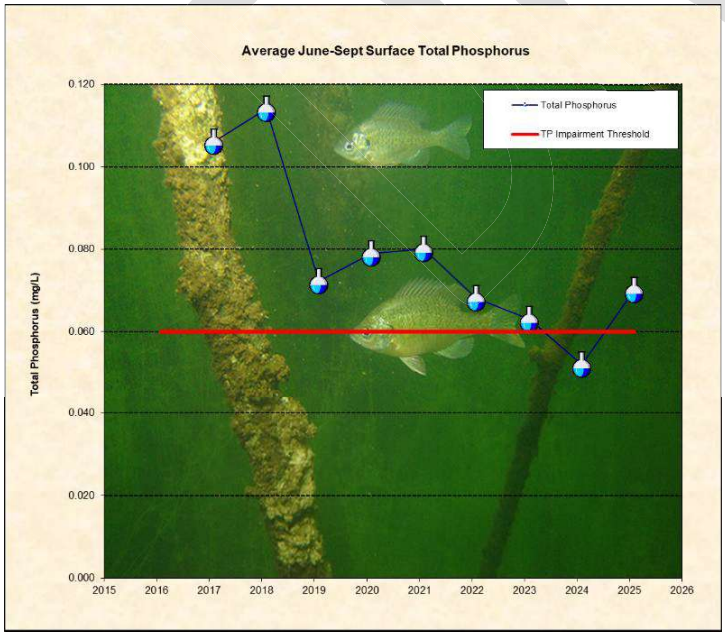
2025 Lake Grade: D-

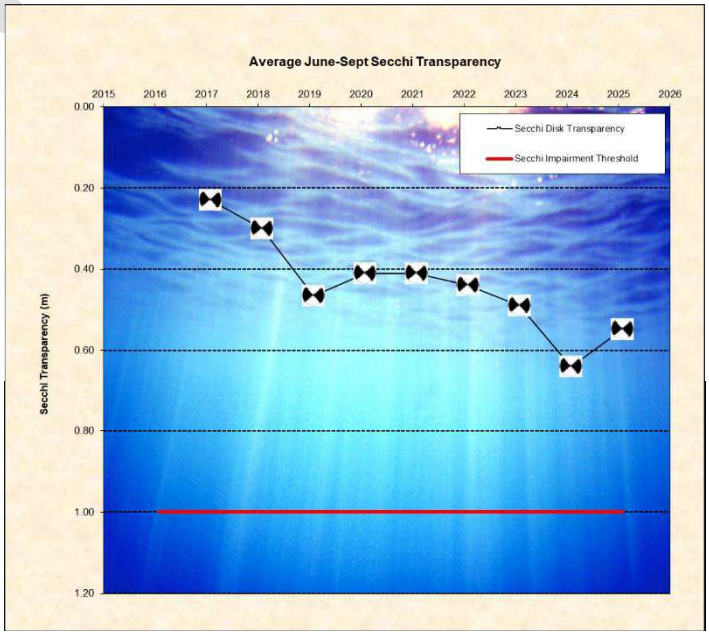
- DNR ID #: 820485
- Municipality: City of Stillwater
- Location: NW$^{1/4}$ Section 20, T30N-R20W
- Lake Size: 6 Acres
- Maximum Depth (2025): 7.5 ft.
- Ordinary High Water Mark: 883.9 ft.
- 100-Year High Water Level: 887.40 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for average total phosphorus and average Secchi transparency, and no trend for the average chlorophyll-α.
- The major land use is urban/residential.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.



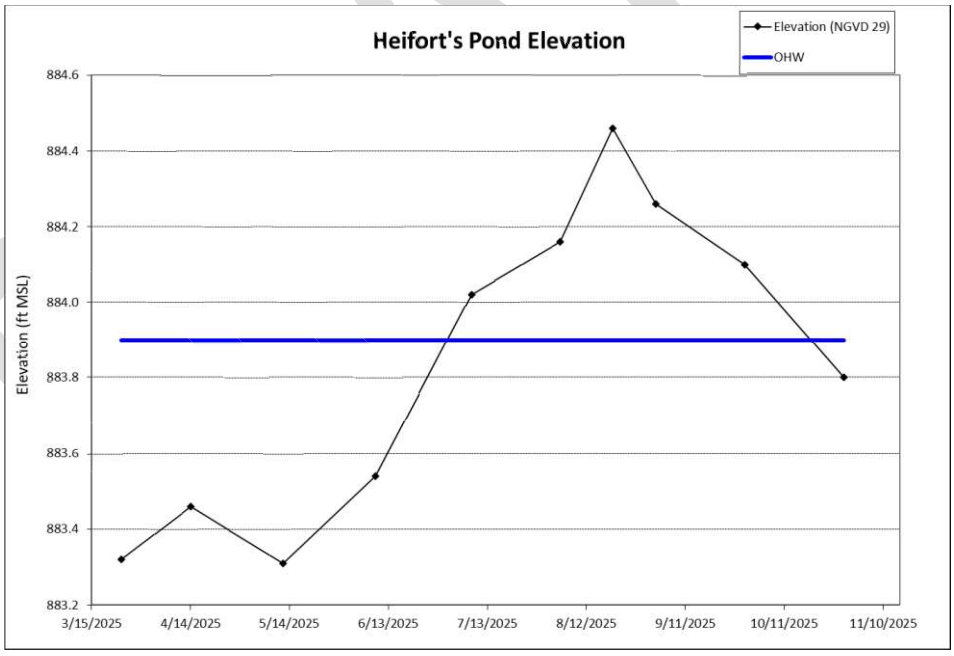


Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/25 13:30	0.053	25.0	23.0	1.40	0.91	10.9	11.88
4/30/25 14:45	0.060	24.0	21.0	1.23	0.90	16.8	NA
5/12/25 11:31	0.066	25.0	25.0	1.48	0.61	21.5	10.12
5/29/25 11:14	0.073	24.0	22.0	1.44	0.80	18.0	NA
6/9/25 14:03	0.066	23.0	22.0	1.49	0.91	20.6	10.18
6/24/25 11:36	0.058	38.0	36.0	1.70	0.80	27.2	NA
7/8/25 12:36	0.072	82.0	81.0	2.14	0.61	28.7	11.44
7/24/25 11:34	0.057	65.0	63.0	2.01	0.60	26.5	NA
8/4/25 13:58	0.103	110.0	100.0	2.58	0.30	24.9	12.50
8/20/25 11:31	0.068	110.0	100.0	2.43	0.30	26.9	NA
9/2/25 11:01	0.079	120.0	120.0	2.68	0.46	21.5	10.84
9/17/25 12:36	0.063	59.0	59.0	2.06	0.50	25.4	NA
9/29/25 13:29	0.055	41.0	41.0	2.17	0.46	20.8	9.16
10/13/25 12:50	0.054	36.0	35.0	1.66	1.10	15.9	NA
2025 Average	0.066	55.9	53.4	1.89	0.66	21.8	10.87
2025 Summer Average	0.069	72.0	69.1	2.14	0.55	24.7	10.82

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*
Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*
Samples collected by a volunteer

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	884.46	8/20/2025	883.31	5/12/2025	883.84

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

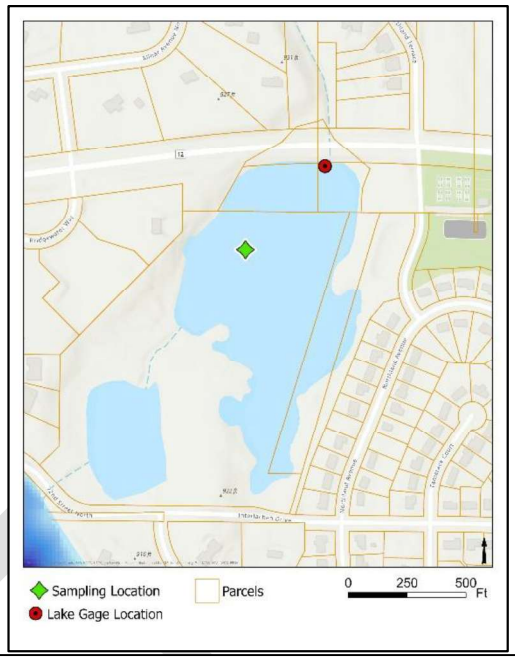


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	D	C	C	D	D	D	D	D	D	NA
Chlorophyll-*a* (ug/l)	D	C	D	D	F	D	D	F	F	NA
Secchi depth (ft)	F	F	F	F	F	F	F	F	F	NA
Overall	**D-**	**D+**	**D**	**D-**	**F+**	**D-**	**D-**	**F+**	**F+**	**NA**

Jackson WMA (Sinnits) Pond

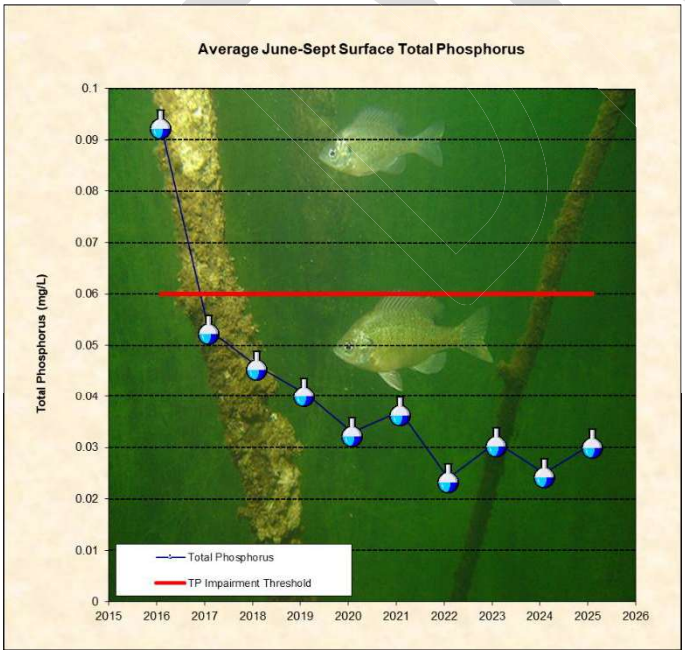
2025 Lake Grade: B

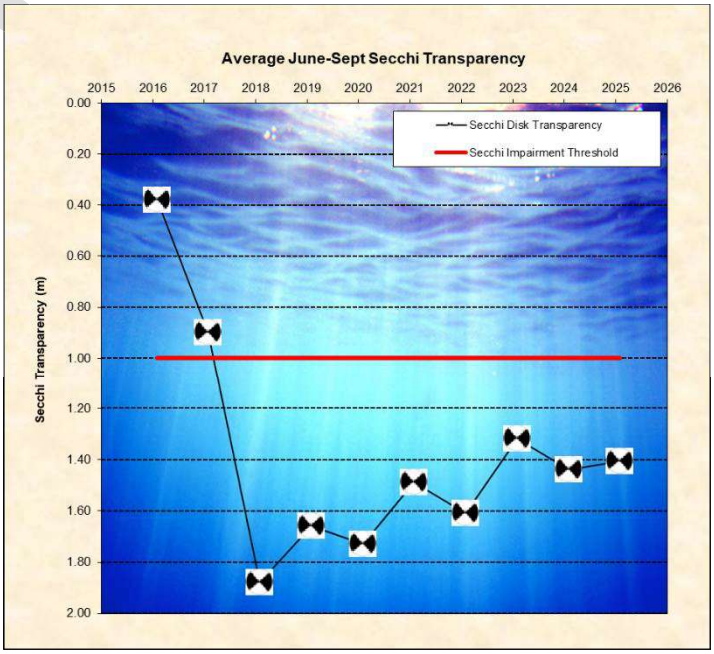
- DNR ID #: 820305
- Municipality: City of Stillwater
- Location: SE$^{1/4}$ Section 30, T30N-R20W
- Lake Size: 14.3 Acres
- Maximum Depth (2025): 8.5 ft.
- Ordinary High Water Mark: NA
- 100-Year High Water Level: 894.94 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for average total phosphorus and for average chlorophyll-α, and the trend for the average Secchi transparency is skewed due to vegetation limiting the transparency.
- The major land use is urban/residential.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).
- The lake is likely infested with Eurasian watermilfoil, as upstream Long Lake is infested.





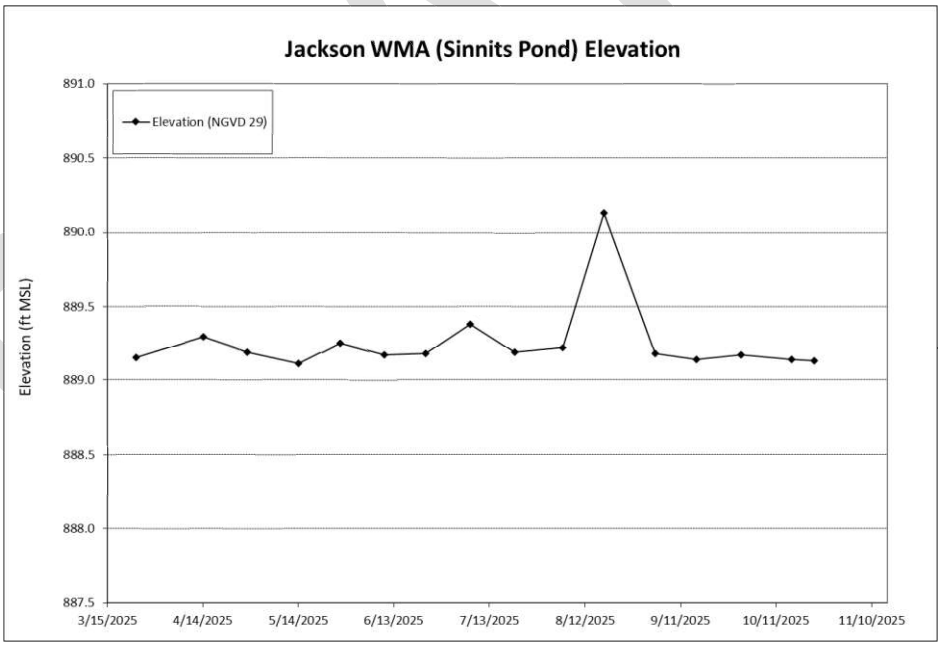
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/2025 15:22	0.035	8.4	7.2	0.61	1.83	11.5	12.10
4/28/2025 14:46	0.032	6.1	5.1	0.54	1.83	15.0	9.70
5/14/2025 14:17	0.031	4.3	3.2	0.67	1.52	25.4	8.89
5/27/2025 14:43	0.026	5.8	5.6	0.60	1.98	18.7	10.36
6/10/2025 13:02	0.034	7.3	5.9	0.67	1.98	21.2	8.06
6/23/2025 15:34	0.030	4.0	3.2	0.63	1.83	28.5	9.19
7/7/2025 15:31	0.033	2.3	2.1	0.55	1.83	29.5	9.81
7/21/2025 15:41	0.042	1.6	1.3	0.54	1.07	25.3	11.82
8/5/2025 13:04	0.022	4.9	4.3	0.59	0.76	25.6	11.19
8/18/2025 15:14	0.028	3.4	3.2	0.58	1.52	24.5	6.40
9/3/2025 7:55	0.028	3.5	3.2	0.60	1.07	20.9	5.69
9/16/2025 11:28	0.032	5.3	4.8	0.57	1.22	23.5	9.84
9/30/2025 13:06	0.027	2.9	2.1	0.56	1.37	21.1	9.15
10/16/2025 11:16	0.021	5.2	3.7	0.51	1.22	13.5	7.14
2025 Average	0.030	4.6	3.9	0.59	1.50	21.7	9.24
2025 Summer Average	0.031	3.9	3.3	0.59	1.41	24.5	9.02

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	890.13	8/18/2025	889.11	5/14/2025	889.25

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

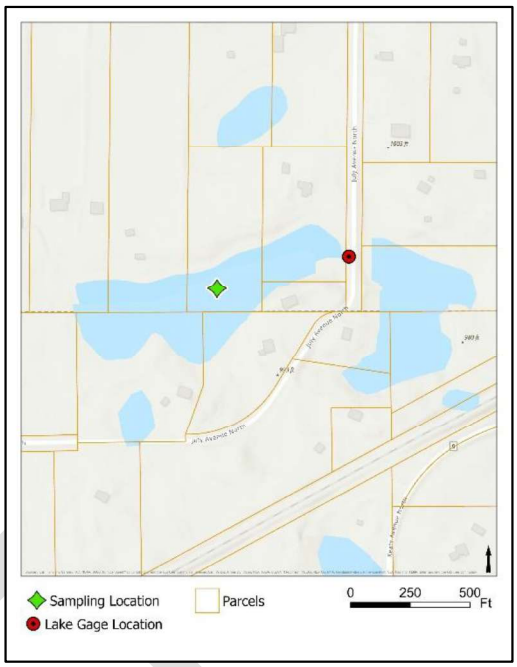


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	B	B	B	B	C	C	C	C	C	D
Chlorophyll-*a* (ug/l)	A	A	A	A	A	A	C	A	B	F
Secchi depth (ft)	C	C	C	C	C	C	C	C	D	F
Overall	**B**	**B**	**B**	**B**	**B-**	**B-**	**C**	**B-**	**C**	**F+**

July Ave Wetland

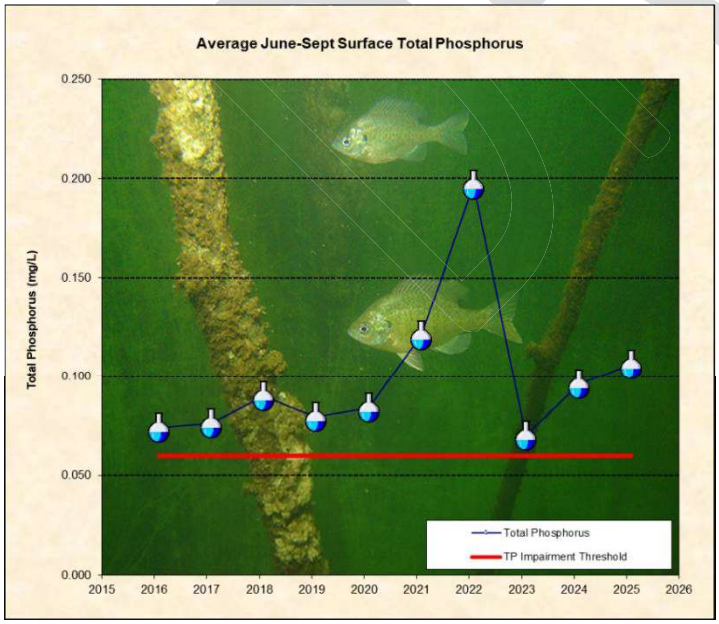
2025 Lake Grade: F+

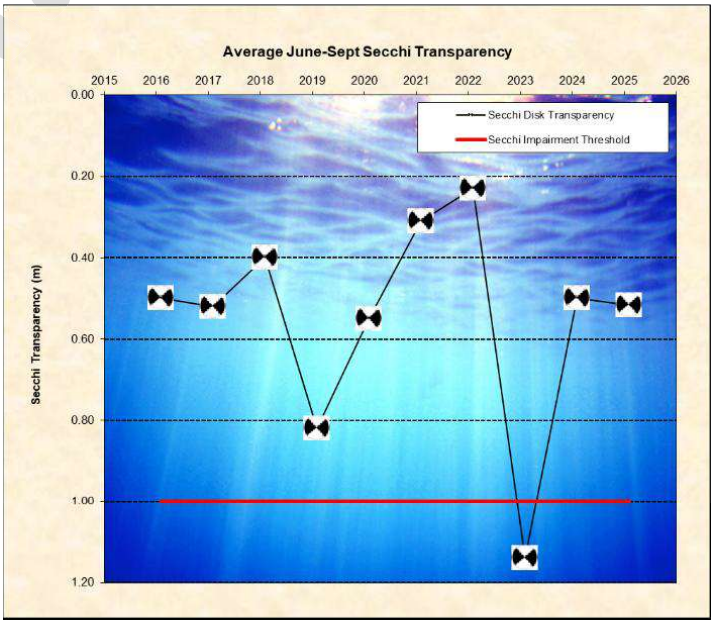
- DNR ID #: 820318
- Municipality: City of Grant
- Location: Section 3, T30N-R21W
- Lake Size: 12 Acres
- Maximum Depth (2025): 8.5 ft.
- Ordinary High Water Mark: NA
- 100-Year High Water Level: 980.66 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as hypereutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **declining** trend for the average Secchi transparency, and no trend for average total phosphorus and average chlorophyll-α.
- The major land use is rural/agricultural.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.





