Shakopee Mdewakanton Sioux Community

Water Quality Report 2024

25 Years of Water Quality Monitoring at SMSC

Natural Resources Department

Background

The SMSC Natural Resources Department has been collecting water quality and weather data since 1999. The overall goal is to ensure that all tribal waters are clean and provide a safe and healthy resource for Community Members, future generations and surrounding communities.

Water Body Type	Number of Waterbodies	Based on SMSC boundaries	Water Uses/goals
Wetlands and ponds within SMSC boundaries	165	582.8 acres	A, R, C
Total surface area of lakes important to SMSC	7	817 acres	A, R, C
Intermittent stream miles within SMSC boundaries	16	3.43 miles	A, R, C
Ditch miles within SMSC boundaries	12	4.42 miles	A, R, C
River frontage miles adjoining SMSC boundaries (Mnisota Wakpa)	1	0.30 miles	A, R, C
Springs within SMSC boundaries or cultural areas	3		A, C

Table 1. SMSC water resources identified within or adjacent to SMSC boundaries as of the 2022 sampling season.

Lakes, streams and wetlands are monitored based on their water uses/goals including aquatic life (A), recreation (R) and/or cultural importance (C).

A: Aquatic Life- Waters should be able to support a healthy community of fish, amphibians, reptiles, vertebrates, invertebrates, plants, waterfowl and mammals. This also includes providing sufficient aquatic habitat.

R: Recreation- Waters shall be suitable for fishing, hunting, kayaking and canoeing for Community Members. In addition, should provide aesthetic enjoyment for surrounding walking paths, neighborhoods and businesses.

C: Cultural importance- Protect water quality and quantity for future generations, including groundwater conservation and environmental restoration.

Summary	Sampling Objective	Uses/ Goals	Sampling Design	Frequency	Sampling Period	Sampling Sessions
Lakes	1, 2, 3	A, R, C	Trend: water quality, level	Bi-weekly	May to Nov	15
			Biological: aquatic vegetation	Annual	May to Nov	1
Lake inlet/outlet	1, 2	A, R	Trend: water quality, flow	Bi-weekly	May to Nov	15
Wetlands, streams and ponds	1, 2, 3	A, R, C	Trend: water quality, level, flow	Weekly	April to Nov	25
			Biological: macroinvertebrates	Funding dependent	May to Nov	Funding dependent
Weather	2	A, R	Trend: Weather	Daily	Jan to Dec	Continuous

Table 2. Summary of SMSC monitoring activities. Obj 1. Monitor trends and compare to MN state standards, Obj 2. Monitor water quantity, Obj 3. Gather new data and determine causes/sources of water quality issues.

The parameters monitored depends on the sampling objectives and water uses/goals at each sampling site.

- **Lakes (4):** Ammonia (NH3), Calcium (Ca), Chlorophyll-a (Chl-a), Chloride (Cl), Clarity (Secchi), Dissolved Oxygen (DO), Magnesium (Mg), Nitrate+Nitrite (NO3+NO2), Total Kjeldahl Nitrogen (TKN), Orthophosphorus, Oxidation Reduction Potential (ORP), pH, Total Phosphorus (TP), Sodium (Na), Specific Conductivity (SpCond), Sulfate (SO4), Temperature, Total Dissolved Solids (TDS), Total Suspended Solids (TSS) and Water Level.
- **Wetlands (1), Streams (2) and Inlet/Outlet (1)**: Dissolved Oxygen (DO), Oxidation Reduction Potential (ORP), pH, Specific Conductivity (SpCond), Stream Flow, Temperature, Total Dissolved Solids (TDS) and Water Level.

Data from this report is submitted annually to the EPA Water Quality Exchange (WQX) database. Methods and procedures follow the EPA approved SMSC Monitoring Strategy and SMSC Quality Assurance Project Plan, updated in 2020. Laboratory analysis was conducted by Pace Analytical Laboratory. Waters are compared to Minnesota Class 2B surface water standards.

Weather

2024 Update

Weather is an important aspect to all water resources and natural resources monitoring. Relationships in water quality data can be related to the local weather conditions. The weather patterns and long term changes directly impact our local ecosystems. Due to this importance, SMSC installed a local weather station in 2001. Measurements include temperature, dew point, wind speed, barometric pressure, rainfall (tipping bucket and manual) and evaporation.

The SMSC weather station data is also compared to the local National Oceanic and Atmospheric Administration (NOAA) weather station in Jordan, MN. This is the closest offical climate location to SMSC. At this location they develop 30 year averages or climate normals that we can compare weather trends to. The most recent 30 year average is from 1991-2020.

Ice depth is measured throughout the winter at most SMSC lakes. Changes in ice depth can impact the aquatic plants that grow the following year and could influence winter kills. In addition, SMSC sampling season is primarily collected from spring ice thaw to winter freeze (April – October).

- In winter 2024, ice was variable, didn't form normal thick ice depths and ice was on/off.
- In spring 2024, ice out occurred at all SMSC lakes by 3/3/24, but refroze briefly 3/27/24.
- In fall 2024, ice cover on SMSC lakes occurred on 12/02/2024. In 2024, 274 days were ice free (45 days more than in 2023).
- Winter lake aeration occurs at two SMSC lakes, Arctic and Pike, to prevent winter fish kills. With an approved MN DNR permit, signs are installed after ice forms and subsequently monitored weekly throughout the winter.

Summer temperatures in 2024 were warmer than in 2022, 2023 and the Jordan 30 year average. With higher temperatures, algae blooms were present at Arctic and Pike mid summer until the end of the season.

- Stream and wetland monitoring began on 4/04/2024 and lake monitoring began on 4/11/2024.
- Stream and wetland monitoring ended on 11/12/2024 and lake monitoring ended on 10/24/2024. Skim ice was present on waterbodies in late November.

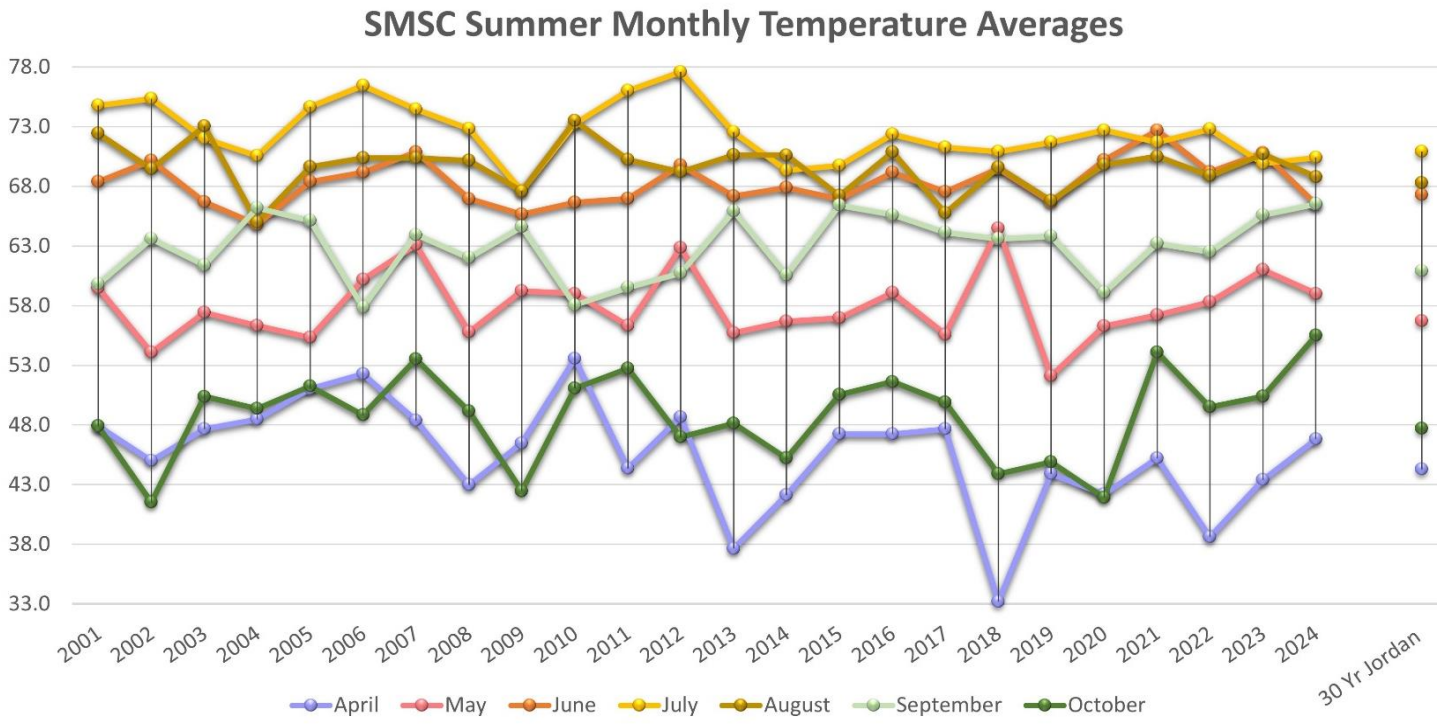
Precipitation has been notable for water resources monitoring for the past 4 years. In 2021 and 2022, the total yearly precipitation totals were 8.5 inches less than the Jordan 30 year average. In 2023 and 2024, precipitation increased, but the rain was inconsistent throughout the year. In 2023, the summer was one of the driest on record. In 2024, the fall was one of the driest in recent years.

