Aquality
Environmental Consulting Ltd.

2024 Annual Summary Report

Fisheries and Water Quality

Prepared for:

Summerside Residents Association

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Prepared by:
Aquality Environmental Consulting Ltd.
#204, 7205 Roper Road NW
Edmonton, AB, Canada, T6B 3J4

2024 Annual Summary Report

Fisheries and Water Quality

Signature Page

Authored by:

Tina McLean, B.Sc., AIT
Junior Aquatic Biologist

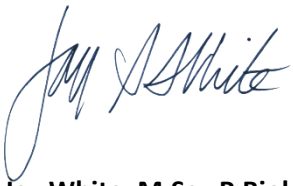
Authored by:

Victoria Adams-Parsons, B.Sc., BIT
Junior Wildlife Biologist

Reviewed and approved by:

Corey Stefura, B.Sc., P.Biol.
Senior Aquatic Biologist

Reviewed and approved by:



Jay White, M.Sc., P.Biol.
Senior Aquatic Biologist

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1 Introduction

The community of Summerside Lake was constructed in south Edmonton in the early 2000s by Brookfield Residential Properties Inc. and surrounds a 12.9 ha (32 acre) man-made lake. Approximately 8,000 residents live in 3,050 dwellings in the community. The lake provides private, residents-only recreational opportunities including swimming, fishing, paddle boarding, canoeing and kayaking in the summer, and ice fishing and skating in the winter. The lake is managed and maintained by the Summerside Residents Association (SSRA). Since its creation, SSRA has been contracting environmental services for lake and fisheries management to assess the health of the lake, identify aquatic ecosystem trends, and provide recommendations for management. Aquality Environmental Consulting Ltd. (Aquality) has been providing professional guidance on lake management since 2021.

2 Objectives

The SSRA identified three main goals for lake management in 2024 which included maintaining safe water quality for recreation, clear water for aesthetics, and improved angling opportunities. The primary objective of the 2024 program was to continue on a trajectory from basic lake monitoring towards a more robust lake management framework with measurable indicators to meet the three goals. To achieve the goals, the following activities were undertaken in 2024:

- Water quality monitoring (winter, spring, summer, and fall),
- Primary productivity monitoring (bi-weekly June to August),
- Invasive Yellow perch removal,
- Phosphorus binding treatment, and
- Cyanobacteria (Blue-green algae) treatments.

The following describes the methods used to complete these studies, the results of the programs, and recommendations to further achieve the goals of Summerside in the future.

In addition to the activities listed above led by Aquality, SSRA also completed their own programs:

- Weekly summer beach monitoring for *Enterococcus* in partnership with Alberta Health Services,
- Documenting cases of Swimmer's itch, and
- A Pooch Patrol program to actively deter waterfowl from around the swimming area.

3 Methods

The methods employed during the 2024 field surveys were conducted in geographically similar locations with similar timing as 2023. Many of the same limnological parameters were measured throughout the year to better understand the nutrient interaction between the water and the substrate.

3.1 Water Quality

Water quality sampling in 2024 replicated sampling from previous monitoring events (Table 1). The water sampling was conducted at six predetermined sampling locations in Summerside Lake to provide a representative sample of the conditions present in each of the four bays and the deeper water in the north and south ends of the lake (Figure 1).

Table 1. Water quality parameters measured as part of the Summerside Lake Water Quality Program, 2024.

Parameter	Date				
	15 Feb	13 May	7 Aug	10 Oct	Jun to Aug
Water temperature and dissolved oxygen profiles	X	X	X	X	
Nutrients	X	X	X	X	
Routine and Metals	X	X	X	X	
Zooplankton					Bi-weekly
Chlorophyll-*a*					Bi-weekly

Water quality results were compared to the *Environmental Quality Guidelines for Alberta Surface Waters* (Government of Alberta, 2018) and the *Water Quality Guidelines for the Protection of Aquatic Life* (Canadian Council of Ministers of the Environment, 1999).

3.1.1 Temperature and Dissolved Oxygen Profiles

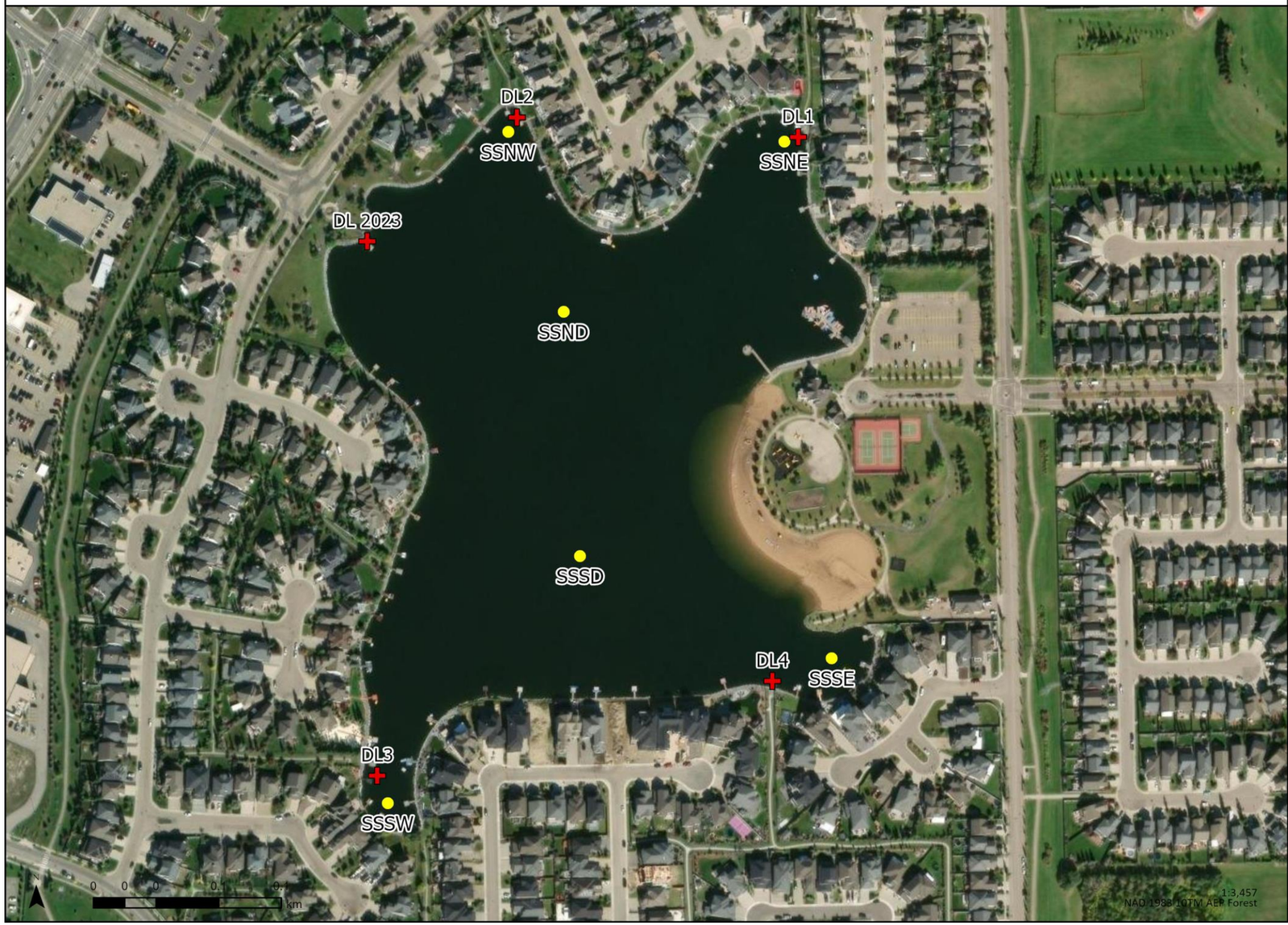
Like many Alberta lakes, water in Summerside Lake stratifies in the summer and winter months, which affects nutrient cycling and the health of the aquatic environment. In summer and winter, the water stratifies, reducing the mixing and exchange of water. When the water is stratified, the deep water becomes less oxygenated over time. Some fish species can tolerate decreased DO; however, DO levels below 5.0 mg/L are less favorable. In the spring and fall when lake turnover occurs, temperature and DO typically will become consistent throughout the water column as the deep and surface waters mix.

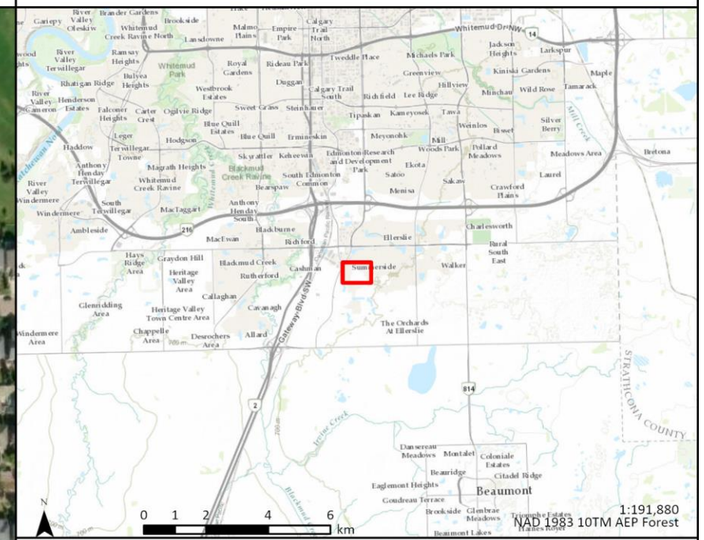
DO and water temperature profiles were conducted at Summerside Lake during the winter, spring, and late summer. These seasonal profiles were also used as supplemental information for other limnological parameters and to assess the risk of winter and summer fish kill events. The profiles were measured at the north and south deep sites measured in previous years (Figure 1) to compare to historical data.

DO and temperature were measured using the same optical dissolved oxygen probe (YSI Pro ODO) used in 2023. Water temperature (°C) and dissolved oxygen profiles (in mg/L and percent saturation [%]) were recorded at 0.5 m depth intervals at each site. Measurements were recorded on the way down and were additionally recorded on the way back up for comparison.

PAGE TITLE: WATER QUALITY MONITORING 2024

LAKE MANAGEMENT
SSRA
SUMMERSIDE LAKE





Legend

- Water Quality Sampling Sites
- Data Logger Locations

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Prepared by: victoriaadamsparsons
Prepared: 2025-01-16

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Figure 1: Water quality sampling sites (SS) and temperature data logger (DL) monitoring stations at Summerside Lake, 2024.

Aquality implemented a long-term water temperature monitoring program using small data loggers in 2023. On 15 May 2024 data loggers were placed in each of the four bays at Summerside Lake. Data loggers were attached to a concrete weight and lowered to a depth ranging between 1.5 and 3.5 m to measure the water temperature near the bottom of the water column. The temperature loggers deployed in 2024 were retrieved on 11 October 2024 and the data were downloaded and analyzed. Additional data was collected over winter of 2023-2024 as one of the loggers deployed in 2023 was not recovered until 18 June 2024; it was found to still be functioning.