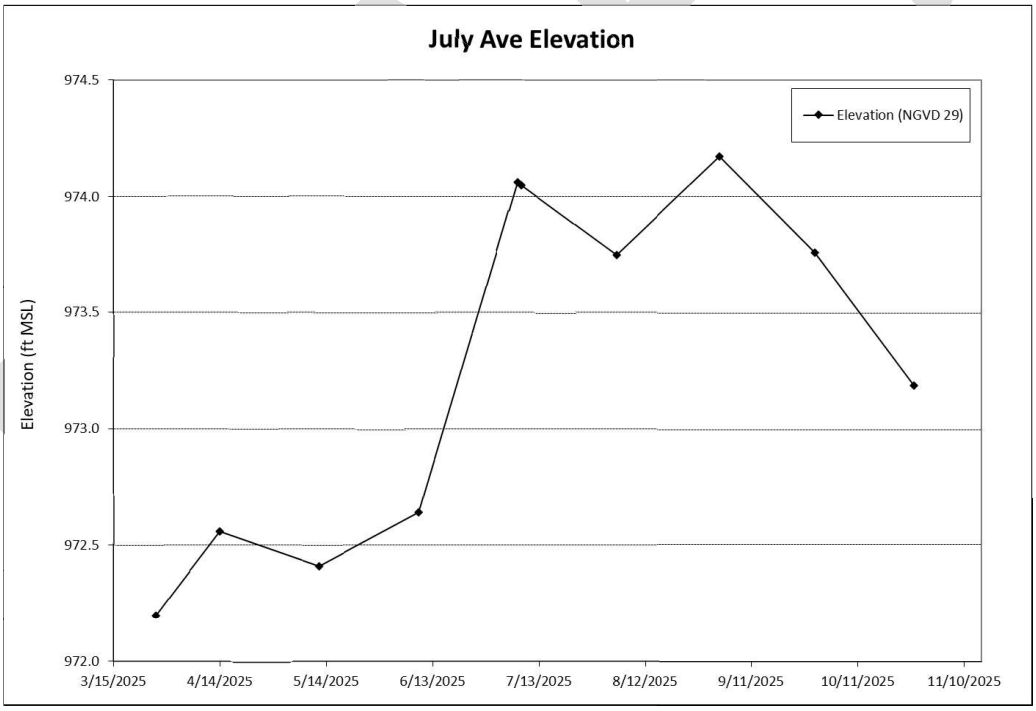
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/2025 12:00	0.077	27.0	24.0	1.33	0.91	11.2	10.50
5/12/2025 12:51	0.103	48.0	40.0	1.65	0.76	22.3	8.96
6/9/2025 11:24	0.108	44.0	36.0	1.72	0.61	19.3	7.63
7/7/2025 13:17	0.113	96.0	90.0	2.04	0.30	30.0	13.83
8/4/2025 13:21	0.128	180.0	170.0	3.53	0.30	24.3	10.91
9/2/2025 11:42	0.113	110.0	110.0	2.94	0.61	22.3	8.11
9/29/2025 11:58	0.069	33.0	30.0	2.07	0.76	20.8	7.78
2025 Average	0.102	76.9	71.4	2.18	0.61	21.5	9.67
2025 Summer Average	0.106	92.6	87.2	2.46	0.52	23.3	9.65

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	974.17	9/2/2025	972.20	3/27/2025	973.28

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

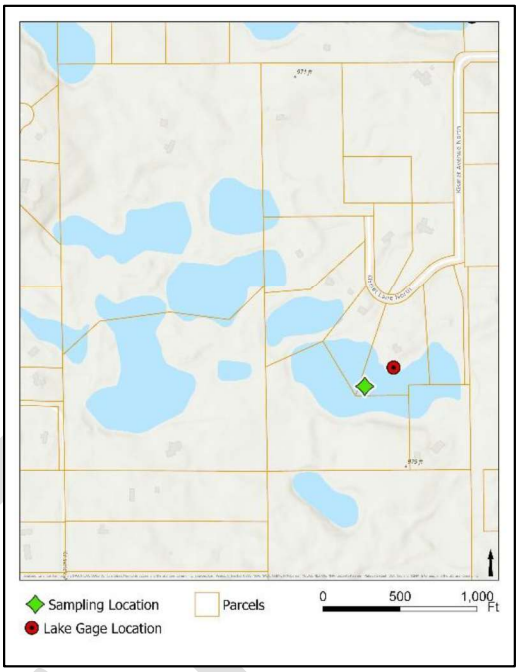


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	D	D	C	F	D	D	D	D	C	D
Chlorophyll-*a* (ug/l)	F	D	C	F	F	D	D	D	D	D
Secchi depth (ft)	F	D	C	F	F	F	D	F	F	F
Overall	**F+**	**D**	**C**	**F**	**F+**	**D-**	**D**	**D-**	**D**	**D-**

Kismet Basin

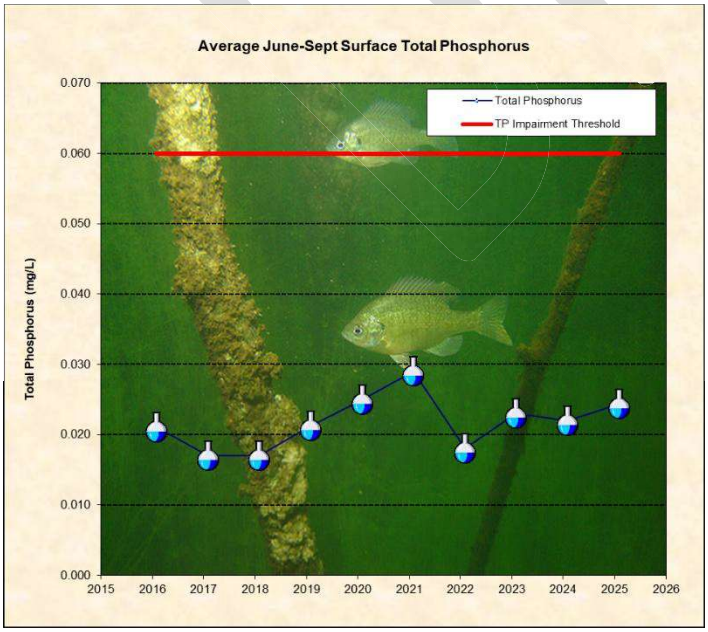
2025 Lake Grade: B

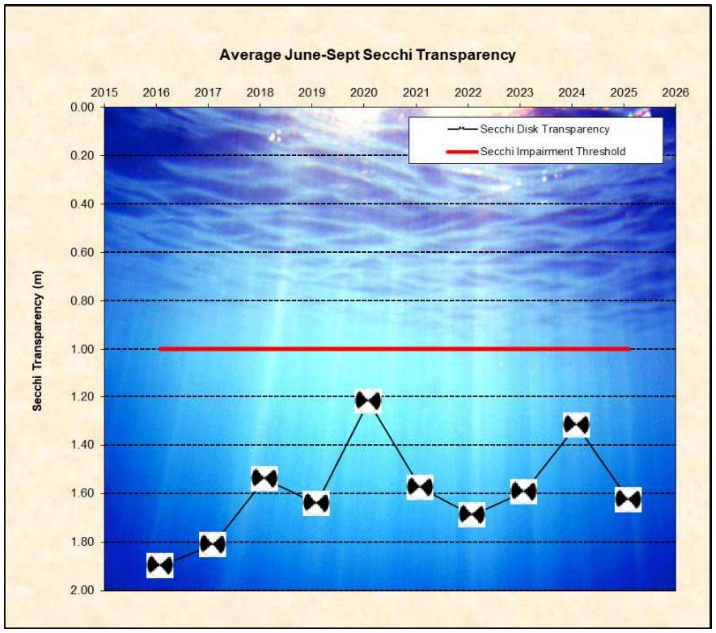
- DNR ID #: 820334
- Municipality: City of Grant
- Location: $S^{1/2}$ Section 11, T30N-R21W
- Lake Size: 70 Acres
- Maximum Depth (2025): 11 ft.
- Ordinary High Water Mark: 943.50 ft.
- 100-Year High Water Level: 946.81 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as mesotrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average total phosphorus and the average chlorophyll-α, and the trend for the average Secchi transparency is skewed due to vegetation limiting the transparency.
- The major land use is rural/agricultural.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





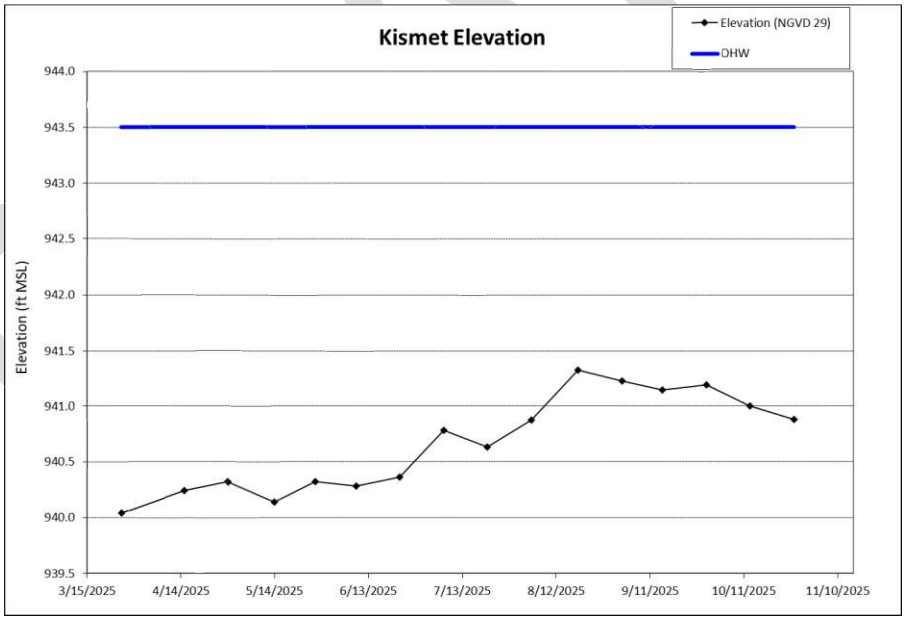
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 14:37	0.023	5.9	5.1	0.58	1.68	10.5	10.29
4/29/2025 11:13	0.026	7.5	5.6	0.60	1.83	14.1	6.38
5/14/2025 11:11	0.022	3.2	2.7	0.65	1.83	24.2	6.91
5/27/2025 10:53	0.026	6.1	5.3	0.66	1.98	18.6	10.96
6/9/2025 9:39	0.030	14.0	12.0	0.71	1.52	20.1	7.23
6/23/2025 14:53	0.029	8.2	5.1	0.78	1.37	28.3	8.24
7/7/2025 9:47	0.019	4.6	3.7	0.59	1.83	26.5	8.08
7/21/2025 12:11	0.030	12.0	10.0	0.65	1.22	23.3	5.43
8/4/2025 9:39	0.028	13.0	10.0	0.61	1.83	23.5	5.65
8/19/2025 10:00	0.024	11.0	9.9	0.60	1.68	23.6	3.35
9/2/2025 10:37	0.021	6.1	5.6	0.55	1.68	21.3	5.86
9/15/2025 11:38	0.018	4.0	3.2	0.52	1.68	22.6	7.60
9/29/2025 9:32	0.020	4.3	3.5	0.50	1.83	19.2	4.17
10/13/2025 11:01	0.013	2.5	2.4	0.46	1.98	14.4	5.52
2025 Average	0.024	7.3	6.0	0.60	1.71	20.7	6.83
2025 Summer Average	0.024	8.6	7.0	0.61	1.63	23.2	6.18

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	941.32	8/19/2025	940.04	3/26/2025	940.67

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

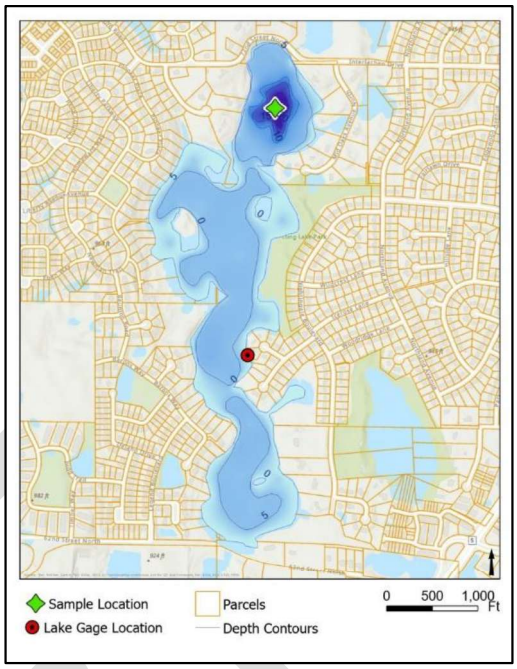


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	B	A	B	A	B	B	A	A	A	B
Chlorophyll-*a* (ug/l)	A	A	A	A	C	A	A	A	A	A
Secchi depth (ft)	C	C	C	C	C	C	C	C	C	C
Overall	**B**	**B+**	**B**	**B+**	**C+**	**B**	**B+**	**B+**	**B+**	**B**

Long Lake

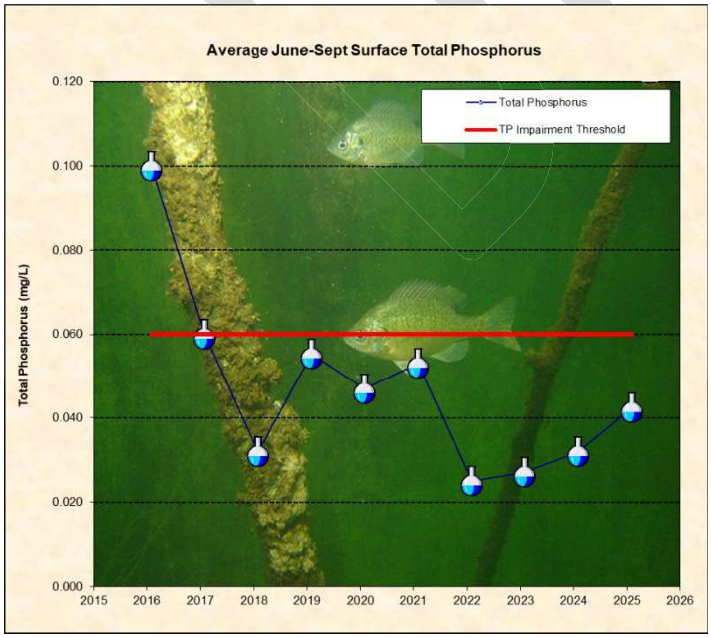
2025 Lake Grade: B

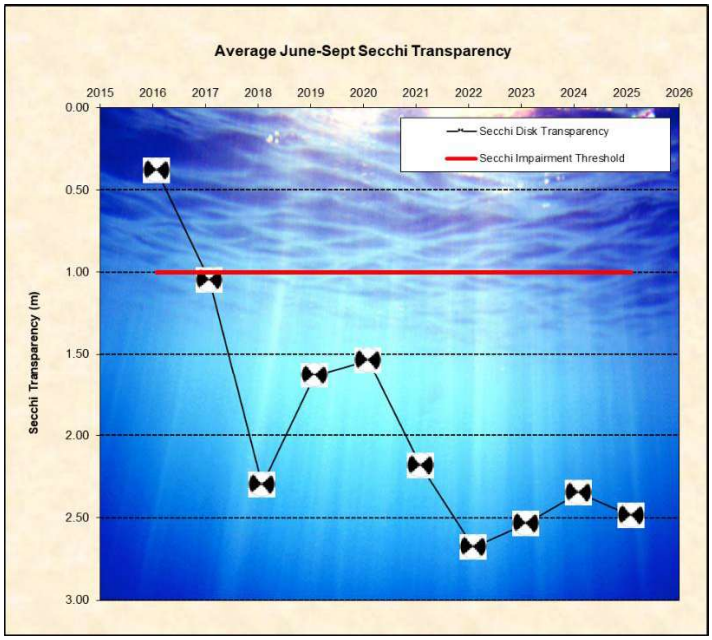
- DNR ID #: 820021
- Municipality: City of Stillwater
- Location: Section 30, T30N-R20W
- Lake Size: 110 Acres
- Maximum Basin Depth (2025): 20 ft.
- Ordinary High Water Mark: 891.50 ft.
- 100-Year High Water Level: 895.10 ft.
- 95% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average Secchi transparency, average chlorophyll-α, and average total phosphorus.
- The major land use is urban/residential.
- The lake stratified in 2025 with a thermocline around 3 meters.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Long Lake is listed as impaired for nutrients on the Minnesota Pollution Control Agency's Impaired Waters List.
- The lake is listed as infested with Eurasian watermilfoil.





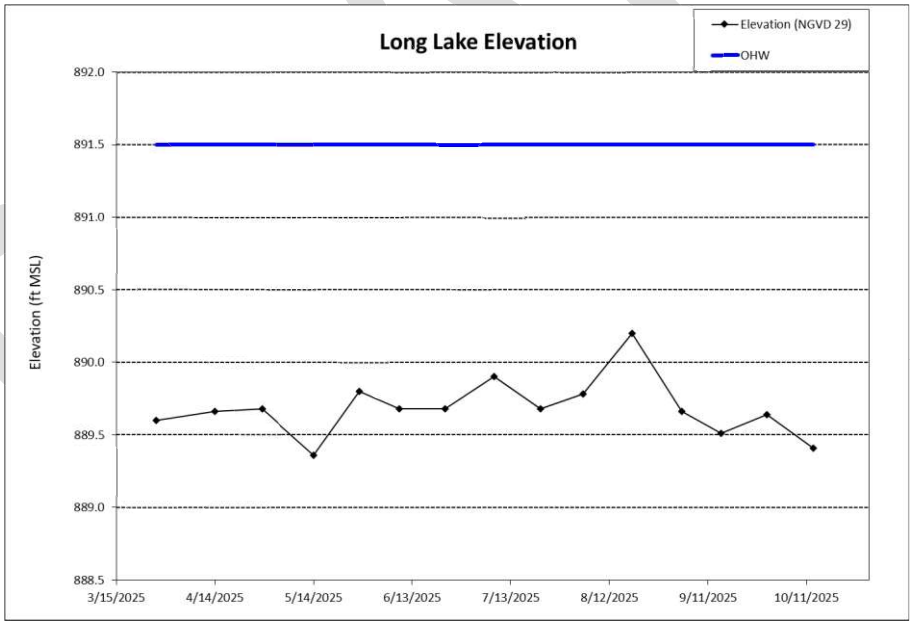
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/2025 14:47	0.028	7.7	6.7	0.51	2.44	10.6	13.56
4/28/2025 14:12	0.032	6.1	5.3	0.46	3.20	14.3	11.05
5/14/2025 13:45	0.032	3.7	3.5	0.06	2.59	24.0	9.77
5/28/2025 12:29	0.032	5.8	5.6	0.51	2.90	17.7	11.05
6/9/2025 15:15	0.033	4.7	4.3	0.63	3.05	21.2	9.12
6/23/2025 16:12	0.044	5.0	4.5	0.62	2.74	28.2	8.17
7/8/2025 13:46	0.042	3.9	2.9	0.62	2.74	29.0	9.85
7/22/2025 13:38	0.037	7.7	7.2	0.59	2.44	26.7	10.34
8/4/2025 15:06	0.046	15.0	13.0	0.69	2.13	25.6	8.14
8/19/2025 14:27	0.044	17.0	16.0	0.72	2.44	27.2	7.75
9/3/2025 8:29	0.059	22.0	19.0	0.77	1.83	21.8	5.38
9/15/2025 15:21	0.036	7.0	6.4	0.61	2.90	24.1	10.32
9/29/2025 14:44	0.040	8.8	9.3	0.58	2.13	22.4	8.35
10/13/2025 15:09	0.040	60.0	58.0	0.66	1.83	16.4	8.80
2025 Average	0.039	12.5	11.6	0.57	2.53	22.1	9.40
2025 Summer Average	0.042	10.1	9.2	0.65	2.49	25.1	8.60

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	890.2	8/19/2025	889.36	5/14/2025	889.68

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

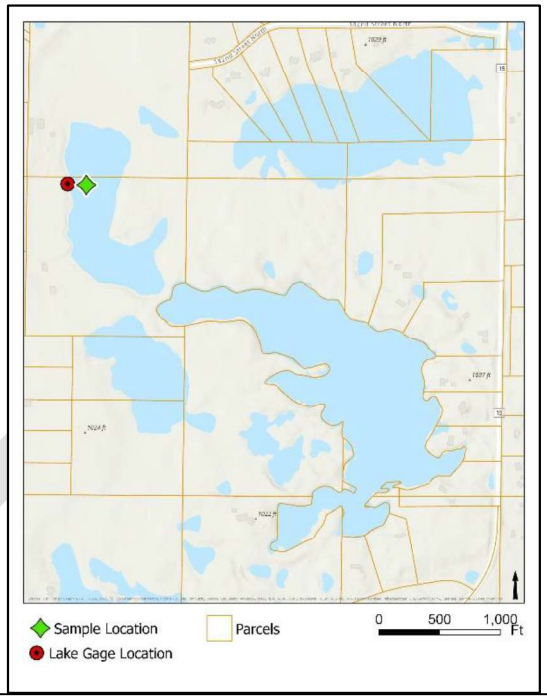


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	C	C	B	B	C	C	C	C	C	D
Chlorophyll-*a* (ug/l)	A	A	A	A	A	B	C	A	B	F
Secchi depth (ft)	B	B	B	B	B	C	C	B	D	F
Overall	**B**	**B**	**B+**	**B+**	**B**	**C+**	**C**	**B**	**C**	**F+**

Lynch Lake – North Basin

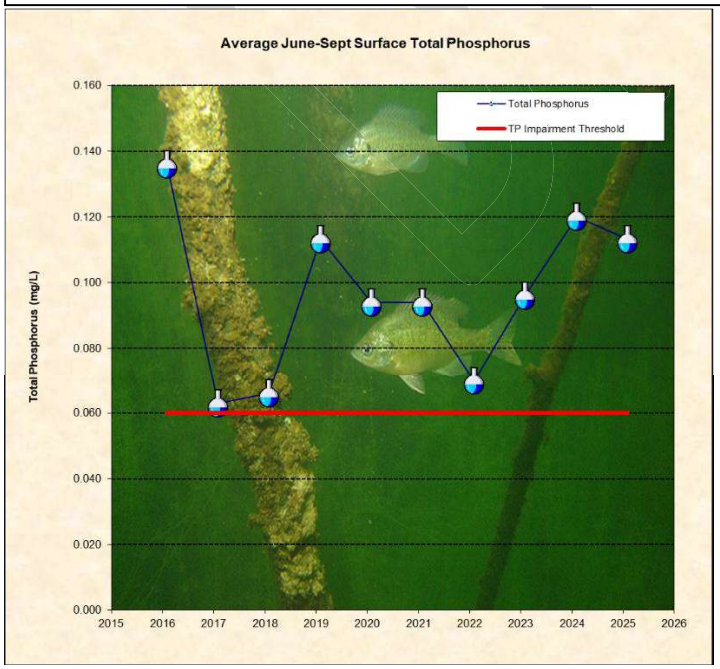
2025 Lake Grade: D

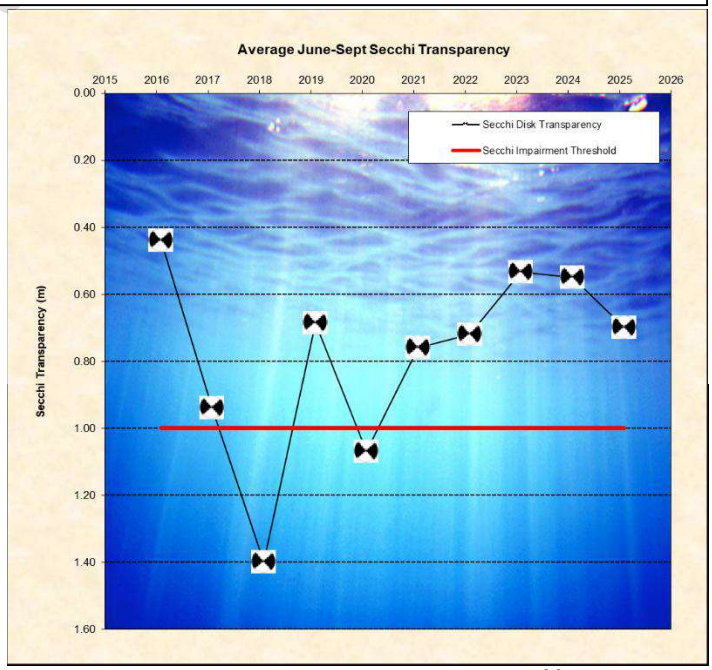
- DNR ID #: 820042
- Municipality: May Township
- Location: Section 30, T31N-R20W
- Lake Size: 87 Acres
- Maximum Depth (2025): 5 ft.
- Ordinary High Water Mark: 1005.30 ft.
- 100-Year High Water Level: 1008.65 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average Secchi transparency, average chlorophyll-α, and average total phosphorus.
- The major land use is rural/agricultural.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lynch Lake is listed as impaired for nutrients on the Minnesota Pollution Control Agency's Impaired Waters List.