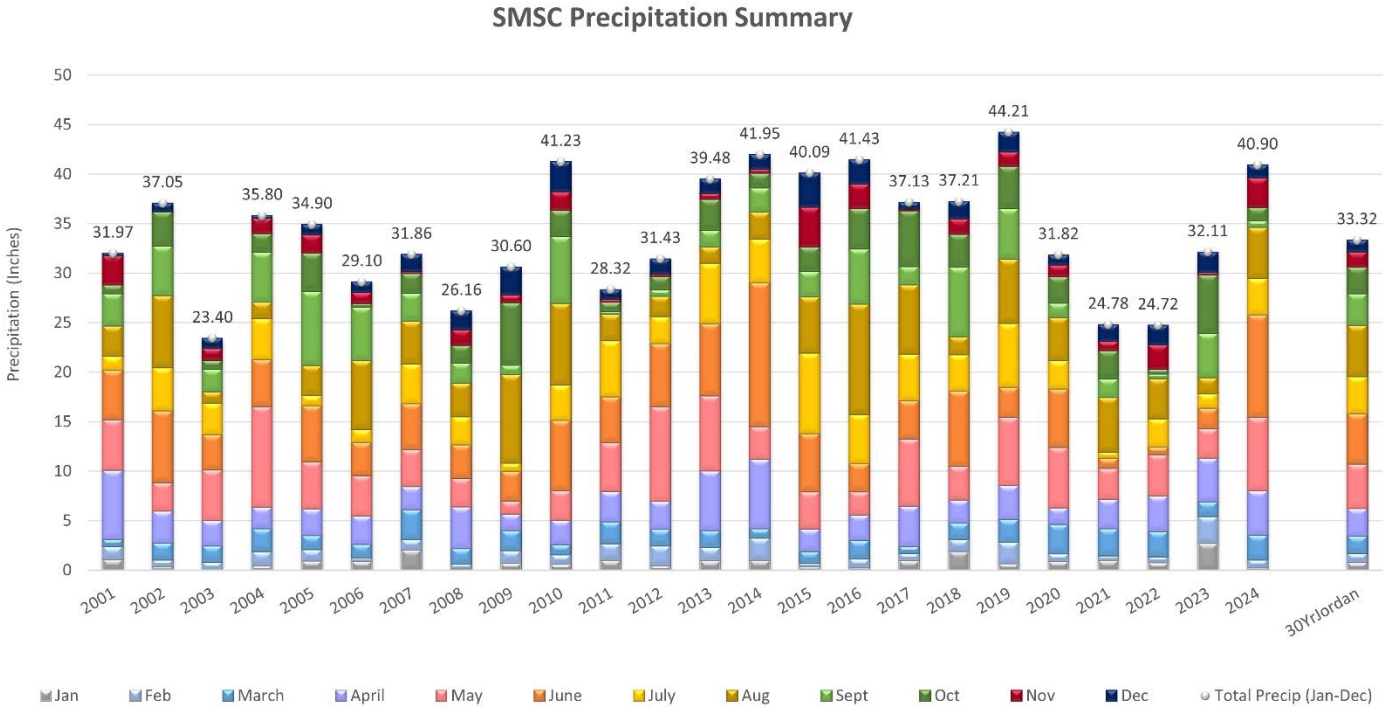
- Precipitation in 2024 was skewed heavily to the early season and early summer, leading to above normal total precipitation.
- Precipitation tapered off later in the year and drought conditions began in Aug/Sept 2024.
- The picture to the right shows a lake outlet, which has a small (harmless) berm built by beavers and/or muskrats. This reduces the rate of water loss on the lake and demonstrates how animals notice precipitation trends and seek consistent water levels in their environment.

Weather

2024 Update

Graphs below represent the temperature and precipitation averages at SMSC from 2001 to 2024. Colors represent the monthly measurements and are the same color on both graphs. The Jordan 30 year average is shown on the far right. Temperature is shown for the summer sampling season (April – October). Precipitation is shown for the entire year.





Arctic Lake

2024 Update

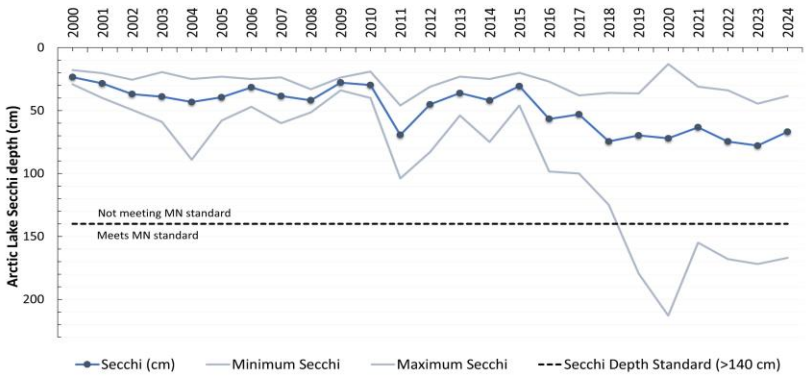
Arctic Lake (MN DNR ID 70008500) is a 24.19 acre basin located south of County Hwy 82, south of the Tewapa neighborhood. Maximum depth is 30 feet and the lake supports a good population of bass and bluegills. The inlet of Arctic Lake comes from Spring Lake Regional Park wetlands and the outlet flows into Upper Prior Lake. Historic land use was primarily row crop agriculture. SMSC Natural Resources began monitoring the lake in 2000 and started restoration work in 2001.

Concerns: Invasive carp, excess nutrients, algal blooms, eutrophic.

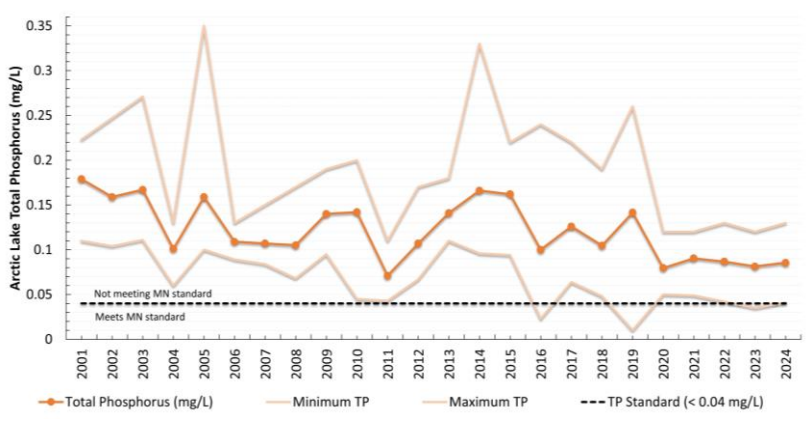
The north upland was planted with native perennial grasses which slows stormwater inputs and better catches sediments before entering the lake. Two large removals of invasive carp occured in 2017. In addition, 118 carp were removed from the outlet channel in May 2022, another 213 in May 2023 and only 11 in May 2024. As a result, the overall clarity depth improved, including early season measurements meeting state standards (May to June).

Historic agriculture included drain tiles that would input fertilizers and nutrients directly into the lake. As a result, the lake holds higher than average phophorus concentrations. Nearby drain tiles were broken and an iron sand filter was implemented to reduce the incoming phosphorus to the lake. Currently, concentrations still exceed the MPCA standard, but there are significantly less spikes than in previous years.

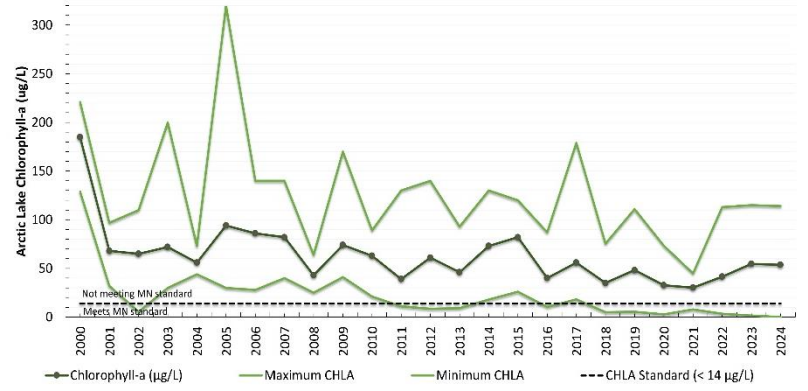
Algae blooms are a concern in Arctic and are measured by chlorophyll-a pigments in the water. From 2022-2024, late season algae was problematic and there was a visible presence of cyanobacteria (blue green algae). Future action includes transplating native aquatic vegetation, which utilize phosphorus in the roots.



Secchi depth measures the depth of water clarity or transparency.



Phosphorus is a nutrient used by plants and algae. Found in fertilizers.



Chlorophyll-a measures the algae pigments in the water. Shows sign of algae blooms, commonly high in late season.

Goals: Remove additional carp and then transplant native aquatic plants to stabilize sediment and utilize nutrients.

Arctic Lake

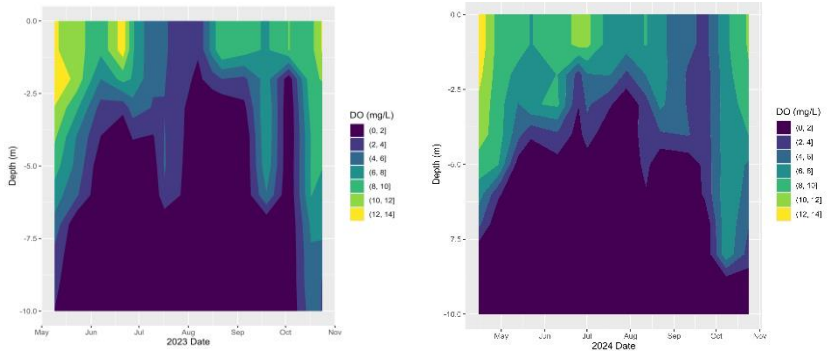
2024 Update

Winter fish kills were reported at Arctic Lake during the 2010-2011 winter. The problem continued due to low dissolved oxygen concentrations in the water (less than 5 mg/L). A lake aeration system was installed at Arctic Lake in the fall of 2016 in order to prevent future winter fish kills. Each year dissolved oxygen is monitored and aerators are checked to ensure working condition. The graph to the right shows the lake dissolved oxygen throughout the water column in summer 2023 and 2024. In 2023, low oxygen (dark blue) occurred below 2 meters most of the year until late October. In 2024, higher oxygen (yellow/green) was at the surface and had better lake stratification. There was only one aerator plume visible throughout both summers, even though 6 plumes should be seen. Additional aerator maintance needs to occur in the future. Full lake turnover occured in late October of both years.