3.1.2 Secchi Depths

Water clarity was measured using a Secchi disk at all six sampling locations during ice-free sampling events, and at the two deep sampling locations each time that chlorophyll-a and Zooplankton samples were collected between 12 June and 20 August 2024.

3.1.3 Nutrients

Water quality results were analyzed to determine potential nutrient sources that contribute to phytoplankton, algae and submergent vegetation growth. Discrete water samples were collected from 0.5 m above the substrate to better understand the nutrient interaction between the water column and the substrate. Samples were collected using a horizontal Beta bottle. Each of the sampling containers was labelled with the date, time, and sampling location. The samples were preserved, placed in a cooler, and immediately transported to ALS Environmental (ALS) in Edmonton for analysis. Water samples were submitted for nutrient analysis, which included lower detection analyses for the phosphorus parameters (Table 2).

Table 2. Nutrient parameters analyzed in Summerside Lake, 2024.

Category	Parameters
Nutrients	Total nitrogen, total Kjeldahl nitrogen, nitrate, nitrite, ammonia, total phosphorus (low level), dissolved phosphate (low level), orthophosphate (low level)

3.1.4 Routine Parameters and Metals

Routine water chemistry and metals were measured during all four sampling events in 2024 at all six water quality sampling locations (Table 3). Like nutrient sampling, a discrete water sample was collected near the substrate using a Horizontal Beta Bottle. Field filtering for dissolved parameters was conducted for all sampling events (Figure 2). Each of the sampling container bottles was labelled with the date, time, and sampling location, then placed in a cooler and transported to ALS for analysis.

Figure 2. Horizontal Beta bottle with collected sample.

Table 3. Routine water chemistry and metal parameters measured in Summerside Lake in 2024.

Category	Parameters
Routine Water Chemistry	pH, Electrical Conductivity (EC), Calcium, Magnesium, Sodium, Potassium, Iron, Sulphate, Chloride, Manganese, carbonate, bicarbonate, nitrate, nitrite, alkalinity, hardness, total dissolved solids, colour, turbidity, total suspended solids
Metals (total and dissolved)	Aluminum (Al), Antimony (Sb), Arsenic (Ar), Barium (Ba), Beryllium (Be), Bismuth (Bi), Boron (B), Cadmium (Cd), Calcium (Ca), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Lithium (Li), Magnesium (Mg), Manganese (Mn), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Potassium (K), Selenium (Se), Silicon (Si), Silver (Ag), Sodium (Na), Strontium (Sr), Sulphur (S), Thallium (Tl), Titanium (Ti), Uranium (U), Vanadium (V), Zinc (Zn)

3.1.5 Chlorophyll-a

Chlorophyll-a is a green pigment found in plants and algae that is required for photosynthesis to occur. The concentration of Chlorophyll-a in a sample of water has been proven to be a reliable indicator of phytoplankton biomass measurement and estimate the trophic status of the lake (how nutrient rich the lake is) (Table 4). Pheophytin is one of the breakdown products of Chlorophyll, so a comparison of the concentration of Pheophytin to Chlorophyll is indicative of the physiological condition of the phytoplankton in the sample.

Table 4. Summary of trophic states.

Trophic State	Productivity	Chlorophyll-a Concentration (µg/L)
Oligotrophic	Low	<2.5
Mesotrophic	Moderate	2.5 - 8
Eutrophic	High	8 – 25
Hypereutrophic	Very High	>25

Water samples for Chlorophyll-a were collected at the two deepest locations bi-weekly from 12 June to 20 August 2024. Silicone tubing was used to obtain a water sample from the upper water column to a depth of two times the Secchi depth measurement at each location. This depth is representative of the euphotic zone which is the depth that light can penetrate the water column allowing photosynthesis to occur in phytoplankton and plants. The samples were submitted to ALS in Edmonton for analysis.

3.1.6 Zooplankton

Monitoring the density and composition of zooplankton is an effective way to assess water quality in Summerside Lake as they are sensitive to changes in environmental conditions. Zooplankton feeds on phytoplankton and algae, helping to control their abundance which improves water clarity. The zooplanktons are in turn eaten by macroinvertebrates and fish. These zooplankton are an essential food source for the fish stocked in Summerside Lake.

Zooplankton samples were collected at the two deep sampling locations bi-weekly from June to August 2024. Samples were collected with a Wisconsin net (20 cm mouth opening, approximately 70 cm long, with 63 µm mesh). A vertical haul was used to obtain an integrated depth sample for most of the water column. Each sample was concentrated into a 250 mL glass bottle vial and preserved with 100 mL of isopropyl alcohol. The samples were submitted to a specialty lab (Invert Solutions) for analysis including zooplankton counts and identification of major taxa.

3.2 Yellow Perch Eradication

Yellow Perch were introduced into Summerside Lake and have proliferated. They currently compete for resources of the desirable stocked trout species. The purpose of the capture and removal of this introduced species is to reduce the competition for available food resources. The removal of Yellow Perch has been conducted annually by Aquality staff since 2021. Fish capture is conducted in the spring when the Yellow Perch moves to shallow waters to spawn when the water temperature increases.

The methods used to capture and remove yellow perch included hoop nets, fyke nets, and minnow traps. These methods have proven to be the most efficient and cost-effective methods for capturing Yellow Perch in Summerside Lake, with a minimal by-catch of the stocked fish species.

The Yellow Perch removal was conducted between 8 and 10 May 2024 by Aquality under Alberta Environment and Protected Areas (AEPA) Fish Research License (FRL)#24-3812.

Ten minnow traps were baited with dry cat food and distributed around the lake (Figure 3). The traps were tied to docks to facilitate easy retrieval. All traps were checked within 24 hours (maximum allowable time) as per the FRL.

One fyke and two hoop nets were deployed at four locations along the east side of Summerside Lake based on suitable habitat and site constraints. The nets were secured to the shore by tying a lead line around large boulders along the water's edge. The terminal cod end of each net was weighted to ensure that any fish captured remained submerged under water until the nets were pulled. Nets were left overnight and pulled the following day (maximum allowable time of less than 24 hours) per the FRL.

Gill nets were not used in 2024.

Upon retrieval of the traps and nets, all fish captured were identified and enumerated. Any species other than Yellow Perch were promptly returned to the lake, unharmed and any Yellow Perch captured were humanely euthanized in buckets containing a concentrated clove oil solution. Representative sample of Yellow Perch were retained until the fork length, weight, sex, and spawning status were determined and recorded. All Yellow Perch removed from Summerside Lake were tabulated and the data were submitted to AEPA per conditions of the FRL.

PAGE TITLE: FISHERIES 2024

LAKE MANAGEMENT
SSRA
SUMMERSIDE LAKE

Legend
- Minnow Traps
- Hoop and Fyke Nets

Aquality Environmental Consulting Ltd.
Prepared by: victoriaadamsparsons
Prepared: 2024-12-20

City of Edmonton, Province of Alberta, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, AAFC, NRCan, Maxar

Figure 3. Locations of Minnow Traps (MT), Hoop Nets (HN), and Fyke Net (FN) used for fish sampling at Summerside Lake, 2024.

3.3 Algae Treatments

Summerside Lake was treated with granular hydrogen peroxide (sodium percarbonate) on 18 June 2024 following the emergence of visible cyanobacteria. Two applicators dispersed the granules using handheld Chapin fertilizer spreaders from the stern of a boat that navigated around the perimeter of the lake at a constant speed. Approximately 400 kilograms (16, 25 kg bags) of food grade sodium percarbonate were applied within the four bays and the main beach area (i.e., along the swim line). Baseline measurements of hydrogen peroxide concentration (ppm) were measured using Bartovation Low Level residual test strips prior to the treatment application. Peroxide measurements were taken again at 10 locations, immediately after treatment application and the following day to ensure that concentrations returned to baseline levels for the protection of recreational users.

Summerside Lake was also treated with Floc N' Lock (Aluminum chlorohydrate) on 26 June 2024 to bind biologically available phosphorus after resident concerns regarding significant green algae presence. A total of 220 L (22, 10 L jugs) of Floc N' Lock was applied around the perimeter of the lake. The product was diluted according to the manufacturers' recommended dosage and the solution was pumped from a tank on the boat through a manifold dispersion system. Water samples were collected and analyzed for nutrient concentrations one week after treatment to determine the effectiveness of the treatment.

4 Results

4.1 Water Quality

4.1.1 Temperature and Dissolved Oxygen Profiles

4.1.1.1 Winter

The lowest water temperature observed during the winter was 0.3 °C at the ice-water interface, and the highest at the bottom, measuring 3.6°C (Figure 4; Appendix A). The rate of temperature increase was highest between the surface and approximately 1.5 m where the thermocline occurred.

The DO declined with depth under ice cover conditions, with the lowest measuring at 3.11 mg/L and the highest at 14.10 mg/L. The north deep site ranged from 13.78 mg/L to 3.11 mg/L and dropped below 5.0 mg/L at 5.0 m. The south deep site ranged from 14.10 mg/L to 4.47 mg/L and dropped below 5.0 mg/L at 5.0 m.

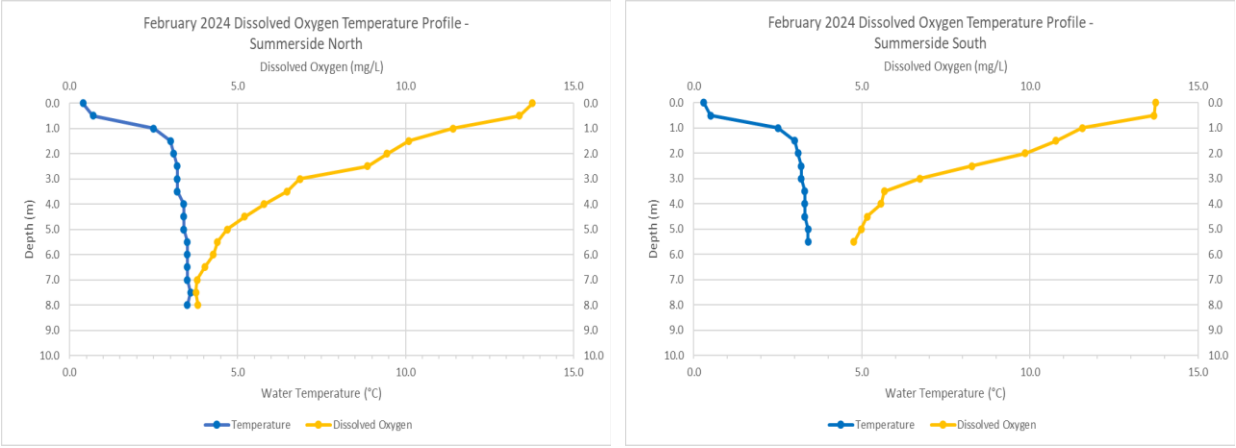

Figure 4. Winter water temperature and dissolved oxygen profiles for Summerside Lake at the north and south sites, 15 February 2024.

4.1.1.2 Spring

The lowest water temperature during the spring was 7.5 °C near the bottom and the highest temperature was 13.0 °C at the water-air interface (Figure 55). The rate of temperature decrease remained relatively constant throughout the water column but there was a sharper decline between 3.0 and 4.5 m. The temperature range throughout the water column was narrower due to mixing from spring turnover.