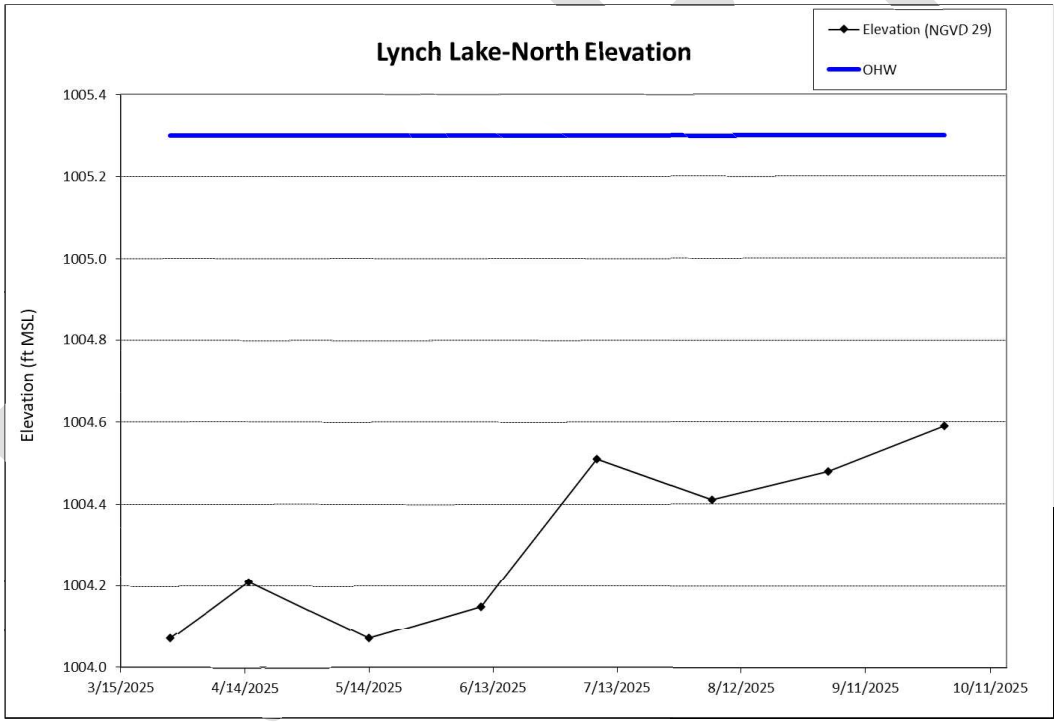


Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 10:08	0.101	35.0	30.0	1.36	0.61	9.3	10.76
5/14/2025 9:03	0.227	71.0	42.0	2.96	0.91	22.7	8.49
6/10/2025 9:26	0.109	65.0	54.0	1.62	0.76	18.7	7.64
7/8/2025 10:19	0.095	45.0	38.0	1.47	0.61	27.1	7.33
8/5/2025 9:12	0.115	36.0	29.0	1.49	0.61	23.4	2.66
9/2/2025 13:38	0.128	32.0	27.0	1.32	0.91	22.1	4.84
9/30/2025 9:37	0.119	40.0	34.0	1.32	0.61	20.0	6.61
2025 Average	0.128	46.3	36.3	1.65	0.72	20.5	6.90
2025 Summer Average	0.113	43.6	36.4	1.44	0.70	22.3	5.82

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*
Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	1004.59	9/30/2025	1004.07	5/14/2025	1004.31

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

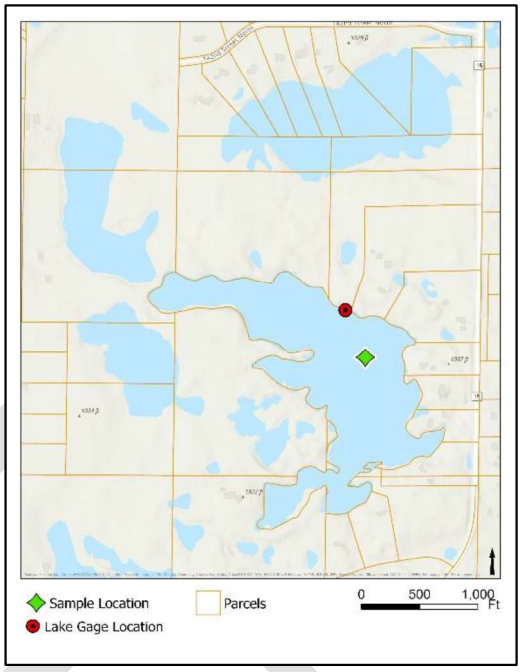


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	D	D	D	D	D	D	D	C	C	D
Chlorophyll-*a* (ug/l)	D	C	D	C	C	C	D	B	C	D
Secchi depth (ft)	D	F	D	D	D	D	D	C	D	F
Overall	**D**	**D**	**D**	**D+**	**D+**	**D+**	**D**	**C+**	**C-**	**D-**

Lynch Lake – South Basin

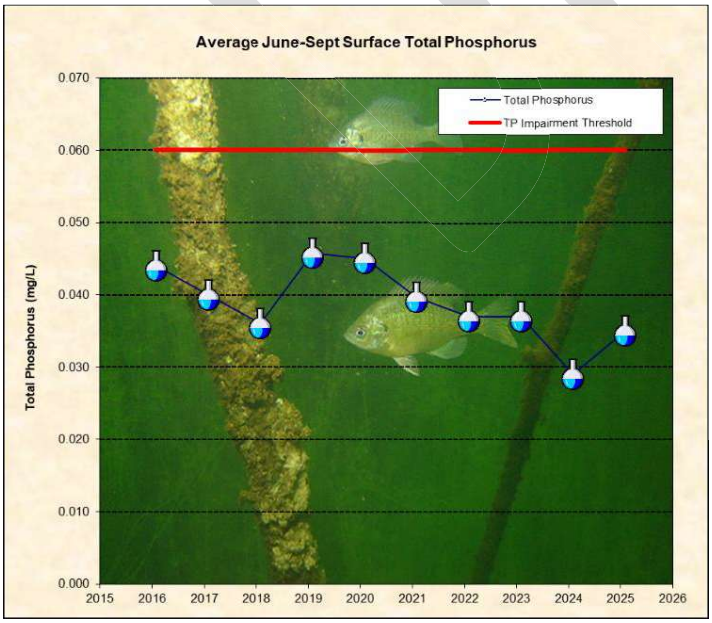
2025 Lake Grade: B-

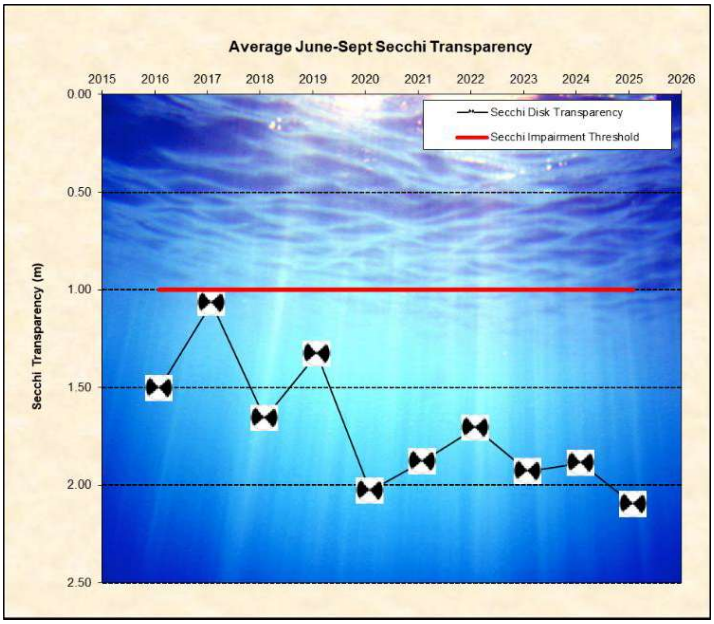
- DNR ID #: 820042
- Municipality: May Township
- Location: Section 30, T31N-R20W
- Lake Size: 87 Acres
- Maximum Depth (2025): 17.5 ft.
- Ordinary High Water Mark: 1005.30 ft.
- 100-Year High Water Level: 1008.65 ft.
- 99% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average Secchi transparency, average chlorophyll-α, and average total phosphorus.
- The major land use is rural/agricultural.
- The lake stratified in 2025 with the thermocline around 3 meters.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lynch Lake is listed as impaired for nutrients on the Minnesota Pollution Control Agency's Impaired Waters List.





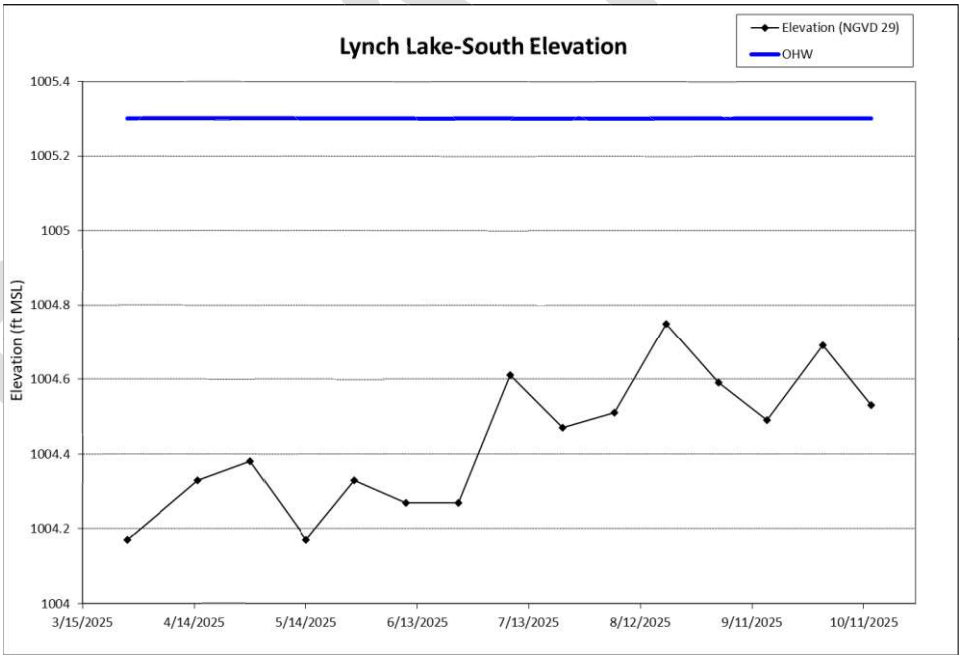
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 10:47	0.036	9.6	8.8	0.80	1.83	9.3	11.70
4/29/2025 11:58	0.036	5.4	4.3	0.96	2.59	13.5	9.06
5/14/2025 9:40	0.038	5.9	4.3	0.91	2.13	22.2	8.53
5/27/2025 11:41	0.038	5.4	4.5	0.93	1.83	18.5	9.63
6/10/2025 9:55	0.040	7.9	6.4	0.87	1.83	19.4	8.13
6/24/2025 10:34	0.032	5.6	4.5	0.96	2.44	26.0	7.43
7/8/2025 10:55	0.028	6.2	4.8	0.82	2.59	27.8	7.77
7/22/2025 9:18	0.029	7.4	6.1	0.81	2.29	24.7	6.96
8/5/2025 9:41	0.035	13.0	10.0	0.78	1.98	24.9	6.21
8/19/2025 10:43	0.044	22.0	20.0	0.89	1.68	24.5	6.74
9/2/2025 13:06	0.036	9.8	8.5	0.83	2.13	23.0	6.83
9/15/2025 12:54	0.035	9.9	8.8	0.86	2.13	21.9	7.75
9/30/2025 10:02	0.034	8.7	6.7	0.81	1.83	20.7	6.66
10/13/2025 12:17	0.034	9.9	8.3	0.77	2.29	15.7	7.26
2025 Average	0.035	9.1	7.6	0.86	2.11	20.9	7.90
2025 Summer Average	0.035	10.1	8.4	0.85	2.10	23.7	7.16

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	1004.75	8/19/2025	1004.17	5/14/2025	1004.44

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

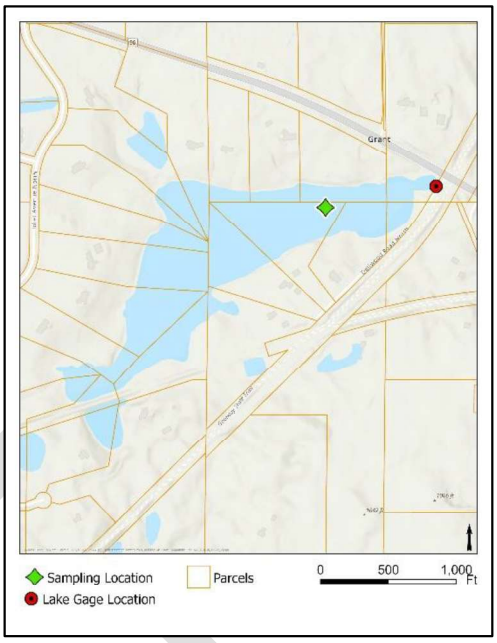


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	C	B	C	C	C	C	C	C	C	C
Chlorophyll-*a* (ug/l)	A	A	B	B	B	A	C	B	B	C
Secchi depth (ft)	C	C	C	C	C	C	C	C	D	C
Overall	**B-**	**B**	**C+**	**C+**	**C+**	**B-**	**C**	**C+**	**C**	**C**

Masterman Lake

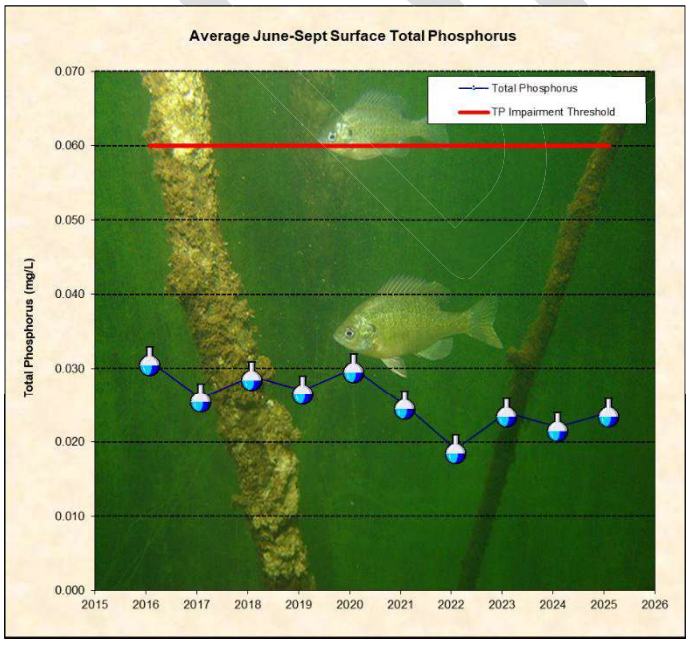
2025 Lake Grade: B

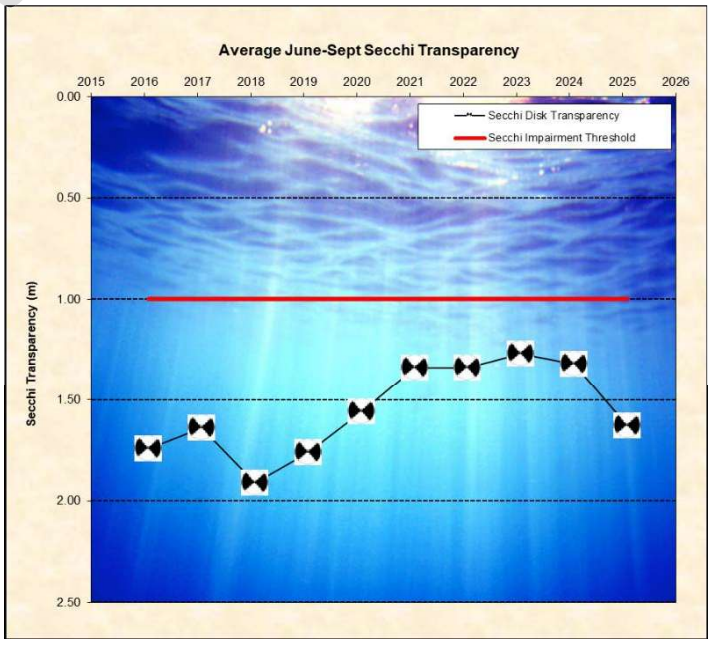
- DNR ID #: 820126
- Municipality: City of Grant
- Location: Section 23, T30N-R21W
- Lake Size: 40 Acres
- Maximum Depth (2025): 7.5 ft.
- Ordinary High Water Mark: 955.70 ft.
- 100-Year High Water Level: 958.29 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average total phosphorus and average chlorophyll-α, and the trend for the average Secchi transparency is skewed due to vegetation limiting the transparency.
- The major land use is rural/agricultural.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





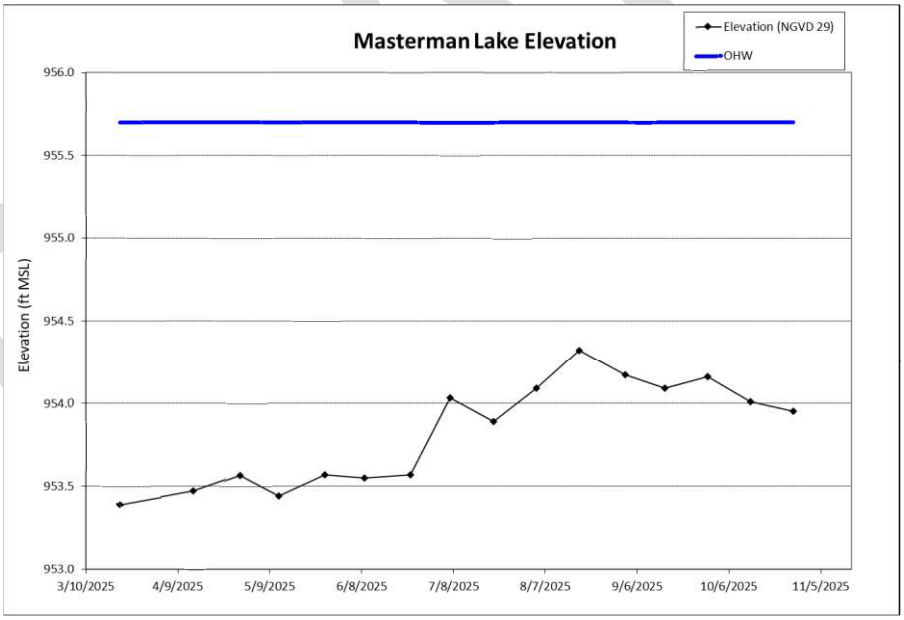
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/2025 9:47	0.028	26.0	24.0	0.80	1.83	11.2	11.03
4/29/2025 9:02	0.041	6.8	5.6	0.87	1.68	13.5	7.89
5/12/2025 9:35	0.036	5.6	4.5	0.78	1.68	20.9	8.41
5/27/2025 8:46	0.020	3.2	2.7	0.64	1.83	17.7	10.77
6/9/2025 9:01	0.020	3.3	2.4	0.59	1.68	19.6	7.84
6/24/2025 8:58	0.021	4.5	3.5	0.65	1.68	25.9	7.83
7/7/2025 9:13	0.032	12.0	9.6	0.64	1.52	26.3	6.04
7/21/2025 9:23	0.022	2.8	2.9	0.58	1.83	23.6	5.47
8/4/2025 8:53	0.024	6.9	5.1	0.59	1.37	24.0	5.03
8/18/2025 11:34	0.024	8.5	6.9	0.61	1.52	23.2	3.72
9/2/2025 9:55	0.019	4.4	3.2	0.58	1.68	21.9	6.92
9/15/2025 9:20	0.034	11.0	10.0	0.66	1.83	21.9	8.10
9/29/2025 9:01	0.019	5.9	3.7	0.48	1.52	19.4	5.32
10/13/2025 9:06	0.016	3.7	3.2	0.43	1.83	14.6	4.51
2025 Average	0.025	7.5	6.2	0.64	1.68	20.3	7.06
2025 Summer Average	0.024	6.6	5.3	0.60	1.63	22.9	6.25

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	954.32	8/18/2025	953.39	3/21/2025	953.83

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

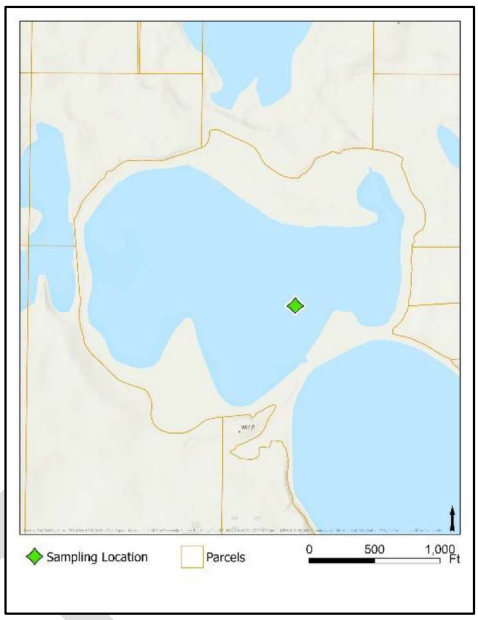


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	B	A	B	A	A	B	B	B	B	B
Chlorophyll-*a* (ug/l)	A	A	A	A	A	B	A	A	B	B
Secchi depth (ft)	C	C	C	C	C	C	C	C	C	C
Overall	**B**	**B+**	**B**	**B+**	**B+**	**B-**	**B**	**B**	**B-**	**B-**

North School Section Lake

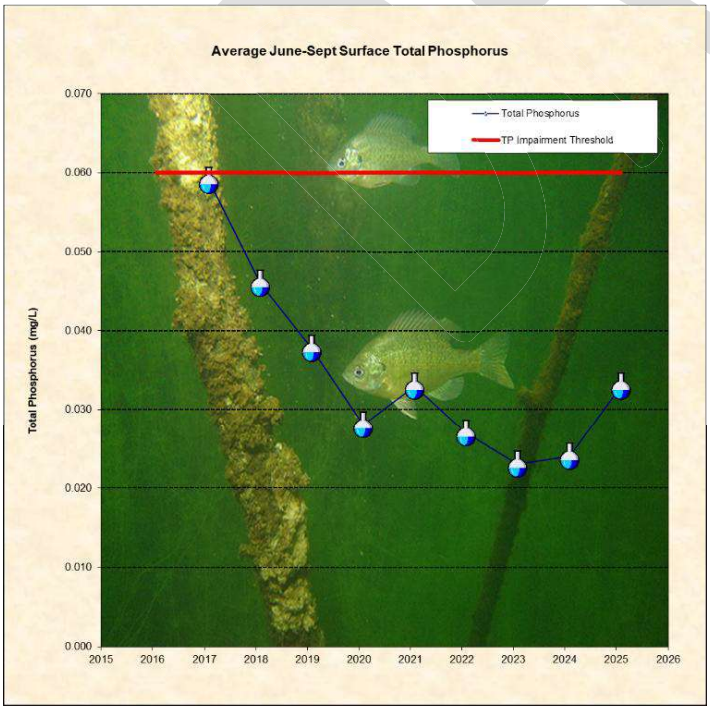
2025 Lake Grade: B

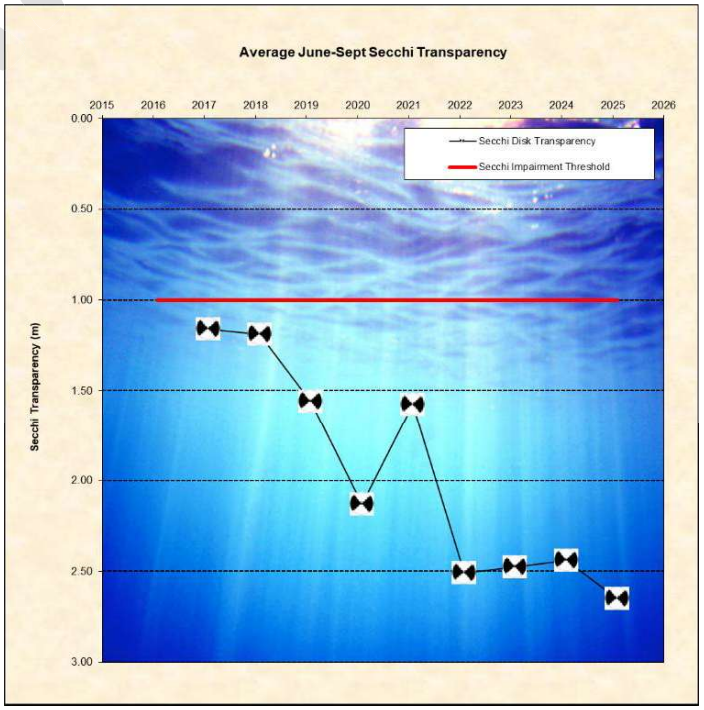
- DNR ID #: 820149
- Municipality: City of Hugo
- Location: SW ¼ Section 25, T31N-R21W
- Lake Size: 40 Acres
- Maximum Depth (2025): 12 ft.
- Ordinary High Water Mark: 963.2 ft.
- 100-Year High Water Level: 974.50 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average Secchi transparency, average chlorophyll-α, and average total phosphorus.
- The major land use is rural/agricultural.
- The North and South School Section basins were connected in 2025.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