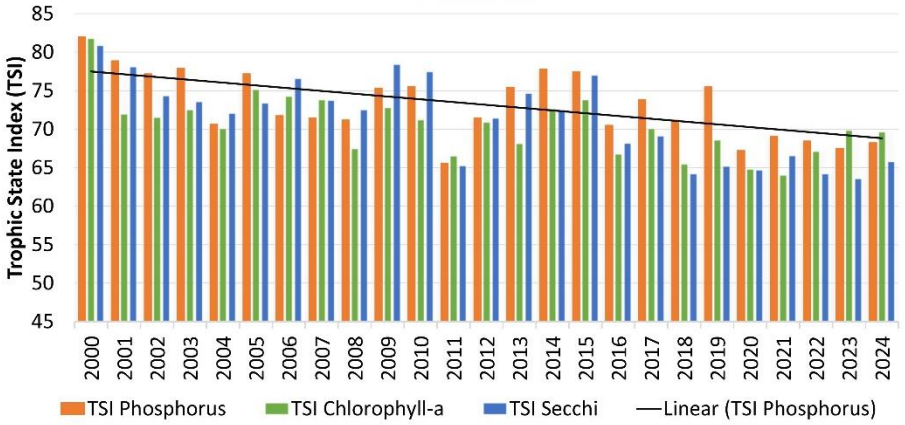
Trophic state index values ranged from 64-70, which means the lake is eutrophic and may experience blue green algae blooms or algae scum in the summer. Although, the overall trend is decreasing and biological condition is improving over time.

Dissolved oxygen indicates oxygen available for aquatic organisms.

2023 **2024**



Carlson's Trophic State Index
Arctic Lake



Arctic Lake E Surface Summary Statistics	2024 Mean	2024 St Dev	2024 Min	2024 Max	1999-2024 Mean	MN/EPA Standards	PASS or FAIL
Ammonia (mg/L)	0.13	0.18	0.03	0.57	0.10		
Calcium (mg/L)	47	5	39	55	43.64		
Chlorophyll-a (µg/L)	54	32	0	114	55.22	<14	FAIL
Chloride (mg/L)	50	6	44	63	34.40	<230	PASS
Clarity (cm)	67	38	39	167	51.72	>140	FAIL
Dissolved Oxygen (mg/L)	8	2	3	14	8.57	>5	PASS
Magnesium (mg/L)	20	1	18	23	20.03		
Nitrate+Nitrite (mg/L)	0.05	0.12	0.02	0.50	0.04	<10	PASS
Kjeldahl Nitrogen, Total (mg/L)	2.2	0.5	1.3	2.9	2.24		
Orthophosphorus (mg/L)	0.01	0.00	0.00	0.01	0.01		
Redox Potential (mV)	316	46	226	404	308.44		
pH (units)	8.0	0.2	7.7	8.5	8.34	6.5-9	PASS
Total Phosphorus (mg/L)	0.09	0.02	0.04	0.13	0.12	<0.04	FAIL
Sodium (mg/L)	17.13	1.95	14.50	20.80	12.97		
Specific Conductivity (µg/L)	491	30	444	539	438.10		
Sulfate (mg/L)	2.33	1.14	1.80	3.60	2.77	<10	PASS
Temperature (°C)	20	5	11	27	21.28		
Total Suspended Solids (mg/L)	14.4	5.5	5.2	23.9	15.59		

Conclusion: Arctic Lakes fails 3 out of 8 standards showing it is a eutrophic lake but the trend is improving for all parameters sampled.

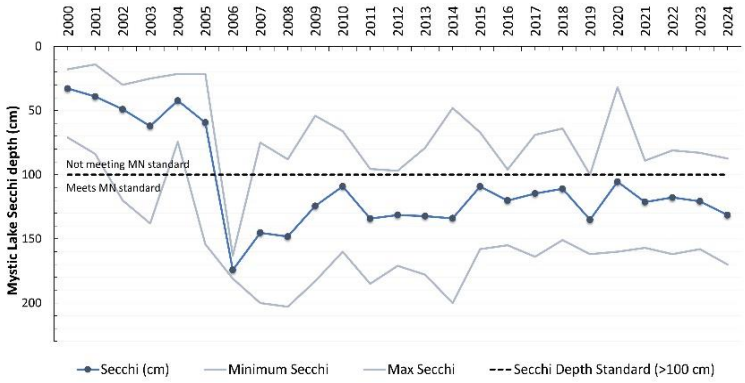
Mystic Lake

2024 Update

Mystic Lake (MN DNR ID 70007900) is a 54.17 acre basin located east of County Hwy 83, west of the Wilds neighborhood. The maximum depth is 5-6 feet and supports a robust population of native plants. There are resident muskrat, snapping turtles, trumpeter swans and waterfowl every summer. Adjacent County Hwy 83 was reconstructed in 2016-2017 that filled in a portion of the west side of the lake and increased the watershed of Mystic Lake. The outlet flows into The Meadows at Mystic Lake wetland complex. Being close to a roadway, deicing salt is a concern because it can have detrimental impacts to aquatic life.

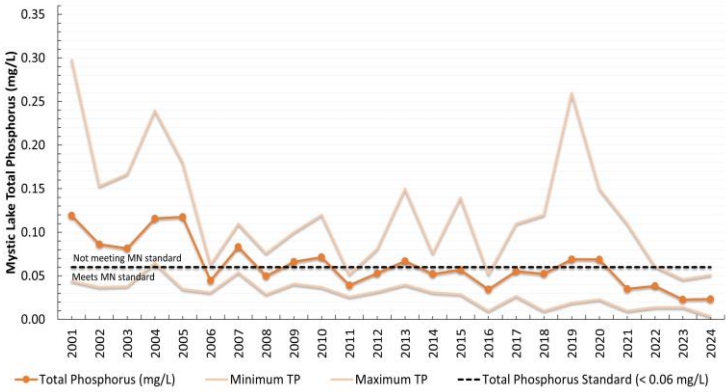
Concerns: Excess salt and invasive species.

As a shallow lake, the clarity of the water is recommended to be greater than 100 cm. The average secchi/clarity measure has met the state standard for the past 18 years. The lake bottom is usually visible early in the year, which allows the aquatic plants to grow and utilize nutrients throughout the year. Also, these plants provide habitat for the wildlife that live in and visit the lake.



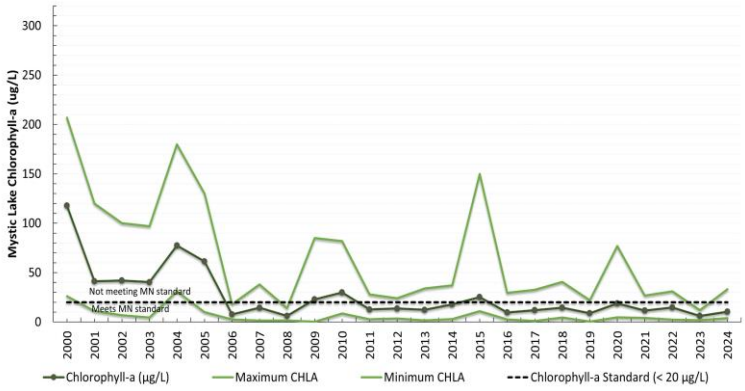
Secchi depth measures the depth of water clarity or transparency.

Excess phosphorus was an issue at Mystic Lake prior to 2006 and the exact cause is unknown. Although, directly adjacent to the water's edge is The Wilds Golf Course, which could potentially input fertilizers and chemicals into the water. Currently there is a wide buffer surrounding the lake which can capture nutrients, like phosphorus, before reaching the water. The average and minimum phosphorus concentrations in 2023 and 2024 were the lowest of all years of sampling.



Phosphorus is a nutrient used by plants and algae. Found in fertilizers.

Also, with less phosphorus spikes there are less available nutrients for algae growth. Chlorophyll-a has been below the state standard since 2015, which directly relates to less frequent algae blooms.



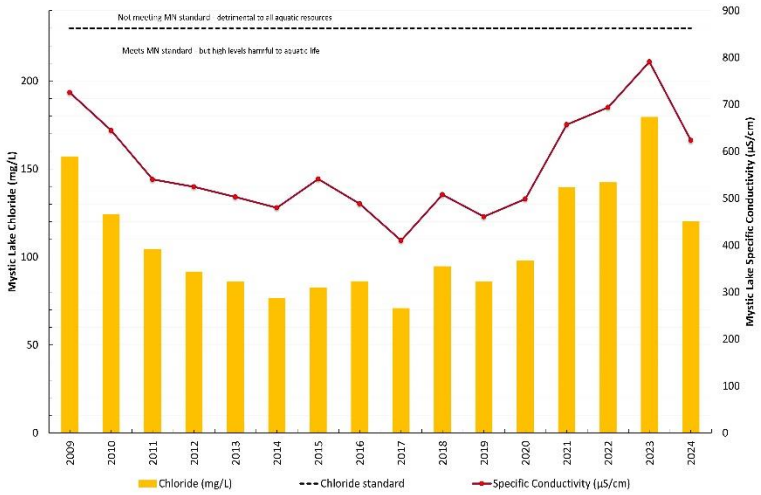
Chlorophyll-a measures the algae pigments in the water. Shows signs of algae blooms.