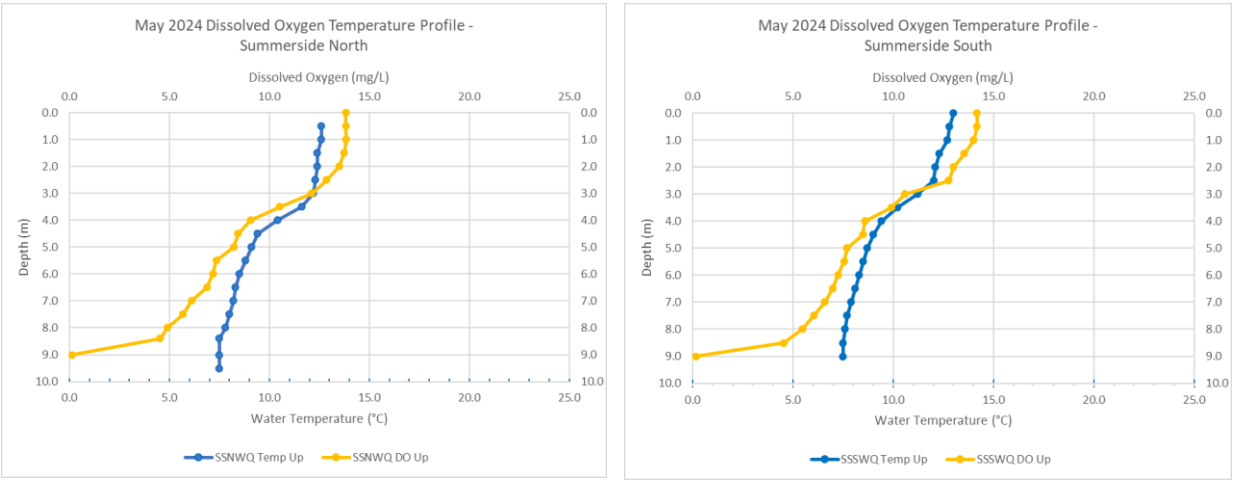

Figure 5. Spring water temperature and dissolved oxygen profiles for Summerside Lake at the north and south sites, 13 May 2024.

DO declined with increasing depth, with the lowest measuring at 0.12 mg/L at the substrate-water interface and the highest at 14.17 mg/L. The north deep site ranged from 13.82 mg/L to 0.12 mg/L and was below 5.0 mg/L at 8.5 m. The south deep site ranged from 14.17 mg/L to 0.16 mg/L and was below 5.0 mg/L at 8.5 m.

4.1.1.3 Summer

The lake was clearly thermally stratified during the summer at a depth of 3.5 m below the surface. The water temperature and dissolved oxygen content both declined substantially below this depth (Figure 6).

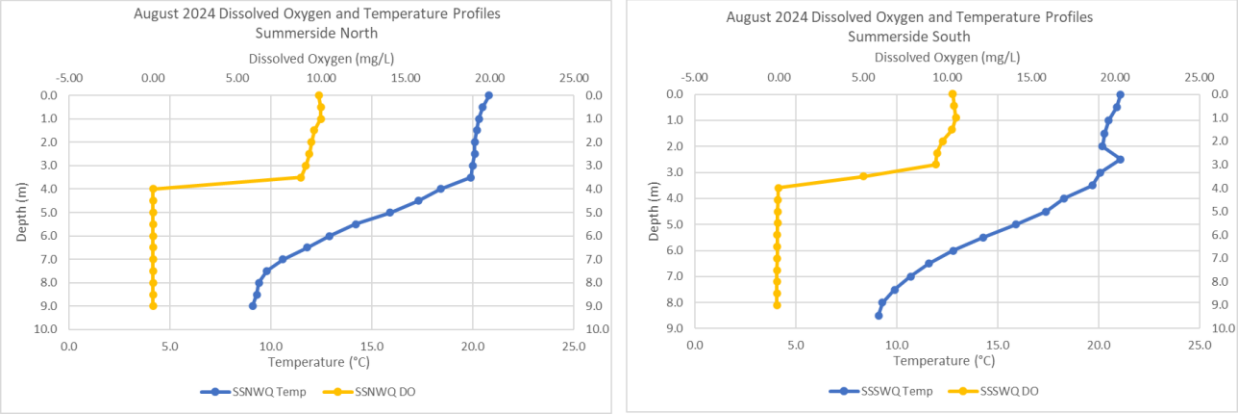

Figure 6. Summer water temperature and dissolved oxygen profiles for Summerside Lake at the north and south sites, 7 August 2024.

The dissolved oxygen concentration below 3.5 m indicated anoxic conditions which are not conducive to aquatic life.

4.1.1.4 Fall

The lake was undergoing fall turnover and was completely mixed during the fall sampling event (Figure 7). This is a natural occurrence in waterbodies in Alberta that results when the loss of temperature stratification allows the deeper waters to circulate to the surface and become re-oxygenated. This is an important biological process that allows fish and other aquatic organisms to survive under the ice during the winter season.

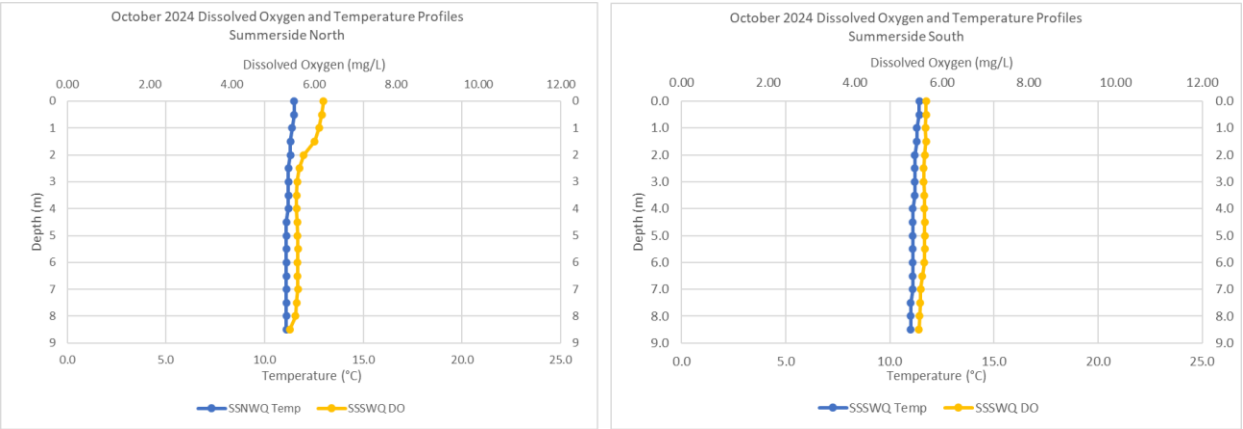

Figure 7. Fall water temperature and dissolved oxygen profiles for Summerside Lake at the north and south deep sites, 10 October 2024.

The water temperatures measured at the deep sites ranged between 11.0 and 11.5°C. The dissolved oxygen concentrations were also uniform and ranged between 5.22 and 6.23 mg/L.

4.1.2 Long-term Water Temperature Monitoring

The water temperatures for the deployment period of four data loggers from 13 May to 12 October in 2024 ranged between 10.81 and 28.74 °C. An additional data logger that was not recovered in 2023 continued to collect temperature data at entry park dock until it was retrieved on 18 June 2024. Average daily air and water temperatures are presented in Figure 8. Average daily air temperatures are more variable due to diurnal temperature fluctuations as the sun rises and sets. Water has much more stable temperatures overall due to the heat storage capacity, but reflects the overall trends in air temperature.

On average, the highest water temperatures were recorded in the SE and NE bays, though results were similar throughout the lake. The high temperatures observed in July correlate to high air temperatures experienced during that time period. Elevated temperatures contributed to the prolific growth of aquatic macrophytes and algae.

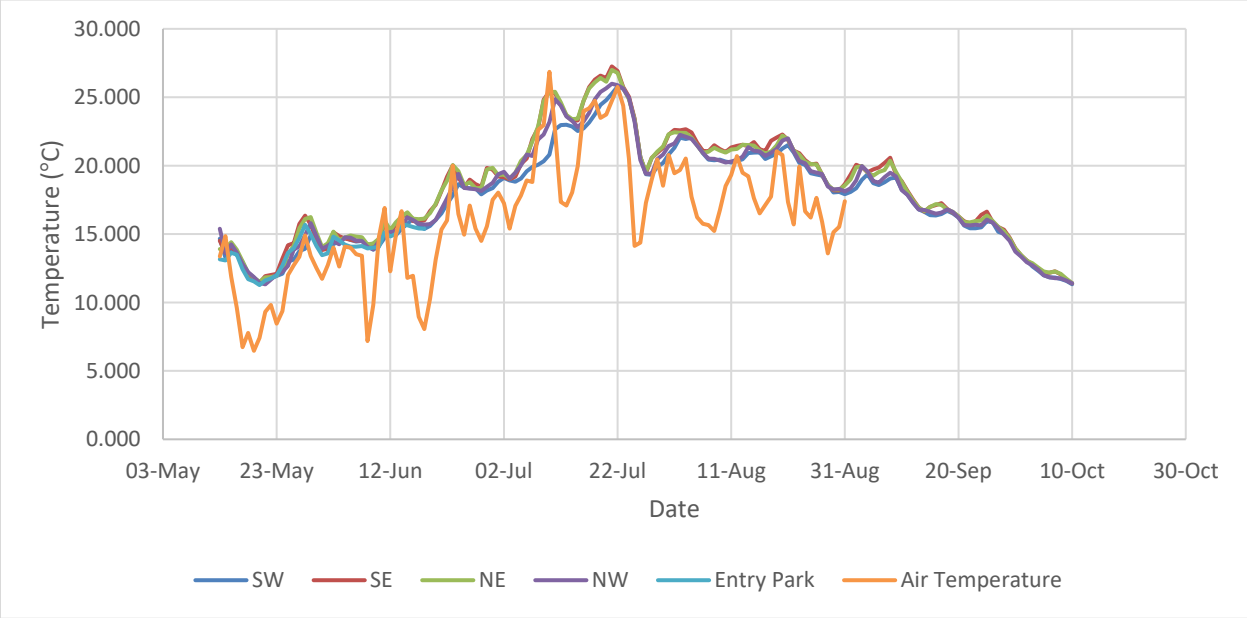

Figure 8. Comparison of average daily air temperatures to daily average water temperatures measured from five data logger locations between 12 May and 10 October in Summerside Lake (ACIS, 2024).

4.1.3 Secchi Depth

Secchi depths varied throughout the summer of 2024 with improvements in water clarity noted during the 12 June and 23 July sampling events (Table 5). A decrease in clarity appears to correlate with increases in chlorophyll-a, which indicates an increase in phytoplankton biomass (Table 7). The increase in clarity appears to correlate with increases in the abundance of zooplankton (Table 8). Historical Secchi depth measurements are reported in Appendix C.

Table 5. Secchi depth measurements (m) at Summerside Lake, 2024.