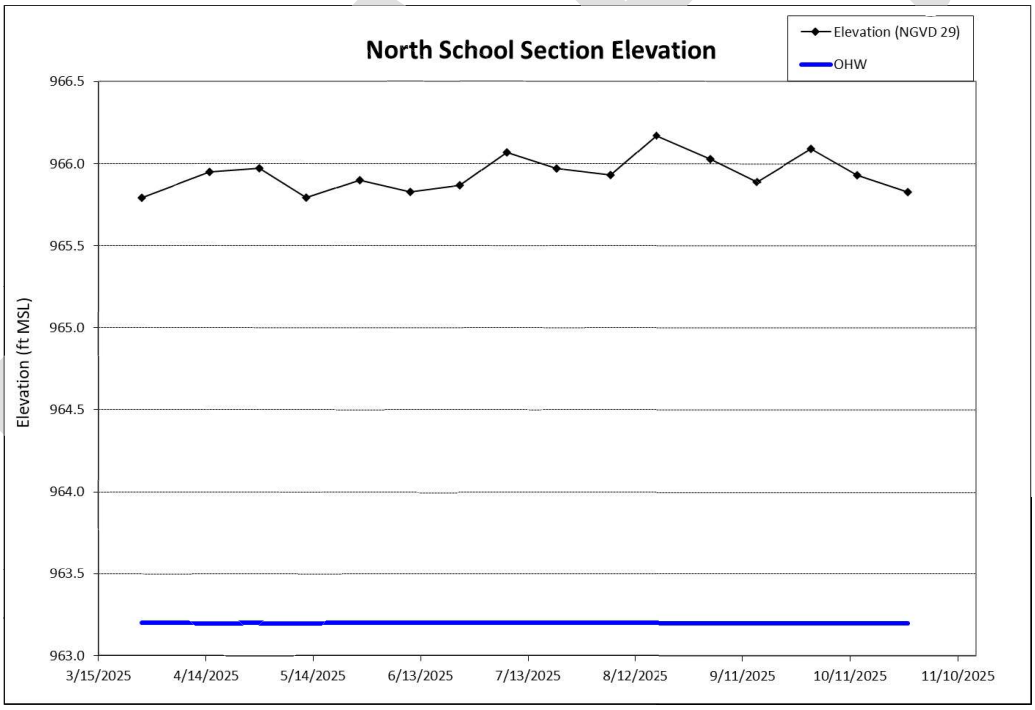
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 12:20	0.024	2.5	1.9	0.60	2.44	9.4	11.79
5/12/2025 14:33	0.031	3.3	2.9	0.68	2.90	20.5	10.68
6/10/2025 11:16	0.035	4.5	4.0	0.72	3.20	19.2	8.93
7/7/2025 13:59	0.028	8.0	7.5	0.77	2.90	28.6	9.13
8/5/2025 10:57	0.042	23.0	22.0	1.16	1.52	24.2	7.93
9/2/2025 15:03	0.030	7.0	7.2	0.73	2.44	22.6	9.06
9/30/2025 11:08	0.030	3.2	2.9	0.59	3.20	20.8	9.14
2025 Average	0.031	7.4	6.9	0.75	2.66	20.8	9.52
2025 Summer Average	0.033	9.1	8.7	0.79	2.65	23.1	8.84

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	966.17	8/18/2025	965.79	5/12/2025	965.94

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

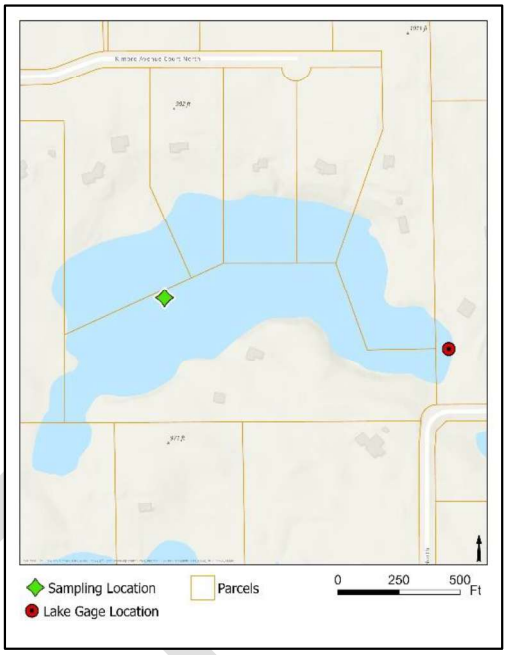


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	C	B	A	B	B	C	C	C	C	NA
Chlorophyll-*a* (ug/l)	A	A	A	A	B	A	C	C	C	NA
Secchi depth (ft)	B	B	B	B	C	B	C	C	C	NA
Overall	**B**	**B+**	**B+**	**B+**	**B-**	**B**	**C**	**C**	**C**	**NA**

Pat Lake

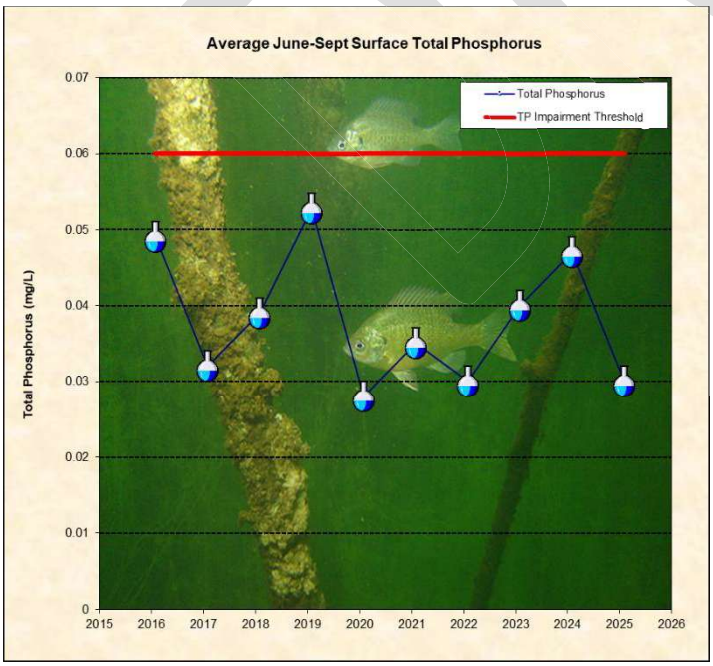
2025 Lake Grade: B

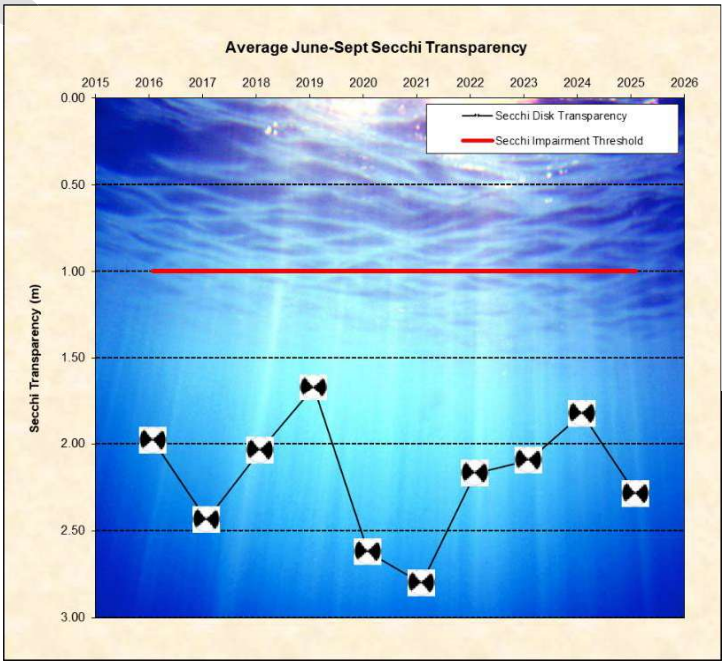
- DNR ID #: 820125
- Municipality: City of Grant
- Location: Section 11, T30N-R21W
- Lake Size: 20 Acres
- Maximum Depth (2025): 16 ft.
- Ordinary High Water Mark: 941.80 ft.
- 100-Year High Water Level: 948.61 ft.
- 99% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as mesotrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average total phosphorus and average chlorophyll-α, and no trend for average Secchi transparency at this time.
- The major land use is rural/agricultural.
- The lake stratified in 2025 with the thermocline between 2 and 3 meters.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





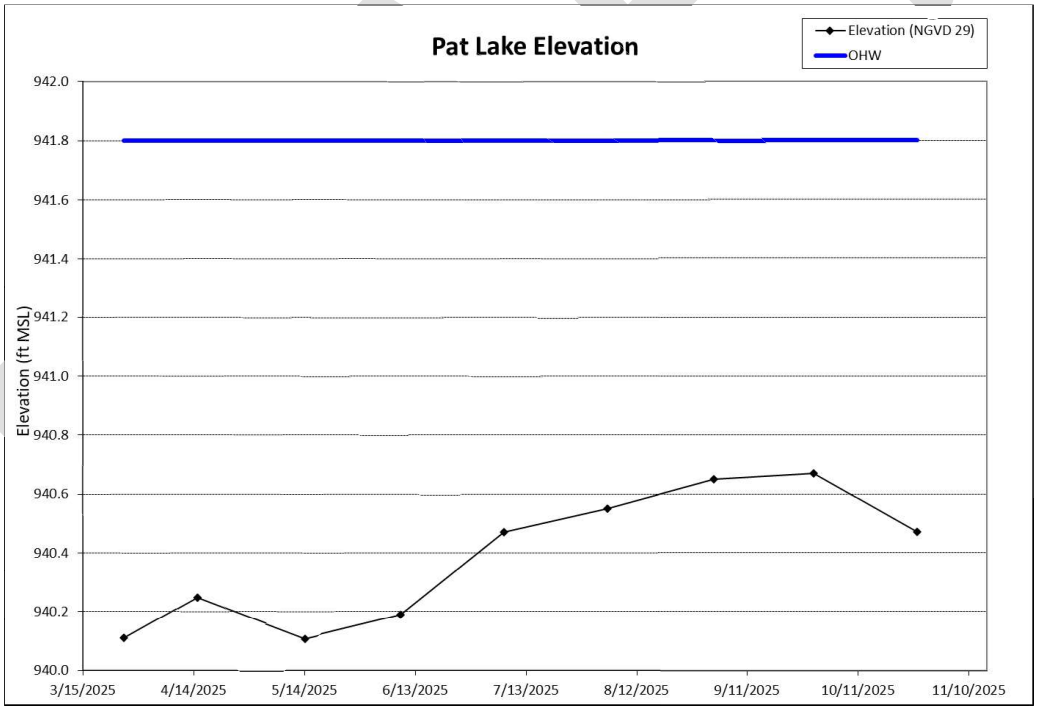
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 14:08	0.031	8.9	7.7	0.62	2.13	10.6	11.80
5/14/2025 10:45	0.038	3.1	2.7	0.65	2.74	24.1	9.82
6/9/2025 10:19	0.037	6.5	5.9	0.68	2.44	20.2	8.93
7/7/2025 10:16	0.034	7.6	6.4	0.59	2.44	27.7	9.39
8/4/2025 10:11	0.030	5.9	5.3	0.62	1.68	25.0	6.42
9/2/2025 11:16	0.030	4.5	4.0	0.63	2.13	22.9	8.61
9/29/2025 10:01	0.021	3.4	2.7	0.52	2.74	20.4	7.57
2025 Average	0.032	5.7	5.0	0.62	2.33	21.6	8.93
2025 Summer Average	0.030	5.6	4.9	0.61	2.29	23.2	8.18

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	940.67	9/29/2025	940.11	5/14/2025	940.39

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

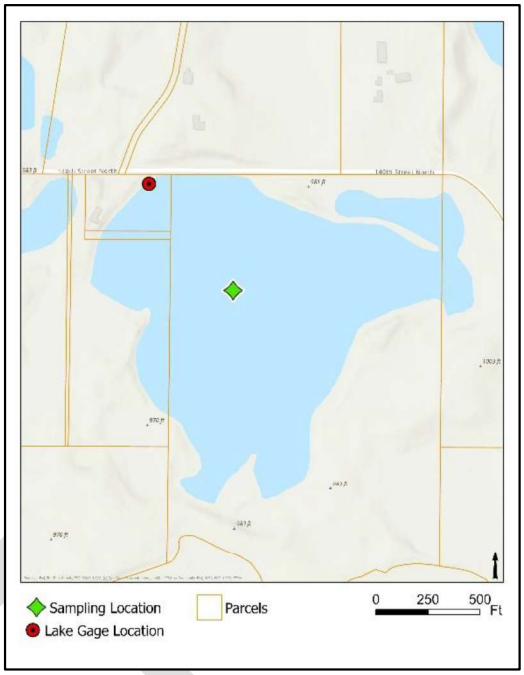


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	C	C	C	B	C	B	C	C	B	C
Chlorophyll-*a* (ug/l)	A	A	A	A	A	A	B	B	A	B
Secchi depth (ft)	B	C	C	B	B	B	C	C	B	C
Overall	**B**	**B-**	**B-**	**B+**	**B**	**B+**	**C+**	**C+**	**B+**	**C+**

Plaisted Lake

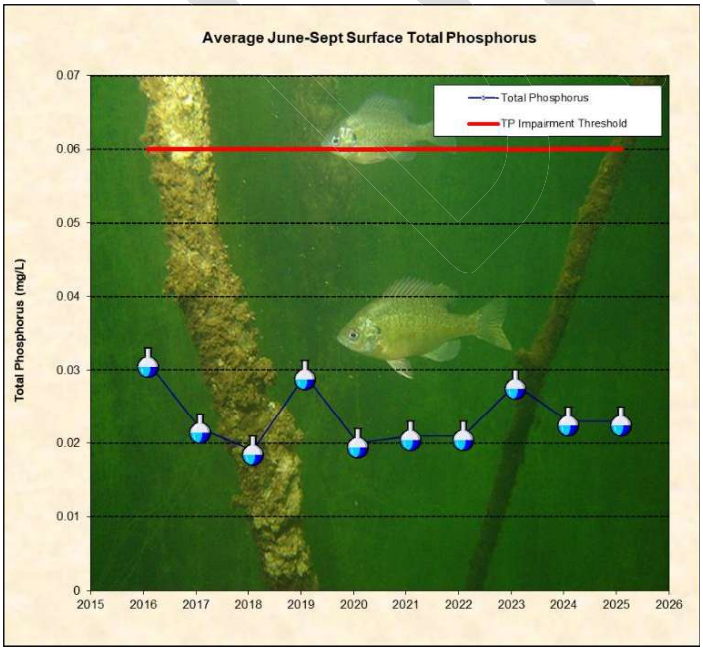
2025 Lake Grade: B+

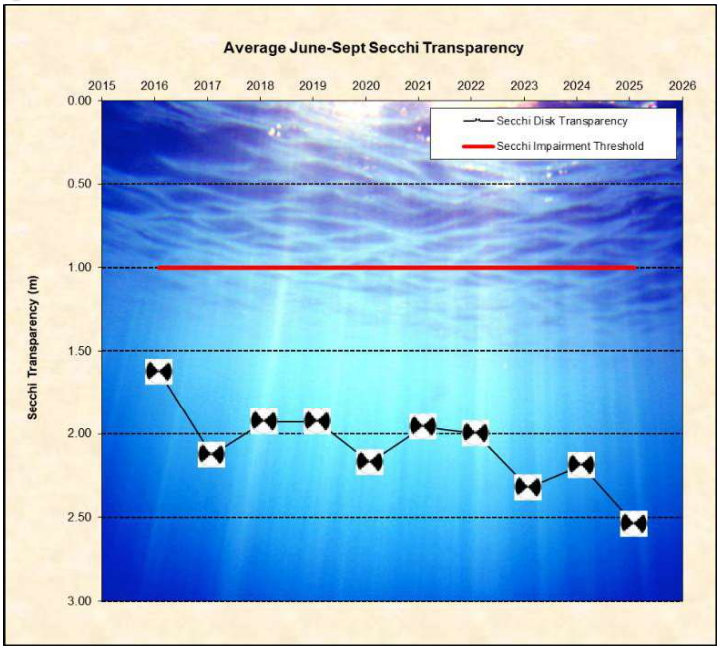
- DNR ID #: 820148
- Municipality: City of Hugo
- Location: Section 25, T31N-R21W
- Lake Size: 70 Acres
- Maximum Depth (2025): 12 ft.
- Ordinary High Water Mark: 966.00 ft.
- 100-Year High Water Level: 974.50 ft.
- 100% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as mesotrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average total phosphorus and average chlorophyll-α, and the trend for the average Secchi transparency is skewed due to vegetation limiting the transparency.
- The major land use is rural/agricultural.
- The lake did not stratify in 2025.
- This lake is categorized as shallow according to the Minnesota Pollution Control Agency's standards.
- Plaisted Lake is listed as impaired for nutrients on the Minnesota Pollution Control Agency's Impaired Waters List, and is listed as infested with Eurasian watermilfoil.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





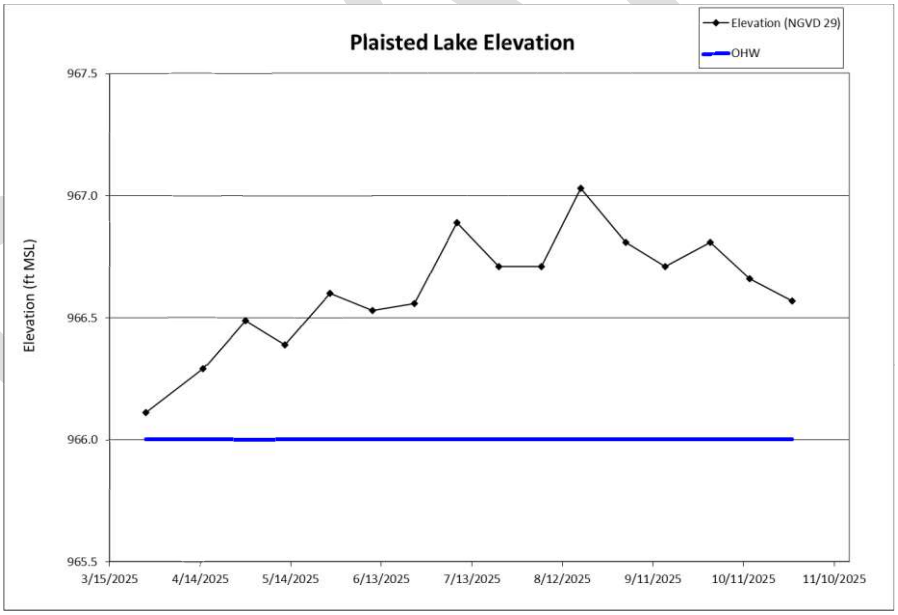
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 9:38	0.019	3.1	2.7	0.51	2.59	9.6	11.17
4/29/2025 13:24	0.023	3.8	2.7	0.47	2.44	14.5	9.57
5/12/2025 13:36	0.026	2.4	1.6	0.57	2.74	21.0	9.95
5/27/2025 13:03	0.024	2.6	2.1	0.61	2.90	18.4	10.68
6/10/2025 9:00	0.035	10.0	8.8	0.60	2.74	20.1	9.06
6/24/2025 9:49	0.023	4.5	4.0	0.64	2.59	25.7	9.03
7/8/2025 9:42	0.021	5.8	4.8	0.61	2.44	27.7	8.92
7/22/2025 9:57	0.024	3.4	2.9	0.52	2.29	24.9	7.34
8/5/2025 10:20	0.023	2.6	1.9	0.58	2.59	24.5	6.75
8/18/2025 13:27	0.022	2.5	2.4	0.52	2.74	23.6	4.94
9/2/2025 14:09	0.020	3.1	3.5	0.52	2.44	22.7	7.10
9/15/2025 13:28	0.018	3.1	2.7	0.50	2.44	22.6	8.37
9/30/2025 10:34	0.022	2.0	1.3	0.47	2.59	21.1	7.19
10/13/2025 12:53	0.019	2.7	2.4	0.44	2.59	15.8	6.95
2025 Average	0.023	3.7	3.1	0.54	2.58	20.9	8.36
2025 Summer Average	0.023	4.1	3.6	0.55	2.54	23.7	7.63

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	967.03	8/18/2025	966.11	3/27/2025	966.62

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

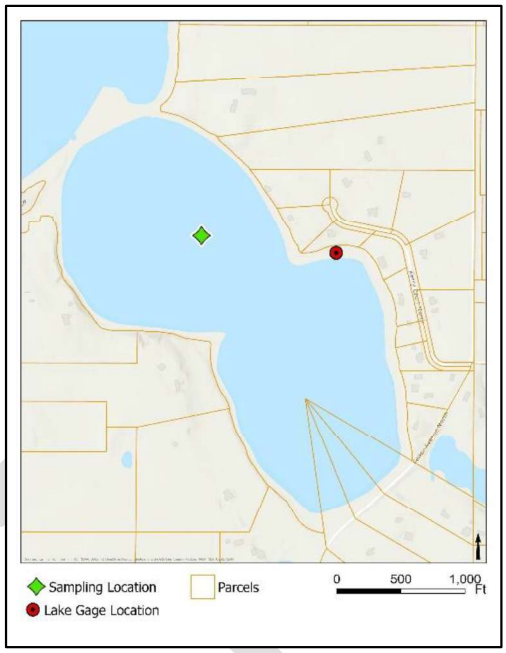


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	B	B	B	A	A	A	B	A	A	B
Chlorophyll-*a* (ug/l)	A	A	A	A	A	A	A	A	A	B
Secchi depth (ft)	B	B	B	C	B	B	C	C	C	C
Overall	**B+**	**B+**	**B+**	**B+**	**A-**	**A-**	**B**	**B+**	**B+**	**B-**