Goals: Continue monitoring aquatic vegetation and identifying invasive species present in the lake.

Mystic Lake

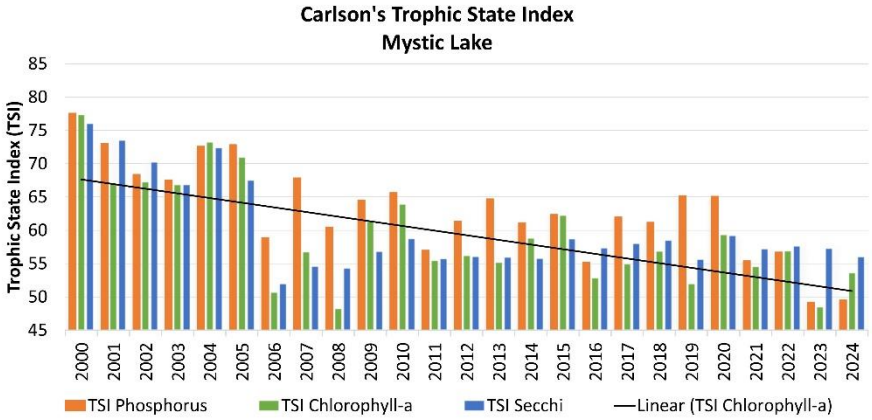
2024 Update

Salt or chloride is toxic to aquatic life because it impacts food sources and can inhibit aquatic species growth and reproduction. The chloride concentration has been rapidly increasing since 2021 and finally decreased in 2024. The mild winter before the 2024 field season led to less winter salt application and less salt in Mystic Lake. The concentration is still below state standards, but the increasing trend needs to be closely monitored. Salt will impact aquatic health within the lake and downstream waters (wetlands at The Meadows at Mystic Lake golf course where water is used for irrigation).



Chloride is a measure of salt and specific conductivity is total ions in the water.

Trophic state index values ranged from 49-57, which means the lake is on the lower bounds of eutrophic. This is a positive improvement to previous years and is good indication of less algae blooms in the summer. Phophorus and chlorophyll show a beneficial change in Mystic Lake's 2023 and 2024 trophic state index.



Conclusions: Mystic Lake passes all standards but shows increasing salt concentrations which can be detrimental to aquatic life in the lake and downstream.

Mystic Lake Center Summary Statistics	2024 Mean	2024 St Dev	2024 Min	2024 Max	1999-2024 Mean	MN/EPA Standards	PASS or FAIL
Ammonia (mg/L)	0.03	0.01	0.03	0.06	0.05		
Calcium (mg/L)	32	8	20	47	27.48		
Chlorophyll-a (µg/L)	10	9	4	33	19.47	<20	PASS
Chloride (mg/L)	120	19	102	150	104.53	<230	PASS
Clarity (cm)	132	25	87	170	114.72	>100	PASS
Dissolved Oxygen (mg/L)	8	2	5	12	8.64	>5	PASS
Magnesium (mg/L)	20	2	17	25	22.21		
Nitrate+Nitrite (mg/L)	0.02	0.02	0.02	0.11	0.03	<10	PASS
Kjeldahl Nitrogen, Total (mg/L)	0.9	0.2	0.7	1.2	1.14		
Orthophosphorus (mg/L)	0.002	0.001	0.002	0.004	0.006		
Redox Potential (mV)	335	34	276	392	374.42		
pH (units)	8.1	0.6	7.5	9.2	8.67	6.5-9	PASS
Total Phosphorus (mg/L)	0.02	0.02	0.00	0.05	0.06	<0.06	PASS
Sodium (mg/L)	52.42	7.88	44.20	69.00	45.37		
Specific Conductivity (µg/L)	623	94	520	816	546.20		
Sulfate (mg/L)	0.56	0.31	0.24	1.00	1.39	<10	PASS
Temperature (°C)	20	4	12	26	21.49		
Total Suspended Solids (mg/L)	3.1	1.7	1.0	7.1	6.19		

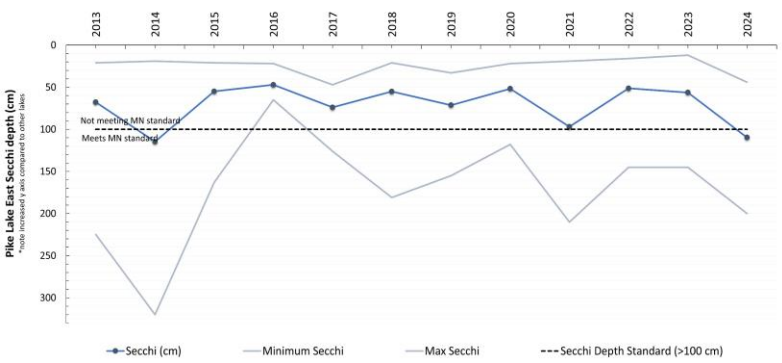
Pike Lake

2024 Update

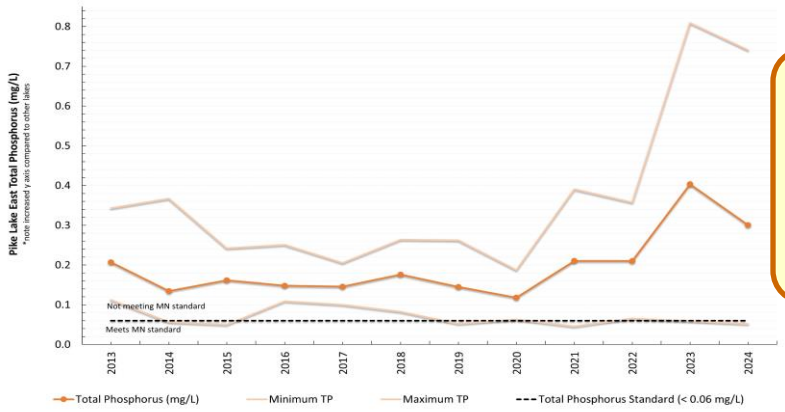
Pike Lake (MN DNR ID 70007600) is a 50.75 acre basin located north of County Hwy 42 and west of Pike Lake Road. Pike Lake has two bays, Pike Lake West and Pike Lake East which are separated by a small island. Pike Lake has been monitored by the Prior Lake-Spring Lake Watershed District since 2012 on both lake bays. SMSC land is on the north portion of Pike Lake East, so the data in this report is focused on Pike Lake East. The maximum depth is 9 feet on Pike Lake East.

Concerns: Invasive species, winter fish kills, excess nutrients, eutrophic.

Pike Lake receives water from the Prior Lake Outlet Channel (PLOC), which is a location where common carp enter the lake. In 2019, it was estimated that 3,400 carp were in the lake, which is three times the recommended carp biomass. Carp feed on the lake bottom which suspends phosphorus and solids, increases algae and decreases water clarity. In 2021, common carp were impacted in a natural winter fish kill due to low dissolved oxygen levels under the ice. Without as many carp in the lake, the water clarity improved in summer 2021, and in 2024 water clarity met the MN standard for the first time since 2014.

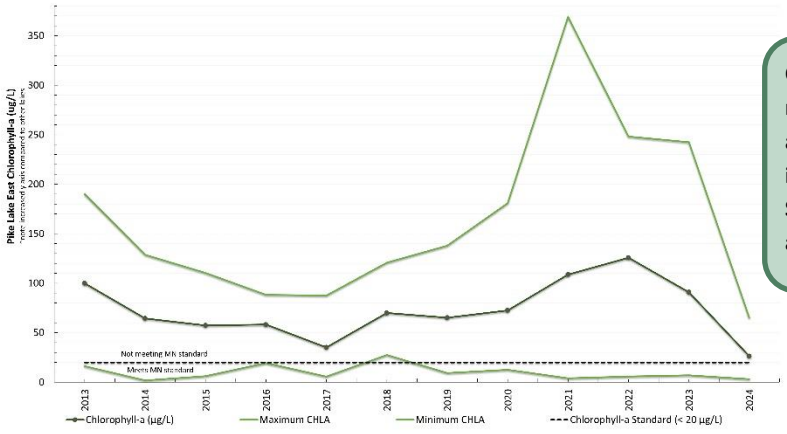


Secchi depth measures the depth of water clarity or transparency.



Phosphorus is a nutrient used by plants and algae. Found in fertilizers.

Phosphorus and chlorophyll-a both improved in 2024 but haven't met water quality standards since 2012. The last several years have been the highest concentrations since sampling began, which coincides with the severe drought. With regular flow from PLOC in 2024, there was flushing in the system, which could be the reason for improved phosphorus and chlorophyll-a levels. Phosphorus is still a ways from meeting standards, this could be due to the agricultural land use and construction surrounding the lake. These activities could be sources of nutrients to the lake.



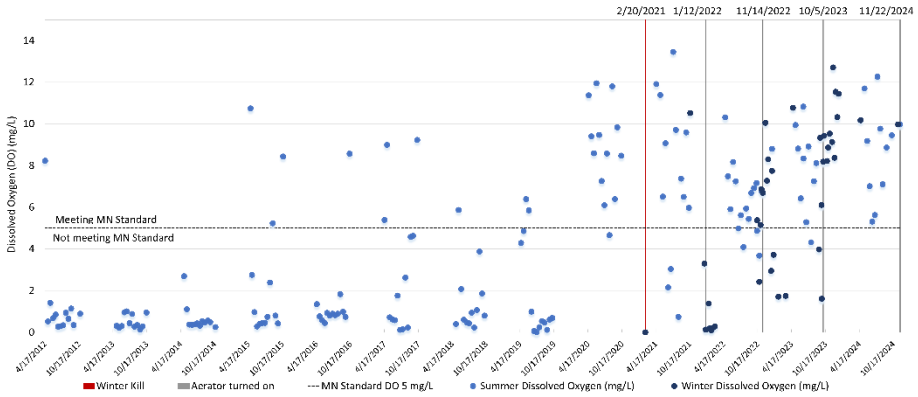
Chlorophyll-a measures the algae pigments in the water. Shows signs of algae blooms.