Survey Date	Sample Location Secchi Depth (m)					
	NE Bay	NW Bay	North Deep	South Deep	SW Bay	SE Bay
2024-05-13	2.5	1.4	1.25	1.25	1.1	1.35
2024-06-12[a]	-	-	4.9	5.5	-	-
2024-06-25[b]	-	-	1.75	1.8	-	-
2024-07-03[c]	0.75	0.6	0.75	0.75	0.8	0.75
2024-07-09	-	-	0.9	0.75	-	-
2024-07-23	-	-	2.9	2.7	-	-
2024-08-07	1.25	1.25	1.25	1.25	1.25	1.25
2024-08-20	-	-	1.5	1.5	-	-
2024-10-10	3.3	2.65	4	4.4	2.15	3.4

[a] Post-treatment with Peroxide (applied 18 June 2024)

[b] Pre-treatment with Floc N'Lock (applied 26 June 2024)

[c] Post-treatment with Floc N'Lock (applied 26 June 2024)

Secchi depth measurements were not collected close enough to the 18 June application date of the peroxide treatment to measure whether water clarity improved or declined as a result of the treatment application.

Secchi depth measurements were collected on 25 June at the two deep locations, the day before the application of the Floc N'Lock. On 3 July, six days post-treatment, Secchi depth measurements were found to have decreased (Table 5). This correlated with an increase in Chlorophyll-a concentration in water samples, suggesting that the alum compound is non-toxic to phytoplankton, as expected (TTable 7).

4.1.4 Nutrients

4.1.4.1 Nitrogen

Total ammonia (N), total Kjeldahl nitrogen, and nitrite were all higher in winter sampling in 2024 than they have been in the previous two years (Appendix C). The concentrations of nitrate and nitrite dropped below detection limits by the spring of 2024 at all six sampling locations. Total ammonia (N) overall was higher than in recent years and remained elevated throughout the year. Guideline exceedances for total ammonia were noted during the summer sampling event at all sites except for the southwest bay. The magnitude of the exceedances was highest in the deep sites (i.e., during anoxic or low oxygen conditions).

4.1.4.2 Phosphorus

Phosphorus parameters were typically substantially higher in the winter and spring of 2024 than in 2023 (Appendix C). The dissolved phosphorus concentrations were variable in 2024 due to natural cycles and

treatment with the phosphorus binder which is discussed below in section 4.3.2. The phosphorus treatment in late June reduced the phosphorus levels at most sites five of the sampling locations, but the concentrations increased again in August 2024.

It is Orthophosphate-P that is biologically available to be taken up by growing plants. The Orthophosphate-P concentrations in the north and south deep sites were substantially higher in the summer (i.e., during anoxic or low oxygen conditions), but had declined during the fall due to additional algal growth and turnover events. Overall, the phosphorus concentrations were like those measured in the spring (i.e., pre-treatment) by fall (Table 6).

Table 6. Orthophosphate-P concentrations (mg/L) in Summerside Lake in 2024.

Date	Sampling Location Orthophosphate-P Concentration (mg/L)					
	NE Bay	**NW Bay**	**North Deep**	**South Deep**	**SW Bay**	**SE Bay**
2024-02-15	0.0334	0.0271	0.0635	0.0685	0.0262	0.0331
2024-05-13[a]	0.0330	0.0143	0.0485	0.0802	0.0075	0.0060
2024-07-03[b]	<0.0010	<0.0010	0.0068	0.4690	<0.0010	<0.0010
2024-08-07	0.0011	<0.0010	0.6140	0.5420	0.0010	0.0014
2024-10-10	0.0682	0.0638	0.0641	0.0653	0.0610	0.0595

[a] Pre-treatment Floc N'Lock (applied 26 June 2024)

[b] Post-treatment Floc N'Lock (applied 26 June 2024)

A previous iteration of the guidelines for Alberta, *Alberta Surface Water Quality Guidelines for the Protection of Freshwater Aquatic Life* (Alberta Environment, 1999) included a total phosphorus guideline value of 0.05 mg/L. Using the 1999 guidance document, the total phosphorus concentrations would be considered exceedances in all seasons at most sites. However, the *Environmental Quality Guidelines for Alberta Surface Waters* (Government of Alberta, 2018) suggests that lake-specific nutrient objectives are developed where nitrogen or phosphorus are increased due to human activity.

4.1.5 Routine Water Quality Measurements

Routine parameters were analyzed during all sampling events in 2024. The results were similar between all sites (Appendix C) although most parameters fluctuated between sites and sample events. Water pH ranged between 7.70 and 8.70 which is typical for Alberta lakes. The average pH was lowest during the winter sampling (7.78) whereas the peak pH (9.07) occurred during the summer sampling in the SE Bay.

4.1.6 Metals

Total and dissolved metals were analyzed during all sampling events. Manganese (dissolved and total) was slightly above guidelines in the summer of 2024 in the two deep locations but returned to below guidelines in the fall. All other metals tested were within safe limits according to the *Surface water guidelines for the protection of freshwater aquatic life* (PAL) (Government of Alberta, 2018)(Appendix C).

4.1.7 Chlorophyll-a and Pheophytin

Chlorophyll-a concentrations increased from the start of the sampling and peaked during the 9 July sample period. Concentrations then declined during the remainder of the sampling period (Table 7). Chlorophyll-a levels ranged between 5.22 µg/L and 56.4 µg/L throughout the six sampling events. The south deep site (SSSD) concentration was generally higher than the north site (SSND), however it was similar between sites in August. The highest concentration of 56.4 µg/L was measured in the south site during the 9 July sample event.

Table 7. Chlorophyll-a and Pheophytin-a concentrations (µg/L) and corresponding Secchi Depth measurements (m) for Summerside Lake, June to August 2024.

Site	Water Quality Measurement	Sample Dates 2024					
		June 12	June 25	July 9	July 23	Aug 7	Aug 20
NORTH DEEP	Chlorophyll-a (µg/L)	5.22	33.4	50.2	30.1	28.7	12.9
	Pheophytin-a (µg/L)	3.73	2.94	<0.100	14.1	3.84	2.67
	Secchi Depth (m)	4.9	1.75	0.9	2.9	1.25	1.5
SOUTH DEEP	Chlorophyll-a (µg/L)	7.89	40.3	56.4	38.5	28.3	12.6
	Pheophytin-a (µg/L)	3.95	0.977	<0.100	19.9	3.48	2.61
	Secchi Depth (m)	5.5	1.8	0.75	2.7	1.25	1.5

The concentration of Chlorophyll-a strongly follows the water temperatures measured by the continuous data loggers as presented in Figure 8 above. Both the temperature and Chlorophyll-a concentrations increased from May to July as the water temperature increased. The concentration levelled out in late July and early August and then decreased in late August. Pheophytin concentrations were low in the beginning of July when the phytoplankton were at their peak biomass and actively growing. As the Chlorophyll-a concentration declined in late July and early August, an increase in pheophytin-a was observed as predicted (i.e., when organisms die-off and Chlorophyll-a breaks down).

A direct comparison of the trophic status of Summerside Lake between 2023 and 2024 cannot be made due to the lack of data available from 2023, as the concentrations of Chlorophyll-a were only measured once in the summer on 11 August. At that time, the Chlorophyll-a values ranged from 9.32 ug/L at the north deep site to 8.97 ug/L at the south deep site. Compared to the samples collected in 2024 at a similar time, the values were found to be higher at 28.7 ug/L at the north deep site and 28.3 ug/L at the south deep site. This suggests that Summerside Lake was more biologically active in 2024 than 2023, but the peak activity in 2023 could have occurred earlier in the season due to many different factors including temperature, amount of sunlight, predation and competition for resources. The biweekly sampling program implemented in 2024 indicates that the peak biological activity occurred in July of 2024. For an annual comparison of trophic status to be conducted, it is recommended that a similar biweekly sampling program be conducted in 2025.

4.1.8 Zooplankton

Zooplankton abundance and biomass analysis were conducted on samples collected during the summer from the north and south deep sites in Summerside Lake. A high-level comparison of abundance of zooplankton, identified as either subphylum Crustacea or phylum Rotifera, is presented in Table 8 below. The abundance of Rotifera and Crustacea dropped by the end of June, notably by 9 July 2024. This decrease in abundance is opposite to the increase of the Chlorophyll-a concentration (phytoplankton biomass) and temperature observed in July (Table 7, Figure 8). The peroxide application on June 18 preceded the decrease in zooplankton abundance and may have contributed to the decline, but the correlation cannot be confirmed.

Table 8. Zooplankton (Abundance/L) measured from 12 June to 20 August in Summerside Lake 2024.

Site	Type of Zooplankton	Summerside Lake 2024					
		June 12	June 25	July 9	July 23	Aug 7	Aug 20
North Deep	Rotifera	1491.4	244.1	19.5	271.4	67.5	56.3
	Crustacea	239.4	164.5	109.1	184.2	287.8	414.6
	Combined Total	1730.8	408.7	128.6	455.5	355.3	470.9
South Deep	Rotifera	1585.2	233.5	20.5	321.7	72.9	78.8
	Crustacea	384.3	152.2	114.7	160.3	280.3	228.6
	Combined Total	1969.5	385.6	135.2	482.0	353.2	307.4

A more detailed analysis of zooplankton species is presented in Appendix D. In 2024, Rotifera zooplankton was typically more abundant than Crustacea zooplankton due to the high abundance of *Keratella cochlearis.* However, the abundance of this species declined sharply in late June. By August, Crustacea zooplankton was more abundant than Rotifera zooplankton (Appendix D). Crustacea zooplankton provided more biomass due to the size difference, similar to previous years (Appendix D,). In 2024, the abundance of Rotifera and Crustacea zooplankton was typically similar between the north and south sites. The highest zooplankton species' richness was during the 9 July event from the south site. Species from the Brachionidae family were the dominant rotifer species encountered in 2024 (Appendix D), with a marked increase over previous years. Synchaetidae abundance declined from 2023. Of the crustaceans, species in the Daphnidae and Cyclopidae families were abundant in both the north and south sites (Appendix D). Bosminidae abundance was also high but were more prevalent in the August samples. Nauplii (early-stage copepods) abundance was higher than in 2023. Cyclopidae contributed the most to overall biomass (Appendix D).

The changes observed in the zooplankton species composition, abundance, and biomass in 2024 are not fully understood. They may be attributed to the reduction in Yellow Perch numbers, natural variation (diurnal and seasonal fluctuations), water temperature changes, the chemical treatments undertaken or

other unknown variables. Zooplankton abundance results from 2021 to 2024 could not be directly compared to results from previous years due to changes in sampling methods.

4.2 Yellow Perch Eradication

A total of 7,078 invasive Yellow Perch were removed from Summerside Lake between 8 and 10 May 2024. The fyke net captured 1,543 Yellow Perch in 43.3 trap-h, and the two hoop nets captured 5,535 Yellow Perch in 85.9 trap-h. Ten baited minnow traps were set throughout the lake but no fish were captured from 422.6 trap-h of effort.

Fork length (mm) and weight (g) data were collected from 150 representative fish in 2024. The fork lengths ranged from 93 mm to 179 mm and the weights ranged from 10.6 g to 81.4 g. The average length and weight of the perch have increased by 13% and 39% respectively from 2023 to 2024 (Table 9).