South School Section Lake

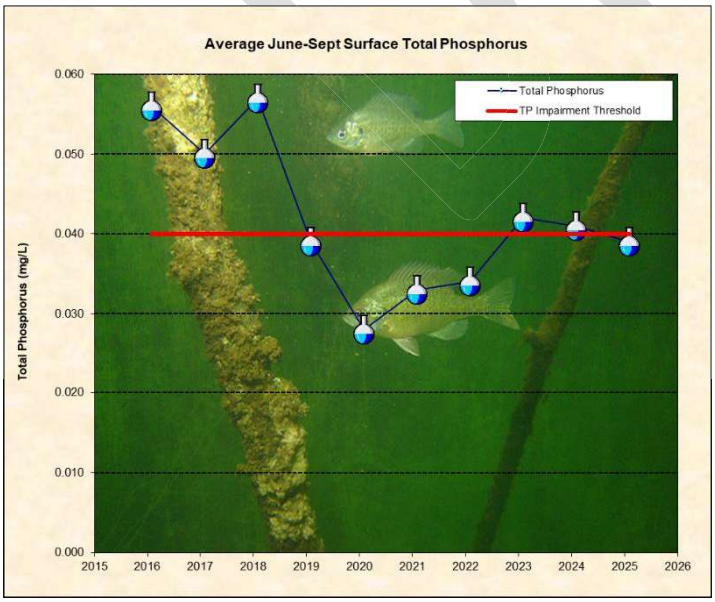
2025 Lake Grade: C+

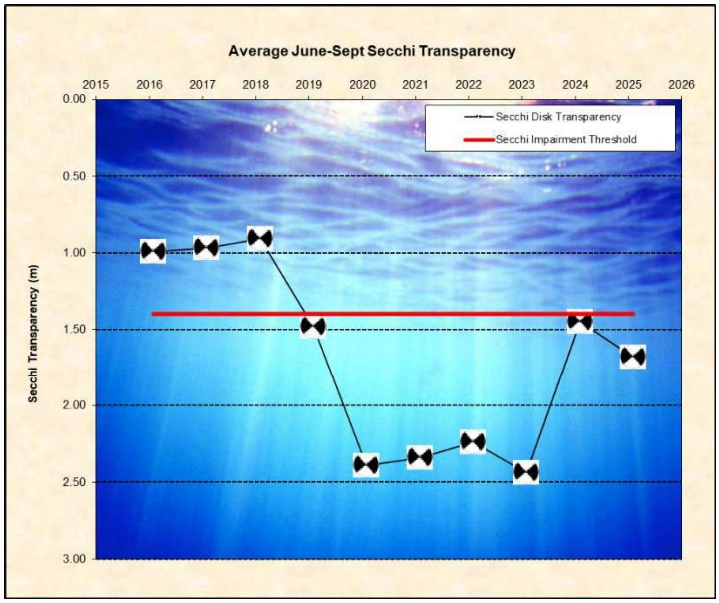
- DNR ID #: 820151
- Municipality: City of Hugo
- Location: S ½ Section 25, T31N-R21W
- Lake Size: 115 Acres
- Maximum Depth (2025): 21 ft.
- Ordinary High Water Mark: 965.30 ft.
- 100-Year High Water Level: 974.50 ft.
- 41% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as eutrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average total phosphorus, and no trend for average Secchi transparency and average chlorophyll-α at this time.
- The major land use is rural/agricultural.
- The lake stratified in 2025 with the thermocline around 4 meters.
- The North and South School Section basins were connected in 2025.
- This lake is categorized as a deep lake according to the Minnesota Pollution Control Agency's standards.
- South School Section Lake is listed as impaired for nutrients on the Minnesota Pollution Control Agency's Impaired Waters List.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





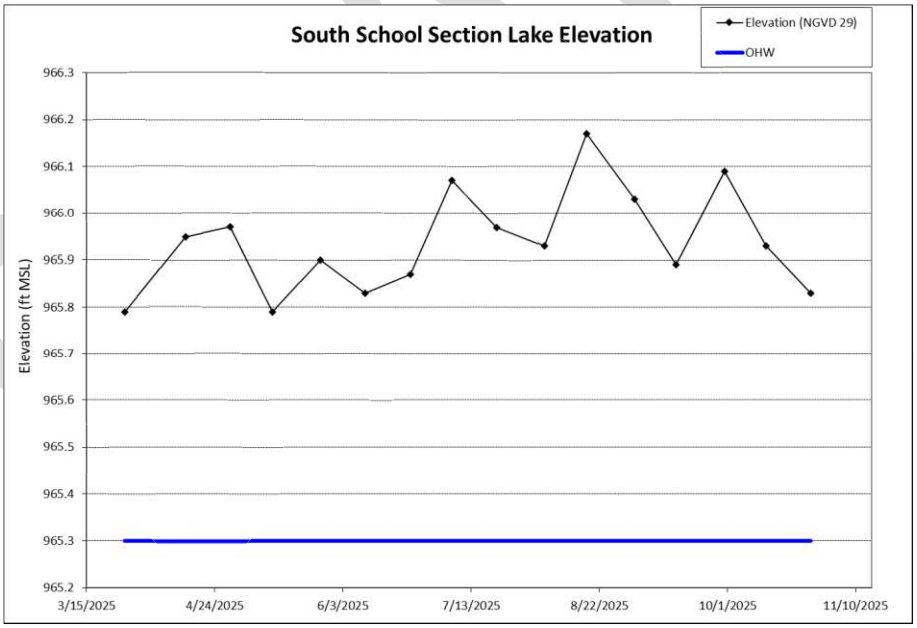
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/15/2025 12:30	0.028	1.8	1.6	0.74	4.42	8.4	12.19
4/29/2025 13:57	0.023	1.5	1.3	0.77	5.64	12.7	10.60
5/12/2025 14:12	0.024	1.6	1.0	0.79	5.64	19.2	10.55
5/27/2025 13:32	0.024	5.4	4.8	0.82	4.72	18.1	10.60
6/10/2025 11:31	0.028	6.4	5.3	0.88	3.66	19.2	8.16
6/24/2025 12:41	0.026	8.5	8.0	1.05	2.44	28.0	8.04
7/7/2025 14:12	0.029	12.0	12.0	0.89	2.13	29.1	8.77
7/21/2025 14:20	0.036	38.0	37.0	1.09	1.22	24.5	8.64
8/5/2025 11:10	0.042	72.0	70.0	1.52	0.91	24.9	9.03
8/18/2025 14:00	0.045	66.0	65.0	1.53	0.91	24.0	5.88
9/2/2025 15:17	0.049	44.0	43.0	1.33	1.37	23.3	8.55
9/15/2025 14:03	0.046	48.0	46.0	1.27	1.22	21.8	10.62
9/30/2025 11:19	0.047	30.0	28.0	1.20	1.22	21.4	7.86
10/13/2025 13:24	0.053	22.0	21.0	1.26	1.98	16.4	7.69
2025 Average	0.036	25.5	24.6	1.08	2.68	20.8	9.08
2025 Summer Average	0.039	36.1	34.9	1.20	1.68	24.0	8.39

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	966.17	8/18/2025	965.79	5/12/2025	965.94

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."

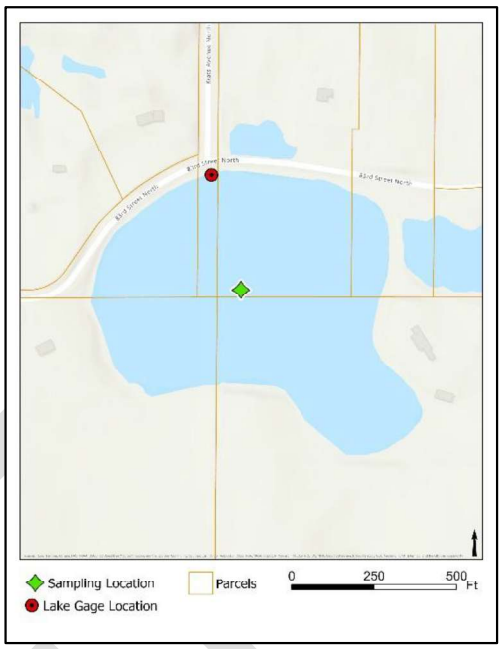


Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	C	C	C	B	B	B	C	C	C	C
Chlorophyll-*a* (ug/l)	C	C	B	B	B	B	C	D	C	C
Secchi depth (ft)	B	C	B	B	B	B	C	D	D	C
Overall	**C+**	**C**	**B-**	**B**	**B**	**B**	**C**	**D+**	**C-**	**C**

Woodpile Lake

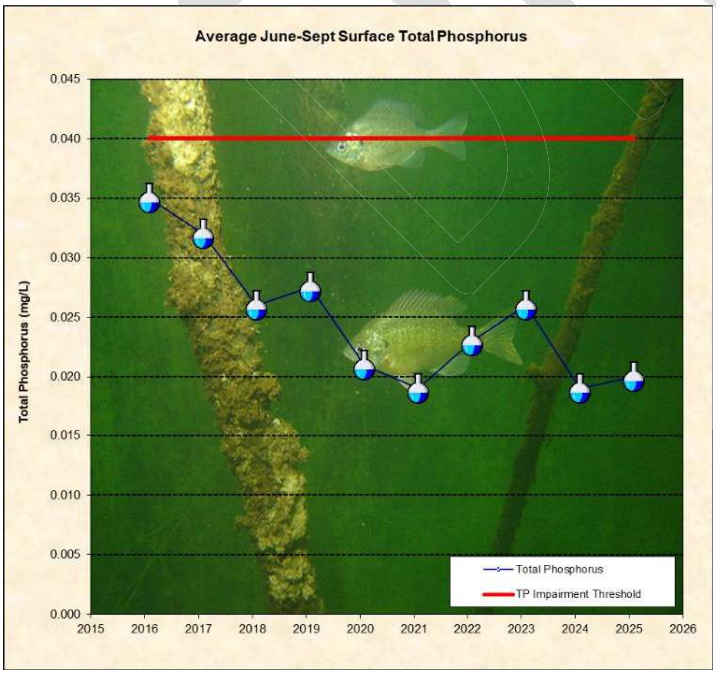
2025 Lake Grade: A

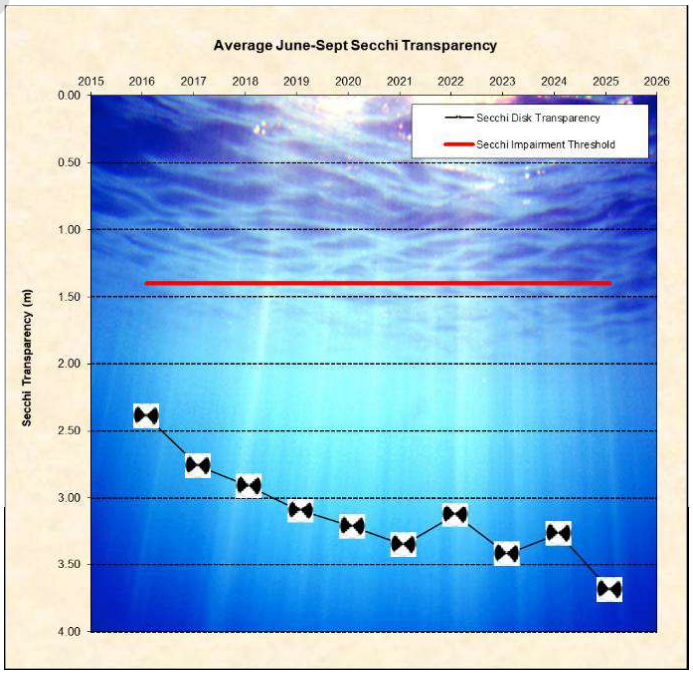
- DNR ID #: 820132
- Municipality: City of Grant
- Location: Section 23, T30N-R21W
- Lake Size: 15 Acres
- Maximum Depth (2025): 26 ft.
- Ordinary High Water Mark: 968.50 ft.
- 100-Year High Water Level: 972.50 ft.
- 8% Littoral
  Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



Summary Points

- Based on chlorophyll-α data, the lake is classified as mesotrophic according to the Carlson Trophic State Index.
- Using the Kendall's Tau correlation test ($p<0.05$) there is a statistically significant **improving** trend for the average Secchi transparency, average chlorophyll-α, and average total phosphorus.
- The major land use is rural/agricultural.
- The lake stratified in 2025 with the thermocline around 3 meters.
- This lake is categorized as a deep lake according to the Minnesota Pollution Control Agency's standards.
- Lab methodology was changed for 2023 total phosphorus sample analysis, as such no results were reported <0.022 mg/L (April-mid September).





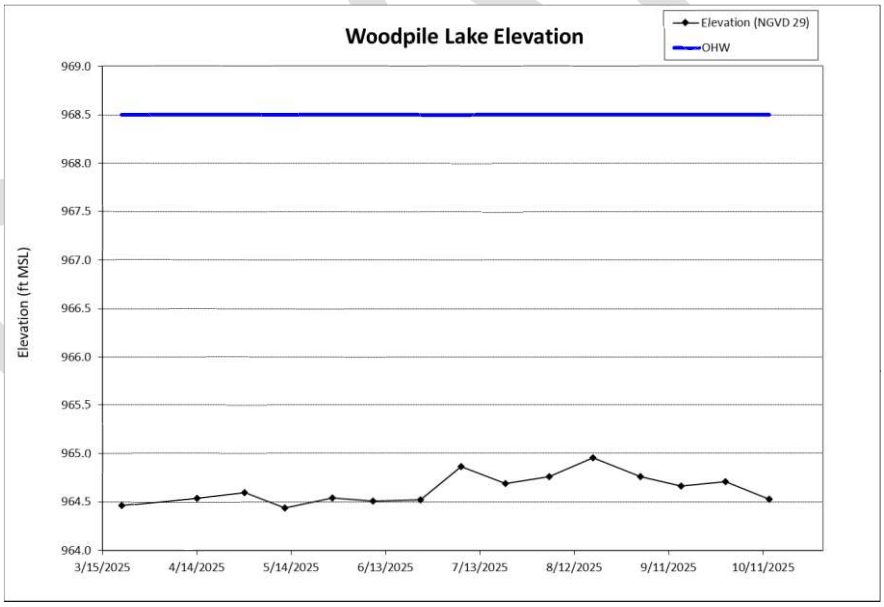
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-*a* (ug/L)	Pheophytin-Corrected Chlorophyll-*a* (ug/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/14/2025 9:00	0.018	2.6	2.9	0.82	3.66	10.0	13.55
4/29/2025 8:26	0.020	4.3	4.0	0.65	4.27	13.5	10.20
5/12/2025 8:48	0.023	2.3	1.6	0.66	4.42	19.8	10.80
5/27/2025 8:19	0.020	2.3	2.1	0.67	4.27	18.2	10.60
6/9/2025 8:31	0.020	3.0	2.4	0.64	4.27	20.5	10.34
6/24/2025 8:15	0.021	2.5	2.1	0.67	3.96	26.2	7.95
7/7/2025 8:44	0.023			0.68	3.96	27.4	9.41
7/21/2025 8:55	0.024	9.6	9.3	0.76	2.74	25.2	9.36
8/4/2025 8:21	0.023	8.1	7.5	0.66	3.20	25.5	7.13
8/18/2025 11:09	0.025	6.6	6.7	0.67	3.51	24.2	6.32
9/2/2025 9:10	0.017	4.7	4.5	0.68	3.51	23.2	7.98
9/15/2025 8:51	0.014	2.7	2.7	0.56	4.27	22.8	9.78
9/29/2025 8:34	0.016	2.2	1.9	0.55	3.81	20.5	8.72
10/13/2025 8:37	0.015	2.0	1.1	0.53	4.27	15.9	6.96
2025 Average	0.020	4.1	3.8	0.66	3.87	20.9	9.22
2025 Summer Average	0.020	4.9	4.6	0.65	3.69	23.9	8.55

Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*

Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*

	High	High Date	Low	Low Date	Average
2025 Elevation (ft)	964.95	8/18/2025	964.44	5/12/2025	964.64

*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."



Lake Water Quality Summary										
	Lake Grades (May-Sept)									
	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016
Total Phosphorus (mg/l)	A	A	B	A	A	A	B	B	B	C
Chlorophyll-*a* (ug/l)	A	A	A	A	A	A	A	A	A	A
Secchi depth (ft)	A	A	A	A	A	A	A	B	B	B
Overall	**A**	**A**	**A-**	**A**	**A**	**A**	**A-**	**B+**	**B+**	**B**

APPENDIX B –STREAM DATA

Total Phosphorus and Total Suspended Solids Loading Tables

Field Water Quality Data Tables

Table 1. Brown's Creek at Highway 15 2025 Total Suspended Solids (TSS) and Total Phosphorus (TP) Loading

	Sample Collection Time				Loading Interval					
Sample Type	Start	End	TSS (mg/L)	TP (mg/L)	Start	End	Interval Volume (cf)	Interval Volume (ac-ft)	Interval TSS (lb)	Interval TP (lb)
*Base**			*6*	*0.110*	*1/1/2025 0:00*	*3/9/2025 13:00*	*16,047,900*	*368.60*	*6,011*	*110.20*
*Snowmelt**			*144*	*0.382*	*3/9/2025 13:00*	*3/11/2025 15:00*	*945,000*	*21.71*	*8,495*	*22.54*
*Base**			*6*	*0.110*	*3/11/2025 15:00*	*3/29/2025 17:00*	*5,859,000*	*134.57*	*2,195*	*40.23*
*Storm**			*305*	*0.700*	*3/29/2025 17:00*	*3/30/2025 17:00*	*1,555,200*	*35.72*	*29,611*	*67.96*
*Base**			*6*	*0.110*	*3/30/2025 17:00*	*4/2/2025 11:00*	*1,425,600*	*32.74*	*534*	*9.79*
*Storm**			*305*	*0.700*	*4/2/2025 11:00*	*4/3/2025 1:00*	*453,600*	*10.42*	*8,637*	*19.82*
*Base**			*6*	*0.110*	*4/3/2025 1:00*	*4/16/2025 10:30*	*4,629,600*	*106.34*	*1,734*	*31.79*
Base			*6*	*0.110*	*4/16/2025 10:30*	*4/17/2025 16:30*	*408,240*	*9.38*	*153*	*2.80*
Storm			*305*	*0.700*	*4/17/2025 16:30*	*4/18/2025 9:30*	*421,809*	*9.69*	*8,031*	*18.43*
Base			*6*	*0.110*	*4/18/2025 9:30*	*4/21/2025 0:30*	*1,194,370*	*27.43*	*447*	*8.20*
Storm			*305*	*0.700*	*4/21/2025 0:30*	*4/21/2025 19:30*	*605,407*	*13.91*	*11,527*	*26.46*
Base			*6*	*0.110*	*4/21/2025 19:30*	*4/28/2025 8:30*	*3,088,780*	*70.95*	*1,157*	*21.21*
Base Grab	4/29/2025 8:21	4/29/2025 8:21	4	0.069	4/28/2025 8:30	4/30/2025 8:30	733,044	16.84	183	3.16
Base			*6*	*0.110*	*4/30/2025 8:30*	*5/13/2025 14:30*	*4,713,320*	*108.26*	*1,765*	*32.37*
Base Grab	5/14/2025 14:09	5/14/2025 14:09	9	0.102	5/13/2025 14:30	5/15/2025 14:30	556,776	12.79	313	3.55
Base			*6*	*0.110*	*5/15/2025 14:30*	*5/19/2025 21:30*	*1,376,920*	*31.63*	*516*	*9.46*
Storm			*305*	*0.700*	*5/19/2025 21:30*	*5/20/2025 9:30*	*277,951*	*6.38*	*5,292*	*12.15*
Storm Composite	5/20/2025 10:19	5/21/2025 13:16	169	0.407	5/20/2025 9:30	5/21/2025 13:30	2,073,210	47.62	21,872	52.67
Base			*6*	*0.110*	*5/21/2025 13:30*	*6/3/2025 8:30*	*5,675,320*	*130.36*	*2,126*	*38.97*
Storm			*305*	*0.700*	*6/3/2025 8:30*	*6/4/2025 2:30*	*384,674*	*8.84*	*7,324*	*16.81*
Base			*6*	*0.110*	*6/4/2025 2:30*	*6/10/2025 8:30*	*1,944,890*	*44.67*	*728*	*13.36*
Base Grab	6/11/2025 8:10	6/11/2025 8:10	5	0.119	6/10/2025 8:30	6/13/2025 0:30	677,366	15.56	211	5.03
Storm Composite	6/13/2025 7:55	6/14/2025 10:14	294	0.218	6/13/2025 0:30	6/14/2025 10:30	1,321,570	30.35	24,255	17.99
Base			*6*	*0.110*	*6/14/2025 10:30*	*6/25/2025 13:30*	*3,790,860*	*87.07*	*1,420*	*26.03*
Storm Composite	6/25/2025 15:23	6/26/2025 13:03	165	0.449	6/25/2025 13:30	6/26/2025 13:30	1,556,370	35.75	16,031	43.62
Base			*6*	*0.110*	*6/26/2025 13:30*	*7/9/2025 10:30*	*6,639,740*	*152.51*	*2,487*	*45.59*
Base Grab	7/10/2025 10:26	7/10/2025 10:26	8	0.189	7/9/2025 10:30	7/11/2025 10:30	526,795	12.10	263	6.22
Base			*6*	*0.110*	*7/11/2025 10:30*	*7/27/2025 20:30*	*4,309,640*	*98.99*	*1,614*	*29.59*
Storm Composite	7/27/2025 20:58	7/28/2025 7:38	331	0.699	7/27/2025 20:30	7/28/2025 8:30	696,533	16.00	14,392	30.39
Base			*6*	*0.110*	*7/28/2025 8:30*	*7/28/2025 21:30*	*843,858*	*19.38*	*316*	*5.79*
Storm			*305*	*0.700*	*7/28/2025 21:30*	*7/29/2025 0:30*	*172,165*	*3.95*	*3,278*	*7.52*
Base			*6*	*0.110*	*7/29/2025 0:30*	*8/4/2025 9:30*	*2,937,710*	*67.48*	*1,100*	*20.17*
Base Grab	8/5/2025 9:11	8/5/2025 9:11	5	0.122	8/4/2025 9:30	8/6/2025 9:30	476,285	10.94	149	3.63
Base			*6*	*0.110*	*8/6/2025 9:30*	*8/9/2025 4:30*	*630,694*	*14.49*	*236*	*4.33*
Storm			*305*	*0.700*	*8/9/2025 4:30*	*8/9/2025 13:30*	*174,174*	*4.00*	*3,316*	*7.61*
Storm Composite	8/9/2025 14:13	8/10/2025 12:59	168	0.797	8/9/2025 13:30	8/10/2025 13:30	541,013	12.43	5,674	26.92
Base			*6*	*0.110*	*8/10/2025 13:30*	*8/15/2025 17:30*	*1,456,620*	*33.46*	*546*	*10.00*
Storm			*305*	*0.700*	*8/15/2025 17:30*	*8/16/2025 10:30*	*434,689*	*9.98*	*8,276*	*19.00*
Storm Composite	8/16/2025 11:01	8/17/2025 2:36	702	1.630	8/16/2025 10:30	8/17/2025 3:30	704,978	16.19	30,894	71.73
Base			*6*	*0.110*	*8/17/2025 3:30*	*9/7/2025 14:30*	*7,779,400*	*178.68*	*2,914*	*53.42*
Base Grab	9/8/2025 14:26	9/8/2025 14:26	6	0.080	9/7/2025 14:30	9/9/2025 14:30	532,562	12.23	199	2.66
Base			*6*	*0.110*	*9/9/2025 14:30*	*9/19/2025 18:30*	*3,052,770*	*70.12*	*1,143*	*20.96*
Storm			*305*	*0.700*	*9/19/2025 18:30*	*9/21/2025 16:30*	*1,113,900*	*25.58*	*21,209*	*48.68*
Base			*6*	*0.110*	*9/21/2025 16:30*	*9/22/2025 0:30*	*136,268*	*3.13*	*51*	*0.94*
Storm			*305*	*0.700*	*9/22/2025 0:30*	*9/23/2025 11:30*	*883,095*	*20.28*	*16,814*	*38.59*
Base			*6*	*0.110*	*9/23/2025 11:30*	*10/7/2025 10:30*	*3,189,600*	*73.26*	*1,195*	*21.90*
Base Grab	10/8/2025 10:28	10/8/2025 10:28	6	0.088	10/7/2025 10:30	10/9/2025 10:30	409,631	9.41	153	2.25
Base			*6*	*0.110*	*10/9/2025 10:30*	*10/28/2025 10:30*	*4,516,180*	*103.73*	*1,692*	*31.01*
*Base**			*6*	*0.110*	*10/28/2025 10:30*	*11/25/2025 16:00*	*6,707,250*	*154.06*	*2,512*	*46.06*
*Storm**			*305*	*0.700*	*11/25/2025 16:00*	*11/26/2025 2:00*	*252,000*	*5.79*	*4,798*	*11.01*
*Base**			*6*	*0.110*	*11/26/2025 2:00*	*1/1/2026 0:00*	*8,533,800*	*196.01*	*3,196*	*58.60*
Storm Average			305	0.700						
Base Average			6	0.110						
All Average			144	0.382						
Total							**119,368,127**	**2,742**	**288,988**	**1,279**
Brown's Creek Major Subwatershed Total Acres							3,532			
Total TSS/TP(lb/ac/yr)									81.82	0.362
Total TSS/TP (kg/ha/yr)									91.71	0.406

Italics indicate estimated concentrations based on average base and storm flow concentrations.