Goals: Native fish repopulation, prevent new invasive species spread.

Pike Lake

2024 Update

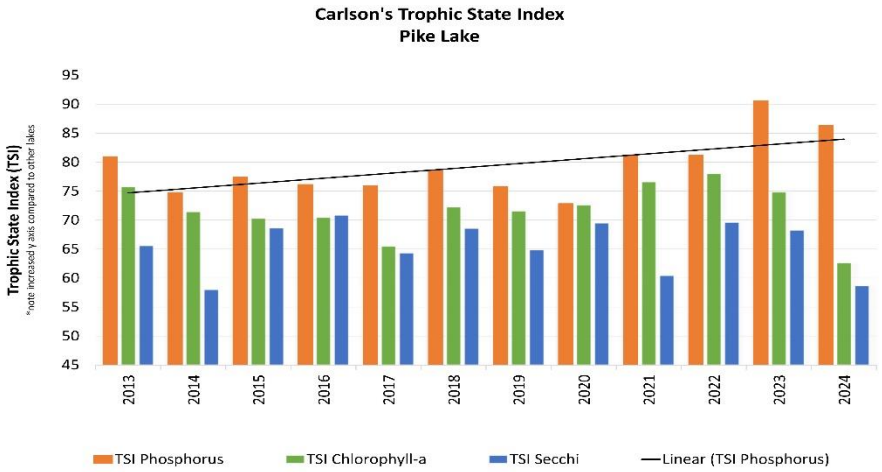
In order to keep the native fish alive, an aerator was installed for winter only use. At Pike Lake, dissolved oxygen has been naturally low and often fell below the state standard, especially during winter months. After the aerator, there is a wider range of oxygen concentrations but it primarily meets the state standard throughout the year and is keeping fish alive. In 2024 all dissolved oxygen measurement levels have been above the MN standard.



Dissolved oxygen is a measure of oxygen in the water. Aquatic life needs 5 mg/L to remain alive.

Salt, or chloride concentrations, are well below the state standard and concentrations seen at Pike Lake are shown in the table below. Although, with the new residential neighborhood under construction, winter deicing has been increasing chloride in the lake in the years 2021-2023. Chloride levels in 2024 were lower than previous years and could be attributed to the very mild winter preceeding sampling season.

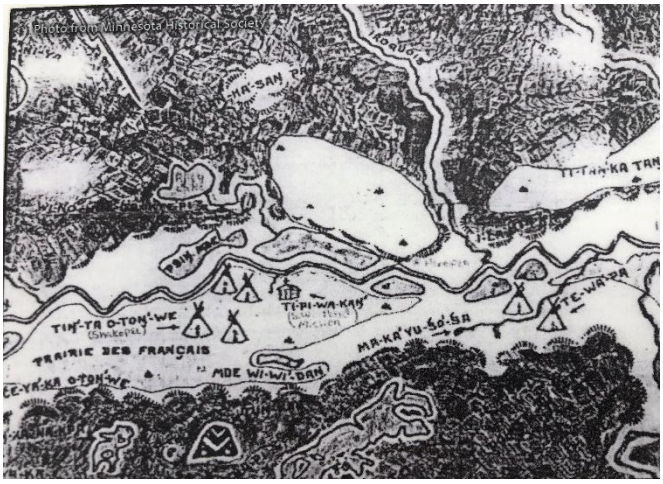
Trophic state index values ranged from 59-86 in 2024, which is a decrease from 2023. The TSI classifies Pike Lake as hypereutrophic, which means throughout the summer the lake experiences heavy algae blooms and stress on biological life. Phosophorus is the parameter that is most elevated and the reason for hypereutrophic classification. Lowering the phosophorus load in the lake would help decrease the likelihood of heavy algae blooms and improve water quality.



Conclusions: Pike Lakes fails 2 out of 6 sampled standards. Improved clarity in 2024 now meets state standards. Continued restoration work will improve lake water quality and aquatic health.

Pike Lake East Summary Statistics	2024 Mean	2024 St Dev	2024 Min	2024 Max	1999-2024 Mean	MN/EPA Standards	PASS or FAIL
Chlorophyll-a (µg/L)	26	22	3	65	75.89	<20	FAIL
Chloride (mg/L)	86	46	67	110	69.15	<230	PASS
Clarity (cm)	110	59	44	200	68.43	>100	PASS
Dissolved Oxygen (mg/L)	9	4	7	10	4.23	>5	PASS
Kjeldahl Nitrogen, Total (mg/L)	1.4	0.7	0.5	2.6	2.54		
Orthophosphorus (mg/L)	0.15	0.14	0.01	0.45	0.04		
Redox Potential (mV)	290	106	264	317	125.26		
pH (units)	8.3	3.9	7.6	9.4	7.84	6.5-9	PASS
Total Phosphorus (mg/L)	0.30	0.21	0.05	0.74	0.20	<0.06	FAIL
Specific Conductivity (µg/L)	519	244	487	549	480.25		
Temperature (°C)	17	9	7	23	18.09		

Deans Lake (Mde Wiwi Dan) 2024 Update



Deans Lake (MN DNR ID 70007400) is a 106.5 acre basin located north of County Hwy 16, north of the SMSC bison prairie and north of SMSC Shutrup prairie. Historical maps show Dakota villages along Mnisota Wakpa, including Deans Lake labeled as Mde Wiwi Dan. Deans Lake is within the Prior Lake minor watershed and towards the end of the Prior Lake Outlet Channel (PLOC). Sampling was previously conducted via Metropolitan Council CAMP Program, from 2002-2011. SMSC began monitoring in 2024 and included water quality, aquatic vegetation, macroinvertebrate survey and a fish survey. The macroinvertebrate sampling along the shoreline found mayflies, caddisflies and good diversity. The score for index of biological integrity (IBI) was 30, showing "excellent" wetland health.

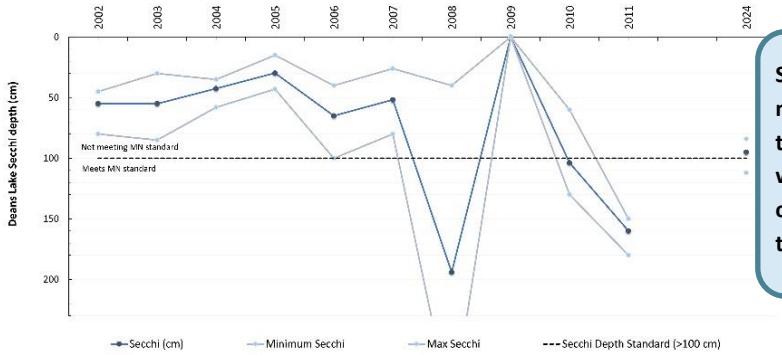
Concerns: Protecting the high quality ecosystem and learn more baseline information about this lake.

Deans Lake has a maximum depth of 4 feet but most of the lake is 1-3 feet deep. Water is clear and the lake bottom was visible most of the summer. Clarity was to the bottom but the sampling site wasn't always greater than 100 cm. An aquatic vegetation survey in 2024 had a total of 15 native species and 1 aquatic invasive species. Horned pondweed was a unique species discovered, which indicates presence of groundwater inputs in the lake since that plant grows in cooler ecosystems.

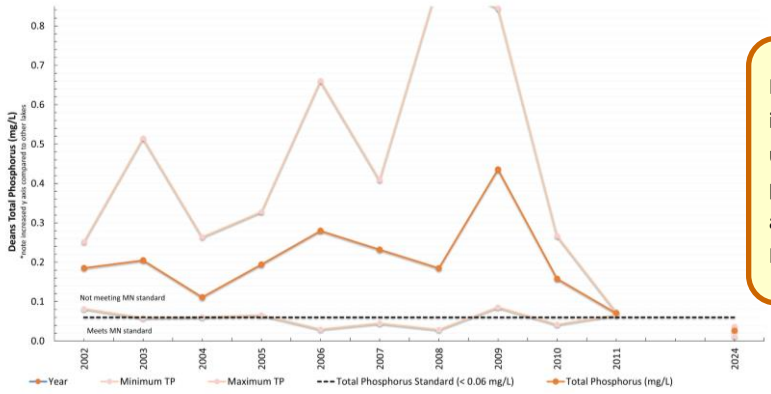
Nutrients are in low concentrations and meeting state standards at all three sampling dates in 2024. This was a great finding because previous monitoring by the Metropolitan Council from 2002-2011 shows high concentrations. One big change is a prairie restoration of the upland slope in the last several years that has kept upland nutrients from reaching the main waterbody.

Chlorophyll-a and algae blooms were not a concern during the 2024 sampling year. Based on previous data, the lake goes through cycles of high chlorophyll-a where there might be associated algae blooms in those years. The reason for those peaks is unknown without more data collection.

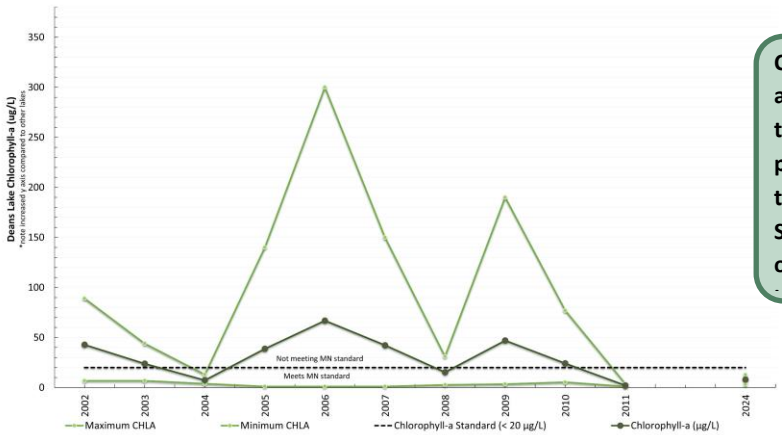
Goals: Collect more Deans Lake data to assess current conditions.