Table 9. Summary of total Yellow Perch caught and representative fork length and weight data for Summerside Lake between 2022 and 2024.

Sample Year	Total Caught	Representative Sample Measured	Fork Length (mm)			Weight (g)		
			Min	Max	Avg	Min	Max	Avg
2022	8,264	81	85	166	113.8	7.3	53.5	18.7
2023	25,099	182	100	200	118.6	12.0	67.1	19.1
2024	7,078	150	93	179	134.4	10.6	81.4	26.6

There was one by-catch of stocked rainbow trout from a hoop net on 9 May 2024. The fish measured 249 mm fork length and was determined to be in good health. It was then released unharmed back into the lake. There was also a by-catch of a Common Muskrat found in the fyke net on 9 May 2024. The muskrat was deceased upon removal and disposed of in landfill waste.

Yellow Perch egg masses were observed along the shoreline near the boat ramp and piers during the fish removal program in 2024, some of the egg masses were removed by hand using dipnets. Fewer egg masses were observed in the shallow water near the boat launch in 2024 than previously observed in 2023. This difference could be due to several factors including program timing, number of available spawning females, and habitat selectivity.

4.3 Algae Treatments

4.3.1 Cyanobacteria (Peroxide)

Visible blue green (cyanobacteria) algal blooms prompted a treatment using food grade granular hydrogen peroxide (sodium percarbonate) on 18 June to prevent larger cyanobacteria blooms from occurring. Pre-treatment background hydrogen peroxide measured between 1 and 5 ppm (Table 10).

Table 10 Baseline hydrogen peroxide concentrations (ppm) in Summerside Lake before treatment application, 18 June 2024.

Sample Location	18- Jun-24	
	Time (24 h)	Reading (ppm)
DOCK 1	10:28	5
DOCK 2	10:33	4
PARK ENTRY DOCK	10:37	3
DOCK 3	10:41	3
DOCK 4	10:43	1
DOCK 5	10:45	3
DOCK 6	10:49	3
BEACH	10:51	4
FISHING DOCK	-	-
BOAT DOCK	10:04	3
BOAT LAUNCH	10:01	5

Treatment started at 11:05 and was completed by 13:28. Post-treatment, the residual hydrogen peroxide measurements were elevated to between 2 and 8 ppm (Table 11). Residual peroxide concentrations were measured again the following morning and found to be similar to pre-treatment (background) concentrations at most sampling locations. Visual evidence of all cyanobacteria masses decreased immediately following treatment.

Table 11. Hydrogen peroxide concentrations (ppm) in Summerside Lake after treatment application, 18 and 19 June 2024.

Sample Location	18- Jun-24		19-Jun-24	
	Time (24 h)	Reading (ppm)	Time (24hr)	Reading (ppm)
DOCK 1	13:32	3	9:41	5
DOCK 2	13:35	3	9:04	4
PARK ENTRY DOCK	13:37	5	8:57	5
DOCK 3	13:42	2	8:51	3
DOCK 4	13:53	6	8:45	4
DOCK 5	13:45	8	8:39	3
DOCK 6	13:49	5	8:31	6
BEACH	13:56	4	-	-
FISHING DOCK	-	-	8:10	3
BOAT DOCK	13:59	4	8:18	3
BOAT LAUNCH	13:59	4	-	-

NOTE: treatment started on **18 June** at **11:05** and was completed by **13:28** the same day.

4.3.2 Green Algae (Floc N'Lock)

A substantial green algal bloom developed within Summerside Lake during late spring and prompted a treatment application of Floc N' Lock (aluminum chlorohydrate) to reduce the bio-available phosphorus. A treatment of the four bays and the shallower perimeter of the lake was completed on 26 June 2024. Treatment started at 0940 h and was completed by approximately 1205 h.

The application of the product resulted in a decrease in orthophosphate-P concentrations in these areas (Table 6). The South Deep site did not decrease compared to the other areas of the lake due to lake bathymetry and proximity to shallower treatment areas. The North Deep site was closer to the shore than the South Deep site, so this area was likely influenced by the Floc N' Lock treatment.

Overall, the treatment was effective. However, low oxygen conditions developed during the summer at the two deep sampling locations during the hot summer days. Anoxic conditions are known to result in the release of Orthophosphate-P and other forms of phosphorus from the sediments. Orthophosphate-P concentrations became very homogenous across the lake in October 2024 when the lake was experiencing fall turnover. At this time, the water was well mixed through the water column with no temperature stratification. This resulted in a minor secondary bloom that was observed in the fall.

4.4 SSRA Activities

There were four reports of Swimmer's Itch in 2024 based on records maintained by SSRA.

The Beach Pooch Patrol Program was used to deter waterfowl from congregating in the swimming area.

There was one issue with the Recreational Beach Water Monitoring Program for *Enterococcus* that resulted in the issue of a Health and Safety Advisory by Alberta Health Services. The high *Enterococcus* measurement was due to a water sample collection technique issue. Training was provided by Aquality staff members to improve the collection technique as per the sampling protocol and, and no further advisories occurred throughout the beach monitoring season. To ensure the safety of the water for use by the residents of Summerside Lake, additional testing was conducted privately.

Two deceased Grass Carp were found along the shoreline by SSRA staff. One specimen was inspected by Aquality staff members, and the fish was found to appear generally healthy with no signs of infection or damage to the body (Photo 4, Appendix A). It was not clear if the fish succumbed to either low dissolved oxygen concentrations and/or high water temperatures or if it died of "old age".

5 Discussion and Conclusions

Overall, the health of Summerside Lake has remained very good. The water transparency was relatively clear despite the increase in vegetation and the very warm summer temperatures experienced in 2024. Recreational users were frequently observed to be ice fishing and skating during winter monitoring events, and people were seen swimming, paddling, and fishing in the lake in the summer.

Routine water quality measurements and metal concentrations remained within expected measurements for an Alberta lake and presented no health concerns for the residents of Summerside.

High water temperatures were again observed in the summer months of June to August 2024, which resulted in the prolific growth of phytoplankton and algae. This was evidenced by the decreased Secchi depth measurements and visual observation. A peroxide treatment conducted in June reduced a cyanobacteria bloom (blue-green algae) cycle.

The application of Floc N'Lock decreased the available nutrient concentrations (orthophosphate-P) in the four bays while the water was temperature stratified during the summer months. However, it is hypothesized that the low dissolved oxygen concentrations (as measured in the deep sites) during the summer resulted in the release of phosphorus from the sediments. During the fall turnover, the water in the lake became well mixed, dispersing available phosphorus throughout the lake. Aquality recommends that Floc N'Lock be applied to the deeper areas of the lake in 2025 to trap phosphorus in the sediments before fall turnover results in a mixing of the water throughout the lake. Aeration of the lake in the summer will potentially increase the overall water temperature of the lake but may reduce the natural release of phosphorus compounds from the sediments in anoxic conditions. A phosphorus objective should be established for Summerside Lake to provide a management trigger for future ongoing lake treatments.

Warm water temperatures in the four bays of Summerside Lake in July and August potentially stressed the stocked fish population. Typically, when the water stratifies in lakes, fish move to the cooler deeper water. The deeper water in Summerside Lake was found to have low oxygen conditions during the August sampling event. Fish typically require a DO concentration of greater than 5 mg/L to thrive. Some fish species, such as Yellow Perch, are more tolerant of lower DO concentrations but most fish become stressed when DO falls to 2-4 mg/L, with a very high risk of mortality below 2 mg/L. When waterbodies are thermally stratified and oxygen is less available at depth, fish will remain closer to the surface of the water. However, the fish are exposed to the warmer surface water from the high ambient air temperatures. Trout species typically prefer oxygen rich environments. Of the fish stocked in Summerside Lake, Rainbow Trout prefer oxygen rich environments such as stream habitats and may have been stressed by the reduced oxygen concentrations and increased water temperatures. Stocked Brook Trout are more tolerant of lower oxygen environments and likely fared better as they are better adapted to the lake environment.

There was no evidence of any fish kills of stocked trout or Yellow Perch observed or reported in 2024. The use of the aerators should be increased if similar water temperatures and resulting oxygen depletion in the stratified water column are experienced in 2025 to ensure the health of the stocked fish population.

The 2024 Yellow Perch eradication program successfully removed 7,078 Yellow Perch. One Rainbow Trout and one muskrat, and a few invasive crayfish were included in the bycatch. The average length and weight of the yellow perch sampled increased while the number of fish captured decreased. This suggests that the removal of Yellow Perch has potentially decreased the overall population and increased the availability of food resources for the remaining fish in the lake. It is recommended that the hoop and fyke nets be used again in the spring of 2025 to capture Yellow Perch to further decrease their population. The use of minnow traps proved to be unsuccessful in 2024, presumably due to the increase in size of the fish since the previous year. It is recommended they be used again in 2025 to capture smaller fish and even some crayfish.

6 Closure

Thank you very much for the opportunity to serve the Summerside Lake Residents Association in managing the water quality and fisheries within the lake. If you have any questions or comments about this report or have any issues in the future, please feel free to contact us at 780-757-5530 or via email at info@aquality.ca.

7 References

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Robertson, M. (2024). *Trout Fishing and Water Temperature, What You Need to Know*. Retrieved from Bow River Blog: https://www.bowriverblog.com/trout-fishing-and-water-temperature-what-you-need-to-know/

Appendix A Site Photographs

Photo 1 **Date:** 13 May 2024 **Location of Photo:** NW Bay **Photo Direction:** West **Description:** Green algae located along the edge of the NW bay with an organic film on the surface of the water.	

Photo 2 **Date:** 10 May 2024 **Location of Photo:** Boat Launch **Photo Direction:** N/A **Description:** Invasive female Northern Crayfish (with eggs) caught in one of the hoop nets.	

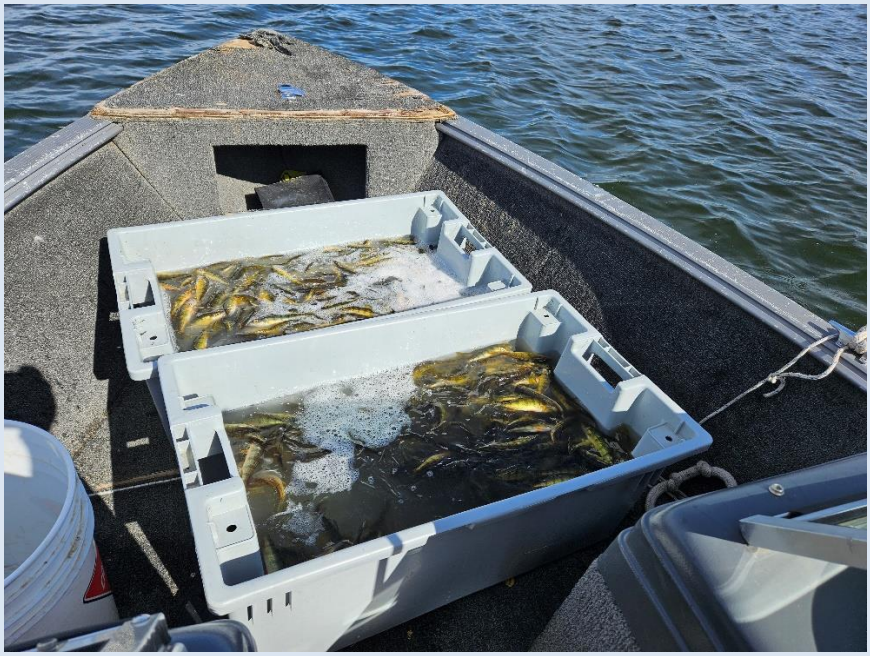
Photo 3	
Date: 10 May 2024	
Location of Photo: East side of Summerside Lake	
Photo Direction: N/A	
Description: Fish captured in one hoop net.	