*Interval volumes were estimated using similar flow conditions.

Table 2. Brown's Creek at McKusick Road 2025 Total Suspended Solids (TSS) and Total Phosphorus (TP) Loading

	Sample Collection Time				Loading Interval					
Sample Type	Start	End	TSS (mg/L)	TP (mg/L)	Start	End	Interval Volume (cf)	Interval Volume (ac-ft)	Interval TSS (lb)	Interval TP (lb)
*Base**			*7*	*0.127*	*1/1/2025 0:00*	*2/24/2025 12:00*	*18,835,200*	*432.62*	*8,231*	*149.33*
*Snowmelt**			*323*	*0.525*	*2/24/2025 12:00*	*2/25/2025 9:00*	*491,400*	*11.29*	*9,908*	*16.11*
*Base**			*7*	*0.127*	*2/25/2025 9:00*	*3/9/2025 13:00*	*4,204,800*	*96.58*	*1,837*	*33.34*
*Snowmelt**			*323*	*0.525*	*3/9/2025 13:00*	*3/11/2025 15:00*	*1,350,000*	*31.01*	*27,221*	*44.24*
*Base**			*7*	*0.127*	*3/11/2025 15:00*	*3/29/2025 18:00*	*7,830,000*	*179.85*	*3,422*	*62.08*
*Storm**			*523*	*0.713*	*3/29/2025 18:00*	*3/30/2025 20:00*	*2,152,800*	*49.45*	*70,286*	*95.82*
*Base**			*7*	*0.127*	*3/30/2025 20:00*	*4/2/2025 12:00*	*1,843,200*	*42.34*	*805*	*14.61*
*Storm**			*523*	*0.713*	*4/2/2025 12:00*	*4/3/2025 3:00*	*702,000*	*16.12*	*22,920*	*31.25*
*Base**			*7*	*0.127*	*4/3/2025 3:00*	*4/10/2025 14:45*	*4,367,925*	*100.33*	*1,909*	*34.63*
Base			*7*	*0.127*	*4/10/2025 14:45*	*4/17/2025 16:45*	*3,912,020*	*89.85*	*1,709*	*31.01*
Storm			*523*	*0.713*	*4/17/2025 16:45*	*4/18/2025 0:45*	*257,529*	*5.92*	*8,408*	*11.46*
Base			*7*	*0.127*	*4/18/2025 0:45*	*4/21/2025 1:45*	*2,129,960*	*48.92*	*931*	*16.89*
Storm Composite[X]	4/21/2025 3:50	4/21/2025 11:05	3,470	1.650	4/21/2025 1:45	4/21/2025 11:45	465,815	10.70	100,904	47.98
Base			*7*	*0.127*	*4/21/2025 11:45*	*4/28/2025 8:45*	*4,807,710*	*110.43*	*2,101*	*38.12*
Base Grab	4/29/2025 8:48	4/29/2025 8:48	4	0.072	4/28/2025 8:45	4/30/2025 8:45	1,074,020	24.67	268	4.83
Base			*7*	*0.127*	*4/30/2025 8:45*	*5/13/2025 14:45*	*5,997,320*	*137.75*	*2,621*	*47.55*
Base Grab	5/14/2025 14:22	5/14/2025 14:22	6	0.093	5/13/2025 14:45	5/15/2025 14:45	627,854	14.42	235	3.65
Storm			*523*	*0.713*	*5/15/2025 14:45*	*5/15/2025 19:45*	*135,773*	*3.12*	*4,433*	*6.04*
Base			*7*	*0.127*	*5/15/2025 19:45*	*5/19/2025 22:45*	*1,858,300*	*42.68*	*812*	*14.73*
Storm Composite	5/19/2025 23:11	5/21/2025 3:51	1,220	1.460	5/19/2025 22:45	5/21/2025 4:45	2,774,420	63.73	211,300	252.87
Storm			*523*	*0.713*	*5/21/2025 4:45*	*5/21/2025 17:45*	*1,569,820*	*36.06*	*51,253*	*69.87*
Base			*7*	*0.127*	*5/21/2025 17:45*	*6/3/2025 7:45*	*9,423,770*	*216.45*	*4,118*	*74.71*
Storm			*523*	*0.713*	*6/3/2025 7:45*	*6/4/2025 3:45*	*645,018*	*14.82*	*21,059*	*28.71*
Base			*7*	*0.127*	*6/4/2025 3:45*	*6/10/2025 8:45*	*3,052,400*	*70.11*	*1,334*	*24.20*
Base Grab	6/11/2025 8:24	6/11/2025 8:24	10	0.132	6/10/2025 8:45	6/12/2025 23:45	1,032,350	23.71	644	8.51
Storm Composite	6/13/2025 0:57	6/13/2025 9:32	1,500	1.290	6/12/2025 23:45	6/13/2025 13:45	838,663	19.26	78,532	67.54
Base			*7*	*0.127*	*6/13/2025 13:45*	*6/25/2025 11:45*	*7,261,420*	*166.79*	*3,173*	*57.57*
Storm Composite[XY]	6/25/2025 12:25	6/25/2025 18:01	3,220	2.060	6/25/2025 11:45	6/25/2025 18:45	667,094	15.32	134,094	85.79
Storm			*523*	*0.713*	*6/25/2025 18:45*	*6/26/2025 18:45*	*3,586,860*	*82.39*	*117,107*	*159.65*
Base			*7*	*0.127*	*6/26/2025 18:45*	*6/29/2025 1:45*	*6,572,900*	*150.97*	*2,872*	*52.11*
Storm			*523*	*0.713*	*6/29/2025 1:45*	*6/29/2025 3:45*	*192,686*	*4.43*	*6,291*	*8.58*
Base			*7*	*0.127*	*6/29/2025 3:45*	*7/5/2025 21:45*	*9,017,840*	*207.13*	*3,941*	*71.49*
Storm			*523*	*0.713*	*7/5/2025 21:45*	*7/6/2025 3:45*	*255,403*	*5.87*	*8,339*	*11.37*
Base			*7*	*0.127*	*7/6/2025 3:45*	*7/9/2025 9:45*	*2,170,500*	*49.85*	*948*	*17.21*
Base Grab	7/10/2025 9:46	7/10/2025 9:46	11	0.234	7/9/2025 9:45	7/11/2025 9:45	805,367	18.50	553	11.76
Base			*7*	*0.127*	*7/11/2025 9:45*	*7/16/2025 0:45*	*1,292,300*	*29.68*	*565*	*10.25*
Storm			*523*	*0.713*	*7/16/2025 0:45*	*7/16/2025 11:45*	*196,406*	*4.51*	*6,412*	*8.74*
Base			*7*	*0.127*	*7/16/2025 11:45*	*7/23/2025 13:45*	*2,452,600*	*56.33*	*1,072*	*19.44*
Storm			*523*	*0.713*	*7/23/2025 13:45*	*7/23/2025 20:45*	*143,406*	*3.29*	*4,682*	*6.38*
Base			*7*	*0.127*	*7/23/2025 20:45*	*7/27/2025 19:45*	*1,494,450*	*34.33*	*653*	*11.85*
Storm Composite	7/27/2025 20:35	7/28/2025 1:17	867	0.791	7/27/2025 19:45	7/28/2025 1:45	837,890	19.25	45,350	41.37
Base			*7*	*0.127*	*7/28/2025 1:45*	*7/28/2025 21:45*	*2,552,750*	*58.63*	*1,116*	*20.24*
Storm			*523*	*0.713*	*7/28/2025 21:45*	*7/29/2025 0:45*	*407,595*	*9.36*	*13,308*	*18.14*
Base			*7*	*0.127*	*7/29/2025 0:45*	*8/4/2025 8:45*	*7,254,250*	*166.62*	*3,170*	*57.51*
Base Grab	8/5/2025 8:19	8/5/2025 8:19	8	0.203	8/4/2025 8:45	8/6/2025 8:45	794,047	18.24	397	10.06
Base			*7*	*0.127*	*8/6/2025 8:45*	*8/9/2025 3:45*	*926,159*	*21.27*	*405*	*7.34*
Storm Composite	8/9/2025 5:06	8/9/2025 12:56	172	0.490	8/9/2025 3:45	8/9/2025 13:45	474,358	10.90	5,093	14.51
Base			*7*	*0.127*	*8/9/2025 13:45*	*8/15/2025 17:45*	*3,463,350*	*79.55*	*1,513*	*27.46*
Storm Composite	8/15/2025 19:12	8/17/2025 10:26	61	0.256	8/15/2025 17:45	8/17/2025 10:45	2,659,830	61.09	10,129	42.51
Base			*7*	*0.127*	*8/17/2025 10:45*	*8/17/2025 22:45*	*842,313*	*19.35*	*368*	*6.68*
Storm			*346*	*0.525*	*8/17/2025 22:45*	*8/18/2025 3:45*	*462,444*	*10.62*	*9,989*	*15.16*
Base			*7*	*0.127*	*8/18/2025 3:45*	*8/29/2025 2:45*	*9,387,930*	*215.63*	*4,102*	*74.43*
Storm			*346*	*0.525*	*8/29/2025 2:45*	*8/29/2025 7:45*	*74,380*	*1.71*	*1,607*	*2.44*
Base			*7*	*0.127*	*8/29/2025 7:45*	*9/7/2025 14:45*	*2,662,310*	*61.15*	*1,163*	*21.11*
Base Grab	9/8/2025 15:08	9/8/2025 15:08	7	0.074	9/7/2025 14:45	9/9/2025 14:45	507,936	11.67	222	2.35
Base			*7*	*0.127*	*9/9/2025 14:45*	*9/19/2025 19:45*	*2,952,380*	*67.81*	*1,290*	*23.41*
Storm			*346*	*0.525*	*9/19/2025 19:45*	*9/20/2025 12:45*	*537,776*	*12.35*	*11,616*	*17.62*
Base			*7*	*0.127*	*9/20/2025 12:45*	*9/22/2025 0:45*	*1,122,270*	*25.78*	*490*	*8.90*
Storm			*346*	*0.525*	*9/22/2025 0:45*	*9/22/2025 6:45*	*296,154*	*6.80*	*6,397*	*9.71*
Base			*7*	*0.127*	*9/22/2025 6:45*	*10/7/2025 9:45*	*5,195,330*	*119.33*	*2,270*	*41.19*
Base Grab	10/8/2025 10:06	10/8/2025 10:06	6	0.081	10/7/2025 9:45	10/9/2025 9:45	538,013	12.36	202	2.72
Base			*7*	*0.127*	*10/9/2025 9:45*	*10/28/2025 11:45*	*6,906,850*	*158.64*	*3,018*	*54.76*
*Base**			*7*	*0.127*	*10/28/2025 11:45*	*11/25/2025 16:00*	*9,738,000*	*223.67*	*4,255*	*77.20*
*Storm**			*346*	*0.525*	*11/25/2025 16:00*	*11/26/2025 9:00*	*535,500*	*12.30*	*11,567*	*17.55*
*Base**			*7*	*0.127*	*11/26/2025 9:00*	*1/1/2026 0:00*	*12,312,000*	*282.79*	*5,380*	*97.61*
Storm Average (Jan 1 - July 31, 2021-2025 Average)			523	0.713						
Storm Average (Aug 1 - Dec 31, 2021-2025 Average)			346	0.525						
Base Average			7	0.127						
All Average			323	0.525						
Total							**191,931,114**	**4,408**	**1,072,318**	**2,474**
Brown's Creek Major Subwatershed Total Acres							3,999			
Total TSS/TP (lb/ac/yr)									268.15	0.619
Total TSS/TP (kg/ha/yr)									300.55	0.693

Italics indicate estimated concentrations based on average base and storm flow concentrations.

*Interval volumes were estimated using similar flow conditions.

[X]TSS result excluded from averages.

[Y]TP result excluded from averages.

Table 3. Brown's Creek at Stonebridge Trail 2025 Total Suspended Solids (TSS) and Total Phosphorus (TP) Loading

	Sample Collection Time				Loading Interval					
Sample Type	Start	End	TSS (mg/L)	TP (mg/L)	Start	End	Interval Volume (cf)	Interval Volume (ac-ft)	Interval TSS (lb)	Interval TP (lb)
*Base**			*6*	*0.099*	*1/1/2025 0:00*	*2/24/2025 12:00*	*21,189,600*	*486.70*	*7,937*	*130.96*
*Snowmelt**			*105*	*0.254*	*2/24/2025 12:00*	*2/25/2025 9:00*	*642,600*	*14.76*	*4,212*	*10.19*
*Base**			*6*	*0.099*	*2/25/2025 9:00*	*3/9/2025 13:00*	*4,730,400*	*108.65*	*1,772*	*29.23*
*Snowmelt**			*105*	*0.254*	*3/9/2025 13:00*	*3/11/2025 15:00*	*1,620,000*	*37.21*	*10,619*	*25.69*
*Base**			*6*	*0.099*	*3/11/2025 15:00*	*3/29/2025 18:00*	*9,396,000*	*215.82*	*3,519*	*58.07*
*Storm**			*247*	*0.520*	*3/29/2025 18:00*	*3/30/2025 20:00*	*2,340,000*	*53.75*	*36,081*	*75.96*
*Base**			*6*	*0.099*	*3/30/2025 20:00*	*4/2/2025 12:00*	*1,958,400*	*44.98*	*734*	*12.10*
*Storm**			*247*	*0.520*	*4/2/2025 12:00*	*4/3/2025 3:00*	*810,000*	*18.60*	*12,490*	*26.29*
*Base**			*6*	*0.099*	*4/3/2025 3:00*	*4/8/2025 12:45*	*3,269,700*	*75.10*	*1,225*	*20.21*
Base			*6*	*0.099*	*4/8/2025 12:45*	*4/17/2025 17:45*	*4,853,790*	*111.49*	*1,818*	*30.00*
Storm			*247*	*0.520*	*4/17/2025 17:45*	*4/18/2025 4:45*	*387,825*	*8.91*	*5,980*	*12.59*
Base			*6*	*0.099*	*4/18/2025 4:45*	*4/21/2025 0:45*	*1,987,490*	*45.65*	*744*	*12.28*
Storm Composite	4/21/2025 3:59	4/21/2025 5:58	85	0.248	4/21/2025 0:45	4/21/2025 9:45	469,372	10.78	2,491	7.27
Base			*6*	*0.099*	*4/21/2025 9:45*	*4/28/2025 8:45*	*5,532,610*	*127.08*	*2,072*	*34.19*
Base Grab	4/29/2025 8:36	4/29/2025 8:36	4	0.071	4/28/2025 8:45	4/30/2025 8:45	1,214,240	27.89	303	5.38
Base			*6*	*0.099*	*4/30/2025 8:45*	*5/13/2025 14:45*	*6,073,260*	*139.50*	*2,275*	*37.53*
Base Grab	5/14/2025 14:42	5/14/2025 14:42	9	0.098	5/13/2025 14:45	5/15/2025 14:45	710,006	16.31	399	4.34
Storm			*247*	*0.520*	*5/15/2025 14:45*	*5/15/2025 20:45*	*173,401*	*3.98*	*2,674*	*5.63*
Base			*6*	*0.099*	*5/15/2025 20:45*	*5/19/2025 22:45*	*1,733,610*	*39.82*	*649*	*10.71*
Storm Composite	5/19/2025 23:21	5/20/2025 11:52	183	0.422	5/19/2025 22:45	5/21/2025 9:45	4,180,240	96.02	47,755	110.12
Base			*6*	*0.099*	*5/21/2025 9:45*	*6/3/2025 8:45*	*11,284,600*	*259.19*	*4,227*	*69.74*
Storm			*247*	*0.520*	*6/3/2025 8:45*	*6/4/2025 3:45*	*490,524*	*11.27*	*7,564*	*15.92*
Base			*6*	*0.099*	*6/4/2025 3:45*	*6/10/2025 8:45*	*2,324,980*	*53.40*	*871*	*14.37*
Base Grab	6/11/2025 8:38	6/11/2025 8:38	3	0.078	6/10/2025 8:45	6/12/2025 22:45	872,661	20.04	163	4.25
Storm			*247*	*0.520*	*6/12/2025 22:45*	*6/14/2025 5:45*	*1,996,830*	*45.86*	*30,790*	*64.82*
Base			*6*	*0.099*	*6/14/2025 5:45*	*6/25/2025 11:45*	*5,185,460*	*119.10*	*1,942*	*32.05*
Storm			*247*	*0.520*	*6/25/2025 11:45*	*6/26/2025 20:45*	*5,379,870*	*123.57*	*82,954*	*174.64*
Base			*6*	*0.099*	*6/26/2025 20:45*	*6/29/2025 1:45*	*7,264,370*	*166.85*	*2,721*	*44.90*
Storm			*247*	*0.520*	*6/29/2025 1:45*	*6/29/2025 4:45*	*353,115*	*8.11*	*5,445*	*11.46*
Base			*6*	*0.099*	*6/29/2025 4:45*	*7/5/2025 21:45*	*10,138,400*	*232.87*	*3,797*	*62.66*
Storm			*247*	*0.520*	*7/5/2025 21:45*	*7/6/2025 5:45*	*359,886*	*8.27*	*5,549*	*11.68*
Base			*6*	*0.099*	*7/6/2025 5:45*	*7/10/2025 8:45*	*2,303,410*	*52.91*	*863*	*14.24*
Base Grab	7/10/2025 9:24	7/10/2025 9:24	113	0.406	7/10/2025 8:45	7/10/2025 9:45	15,428	0.35	109	0.39
Base			*6*	*0.099*	*7/10/2025 9:45*	*7/16/2025 0:45*	*1,874,770*	*43.06*	*702*	*11.59*
Storm			*247*	*0.520*	*7/16/2025 0:45*	*7/16/2025 12:45*	*211,373*	*4.85*	*3,259*	*6.86*
Base			*6*	*0.099*	*7/16/2025 12:45*	*7/23/2025 12:45*	*2,591,840*	*59.53*	*971*	*16.02*
Storm			*247*	*0.520*	*7/23/2025 12:45*	*7/23/2025 18:45*	*112,569*	*2.59*	*1,736*	*3.65*
Base			*6*	*0.099*	*7/23/2025 18:45*	*7/27/2025 19:45*	*1,549,600*	*35.59*	*580*	*9.58*
Storm Composite	7/27/2025 20:50	7/28/2025 1:01	626	0.866	7/27/2025 19:45	7/28/2025 1:45	1,189,470	27.32	46,483	64.30
Storm			*247*	*0.520*	*7/28/2025 1:45*	*7/28/2025 11:45*	*1,696,010*	*38.96*	*26,151*	*55.06*
Base			*6*	*0.099*	*7/28/2025 11:45*	*8/4/2025 8:45*	*10,208,500*	*234.48*	*3,824*	*63.09*
Base Grab	8/5/2025 9:12	8/5/2025 9:12	6	0.178	8/4/2025 8:45	8/6/2025 8:45	736,793	16.92	276	8.19
Base			*6*	*0.099*	*8/6/2025 8:45*	*8/9/2025 4:45*	*965,184*	*22.17*	*362*	*5.97*
Storm			*247*	*0.520*	*8/9/2025 4:45*	*8/9/2025 11:45*	*427,563*	*9.82*	*6,593*	*13.88*
Base			*6*	*0.099*	*8/9/2025 11:45*	*8/15/2025 18:45*	*3,214,680*	*73.84*	*1,204*	*19.87*
Storm			*247*	*0.520*	*8/15/2025 18:45*	*8/16/2025 12:45*	*996,074*	*22.88*	*15,359*	*32.33*
Base			*6*	*0.099*	*8/16/2025 12:45*	*8/17/2025 22:45*	*2,995,310*	*68.80*	*1,122*	*18.51*
Storm			*247*	*0.520*	*8/17/2025 22:45*	*8/18/2025 5:45*	*810,889*	*18.63*	*12,503*	*26.32*
Base			*6*	*0.099*	*8/18/2025 5:45*	*8/29/2025 3:45*	*10,088,000*	*231.71*	*3,779*	*62.35*
Storm			*247*	*0.520*	*8/29/2025 3:45*	*8/29/2025 8:45*	*83,819*	*1.93*	*1,292*	*2.72*
Base			*6*	*0.099*	*8/29/2025 8:45*	*9/7/2025 14:45*	*3,404,620*	*78.20*	*1,275*	*21.04*
Base Grab	9/8/2025 14:52	9/8/2025 14:52	8	0.085	9/7/2025 14:45	9/9/2025 14:45	702,860	16.14	351	3.73
Base			*6*	*0.099*	*9/9/2025 14:45*	*9/19/2025 20:45*	*3,211,310*	*73.76*	*1,203*	*19.85*
Storm			*247*	*0.520*	*9/19/2025 20:45*	*9/20/2025 20:45*	*989,971*	*22.74*	*15,265*	*32.14*
Base			*6*	*0.099*	*9/20/2025 20:45*	*9/22/2025 0:45*	*1,028,000*	*23.61*	*385*	*6.35*
Storm			*247*	*0.520*	*9/22/2025 0:45*	*9/22/2025 14:45*	*954,658*	*21.93*	*14,720*	*30.99*
Base			*6*	*0.099*	*9/22/2025 14:45*	*10/7/2025 9:45*	*5,765,950*	*132.44*	*2,160*	*35.63*
Base Grab	10/8/2025 9:46	10/8/2025 9:46	8	0.086	10/7/2025 9:45	10/9/2025 9:45	545,618	12.53	272	2.93
Base			*6*	*0.099*	*10/9/2025 9:45*	*10/28/2025 10:45*	*6,325,420*	*145.29*	*2,369*	*39.09*
*Base**			*6*	*0.099*	*10/28/2025 10:45*	*11/25/2025 16:00*	*10,361,925*	*238.00*	*3,881*	*64.04*
*Storm**			*247*	*0.520*	*11/25/2025 16:00*	*11/26/2025 11:00*	*752,400*	*17.28*	*11,601*	*24.42*
*Base**			*6*	*0.099*	*11/26/2025 11:00*	*1/1/2026 0:00*	*13,818,600*	*317.40*	*5,176*	*85.40*
Storm Average (2021-2025 Average)			247	0.520						
Base Average			6	0.099						
All Average			105	0.254						
Total							**208,855,854**	**4,797**	**477,596**	**1,966**
Brown's Creek Major Subwatershed Total Acres							4,189			
Total TSS/TP(lb/ac/yr)									114.01	0.469
Total TSS/TP (kg/ha/yr)									127.79	0.526

Italics indicate estimated concentrations based on average base and storm flow concentrations.