Secchi depth measures the depth of water clarity or transparenc



Phosphorus is a nutrient used by plants and algae. Found in

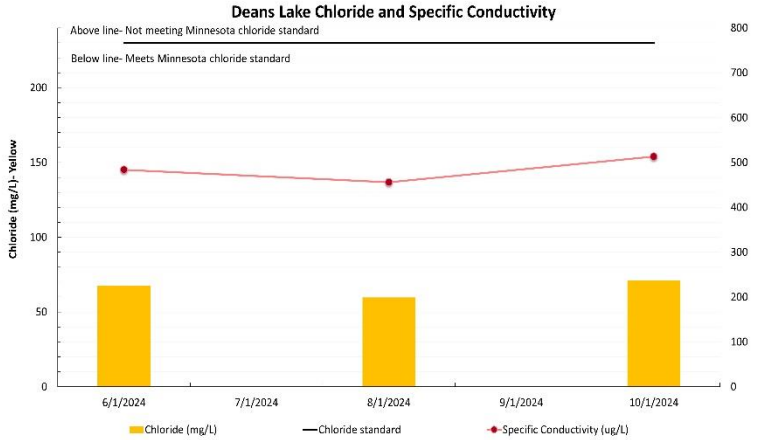


Chlorophyll-a measures the algae pigments in the water. Shows signs of algae

Deans Lake

2024 Update

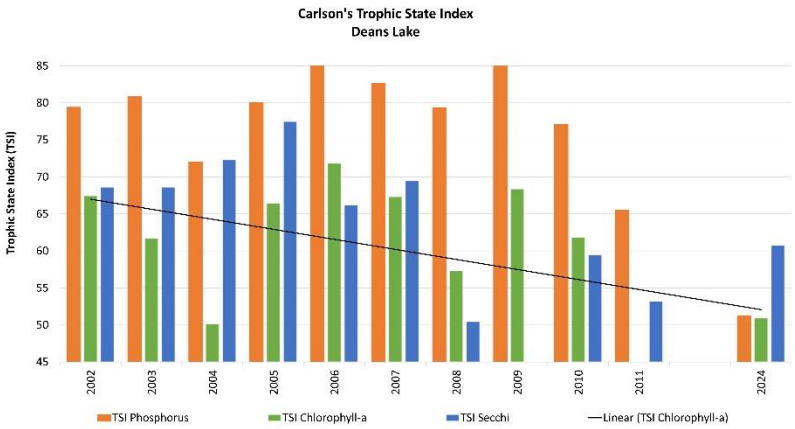
Chloride yearly average was 66 mg/L in 2024, which is similar to the concentration in Howard Lake. The chloride inputs are likely coming into Deans Lake from the Prior Lake Outlet Channel (PLOC). Upstream PLOC goes underneath several roadways and likely receives salting inputs from winter and spring snowmelt. Unfortunately, the roadways that are upstream of Deans Lake do not have SMSC road management. Although, there is room for improved City and County road management/salt reduction following the Twin Cities Metropolitan Chloride Management Plan.



Chloride is a measure of salt and specific conductivity is total ions in the water.

Fish surveys revealed a very productive fisheries habitat in Deans Lake. There was diverse fish populations and no invasive common carp found. In addition, several turtle species were found, including the smooth softshell turtle, which is a new species documentation for an SMSC water resource.

Trophic state index values ranged from 51-61 in 2024, which means the lake is on the lower bounds of eutrophic. This is a good level for a shallow lake in this region and lower than previous years.



Conclusions: Deans Lake passes all standards except for clarity (due to depth limitations) and water quality is improved since 2002-2011.

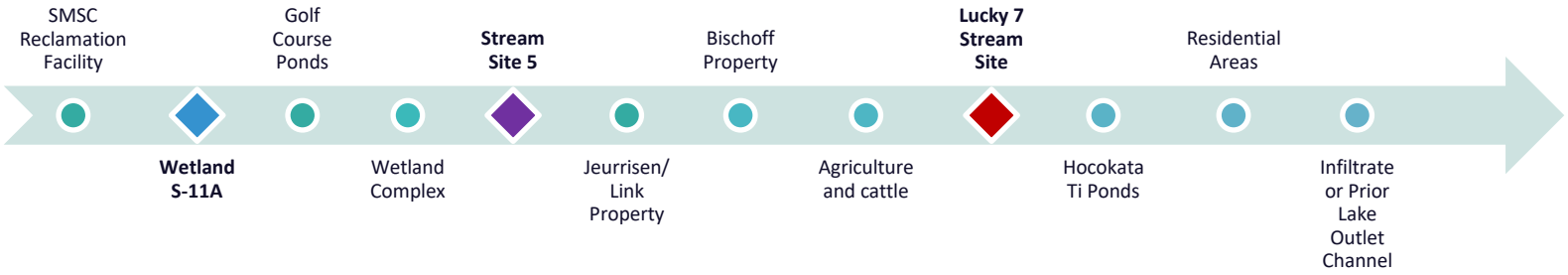
Deans Lake Summary Statistics	2024 Mean	2024 St Dev	2024 Min	2024 Max	2002-2011 Mean	MN/EPA Standards	PASS or FAIL
Ammonia (mg/L)	0.03	0.03	0.03	0.05			
Calcium (mg/L)	29	1	27	30			
Chlorophyll-a (µg/L)	8	2	3	13	34.46	<20	PASS
Chloride (mg/L)	66	6	60	71		<230	PASS
Clarity (cm)	95	15	84	112	83.88	>100	FAIL
Dissolved Oxygen (mg/L)	10	4	6	14		>5	PASS
Magnesium (mg/L)	22	0	20	26			
Nitrate+Nitrite (mg/L)	0.02	0.00	0.02	0.02		<10	PASS
Kjeldahl Nitrogen, Total (mg/L)	1.1	0.6	1.0	1.2	2.64		
Orthophosphorus (mg/L)	0.009	0.011	0.002	0.017			
Redox Potential (mV)	334	11	322	341			
pH (units)	8.5	0.5	8.0	9.1		6.5-9	PASS
Total Phosphorus (mg/L)	0.03	0.01	0.01	0.04	0.22	<0.06	PASS
Sodium (mg/L)	27.93	2.04	25.70	29.70			
Specific Conductivity (µg/L)	484	29	456	513			
Sulfate (mg/L)	8.50	4.04	4.00	11.80		<10	PASS
Temperature (°C)	19	7	11	24	23.62		
Total Suspended Solids (mg/L)	1.1	0.7	0.5	1.4	1.07		

Streams & Wetlands

2024 Update

Streams across SMSC provide an important role of carrying water to mitigate damage from large precipitation events. Wetlands will hold a signficant amount of water after precipitation events and can filter the water before flowing further downstream. Both provide habitat for a variety of waterfowl, aquatic invertebrates and animals. Within the Prior Lake Minor Watershed, monitoring occurs at several key sites along a stream system that flows through SMSC land.

Monitoring sites are shown as diamonds and colors represent their associated color in the graphs.



Concerns: Salts, suspended solids and drought impacts on aquatic life.

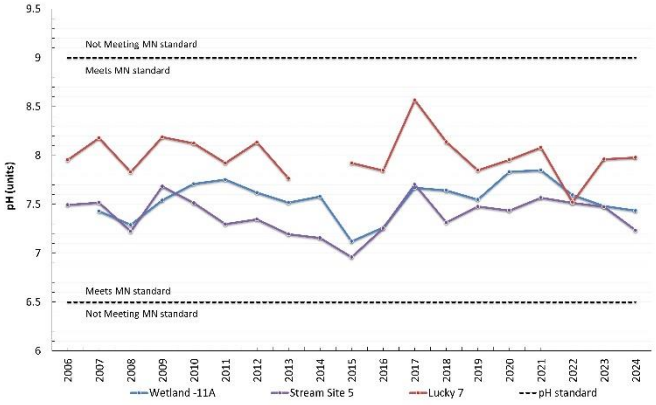
Wetland S-11A (BLUE) is the first measuring point downstream from the SMSC Water Reclamation Facilty. Specific conductivity decreased significantly after the installation of reverse osmosis in 2009. This eliminated the need for water softeners around the Community and decreased the dissolved solids flowing downstream.

Stream Site 5 (PURPLE) is downstream of the large golf course and wetland complex, so stream flow and water quality are more consistent.

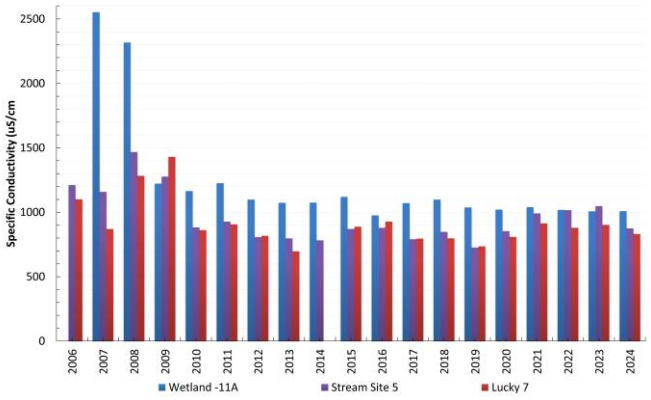
Lucky 7 Stream Site (RED) is directly downstream from agriculture and cattle land and consistently has higher pH than the other sites, but meets MN standards. Specific conductivity is similar to upstream and has stabilized to a new normal after 2009.