Photo 4	
Date: 13 May 2024	
Location of Photo: West side of Summerside Lake at Entry Park Dock.	
Photo Direction: N/A	
Description: Deceased Grass Carp found by SSRA staff.	

Photo 5	
Date: 18 June 2024	
Location of Photo: East side of Summerside Lake at boat launch	
Photo Direction: West	
Description: The water surface immediately post-peroxide application.	

Appendix B Temperature and Dissolved Oxygen Profiles Summerside Lake

Project Number:	23-063		**Comments:**		
Project Location:	Summerside Lake		Sunny with little to no wind and cloud cover, -6°C Ice depth of 0.48 Total depth 9.2 m		
Samplers:	TM & VAP				
Date:	15-Feb-24				
Time:	12:21 - 13:15				
Site ID:	SSN WQ				
Site Location:	**NAD83**	**Easting:**	335720	**Northing:**	5921636

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen % Sat	pH	Conductivity (µS/cm)
0	1.8	12.85	92.1		
0.5	1.2	13.44	94.9		
1.0	1.9	12.93	93.3		
1.5	2.7	11.47	84.6		
2.0	6.0	10.49	78.0		
2.5	3.1	9.88	73.6		
3.0	3.2	7.99	59.6		
3.5	3.2	7.17	53.6		
4.0	3.3	6.69	50.1		
4.5	3.3	6.05	45.4		
5.0	3.4	5.13	28.6		
5.5	3.4	4.70	26.4		
6.0	3.4	4.61	24.7		
6.5	3.4	4.42	33.3		
7.0	3.4	4.31	32.4		
7.5	3.5	4.17	31.3		
8.0	3.5	4.01	30.3		
8.5	3.6	3.11	23.5		
9.0					
9.5					
9.5					
9.0					
8.5					
8.0	3.5	3.82	28.8		
7.5	3.6	3.76	28.4		
7.0	3.5	3.79	28.6		
6.5	3.5	4.02	30.3		
6.0	3.5	4.28	32.2		
5.5	3.5	4.40	33.1		
5.0	3.4	4.69	35.2		
4.5	3.4	5.21	39.1		
4.0	3.4	5.79	43.4		
3.5	3.2	6.48	48.4		
3.0	3.2	6.85	51.2		
2.5	3.2	8.87	66.1		
2.0	3.1	9.45	70.4		
1.5	3	10.10	75.0		
1.0	2.5	11.41	83.5		
0.5	0.7	13.39	93.4		
0.0	0.4	13.78	95.4		

Project Number:	23-063		**Comments:**		
Project Location:	Summerside Lake		Cloudy with slight wind, -6°C Ice depth of 0.49 Total depth 6.5 m		
Samplers:	TM & VAP				
Date:	15-Feb-24				
Time:	15:01				
Site ID:	SSS WQ				
Site Location:	**NAD83**	**Easting:**	335705	**Northing:**	5921467

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen % Sat	pH	Conductivity (µS/cm)
0	0.9	13.65	95.9		
0.5	0.7	14.10	98.3		
1.0	1.8	12.85	93.3		
1.5	2.8	11.60	85.7		
2.0	3.0	11.22	83.4		
2.5	3.1	10.87	81.0		
3.0	3.1	8.58	63.8		
3.5	3.2	7.56	56.4		
4.0	3.2	6.65	49.7		
4.5	3.2	6.27	46.9		
5.0	3.3	5.85	43.8		
5.5	3.4	4.97	37.2		
6.0	3.5	4.47	33.7		
6.5					
7.0					
7.5					
8.0					
8.5					
9.0					
9.5					
9.5					
9.0					
8.5					
8.0					
7.5					
7.0					
6.5					
6.0					
5.5	3.4	4.76	35.7		
5.0	3.4	4.98	37.3		
4.5	3.3	5.16	38.7		
4.0	3.3	5.57	41.7		
3.5	3.3	5.67	42.4		
3.0	3.2	6.73	50.2		
2.5	3.2	8.27	61.7		
2	3.1	9.86	73.4		
1.5	3	10.77	80.0		
1	2.5	11.56	84.7		
0.5	0.5	13.69	95.1		
0.0	0.3	13.74	94.7		

Project Number:	23-063		**Comments:**		
Project Location:	Summerside Lake		**Barometric Pressure 100.9 Kpa**		
Samplers:	Tina M. & Victoria A-P		**Weather was overcast with calm waters and 16°C**		
Date:	13-May-24		**Site depth = 9.6m**		
Time:	11:30				
Site ID:	SSN WQ				
Site Location:	**NAD83**	**Easting:**	335726	**Northing:**	5921651

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen % Sat	pH	Conductivity (µS/cm)
0	12.4	13.57	127		
0.5	12.4	13.65	127.6		
1.0	12.3	13.68	127.9		
1.5	12.3	13.67	127.8		
2.0	12.3	13.61	127.3		
2.5	12.3	13.09	122.1		
3.0	11.7	12.54	115.7		
3.5	10.4	10.87	97.3		
4.0	9.6	9.65	84.8		
4.5	9.2	9.05	78.7		
5.0	8.9	8.57	74.0		
5.5	8.6	7.93	67.9		
6.0	8.4	7.57	64.6		
6.5	8.1	7.20	61.1		
7.0	8.0	6.57	55.4		
7.5	7.9	6.13	51.6		
8.0	7.6	5.25	43.8		
8.4	7.5	3.05	25.6		
9.0	7.5	0.12	1.0		
9.5					
10.0					
9.5					
9.0	7.5	0.12	1.0		
8.4	7.5	4.54	37.8		
8.0	7.5	4.90	40.8		
7.5	7.8	5.69	47.7		
7.0	8.0	6.10	51.5		
6.5	8.2	6.87	58.2		
6.0	8.3	7.18	61.0		
5.5	8.5	7.34	62.8		
5.0	8.8	8.21	70.7		
4.5	9.1	8.44	73		
4.0	9.4	9.05	78.9		
3.5	10.4	10.51	93.9		
3.0	11.6	12.13	111.4		
2.5	12.2	12.86	119.7		
2.0	12.3	13.48	125.9		
1.5	12.4	13.74	128.5		
1.0	12.4	13.84	129.7		
0.5	12.6	13.82	129.9		
0.0	12.6	13.82	130.0		

Project Number:	23-063		**Comments:**		
Project Location:	Summerside Lake		**Barometric pressure 100.9 Kpa.**		
Samplers:	Tina M. & Victoria A-P		**Weather was overcast with light wind and 16°C.**		
Date:	13-May-24		**Site depth = 9.2m**		
Time:	12:45				
Site ID:	SSS WQ				
Site Location:	**NAD83**	**Easting:**	335720	**Northing:**	5921470

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen % Sat	pH	Conductivity (µS/cm)
0	**12.8**	**13.69**	**129.4**		
0.5	12.7	13.85	130.4		
1.0	12.4	13.07	131.8		
1.5	12.3	14.06	131.4		
2.0	12.3	13.64	127.3		
2.5	12.1	13.08	121.7		
3.0	11.3	11.66	106.4		
3.5	10.3	10.33	92.1		
4.0	9.4	8.85	77.3		
4.5	9.1	8.77	76.0		
5.0	8.8	8.67	74.6		
5.5	8.6	7.85	67.2		
6.0	8.3	7.41	63.0		
6.5	8.1	7.36	62.3		
7.0	7.9	6.86	57.8		
7.5	7.9	6.70	56.5		
8.0	7.6	5.80	48.5		
8.5	7.5	4.86	40.6		
9.0	7.5	0.16	1.4		
9.5					
10.0					
9.5					
9.0	7.5	0.16	1.4		
8.5	7.5	4.54	37.8		
8.0	7.6	5.46	45.6		
7.5	7.7	6.04	50.6		
7.0	7.9	6.58	55.4		
6.5	8.1	6.97	58.9		
6.0	8.3	7.25	61.7		
5.5	8.5	7.55	64.6		
5.0	8.7	7.69	66.1		
4.5	9.0	8.48	73.4		
4.0	9.4	8.58	74.9		
3.5	10.2	9.89	87.9		
3.0	11.2	10.58	96.1		
2.5	12	12.76	118.4		
2	12.1	12.99	120.8		
1.5	12.3	13.54	126.3		
1	12.7	14.01	132.1		
0.5	12.8	14.17	134.1		
0.0	13.0	14.17	134.5		

Project Number:	23-063		**Comments:**		
Project Location:	Summerside Lake		**700mm asl, 102.8 kPa, 714.3 mmHg**		
Samplers:	TM/WB				
Date:	07-Aug-24				
Time:	11:25				
Site ID:	SSND WQ				
Site Location:	**NAD83**	**Easting:**	335745	**Northing:**	5921656

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen % Sat	pH	Conductivity (µS/cm)
Surface (0.0)	20.7	106.50	9.62		
0.5	20.4	108.50	9.79		
1.0	20.4	109.20	9.90		
1.5	20.0	105.60	9.59		
2.0	20.0	105.40	9.59		
2.5	19.9	103.10	9.39		
3.0	19.8	102.60	9.35		
3.5	19.7	99.50	9.09		
4.0	18.0	3.00	0.26		
4.5	17.8	1.10	0.10		
5.0	16.3	0.40	0.04		
5.5	14.8	0.10	0.01		
6.0	13.4	0.00	0.00		
6.5	12.4	0.00	0.00		
7.0	11.4	0.00	0.00		
7.5	10.3	0.00	0.00		
8.0	9.9	0.00	0.00		
8.5	9.5	0.00	0.00		
9.0	9.1	0.00	0.00		
9.5					
9.0	9.1	0.00	0.00		
8.5	9.3	0.00	0.00		
8.0	9.4	0.00	0.00		
7.5	9.8	0.00	0.00		
7.0	10.6	0.00	0.00		
6.5	11.8	0.00	0.00		
6.0	12.9	0.00	0.00		
5.5	14.2	0.00	0.00		
5.0	15.9	0.00	0.00		
4.5	17.3	0.00	0.00		
4.0	18.4	0.00	0.00		
3.5	19.9	96.50	8.79		
3.0	20	100.00	9.09		
2.5	20.1	102.30	9.28		
2	20.1	103.80	9.42		
1.5	20.2	105.60	9.57		
1	20.3	110.10	9.96		
0.5	20.5	110.80	9.96		
Surface (0.0)	20.8	110.60	9.84		