*Interval volumes were estimated using similar flow conditions.

Table 4. Brown's Creek Diversion Structure Drainage 2025 Total Suspended Solids (TSS) and Total Phosphorus (TP) Loading

	Sample Collection Time				Loading Interval					
Sample Type	Start	End	TSS (mg/L)	TP (mg/L)	Start	End	Interval Volume (cf)	Interval Volume (ac-ft)	Interval TSS (lb)	Interval TP (lb)
*Base**			*4*	*0.077*	*1/1/2025 0:00*	*3/9/2025 10:00*	*4,077,360*	*93.65*	*1,018*	*19.60*
*Snowmelt**			*64*	*0.204*	*3/9/2025 10:00*	*3/10/2025 18:00*	*172,800*	*3.97*	*690*	*2.20*
*Base**			*4*	*0.077*	*3/10/2025 18:00*	*3/29/2025 18:00*	*1,231,200*	*28.28*	*307*	*5.92*
*Storm**			*134*	*0.352*	*3/29/2025 18:00*	*3/30/2025 15:00*	*945,000*	*21.71*	*7,905*	*20.77*
*Base**			*4*	*0.077*	*3/30/2025 15:00*	*4/2/2025 12:00*	*1,242,000*	*28.53*	*310*	*5.97*
*Storm**			*134*	*0.352*	*4/2/2025 12:00*	*4/2/2025 20:00*	*158,400*	*3.64*	*1,325*	*3.48*
*Base**			*4*	*0.077*	*4/2/2025 20:00*	*4/17/2025 16:00*	*3,204,000*	*73.59*	*800*	*15.40*
*Storm**			*134*	*0.352*	*4/17/2025 16:00*	*4/18/2025 1:00*	*105,300*	*2.42*	*881*	*2.31*
*Base**			*4*	*0.077*	*4/18/2025 1:00*	*4/21/2025 0:00*	*511,200*	*11.74*	*128*	*2.46*
*Storm**			*134*	*0.352*	*4/21/2025 0:00*	*4/21/2025 9:00*	*178,200*	*4.09*	*1,491*	*3.92*
*Base**			*4*	*0.077*	*4/21/2025 9:00*	*4/30/2025 14:30*	*1,594,800*	*36.63*	*398*	*7.67*
Base Grab	5/1/2025 14:09	5/1/2025 14:09	3	0.051	4/30/2025 14:30	5/2/2025 14:30	260,772	5.99	49	0.83
Base			*4*	*0.077*	*5/2/2025 14:30*	*5/11/2025 14:30*	*818,730*	*18.81*	*204*	*3.94*
Base Grab	5/12/2025 14:28	5/12/2025 14:28	3	0.074	5/11/2025 14:30	5/15/2025 15:30	238,053	5.47	45	1.10
Storm			*134*	*0.352*	*5/15/2025 15:30*	*5/15/2025 19:30*	*21,141*	*0.49*	*177*	*0.46*
Base			*4*	*0.077*	*5/15/2025 19:30*	*5/19/2025 22:30*	*286,922*	*6.59*	*72*	*1.38*
Storm			*134*	*0.352*	*5/19/2025 22:30*	*5/20/2025 6:30*	*66,862*	*1.54*	*559*	*1.47*
Storm Composite	5/20/2025 6:52	5/21/2025 0:40	94	0.280	5/20/2025 6:30	5/21/2025 1:30	816,166	18.75	4,789	14.27
Base			*4*	*0.077*	*5/21/2025 1:30*	*6/3/2025 7:30*	*4,227,090*	*97.09*	*1,056*	*20.32*
Storm			*134*	*0.352*	*6/3/2025 7:30*	*6/3/2025 19:30*	*137,867*	*3.17*	*1,153*	*3.03*
Base Grab	6/10/2025 13:32	6/10/2025 13:32	10	0.128	6/3/2025 19:30	6/11/2025 13:30	1,173,070	26.94	732	9.37
Base			*4*	*0.077*	*6/11/2025 13:30*	*6/12/2025 22:30*	*156,920*	*3.60*	*39*	*0.75*
Storm Composite	6/13/2025 0:52	6/13/2025 8:32	30	0.176	6/12/2025 22:30	6/13/2025 9:30	235,592	5.41	441	2.59
Base			*4*	*0.077*	*6/13/2025 9:30*	*6/25/2025 11:30*	*3,553,120*	*81.61*	*887*	*17.08*
Storm Composite	6/25/2025 13:29	6/25/2025 22:20	70	0.281	6/25/2025 11:30	6/25/2025 22:30	702,322	16.13	3,069	12.32
Base			*4*	*0.077*	*6/25/2025 22:30*	*6/26/2025 13:30*	*1,098,100*	*25.22*	*274*	*5.28*
Storm			*134*	*0.352*	*6/26/2025 13:30*	*6/26/2025 20:30*	*559,238*	*12.85*	*4,678*	*12.29*
Base			*4*	*0.077*	*6/26/2025 20:30*	*6/29/2025 1:30*	*3,297,020*	*75.73*	*823*	*15.85*
Storm			*134*	*0.352*	*6/29/2025 1:30*	*6/29/2025 5:30*	*214,526*	*4.93*	*1,795*	*4.71*
Base			*4*	*0.077*	*6/29/2025 5:30*	*7/5/2025 21:30*	*3,248,560*	*74.62*	*811*	*15.62*
Storm			*134*	*0.352*	*7/5/2025 21:30*	*7/6/2025 1:30*	*90,997*	*2.09*	*761*	*2.00*
Base			*4*	*0.077*	*7/6/2025 1:30*	*7/9/2025 9:30*	*956,806*	*21.98*	*239*	*4.60*
Base Grab	7/10/2025 10:03	7/10/2025 10:03	3	0.084	7/9/2025 9:30	7/11/2025 9:30	340,733	7.83	64	1.79
Base			*4*	*0.077*	*7/11/2025 9:30*	*7/16/2025 0:30*	*517,968*	*11.90*	*129*	*2.49*
Storm			*134*	*0.352*	*7/16/2025 0:30*	*7/16/2025 10:30*	*66,825*	*1.53*	*559*	*1.47*
Base			*4*	*0.077*	*7/16/2025 10:30*	*7/23/2025 13:30*	*898,709*	*20.64*	*224*	*4.32*
Storm			*134*	*0.352*	*7/23/2025 13:30*	*7/23/2025 17:30*	*28,133*	*0.65*	*235*	*0.62*
Base			*4*	*0.077*	*7/23/2025 17:30*	*7/27/2025 20:30*	*561,913*	*12.91*	*140*	*2.70*
Storm Composite	7/27/2025 20:46	7/28/2025 4:47	161	0.470	7/27/2025 20:30	7/28/2025 5:30	681,789	15.66	6,852	20.00
Base			*4*	*0.077*	*7/28/2025 5:30*	*7/28/2025 21:30*	*652,523*	*14.99*	*163*	*3.14*
Storm			*134*	*0.352*	*7/28/2025 21:30*	*7/29/2025 1:30*	*176,443*	*4.05*	*1,476*	*3.88*
Base			*4*	*0.077*	*7/29/2025 1:30*	*8/3/2025 14:30*	*2,660,380*	*61.11*	*664*	*12.79*
Base Grab	8/4/2025 14:36	8/4/2025 14:36	3	0.064	8/3/2025 14:30	8/5/2025 14:30	263,509	6.05	49	1.05
Base			*4*	*0.077*	*8/5/2025 14:30*	*8/9/2025 4:30*	*362,105*	*8.32*	*90*	*1.74*
Storm Composite	8/9/2025 5:30	8/9/2025 9:20	283	0.546	8/9/2025 4:30	8/9/2025 10:30	137,881	3.17	2,436	4.70
Base			*4*	*0.077*	*8/9/2025 10:30*	*8/15/2025 18:30*	*1,697,900*	*39.00*	*424*	*8.16*
Storm			*134*	*0.352*	*8/15/2025 18:30*	*8/15/2025 22:30*	*54,414*	*1.25*	*455*	*1.20*
Base			*4*	*0.077*	*8/15/2025 22:30*	*8/16/2025 7:30*	*116,524*	*2.68*	*29*	*0.56*
Storm Composite	8/16/2025 7:29	8/17/2025 23:58	166	0.361	8/16/2025 7:30	8/17/2025 23:30	1,444,420	33.18	14,968	32.55
Storm			*134*	*0.352*	*8/17/2025 23:30*	*8/18/2025 5:30*	*257,261*	*5.91*	*2,152*	*5.65*
Base			*4*	*0.077*	*8/18/2025 5:30*	*9/3/2025 10:30*	*4,623,020*	*106.19*	*1,154*	*22.22*
Base Grab	9/4/2025 10:38	9/4/2025 10:38	3	0.057	9/3/2025 10:30	9/5/2025 10:30	248,613	5.71	47	0.88
Base			*4*	*0.077*	*9/5/2025 10:30*	*9/21/2025 23:30*	*1,659,290*	*38.11*	*414*	*7.98*
Storm			*134*	*0.352*	*9/21/2025 23:30*	*9/22/2025 4:30*	*66,439*	*1.53*	*556*	*1.46*
Base			*4*	*0.077*	*9/22/2025 4:30*	*10/7/2025 9:30*	*1,722,870*	*39.57*	*430*	*8.28*
Base Grab	10/8/2025 9:33	10/8/2025 9:33	5	0.078	10/7/2025 9:30	10/9/2025 9:30	132,089	3.03	41	0.64
Base			*4*	*0.077*	*10/9/2025 9:30*	*10/28/2025 15:30*	*1,420,880*	*32.64*	*355*	*6.83*
*Base**			*4*	*0.077*	*10/28/2025 15:30*	*11/25/2025 15:00*	*1,692,180*	*38.87*	*423*	*8.13*
*Storm**			*134*	*0.352*	*11/25/2025 15:00*	*11/25/2025 22:00*	*57,960*	*1.33*	*485*	*1.27*
*Base**			*4*	*0.077*	*11/25/2025 22:00*	*1/1/2026 0:00*	*2,182,320*	*50.13*	*545*	*10.49*
Storm Average			134	0.352						
Base Average			4	0.077						
All Average			64	0.204						
Total							**60,305,225**	**1,385**	**73,469**	**416**
Brown's Creek Major Subwatershed Total Acres							3,855			
Total TSS/TP(lb/ac/yr)									19.06	0.108
Total TSS/TP (kg/ha/yr)									21.36	0.121

Italics indicate estimated concentrations based on average base and storm flow concentrations.
*Interval volumes

Table 5. Tributary to Long Lake at Marketplace Pond 2025 Total Suspended Solids (TSS) and Total Phosphorus (TP) Loading

	Sample Collection Time				Loading Interval					
Sample Type	Start	End	TSS (mg/L)	TP (mg/L)	Start	End	Interval Volume (cf)	Interval Volume (ac-ft)	Interval TSS (lb)	Interval TP (lb)
*Intermittent Flow**			*4*	*0.117*	*1/1/2025 0:00*	*2/24/2025 11:00*	*4,705*	*0.11*	*1*	*0.03*
*Snowmelt**			*16*	*0.127*	*2/24/2025 11:00*	*2/27/2025 10:00*	*511,200*	*11.74*	*511*	*4.05*
*Intermittent Flow**			*4*	*0.117*	*2/27/2025 10:00*	*3/8/2025 12:00*	*785*	*0.02*	*0*	*0.01*
*Snowmelt**			*16*	*0.127*	*3/8/2025 12:00*	*3/11/2025 15:00*	*810,000*	*18.60*	*809*	*6.42*
*Base**			*4*	*0.117*	*3/11/2025 15:00*	*3/29/2025 18:00*	*234,900*	*5.40*	*59*	*1.72*
*Storm**			*19*	*0.130*	*3/29/2025 18:00*	*3/30/2025 4:00*	*576,000*	*13.23*	*683*	*4.67*
*Base**			*4*	*0.117*	*3/30/2025 4:00*	*4/2/2025 11:00*	*355,500*	*8.17*	*89*	*2.60*
*Storm**			*19*	*0.130*	*4/2/2025 11:00*	*4/2/2025 19:00*	*122,400*	*2.81*	*145*	*0.99*
*Base**			*4*	*0.117*	*4/2/2025 19:00*	*4/17/2025 17:00*	*386,640*	*8.88*	*97*	*2.82*
*Storm**			*19*	*0.130*	*4/17/2025 17:00*	*4/17/2025 22:00*	*54,000*	*1.24*	*64*	*0.44*
*Base**			*4*	*0.117*	*4/17/2025 22:00*	*4/20/2025 17:00*	*241,200*	*5.54*	*60*	*1.76*
*Storm**			*19*	*0.130*	*4/20/2025 17:00*	*4/21/2025 22:00*	*626,400*	*14.39*	*743*	*5.08*
Base			*4*	*0.117*	*4/21/2025 22:00*	*5/15/2025 14:00*	*613,440*	*14.09*	*153*	*4.48*
*Storm**			*19*	*0.130*	*5/15/2025 14:00*	*5/15/2025 18:00*	*25,200*	*0.58*	*30*	*0.20*
*Base**			*4*	*0.117*	*5/15/2025 18:00*	*5/19/2025 19:00*	*139,680*	*3.21*	*35*	*1.02*
*Storm**			*19*	*0.130*	*5/19/2025 19:00*	*5/20/2025 13:00*	*583,200*	*13.40*	*692*	*4.73*
*Base**			*4*	*0.117*	*5/20/2025 13:00*	*6/2/2025 15:30*	*566,100*	*13.00*	*141*	*4.13*
Base			*4*	*0.117*	*6/2/2025 15:30*	*6/2/2025 18:30*	*54*	*0.00*	*0*	*0.00*
Storm			*19*	*0.130*	*6/2/2025 18:30*	*6/2/2025 21:30*	*4,374*	*0.10*	*5*	*0.04*
Base			*4*	*0.117*	*6/2/2025 21:30*	*6/3/2025 7:30*	*3,876*	*0.09*	*1*	*0.03*
Storm Composite	6/3/2025 8:55	6/3/2025 14:51	17	0.120	6/3/2025 7:30	6/3/2025 15:30	119,180	2.74	126	0.89
Base			*4*	*0.117*	*6/3/2025 15:30*	*6/12/2025 16:30*	*312,994*	*7.19*	*78*	*2.29*
Storm			*19*	*0.130*	*6/12/2025 16:30*	*6/12/2025 21:30*	*19,048*	*0.44*	*23*	*0.15*
Storm Composite	6/12/2025 23:28	6/13/2025 2:11	14	0.132	6/12/2025 21:30	6/13/2025 2:30	156,593	3.60	137	1.29
Base			*4*	*0.117*	*6/13/2025 2:30*	*6/13/2025 5:30*	*92,027*	*2.11*	*23*	*0.67*
Storm			*19*	*0.130*	*6/13/2025 5:30*	*6/13/2025 9:30*	*137,532*	*3.16*	*163*	*1.12*
Base			*4*	*0.117*	*6/13/2025 9:30*	*6/16/2025 20:30*	*480,024*	*11.03*	*120*	*3.51*
Storm			*19*	*0.130*	*6/16/2025 20:30*	*6/17/2025 0:30*	*16,501*	*0.38*	*20*	*0.13*
Base			*4*	*0.117*	*6/17/2025 0:30*	*6/25/2025 11:30*	*126,656*	*2.91*	*32*	*0.93*
Storm Composite	6/25/2025 11:55	6/25/2025 15:25	28	0.138	6/25/2025 11:30	6/25/2025 19:30	483,199	11.10	845	4.16
Base			*4*	*0.117*	*6/25/2025 19:30*	*6/26/2025 13:30*	*506,302*	*11.63*	*126*	*3.70*
Storm			*19*	*0.130*	*6/26/2025 13:30*	*6/26/2025 18:30*	*177,899*	*4.09*	*211*	*1.44*
Base			*4*	*0.117*	*6/26/2025 18:30*	*6/29/2025 0:30*	*513,168*	*11.79*	*128*	*3.75*
Storm			*19*	*0.130*	*6/29/2025 0:30*	*6/29/2025 4:30*	*48,223*	*1.11*	*57*	*0.39*
Base			*4*	*0.117*	*6/29/2025 4:30*	*7/5/2025 5:30*	*307,380*	*7.06*	*77*	*2.25*
Storm			*19*	*0.130*	*7/5/2025 5:30*	*7/5/2025 14:30*	*35,337*	*0.81*	*42*	*0.29*
Base			*4*	*0.117*	*7/5/2025 14:30*	*7/5/2025 21:30*	*44,683*	*1.03*	*11*	*0.33*
Storm			*19*	*0.130*	*7/5/2025 21:30*	*7/6/2025 2:30*	*114,535*	*2.63*	*136*	*0.93*
Base Grab	7/9/2025 9:50	7/9/2025 9:50	3	0.104	7/6/2025 2:30	7/10/2025 10:30	294,001	6.75	55	1.91
Base			*4*	*0.117*	*7/10/2025 10:30*	*7/16/2025 0:30*	*76,109*	*1.75*	*19*	*0.56*
Storm			*19*	*0.130*	*7/16/2025 0:30*	*7/16/2025 4:30*	*25,259*	*0.58*	*30*	*0.20*
Base			*4*	*0.117*	*7/16/2025 4:30*	*7/16/2025 6:30*	*13,500*	*0.31*	*3*	*0.10*
Storm Composite	7/16/2025 7:46	7/16/2025 14:13	14	0.150	7/16/2025 6:30	7/16/2025 14:30	116,695	2.68	102	1.09
Base			*4*	*0.117*	*7/16/2025 14:30*	*7/21/2025 10:30*	*306,543*	*7.04*	*77*	*2.24*
Storm			*19*	*0.130*	*7/21/2025 10:30*	*7/21/2025 13:30*	*14,929*	*0.34*	*18*	*0.12*
Base			*4*	*0.117*	*7/21/2025 13:30*	*7/23/2025 9:30*	*91,734*	*2.11*	*23*	*0.67*
Storm			*19*	*0.130*	*7/23/2025 9:30*	*7/23/2025 13:30*	*25,173*	*0.58*	*30*	*0.20*
Storm Composite	7/23/2025 14:22	7/23/2025 17:45	19	0.121	7/23/2025 13:30	7/23/2025 18:30	93,195	2.14	111	0.70
Base			*4*	*0.117*	*7/23/2025 18:30*	*7/27/2025 20:30*	*342,071*	*7.86*	*85*	*2.50*
Storm Composite	7/27/2025 20:37	7/27/2025 21:58	28	0.178	7/27/2025 20:30	7/28/2025 1:30	229,497	5.27	401	2.55
Base			*4*	*0.117*	*7/28/2025 1:30*	*7/28/2025 21:30*	*292,416*	*6.72*	*73*	*2.14*
Storm			*19*	*0.130*	*7/28/2025 21:30*	*7/29/2025 0:30*	*81,716*	*1.88*	*97*	*0.66*
Base			*4*	*0.117*	*7/29/2025 0:30*	*8/3/2025 13:30*	*432,761*	*9.94*	*108*	*3.16*
Base Grab	8/4/2025 13:48	8/4/2025 13:48	5	0.129	8/3/2025 13:30	8/5/2025 13:30	15,365	0.35	5	0.12
Base			*4*	*0.117*	*8/5/2025 13:30*	*8/9/2025 4:30*	*4,251*	*0.10*	*1*	*0.03*
Storm Composite	8/9/2025 4:51	8/9/2025 7:34	17	0.104	8/9/2025 4:30	8/9/2025 10:30	320,327	7.36	340	2.08
Base			*4*	*0.117*	*8/9/2025 10:30*	*8/15/2025 16:30*	*685,939*	*15.76*	*171*	*5.01*
Storm Composite	8/15/2025 12:11	8/15/2025 21:49	14	0.093	8/15/2025 16:30	8/15/2025 21:30	204,571	4.70	179	1.19
Base			*4*	*0.117*	*8/15/2025 21:30*	*8/16/2025 6:30*	*298,358*	*6.85*	*75*	*2.18*
Storm			*19*	*0.130*	*8/16/2025 6:30*	*8/16/2025 10:30*	*225,644*	*5.18*	*268*	*1.83*
Base			*4*	*0.117*	*8/16/2025 10:30*	*8/17/2025 22:30*	*523,942*	*12.03*	*131*	*3.83*
Storm			*19*	*0.130*	*8/17/2025 22:30*	*8/18/2025 2:30*	*107,510*	*2.47*	*128*	*0.87*
Base			*4*	*0.117*	*8/18/2025 2:30*	*8/29/2025 2:30*	*483,634*	*11.11*	*121*	*3.53*
Storm			*19*	*0.130*	*8/29/2025 2:30*	*8/29/2025 5:30*	*18,079*	*0.42*	*21*	*0.15*
Base			*4*	*0.117*	*8/29/2025 5:30*	*9/2/2025 9:30*	*142,841*	*3.28*	*36*	*1.04*
Storm			*19*	*0.130*	*9/2/2025 9:30*	*9/2/2025 12:30*	*5,898*	*0.14*	*7*	*0.05*
Base			*4*	*0.117*	*9/2/2025 12:30*	*9/4/2025 16:30*	*31,231*	*0.72*	*8*	*0.23*
Storm			*19*	*0.130*	*9/4/2025 16:30*	*9/4/2025 21:30*	*18,093*	*0.42*	*21*	*0.15*
Base			*4*	*0.117*	*9/4/2025 21:30*	*9/9/2025 15:30*	*115,444*	*2.65*	*29*	*0.84*
Storm			*19*	*0.130*	*9/9/2025 15:30*	*9/9/2025 18:30*	*4,934*	*0.11*	*6*	*0.04*
Base			*4*	*0.117*	*9/9/2025 18:30*	*9/19/2025 17:30*	*77,527*	*1.78*	*19*	*0.57*
Storm			*19*	*0.130*	*9/19/2025 17:30*	*9/19/2025 22:30*	*23,822*	*0.55*	*28*	*0.19*
Base			*4*	*0.117*	*9/19/2025 22:30*	*9/21/2025 23:30*	*90,443*	*2.08*	*23*	*0.66*
Storm			*19*	*0.130*	*9/21/2025 23:30*	*9/22/2025 7:30*	*368,298*	*8.46*	*437*	*2.99*
Base			*4*	*0.117*	*9/22/2025 7:30*	*10/9/2025 17:30*	*734,059*	*16.86*	*183*	*5.36*
Storm			*19*	*0.130*	*10/9/2025 17:30*	*10/9/2025 21:30*	*3,904*	*0.09*	*5*	*0.03*
Base			*4*	*0.117*	*10/9/2025 21:30*	*10/14/2025 14:30*	*41,693*	*0.96*	*10*	*0.30*
Storm			*19*	*0.130*	*10/14/2025 14:30*	*10/14/2025 23:30*	*24,699*	*0.57*	*29*	*0.20*
Base			*4*	*0.117*	*10/14/2025 23:30*	*10/25/2025 2:30*	*191,429*	*4.40*	*48*	*1.40*
Storm			*19*	*0.130*	*10/25/2025 2:30*	*10/25/2025 8:30*	*6,944*	*0.16*	*8*	*0.06*
Base			*4*	*0.117*	*10/25/2025 8:30*	*10/27/2025 12:30*	*32,361*	*0.74*	*8*	*0.24*
*Base**			*4*	*0.117*	*10/27/2025 12:30*	*11/25/2025 15:00*	*125,730*	*2.89*	*31*	*0.92*
*Storm**			*19*	*0.130*	*11/25/2025 15:00*	*11/25/2025 21:00*	*140,400*	*3.22*	*167*	*1.14*
*Intermittent Flow**			*4*	*0.117*	*11/25/2025 21:00*	*1/1/2026 0:00*	*15,606*	*0.36*	*4*	*0.11*
Storm Average			19	0.130						
Base Average			4	0.117						
All Average			16	0.127						
Total							**17,069,510**	**392**	**10,449**	**130**
Brown's Creek Major Subwatershed Total Acres							410			
Total TSS/TP(lb/ac/yr)									25.49	0.316
Total TSS/TP (kg/ha/yr)									28.57	0.354

Italics indicate estimated concentrations based on average base and storm flow concentrations.