Following Lucky 7 and Hoċokata Ti ponds, the majority of this water will infiltrate to groundwater. During high flow years, the water connects to the Prior Lake Outlet Channel and ultimately flows to the Minnesota River. Drought conditions occurred Aug/Sept in 2024, so sites had minimal flow or were dry.

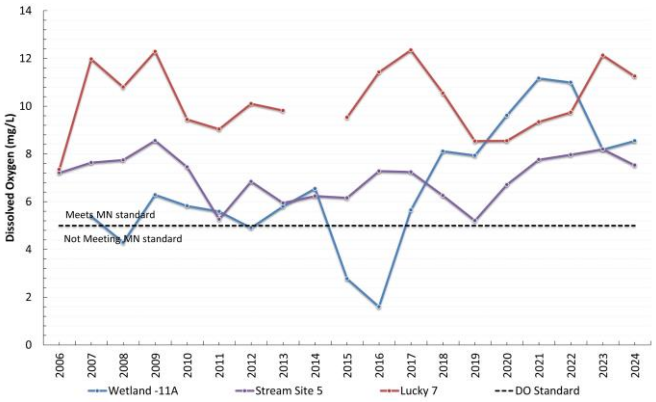
Goals: Continue monitoring to ensure concentrations are healthy for aquatic life.



pH is a measure of acidity or alkalinity. Streams and wetlands must be neutral.



Specific conductivity measures dissolved solids in water, ex. salts.



Dissolved oxygen is measured to know if the water is healthy for aquatic life.

Streams & Wetlands

2024 Update

***Photo 1**: Wetland S-11a receives water from WRF*

***Photo 2**: Stream Site 5 in May, after high water*

***Photo 3:** Lucky 7, turbulent flow from culvert in May*

All streams and wetlands around SMSC were in summer drought conditions from 2021-2024. Stream Site 5 yearly average discharge was 2.39 cfs in 2024. Lucky 7 yearly average discharge was 4.56 cfs in 2024 (when flowing) but had 5 weeks of dry conditions. Although at all sites, when water was present, the water quality met state standards for aquatic health, and specific conductivity decreased as water flowed downstream. Macroinvertebrates were sampled in 5 new wetland sites and 2 stream sites (including downstream Stream Site 5). Data is still being analyzed to calculate IBI.

Wetland S-11a Summary Statistics	2024 Mean	2024 St Dev	2024 Min	2024 Max	2000-2024 Mean	MN/EPA Standards	PASS or FAIL
Dissolved Oxygen (mg/L)	9	5	0	22	7.18	>5	PASS
Redox Potential (mV)	287	76	94	391	343.68		
pH (units)	7.4	0.5	6.9	8.3	7.56	6.5-9	PASS
Specific Conductivity (µg/L)	1007	373	154	1164	1147.88		
Temperature (°C)	16	5	3	25	17.20	Background	PASS
Total Dissolved Solids (g/L)	1	0	0	1	0.73		

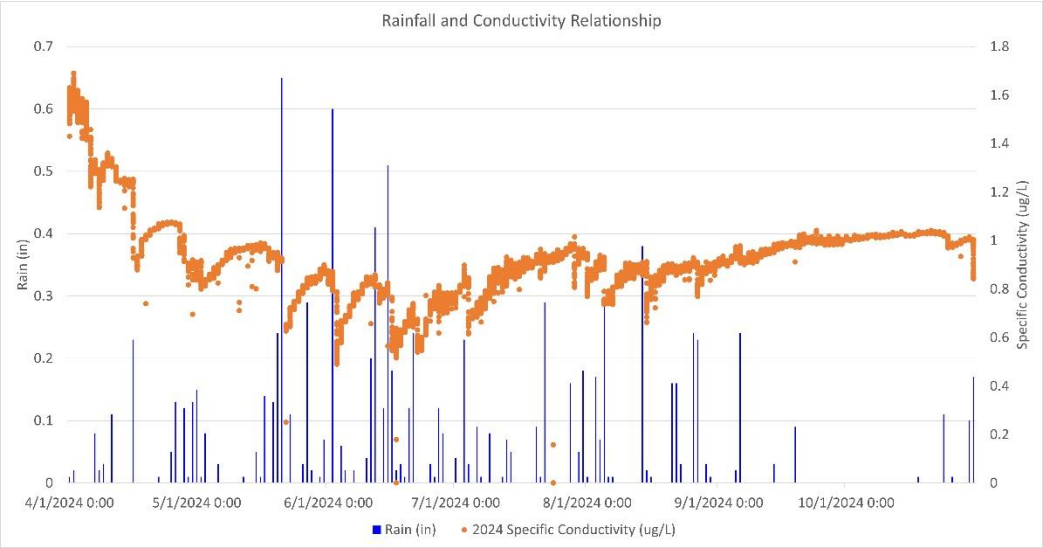
Stream Site 5 Summary Statistics	2024 Mean	2024 St Dev	2024 Min	2024 Max	2000-2024 Mean	MN/EPA Standards	PASS or FAIL
Dissolved Oxygen (mg/L)	8	2	2	12	6.90	>5	PASS
Redox Potential (mV)	332	70	255	396	357.55		
pH (units)	7.2	0.5	6.4	7.7	7.36	6.5-9	PASS
Specific Conductivity (µg/L)	875	238	584	1099	944.33		
Temperature (°C)	14	6	3	21	14.41	Background	PASS
Total Dissolved Solids (g/L)	1	0	0	1	0.60		
Stream Flow (cfs) N=29 in 2024	2.39	3.12	-0.03	14.56	2.26		

Lucky 7 Summary Statistics	2024 Mean	2024 St Dev	2024 Min	2024 Max	2000-2024 Mean	MN/EPA Standards	PASS or FAIL
Dissolved Oxygen (mg/L)	11	3	6	18	10.05	>5	PASS
Redox Potential (mV)	300	69	193	386	342.45		
pH (units)	8.0	0.7	7.2	8.7	7.97	6.5-9	PASS
Specific Conductivity (µg/L)	832	156	606	985	851.14		
Temperature (°C)	17	7	3	25	16.32	Background	PASS
Total Dissolved Solids (g/L)	1	0	0	1	0.54		
Stream Flow (cfs) N=21 in 2024	4.56	4.89	-0.16	22.93	3.06		

Golf Pond

2024 Update

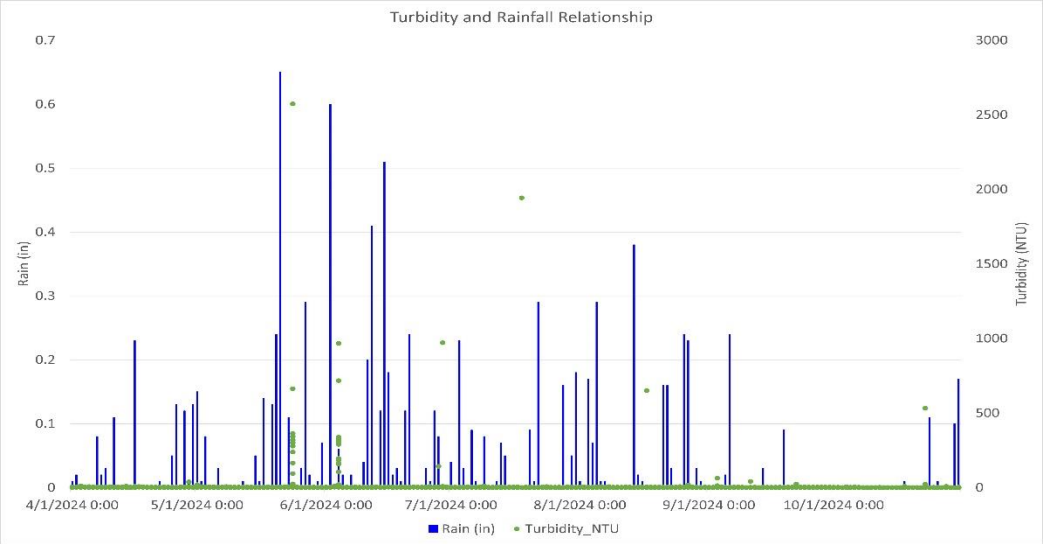
The Golf Pond is an 8 acre pond within The Meadows at Mystic Lake golf course. This pond receives stormwater runoff from roads and parking lots, and also receives treated water from the SMSC Water Reclamation Facility. Not only is this site at a critical location within the watershed, but it also is the source basin for reuse irrigation at the golf course and nearby enterprise landscaping. Water reuse helps conserve our groundwater resources and reduce the use of fertilizers for healthier turf grass and better surrounding water quality. Water level at the site responds directly with precipitation events, but the pond has overall consistent water level throughout summer months.



Specific Conductivity- measured in micrograms/L

Rainfall- measuring rain in inches at SMSC weather station

Concerns: Excess salt preventing water reuse irrigation and salt damaging SMSC waterbodies downstream.