Project Number:	23-063		**Comments:**		
Project Location:	Summerside Lake		**700mm asl, 102.8 kPa, 714.2 mmHg**		
Samplers:	TM/WB				
Date:	07-Aug-24				
Time:	12:25				
Site ID:	SSSD WQ				
Site Location:	**NAD83**	**Easting:**	335729	**Northing:**	5921428

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen % Sat	pH	Conductivity (µS/cm)
Surface (0.0)	21.4	111.70	9.86		
0.5	21.1	111.60	10.02		
1.0	20.4	115.00	10.40		
1.5	20.3	115.00	10.40		
2.0	20.1	113.90	10.34		
2.5	20.0	110.70	10.05		
3.0	19.9	109.00	9.92		
3.5	19.3	50.20	4.64		
4.0	18.2	3.30	0.31		
4.5	18.6	1.30	0.12		
5.0	17.7	1.60	0.14		
5.5	18.9	1.90	0.17		
6.0	16.9	0.40	0.04		
6.5	13.1	-0.08	-0.10		
7.0	11.3	-0.09	-0.10		
7.5	10.5	-0.09	-0.11		
8.0	9.8	-0.09	-0.11		
8.5	9.4	-0.09	-0.11		
9.0	8.8	-0.09	-0.11		
9.5					
9.0	8.8	-0.09	-0.11		
8.5	9.1	-0.09	-0.11		
8.0	9.3	-0.09	-0.11		
7.5	9.9	-0.09	-0.11		
7.0	10.7	-0.09	-0.10		
6.5	11.6	-0.09	-0.10		
6.0	12.8	-0.08	-0.09		
5.5	14.3	-0.08	-0.08		
5.0	15.9	-0.07	-0.07		
4.5	17.4	-0.06	-0.06		
4.0	18.3	-0.03	-0.03		
3.5	19.7	55.30	5.05		
3.0	20.1	102.90	9.33		
2.5	21.1	103.70	9.40		
2.0	20.2	107.40	9.73		
1.5	20.3	113.90	10.29		
1.0	20.5	116.90	10.53		
0.5	20.9	117.00	10.43		
Surface (0.0)	21.1	116.30	10.33		

Project Number:	23-063		**Comments:**		
Project Location:	Summerside Lake		Corrrected Barometric Pressure: 709.5 mmHg		
Samplers:	TM, WB				
Date:	10-Oct-24				
Time:	13:30				
Site ID:	SSN WQ				
Site Location:	**NAD83**	**Easting:**	335732	**Northing:**	5921652

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen % Sat	pH	Conductivity (µS/cm)
Surface (0.0)	11.5	57.2	6.23		
0.5	11.5	56.7	6.19		
1.0	11.4	56.0	6.12		
1.5	11.3	55.1	6.02		
2.0	11.3	52.5	5.75		
2.5	11.2	51.5	5.64		
3.0	11.2	50.9	5.59		
3.5	11.2	50.8	5.58		
4.0	11.2	50.8	5.58		
4.5	11.1	50.9	5.59		
5.0	11.1	50.9	5.60		
5.5	11.1	51.0	5.61		
6.0	11.1	51.0	5.60		
6.5	11.1	50.9	5.60		
7.0	11.1	51.0	5.61		
7.5	11.1	50.7	5.58		
8.0	11.1	50.4	5.55		
8.5	11.1	49.0	5.41		
9.0					
9.5					
9.0					
8.5	11.1	49.0	5.41		
8.0	11.1	49.8	5.48		
7.5	11.1	50.1	5.52		
7.0	11.1	50.2	5.52		
6.5	11.1	50.4	5.54		
6.0	11.1	50.8	5.58		
5.5	11.1	50.8	5.59		
5.0	11.1	50.8	5.58		
4.5	11.1	50.8	5.58		
4.0	11.1	50.6	5.56		
3.5	11.2	47.7	5.23		
3.0	11.2	47.5	5.22		
2.5	11.2	48.0	5.28		
2	11.3	51.5	5.65		
1.5	11.3	52.5	5.75		
1	11.4	54.8	5.99		
0.5	11.5	55.2	6.03		
Surface (0.0)	11.5	55.8	6.10		

Project Number:	23-063		**Comments:**		
Project Location:	Summerside Lake		Corrected Barometric Pressure: 709.5 mmHg		
Samplers:	TM, WB				
Date:	10-Oct-24				
Time:	12:47				
Site ID:	SSS WQ				
Site Location:	**NAD83**	**Easting:**	335736	**Northing:**	5921430

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen % Sat	pH	Conductivity (µS/cm)
0	11.5	53.1	5.78		
0.5	11.4	51.60	5.6		
1.0	11.4	51.40	5.6		
1.5	11.3	51.50	5.7		
2.0	11.2	51.50	5.7		
2.5	11.2	51.20	5.6		
3.0	11.2	50.80	5.6		
3.5	11.2	50.70	5.6		
4.0	11.2	50.70	5.6		
4.5	11.1	50.60	5.6		
5.0	11.1	50.80	5.6		
5.5	11.1	50.90	5.6		
6.0	11.1	50.50	5.6		
6.5	11.1	50.60	5.6		
7.0	11.1	50.80	5.6		
7.5	11.1	50.80	5.6		
8.0	11.1	50.80	5.6		
8.5	11.0	50.10	5.5		
9.0					
9.5					
9.0					
8.5	11.0	49.70	5.5		
8.0	11.0	49.70	5.5		
7.5	11.0	49.90	5.5		
7.0	11.1	50.00	5.5		
6.5	11.1	50.40	5.6		
6.0	11.1	50.80	5.6		
5.5	11.1	50.90	5.6		
5.0	11.1	50.9	5.6		
4.5	11.1	50.9	5.6		
4.0	11.1	50.9	5.59		
3.5	11.2	50.9	5.59		
3.0	11.2	50.8	5.58		
2.5	11.2	50.8	5.58		
2	11.2	51	5.6		
1.5	11.3	51.4	5.63		
1	11.3	51.4	5.62		
0.5	11.4	51.5	5.63		
Surface (0.0)	11.4	51.5	5.63		

Appendix C Water Quality Data

Table 12. Nutrient concentrations in water samples in Summerside Lake in 2024. Exceedances are highlighted in red.

				Ammonia - N	Phosphorus (Dissolved - Low Level)	Kjeldahl Nitrogen (Total)	Phosphorus (Total - Low Level)	Orthophosphate-P (Low Level)	Nitrate - N	Nitrite - N	Nitrate and Nitrite - N
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Site Id	**Sample Description**	**Season**	**Sampled Date**	**0.025**	**0.005**	**0.1**	**0.005**	**0.003/0.001**	**0.01**	**0.010**	**0.0200**
NE Bay	Bottom	Winter	2024-02-15	0.222	0.0615	1.14	0.0995	0.0334	0.050	0.011	0.061
NW Bay	Bottom	Winter	2024-02-15	0.228	0.0499	1.14	0.0769	0.0271	0.059	0.010	0.069
NORTH Deep	Bottom	Winter	2024-02-15	0.371	0.0802	0.645	0.0923	0.0635	0.087	<0.010	0.087
SOUTH Deep	Bottom	Winter	2024-02-15	0.361	0.0830	1.10	0.0919	0.0685	0.077	<0.010	0.077
SW Bay	Bottom	Winter	2024-02-15	0.222	0.0432	1.20	0.0733	0.0262	0.043	0.012	0.055
SE Bay	Bottom	Winter	2024-02-15	0.249	0.0499	1.15	0.0770	0.0331	0.049	0.012	0.061
NE Bay	Bottom	Spring	2024-05-13	0.0737	0.0742	0.892	0.1020	0.0330	<0.020	<0.010	<0.0224
NW Bay	Bottom	Spring	2024-05-13	0.0062	0.0250	0.885	0.0687	0.0143	<0.020	<0.010	<0.0224
NORTH Deep	Bottom	Spring	2024-05-13	0.1160	0.0616	0.916	0.0956	0.0485	<0.020	<0.010	<0.0224
SOUTH Deep	Bottom	Spring	2024-05-13	0.2090	0.0955	1.100	0.1680	0.0802	<0.020	<0.010	<0.0224
SW Bay	Bottom	Spring	2024-05-13	0.0057	0.0333	0.774	0.0959	0.0075	<0.020	<0.010	<0.0224
SE Bay	Bottom	Spring	2024-05-13	0.0164	0.0374	0.961	0.0739	0.0060	<0.020	<0.010	<0.0224
NE Bay	Bottom	Post Treatment	2024-07-03	0.0532	0.0739	0.754	0.0378	<0.0010	<0.020	<0.010	<0.0224
NW Bay	Bottom	Post Treatment	2024-07-03	0.0404	0.0280	1.46	0.0795	<0.0010	<0.020	<0.010	<0.0224
NORTH Deep	Bottom	Post Treatment	2024-07-03	0.152	0.0876	0.874	0.0585	0.0068	<0.020	<0.010	<0.0224
SOUTH Deep	Bottom	Post Treatment	2024-07-03	1.52	0.504	2.99	0.480	0.469	<0.020	<0.010	<0.0224
SW Bay	Bottom	Post Treatment	2024-07-03	0.0093	0.0198	1.38	0.0558	<0.0010	<0.020	<0.010	<0.0224
SE Bay	Bottom	Post Treatment	2024-07-03	0.0215	0.0213	1.70	0.0716	<0.0010	<0.020	<0.010	<0.0224
NE Bay	Bottom	Summer	2024-08-07	0.2670	0.0186	1.320	0.0470	0.0011	<0.020	<0.010	<0.0500
NW Bay	Bottom	Summer	2024-08-07	0.0727	0.0179	1.280	0.0217	<0.0010	<0.020	<0.010	<0.0500
NORTH Deep	Bottom	Summer	2024-08-07	2.8500	0.7100	3.730	0.7230	0.6140	<0.020	<0.010	<0.0500
SOUTH Deep	Bottom	Summer	2024-08-07	2.1200	0.5830	2.430	0.5970	0.5420	<0.020	<0.010	<0.0500
SW Bay	Bottom	Summer	2024-08-07	0.0405	0.0195	1.100	0.0272	0.0010	<0.020	<0.010	<0.0500
SE Bay	Bottom	Summer	2024-08-07	0.0753	0.0196	1.170	0.0353	0.0014	<0.020	<0.010	<0.0500
NE Bay	Bottom	Fall	2024-10-10	0.3670	0.0830	1.070	0.1040	0.0682	<0.020	<0.010	<0.0224
NW Bay	Bottom	Fall	2024-10-10	0.3300	0.0830	1.040	0.0981	0.0638	<0.020	<0.010	<0.0224
NORTH Deep	Bottom	Fall	2024-10-10	0.3600	0.0849	1.050	0.0966	0.0641	<0.020	<0.010	<0.0224
SOUTH Deep	Bottom	Fall	2024-10-10	0.3540	0.0808	1.020	0.0957	0.0653	<0.020	<0.010	<0.0224
SW Bay	Bottom	Fall	2024-10-10	0.3430	0.0794	1.040	0.0945	0.0610	<0.020	<0.010	<0.0224
SE Bay	Bottom	Fall	2024-10-10	0.3490	0.0802	1.010	0.0960	0.0595	<0.020	<0.010	<0.0224

Table 13. Routine parameters in water samples in Summerside Lake in 2024. Exceedances are highlighted in red.