*Interval volumes were estimated using similar flow conditions.

Table 6. Tributary to Long Lake at 62nd Street 2025 Total Suspended Solids (TSS) and Total Phosphorus (TP) Loading

	Sample Collection Time				Loading Interval					
Sample Type	Start	End	TSS (mg/L)	TP (mg/L)	Start	End	Interval Volume (cf)	Interval Volume (ac-ft)	Interval TSS (lb)	Interval TP (lb)
*Intermittent Flow**			*24*	*0.254*	*1/1/2025 0:00*	*3/9/2025 10:00*	*5,825*	*0.13*	*8.73*	*0.09*
*Snowmelt**			*46*	*0.371*	*3/9/2025 10:00*	*3/10/2025 18:00*	*57,600*	*1.32*	*165.40*	*1.33*
*Base**			*24*	*0.254*	*3/10/2025 18:00*	*3/29/2025 18:00*	*32,832*	*0.75*	*49.19*	*0.52*
*Storm**			*74*	*0.513*	*3/29/2025 18:00*	*3/30/2025 15:00*	*64,260*	*1.48*	*296.85*	*2.06*
*Base**			*24*	*0.254*	*3/30/2025 15:00*	*4/2/2025 12:00*	*12,420*	*0.29*	*18.61*	*0.20*
*Storm**			*74*	*0.513*	*4/2/2025 12:00*	*4/2/2025 20:00*	*43,200*	*0.99*	*199.56*	*1.38*
*Base**			*24*	*0.254*	*4/2/2025 20:00*	*4/8/2025 11:00*	*24,300*	*0.56*	*36.41*	*0.39*
Base			*24*	*0.254*	*4/8/2025 11:00*	*5/19/2025 20:00*	*68,143*	*1.57*	*102.09*	*1.08*
Storm			*74*	*0.513*	*5/19/2025 20:00*	*5/20/2025 18:00*	*64,374*	*1.48*	*297.38*	*2.06*
Base	*5/21/2025 13:36*	*5/21/2025 13:36*	*24*	*0.254*	*5/20/2025 18:00*	*6/3/2025 8:00*	*97,901*	*2.25*	*146.68*	*1.55*
Storm	*6/3/2025 10:17*	*6/3/2025 10:17*	*74*	*0.513*	*6/3/2025 8:00*	*6/3/2025 16:00*	*5,263*	*0.12*	*24.31*	*0.17*
Base	*6/10/2025 13:05*	*6/10/2025 13:05*	*24*	*0.254*	*6/3/2025 16:00*	*6/12/2025 22:00*	*14,307*	*0.33*	*21.44*	*0.23*
Storm	*6/13/2025 8:05*	*6/13/2025 8:05*	*74*	*0.513*	*6/12/2025 22:00*	*6/13/2025 12:00*	*47,357*	*1.09*	*218.77*	*1.52*
Base			*24*	*0.254*	*6/13/2025 12:00*	*6/25/2025 12:00*	*51,487*	*1.18*	*77.14*	*0.82*
Storm	*6/25/2025 13:50*	*6/25/2025 13:50*	*74*	*0.513*	*6/25/2025 12:00*	*6/25/2025 21:00*	*241,678*	*5.55*	*1,116.44*	*7.74*
Base			*24*	*0.254*	*6/25/2025 21:00*	*6/26/2025 13:00*	*91,226*	*2.10*	*136.68*	*1.45*
Storm			*74*	*0.513*	*6/26/2025 13:00*	*6/26/2025 20:00*	*63,660*	*1.46*	*294.08*	*2.04*
Base			*24*	*0.254*	*6/26/2025 20:00*	*6/29/2025 1:00*	*111,615*	*2.56*	*167.22*	*1.77*
Storm			*74*	*0.513*	*6/29/2025 1:00*	*6/29/2025 9:00*	*20,953*	*0.48*	*96.79*	*0.67*
Base			*24*	*0.254*	*6/29/2025 9:00*	*7/5/2025 21:00*	*33,026*	*0.76*	*49.48*	*0.52*
Storm			*74*	*0.513*	*7/5/2025 21:00*	*7/6/2025 1:00*	*9,490*	*0.22*	*43.84*	*0.30*
Base	*7/9/2025 9:32*	*7/9/2025 9:32*	*24*	*0.254*	*7/6/2025 1:00*	*7/16/2025 1:00*	*16,733*	*0.38*	*25.07*	*0.27*
Storm	*7/16/2025 8:57*	*7/16/2025 8:57*	*74*	*0.513*	*7/16/2025 1:00*	*7/16/2025 12:00*	*8,164*	*0.19*	*37.71*	*0.26*
Base			*24*	*0.254*	*7/16/2025 12:00*	*7/23/2025 10:00*	*11,489*	*0.26*	*17.21*	*0.18*
Storm			*74*	*0.513*	*7/23/2025 10:00*	*7/23/2025 23:00*	*9,981*	*0.23*	*46.11*	*0.32*
Base			*24*	*0.254*	*7/23/2025 23:00*	*7/27/2025 20:00*	*6,704*	*0.15*	*10.04*	*0.11*
Storm			*74*	*0.513*	*7/27/2025 20:00*	*7/28/2025 1:00*	*46,616*	*1.07*	*215.34*	*1.49*
Base			*24*	*0.254*	*7/28/2025 1:00*	*7/28/2025 22:00*	*28,053*	*0.64*	*42.03*	*0.44*
Storm	*7/29/2025 14:30*	*7/29/2025 14:30*	*74*	*0.513*	*7/28/2025 22:00*	*7/29/2025 15:00*	*35,221*	*0.81*	*162.70*	*1.13*
Base	*8/4/2025 14:12*	*8/4/2025 14:12*	*24*	*0.254*	*7/29/2025 15:00*	*8/9/2025 4:00*	*25,576*	*0.59*	*38.32*	*0.41*
Storm			*74*	*0.513*	*8/9/2025 4:00*	*8/9/2025 10:00*	*30,277*	*0.70*	*139.87*	*0.97*
Base			*24*	*0.254*	*8/9/2025 10:00*	*8/15/2025 16:00*	*23,312*	*0.54*	*34.93*	*0.37*
Storm			*74*	*0.513*	*8/15/2025 16:00*	*8/16/2025 14:00*	*118,151*	*2.71*	*545.80*	*3.78*
Base			*24*	*0.254*	*8/16/2025 14:00*	*8/17/2025 23:00*	*96,549*	*2.22*	*144.65*	*1.53*
Storm			*74*	*0.513*	*8/17/2025 23:00*	*8/18/2025 8:00*	*55,017*	*1.26*	*254.15*	*1.76*
Base	*8/18/2025 9:39*	*8/18/2025 9:39*	*24*	*0.254*	*8/18/2025 8:00*	*8/21/2025 7:00*	*93,192*	*2.14*	*139.62*	*1.48*
Event			*24*	*0.254*	*8/21/2025 7:00*	*8/22/2025 1:00*	*16,044*	*0.37*	*24.04*	*0.25*
Base			*24*	*0.254*	*8/22/2025 1:00*	*8/22/2025 7:00*	*536*	*0.01*	*0.80*	*0.01*
Event			*24*	*0.254*	*8/22/2025 7:00*	*8/22/2025 22:00*	*40,786*	*0.94*	*61.11*	*0.65*
Base			*24*	*0.254*	*8/22/2025 22:00*	*8/25/2025 8:00*	*7,037*	*0.16*	*10.54*	*0.11*
Event			*24*	*0.254*	*8/25/2025 8:00*	*8/26/2025 21:00*	*133,965*	*3.08*	*200.71*	*2.12*
Base	*9/4/2025 9:46*	*9/4/2025 9:46*	*24*	*0.254*	*8/26/2025 21:00*	*9/21/2025 23:00*	*32,443*	*0.75*	*48.61*	*0.51*
Storm			*74*	*0.513*	*9/21/2025 23:00*	*9/22/2025 6:00*	*23,213*	*0.53*	*107.23*	*0.74*
Base	*10/6/2025 13:44*	*10/6/2025 13:44*	*24*	*0.254*	*9/22/2025 6:00*	*10/28/2025 10:00*	*64,008*	*1.47*	*95.90*	*1.01*
*Base**			*24*	*0.254*	*10/28/2025 10:00*	*11/25/2025 15:00*	*24,372*	*0.56*	*36.51*	*0.39*
*Storm**			*74*	*0.513*	*11/25/2025 15:00*	*11/26/2025 0:00*	*55,080*	*1.27*	*254.44*	*1.76*
*Intermittent Flow**			*24*	*0.254*	*11/26/2025 0:00*	*1/1/2026 0:00*	*3,110*	*0.07*	*4.66*	*0.05*
Storm Average			74	0.513						
Base Average			24	0.254						
All Average			46	0.371						
Total							**2,166,546**	**50**	**6,265**	**50**
Brown's Creek Major Subwatershed Total Acres							575			
Total TSS/TP(lb/ac/yr)									10.90	0.087
Total TSS/TP (kg/ha/yr)									12.21	0.097

Italics indicate estimated concentrations based on average base and storm flow concentrations.
*Interval volumes were estimated using similar flow conditions.

Table 7. Brown's Creek at Highway 15 2025 Field Water Quality Results

Date/Time	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH
4/29/2025 8:21	7.7	8.13	332	7.35
5/14/2025 14:09	20.1	6.12	402	7.60
6/11/2025 8:10	15.4	4.94	370	7.36
7/10/2025 10:26	18.5	4.24	371	7.24
8/5/2025 9:11	16.1	3.74	384	7.38
9/8/2025 14:26	14.0	3.91	394	7.31
10/8/2025 10:28	8.9	3.63	406	7.50

Exceeds Water Quality Standard

Table 8. Brown's Creek at McKusick Road 2025 Field Water Quality Results

Date/Time	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH
4/29/2025 8:48	8.5	10.94	362	7.94
5/14/2025 14:22	20.3	8.22	435	8.13
6/11/2025 8:24	15.5	8.75	408	7.95
7/10/2025 9:46	18.7	7.71	412	7.79
8/5/2025 8:19	16.1	6.79	393	7.47
9/8/2025 15:08	14.7	9.10	433	7.98
10/8/2025 10:06	8.5	9.90	446	8.04

Exceeds Water Quality Standard

Table 9. Brown's Creek at Stonebridge Trail 2025 Field Water Quality Results

Date/Time	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH
4/29/2025 8:36	8.7	11.29	364	8.07
5/14/2025 14:42	20.1	8.20	441	8.13
6/11/2025 8:38	15.9	9.16	404	8.04
7/10/2025 9:24	19.0	8.03	408	7.90
8/5/2025 9:12	16.6	7.48	416	7.79
9/8/2025 14:52	14.5	9.36	436	8.10
10/8/2025 9:46	8.5	9.98	446	8.17

Exceeds Water Quality Standard

Table 10. Brown's Creek Outlet 2025 Field Water Quality Results

Date/Time	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH
1/15/2025 14:15	-0.2	14.12	472	8.56
1/29/2025 10:20	1.8	12.90	460	8.55
2/25/2025 10:08	1.9	15.04	467	8.26
3/12/2025 10:10	2.3	14.10	297	8.30
3/25/2025 9:55	2.9	14.02	457	8.45
4/9/2025 10:40	5.2	13.41	410	8.35
4/23/2025 9:12	8.1	12.72	370	8.30
5/6/2025 9:47	13.0	11.46	422	8.46
5/21/2025 14:02	8.1	11.80	278	7.88
6/4/2025 13:48	15.7	9.85	383	8.32
6/18/2025 9:28	15.9	9.30	427	8.16
7/2/2025 9:43	20.1	8.58	393	7.98
7/16/2025 10:10	18.6	8.35	444	8.21
7/30/2025 8:46	20.8	8.88	319	8.07
8/13/2025 9:29	16.4	9.02	393	8.25
8/18/2025 10:46	19.4	7.84	280	8.04
8/27/2025 9:07	13.8	9.75	453	8.31
9/10/2025 8:32	13.6	9.81	470	8.15
9/24/2025 8:46	14.1	9.26	424	8.18
10/7/2025 14:23	12.5	9.76	481	8.38
10/22/2025 9:10	7.9		458	
11/5/2025 11:20	7.3		472	8.26
11/19/2025 11:21	4.8	12.76	475	8.10
12/3/2025 9:25	1.1	14.53	527	8.21
12/17/2025 10:20	1.3	13.91	477	8.12
12/31/2025 10:02	1.8	14.28	472	8.29

Exceeds Water Quality Standard

Table 11. Brown's Creek Diversion 2025 Field Water Quality Results

Date/Time	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH
5/1/2025 14:09	14.5	9.90	402	7.56
5/12/2025 14:28	20.9	7.86	513	7.51
6/10/2025 13:32	19.2	7.05	393	7.44
7/10/2025 10:03	22.7	4.91	413	7.28
8/4/2025 14:36	22.0	5.15	396	7.38
9/4/2025 10:38	14.6	6.44	401	7.49
10/8/2025 9:33	9.6	6.95	479	7.61

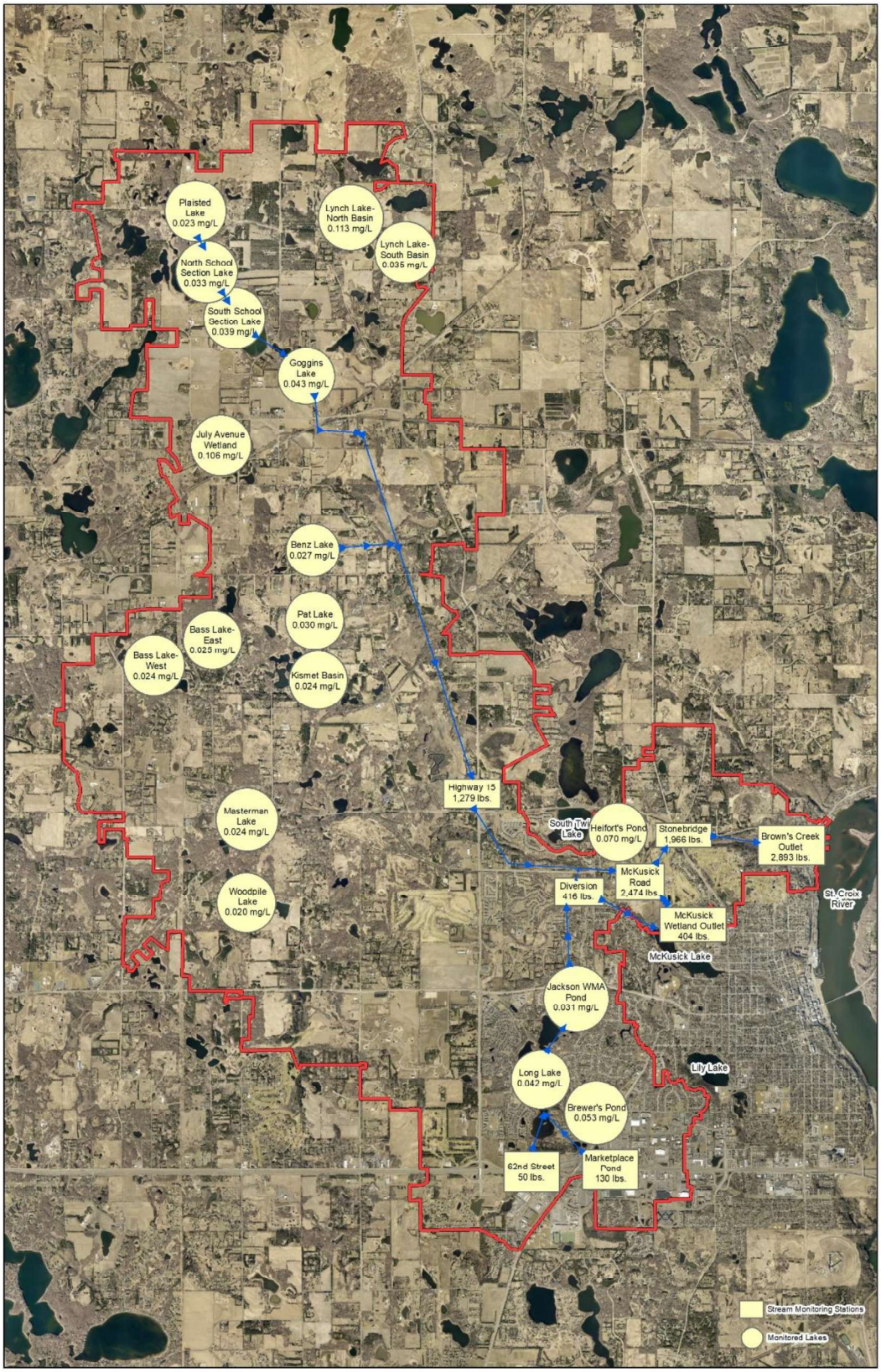
Exceeds Water Quality Standard

Table 12. Tributary to Long Lake at 62nd Street 2025 Field Water Quality Results

Date/Time	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH
6/3/2025 10:17	14.9	6.33	644	7.23
6/10/2025 13:05	16.1	5.97	951	7.22
7/9/2025 9:32	18.6	4.30	780	7.11
8/4/2025 14:12	18.9	5.13	845	7.19
8/18/2025 9:39	20.8	5.62	233	6.95
9/4/2025 9:46	12.7	4.68	938	7.36
10/6/2025 13:44	14.8	4.94	448	7.33

Exceeds Water Quality Standard

APPENDIX C – 2025 BROWN'S CREEK TOTAL PHOSPHORUS FLOW CHART



GLOSSARY

2A Waters- Waters of the state designated by the Minnesota Pollution Control Agency as Class 2 for aquatic life and recreation beneficial uses, and Subclass A for cold water habitat lakes and streams.

2B Waters- Waters of the state designated by the Minnesota Pollution Control Agency as Class 2 for aquatic life and recreation beneficial uses, and Subclass A for warm water habitat lakes and streams.

Anoxic- Lacking oxygen.

Best Management Practice (BMP)- Any practice or constructed feature designed to reduce pollution, erosion, or other environmental degradation such as silt fence, rain gardens, storm water pollution prevention plans, buffer strips, etc.

Biota- Living organisms such as plants, animals, and bacteria.

Chronic Standard- The highest water concentration or fish tissue concentration of a toxicant or effluent to which aquatic life, humans, or wildlife can be exposed indefinitely without causing chronic toxicity.

Composite Sample- A collection of individual samples taken over the course of a storm and combined into a single sample to represent conditions throughout the entire storm event.

Discharge- The amount of water moving past a given point in a stream, usually measured in cubic feet per second, but may also be discussed as the total volume of water that flowed through a site in a year, measured in cubic feet.

Eutrophic- Bodies of water with high levels of biological productivity characterized by high amounts of aquatic vegetation with clear water, or minimal vegetation with green water due to algal growth shading out larger plants. These waters are often shallow, have excessive nutrients, and may experience severe algal blooms resulting in anoxic conditions and potential fish kills. Most district lakes fall within this classification.

External Load- Nutrients or pollution contributed from outside a water body such as atmospheric deposition or inlets from streams or pipes.

Final Acute Value (FAV)- An estimate of the concentration of a pollutant corresponding to the cumulative probability of 0.05 in the distribution of all the acute toxicity values for the genera or species from the acceptable acute toxicity tests conducted on a pollutant. This concentration is

severe enough to rapidly induce a response, normally observed in 96 hours or less. Acute mortality can be expected above this concentration.

Gaining Stream- A stream which gains water through the stream bed from groundwater.

Hypereutrophic- Bodies of water with extremely high biological productivity and nutrients which often experience severe algal blooms, very low clarity, and limited aquatic life beyond algae and vegetation. Often have the appearance of “pea soup” in mid-summer.

Impaired Waters List/303(d) List- A section of the Clean Water Act which lists water bodies impaired by one or more pollutants for which a TMDL study should be completed.

Internal Load- Nutrients or pollution cycled within a lake from sediments, vegetation, or other sources within a water body.

Littoral- The area of a lake less than 15 feet deep dominated by aquatic vegetation.

Load/Loading- The amount of nutrients or pollutants from a source, usually expressed as pounds or pounds per acre.

Losing Stream- A stream which loses water through the stream bed to the groundwater.

Maximum Standard- The highest concentration of a toxicant in water to which aquatic organisms can be exposed for a brief time with zero or slight mortality. The max standard is half of the final acute value.

Mesotrophic- Bodies of water with an intermediate amount of biological productivity. These waters are typically clear water with healthy aquatic vegetation, some algal growth, and an intermediate amount of nutrients. When stratified, these waters may become anoxic near the bottom.

Non-point Source- A source of pollution from a undefined area such as runoff from a landscape.

Nutrients- Discussed in this report as total phosphorus (TP), total suspended solids (TSS) or sediment, and total Kjeldahl nitrogen (TKN).

Ordinary High Water Level (OHWL)- The boundary of public waters and wetlands determined by a level of water maintained with enough time to leave evidence upon the landscape, such as a change in natural vegetation from terrestrial to aquatic, or the top of the bank of a channel.

Oligotrophic- Bodies of water with low biological productivity characterized by clear water, low algal growth, low nutrient concentrations, minimal aquatic vegetation, and well-oxygenated water.

Point Source- A source of pollution from a single defined outlet such as a pipe.

Shallow Lake- A lake 50 acres or greater in size and less than 15 feet deep, or has greater than 80% littoral area.

Stratification- Separation of water within a lake based on density as a result of differences in water temperature from warm water near the surface and heavy, cold water near the bottom.

Thermocline/metalimnion- The boundary between warm and cold water within a stratified lake characterized by a sudden change in temperature and dissolved oxygen.

Total Maximum Daily Load (TMDL)- Defined by the Clean Water Act as the amount of a pollutant a water body can receive and still meet water quality standards. TMDL studies will often assign a point source load, non-point source load, internal load, and a margin of safety to each pollutant to guide management activities for load reductions from each source.