Turbidity- measured in nephelometric turbidity units (NTU)

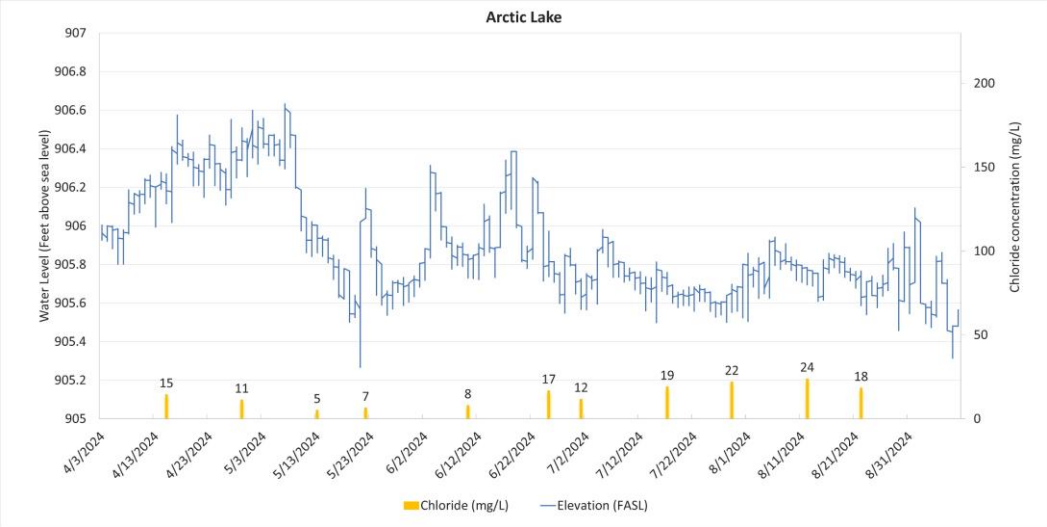
Rainfall- measuring rain in inches at the SMSC weather station.

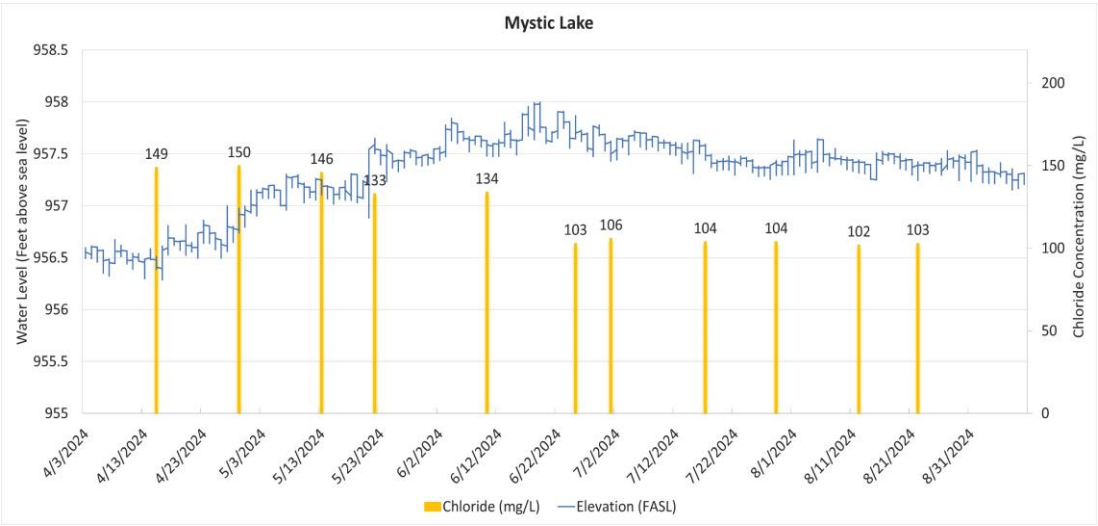
A continuous water sonde is deployed at this location to measure specific conductivity as a means to understand potential chloride concentration in the water reuse. You can see the spike in conductivity following the winter snowmelt as large volumes of winter road salt enter the pond in runoff. The graph displays how rain events flush the system as conductivity levels decrease as the water level rises. The water sonde also measures turbidity, which shows how cloudy the water is. High turbidity can lead decreased ecological productivity and habitat quality. The graph shows that there are spikes in turbidity after rain events, which are likely due to sediment and other pollutants from runoff entering the pond. The turbidity peaks about 36 hours after rain events, with a return to normal after about 2.5 hours later once the turbid water has either exited the system or the particulates settled at the bottom.

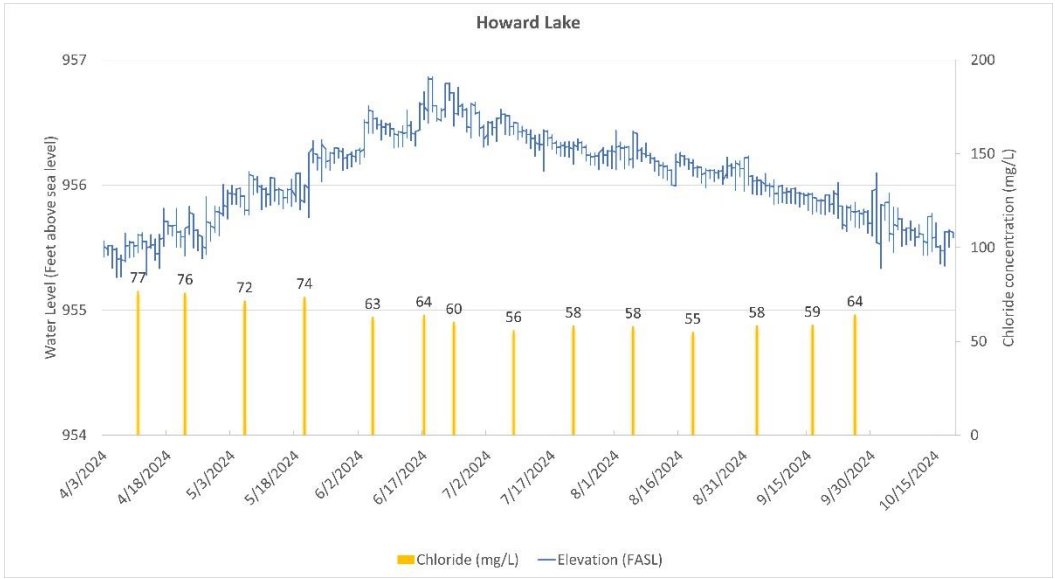
Goals: Implement real time monitoring with the continuous sonde for all staff to track water quality.

Water Level Impacts

2024 Update







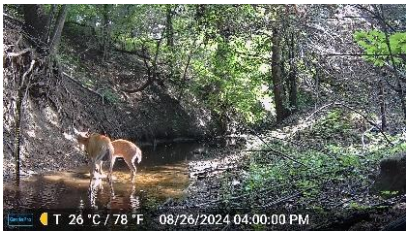
---**Water levels at SMSC were impacted again by late season drought. Arctic Lake water level dropped 2.05 feet in 2024 (0.15 ft more than 2023).** For Arctic Lake, water level slightly increased chloride concentrations due to less dilution, but the concentrations are the lowest of all SMSC lakes. Less construction in the nearby Tewapa neighborhood might have contributed to low concentrations too. Chloride is important to monitor because it's toxic to aquatic life at 230 mg/L.

---**Mystic Lake water level raised 1.71 feet in 2024 (0.34 ft less change than in 2023).** Chloride concentrations were higher early in the season, which is also when stormwater inputs of winter deicing salt goes into the lake. Water level increased from April to June and diluted the chloride concentrations to a more reasonable level for Mystic Lake. Chloride doesn't break down and remains dissolved in the water.

---**Howard Lake water level changed 1.60 feet in 2024 (0.63 ft less than in 2023).** The chloride concentrations slowly decreased over the year, which was opposite to 2023. This is a positive trend that chloride is not increasing over the summer. Howard Lake shows larger rain events from April to July, followed by decreased water level to drought conditions in September. Howard Lake watershed is small and responds quickly to precipitation events.

Summary – "25 years of monitoring" 2024 Update

- **Arctic Lake**
  Sampling began in 1999 and SMSC has a long history of conducting restoration projects within the lake and in the surrounding watershed. High in-lake nutrient concentrations have decreased over time, especially after projects like upland prairie restoration, iron sand filter installation and invasive common carp removals. Although, all parameters are still not meeting state standards because lake restoration takes time to demonstrate lasting change in the water quality. Monitoring parameters are more consistent that previous years, which poses a positive change. There are a few more future projects that we hope to conduct in the lake, including native aquatic vegetation transplanting and determining the extent of internal phosphorus loading.



- **Mystic Lake**
  Sampling began in 1999 and initially showed high nutrient concentrations and likely algae blooms. Over the years, total phosphorus and chlorophyll-a concentrations have steadily decreased and clarity has increased. Even with the surrounding land use (roadways, golf course and residential), this lake demonstrates good water quality, abundant native vegetation and many organisms that utilize the lake. Chloride concentrations are elevated, but we monitor this closely and work towards better salt management in the surrounding watershed.

- **Pike Lake**
  Pike Lake has been impaired for nutrients since 2002 and monitored since 2013 by the Prior Lake-Spring Lake Watershed District. SMSC owns land on the northern shore and conducts restoration work to improve the land and water resources. Projects have included carp removal, fish stocking and lake aeration. In 2024, Pike Lake met the MN water clarity standard for the first time in the last 10 years, as well as having consistent oxygen levels above the MN standard.

- **Deans Lake**
  Sampling began in 2002 through the Metropolitan Council CAMP program and ended in 2012. SMSC began monitoring in 2024, as funding was available. Recent water quality monitoring shows low nutrients, no algae blooms, abundant native vegetation, excellent macroinvertebrate IBI, abundant fisheries and turtle species. A new species documented on SMSC property was a smooth softshell turtle on Deans Lake!

- **Streams and Wetlands**
  There were 5 total SMSC wetlands surveyed for macroinvertebrates and 2 stream sites in 2024. Data is still being processed and analyzed for Index of Biological Integrity.

- **Golf Pond**
  A continuous sensor measuring specific conductivity and turbidity is deployed in the water reuse pond that irrigates the golf course. We measured that the turbidity increases 36 hours after rain events, with a return to normal about 2.5 hours later when the water either exited the system or particulates settled at the bottom.

- **Additional monitoring and education events**
  - No zebra mussels were found in any of the 6 SMSC lakes that were monitored in 2022-2024.
  - In 2024, SMSC hosted the We Are Water MN traveling exhibit and the Natural Resources event educated 122 people. Also, there were six youth education events, including a Community Member canoeing event at Lake O'Dowd.