			Parameter Name	pH	Temp. of observed pH	E.C. (at 25°C)	Ca (Diss.)	Mg (Diss.)	Na (Diss.)	K (Diss.)	Fe (Diss.)	Mn (Diss.)	Cl (Diss.)	SO4 (Diss.)	OH	CO_3	HCO_3	P-Alkalinity (as CaCO3)	T-Alkalinity (as CaCO3)	TDS (Calculated)	Hardness (as CaCO3)	Ionic Balance (Diss.)
			Unit		°C	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%
			D.L.	1		1	0.2	0.2	0.4	0.4	0.01	0.005	0.9				5	5	1			
Site Id	**Sample Description**	**Season**	**Sample Date**																			
NE Bay	Bottom	Winter	2024-02-15	7.88	20.0	698	51.2	26.4	62.2	4.95	<0.010	0.00994	11.9	234	<1.0	<1.0	166		136	474	236	94.9
NW Bay	Bottom	Winter	2024-02-15	7.90	20.0	692	51.0	26.2	64.5	4.89	<0.010	0.01170	12.1	235	<1.0	<1.0	166		136	477	235	95.5
NORTH Deep	Bottom	Winter	2024-02-15	7.46	20.0	686	52.0	26.0	59.6	4.77	<0.010	0.11000	11.8	233	<1.0	<1.0	157		129	467	237	95.6
SOUTH Deep	Bottom	Winter	2024-02-15	7.45	20.0	685	51.4	26.1	61.3	4.85	<0.010	0.00266	11.9	235	<1.0	<1.0	157		129	470	236	95.8
SW Bay	Bottom	Winter	2024-02-15	8.02	20.0	704	52.0	25.7	60.4	4.85	<0.010	0.00203	11.9	236	<1.0	<1.0	154		126	468	236	95.6
SE Bay	Bottom	Winter	2024-02-15	7.97	20.0	691	52.5	25.3	60.8	4.84	<0.010	0.00543	11.9	235	<1.0	<1.0	154		126	467	235	96.0
NE Bay	Bottom	Spring	2024-05-13	8.06		666	49.6	24.7	57.7	4.38	<0.010	0.07630	11.1	216	<1.0	<1.0	151		124	440	226	97.3
NW Bay	Bottom	Spring	2024-05-13	8.70		649	50.0	24.8	57.6	4.49	<0.010	0.00346	11.1	217	<1.0	7.0	133		121	439	227	98.1
NORTH Deep	Bottom	Spring	2024-05-13	7.80		661	52.6	25.4	61.0	4.56	<0.010	0.12200	11.1	216	<1.0	<1.0	150		123	447	236	102
SOUTH Deep	Bottom	Spring	2024-05-13	7.70		666	53.1	24.1	57.3	4.48	<0.010	0.32600	11.0	216	<1.0	<1.0	149		122	442	232	99.6
SW Bay	Bottom	Spring	2024-05-13	8.66		659	54.4	25.2	57.9	4.36	<0.010	0.00328	11.1	217	<1.0	6.7	135		122	444	240	101
SE Bay	Bottom	Spring	2024-05-13	8.34		674	50.9	25.6	59.3	4.46	<0.010	0.02970	11.0	216	<1.0	2.6	146		124	443	232	100
NE Bay	Bottom	Summer	2024-08-07	8.21		671	44.4	25.0	54.9	4.80	0.016	0.04420	11.8	225	<1.0	<1.0	129		106	433	214	94.6
NW Bay	Bottom	Summer	2024-08-07	8.9		645	44.6	25.2	55.3	4.70	0.017	0.00442	11.8	229	<1.0	7.6	110		103	435	215	94.7
NORTH Deep	Bottom	Summer	2024-08-07	7.84		678	53.9	22.8	55.8	4.65	<0.010	0.99900	11.4	148	<1.0	<1.0	266		218	440	228	94.1
SOUTH Deep	Bottom	Summer	2024-08-07	7.87		672	53.1	23.1	53.0	4.61	0.014	0.98300	11.4	166	<1.0	<1.0	240		196	439	228	92.5
SW Bay	Bottom	Summer	2024-08-07	8.93		636	43.7	25.1	60.1	4.75	0.019	0.00719	11.8	228	<1.0	8.4	106		104	439	212	96.9
SE Bay	Bottom	Summer	2024-08-07	9.01		638	43.4	24.7	58.2	4.67	0.018	0.00440	11.8	229	<1.0	9.7	110		103	437	210	95.0
NE Bay	Bottom	Fall	2024-10-10	8.33		672	50.9	26.4	58.2	4.83	0.023	0.19500	11.5	217	<1.0	<1.0	144		118	462	224	98.3
NW Bay	Bottom	Fall	2024-10-10	8.22		666	51.4	27.4	62.9	4.99	0.023	0.20100	11.7	221	<1.0	<1.0	145		119	455	237	105
NORTH Deep	Bottom	Fall	2024-10-10	7.86		670	51.0	27.4	60.5	4.98	0.022	0.20100	11.8	221	<1.0	<1.0	148		121	454	236	102
SOUTH Deep	Bottom	Fall	2024-10-10	7.89		686	51.4	26.7	60.8	4.94	0.022	0.19400	11.8	221	<1.0	<1.0	145		119	453	246	103
SW Bay	Bottom	Fall	2024-10-10	7.96		678	50.8	27.9	58.9	4.88	0.023	0.19600	11.8	221	<1.0	<1.0	145		119	451	239	102
SE Bay	Bottom	Fall	2024-10-10	7.66		676	51.2	26.9	58.8	4.90	0.022	0.19500	11.8	221	<1.0	<1.0	146		119	450	249	102

Table 14. Total metals in water samples in the winter and spring of 2024 in Summerside Lake.

			NE Bay	NW Bay	NORTH Deep	SOUTH Deep	SW Bay	SE Bay	NE Bay	NW Bay	NORTH Deep	SOUTH Deep	SW Bay	SE Bay
			Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
			Winter	Winter	Winter	Winter	Winter	Winter	Spring	Spring	Spring	Spring	Spring	Spring
			2024-02-15	2024-05-13	2024-05-13	2024-05-13	2024-05-13	2024-05-13	2024-05-13	2024-05-13	2024-05-13	2024-05-13	2024-05-13	2024-05-13
Parameter Name	**Unit**	**D.L.**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**
Aluminum, total	mg/L	0.0030	<0.0030	0.0034	0.0046	0.0038	<0.0030	0.0041	0.0166	0.0060	0.0121	0.0537	0.0078	0.0234
Antimony, total	mg/L	0.00010	<0.00010	0.00010	0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00011	0.00011	0.00010	0.00010
Arsenic, total	mg/L	0.00010	0.00169	0.00172	0.00175	0.00174	0.00169	0.00169	0.00152	0.00147	0.00159	0.00165	0.00147	0.00155
Barium, total	mg/L	0.00010	0.0459	0.0457	0.0474	0.0459	0.0454	0.0456	0.0441	0.0400	0.0462	0.0508	0.0405	0.0427
Beryllium, total	mg/L	0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth, total	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron, total	mg/L	0.010	0.071	0.074	0.072	0.073	0.073	0.073	0.061	0.062	0.062	0.060	0.062	0.061
Cadmium, total	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium, total	mg/L	0.050	51.8	53.3	53.4	53.4	51.6	52.8	50.7	51.6	50.4	50.1	51.7	51.8
Cesium, total	mg/L	0.000010	-	-	-	-	-	-	-	-	-	-	-	-
Chromium, total	mg/L	0.00050	<0.00050	<0.00050	0.00710	<0.00050	<0.00050	<0.00050	0.00601	0.00614	0.00611	0.00691	0.00584	0.00593
Cobalt, total	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	<0.00010
Copper, total	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00897	0.00911	0.00868	0.00926	0.00869	0.00998
Iron, total	mg/L	0.010	<0.010	<0.010	0.118	<0.010	<0.010	<0.010	0.074	0.046	0.062	0.166	0.043	0.078
Lead, total	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000058	0.000357	0.000358	0.000346	0.000378	0.000317	0.000338
Lithium, total	mg/L	0.0010	0.0355	0.0368	0.0362	0.0360	0.0366	0.0362	0.0326	0.0328	0.0326	0.0324	0.0330	0.0330
Magnesium, total	mg/L	0.100	26.4	26.8	25.6	26.0	26.0	26.5	25.7	25.8	26.2	25.9	25.8	25.0
Manganese, total	mg/L	0.00010	0.0200	0.0210	0.192	0.0444	0.0114	0.0208	0.119	0.0493	0.254	0.494	0.0611	0.0785
Mercury, total	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum, total	mg/L	0.000050	0.000468	0.000491	0.00139	0.000437	0.000496	0.000440	0.000607	0.000645	0.000605	0.000671	0.000649	0.000655
Nickel, total	mg/L	0.00050	0.00064	0.00067	0.00086	0.00065	0.00066	0.00062	0.00644	0.00629	0.00644	0.00668	0.00098	0.00622
Phosphorus, total	mg/L	0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Potassium, total	mg/L	0.050	4.88	4.89	4.75	4.87	4.77	4.84	4.53	4.48	4.52	4.64	4.61	4.56
Rubidium, total	mg/L	0.00020	-	-	-	-	-	-	-	-	-	-	-	-
Selenium, total	mg/L	0.000050	<0.000050	<0.000050	<0.000050	0.000054	<0.000050	0.000052	0.000052	0.000056	<0.000050	0.000059	0.000052	0.000068
Silicon, total	mg/L	0.10	<0.10	<0.10	0.30	0.22	<0.10	<0.10	0.32	0.21	0.45	0.74	0.22	0.30
Silver, total	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, total	mg/L	0.050	64.4	64.7	61.8	64.3	63.7	63.1	58.1	58.8	59.1	60.0	60.7	59.6
Strontium, total	mg/L	0.00020	0.539	0.547	0.575	0.568	0.549	0.572	0.537	0.532	0.534	0.530	0.522	0.526
Tellurium, total	mg/L	0.00020	-	-	-	-	-	-	-	-	-	-	-	-
Thallium, total	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium, total	mg/L	0.00010	-	-	-	-	-	-	-	-	-	-		-
Tin, total	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00018	<0.00010	0.00014	<0.00010	<0.00010	<0.00010
Titanium, total	mg/L	0.00030	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Uranium, total	mg/L	0.000010	0.000381	0.000400	0.000417	0.000371	0.000375	0.000388	0.000374	0.000368	0.000350	0.000353	0.000375	0.000377
Vanadium, total	mg/L	0.00050	0.00056	0.00055	0.00162	0.00052	0.00051	0.00054	<0.00050	<0.00050	<0.00050	0.00059	<0.00050	<0.00050
Zinc, total	mg/L	0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0093	0.0055	0.0060	0.0073	0.0066	0.0064
Zirconium, total	mg/L	0.00020	-	-	-	-	-	-	-	-	-	-	-	-

Table 15. Total metals in water samples in summer and fall of 2024 in Summerside Lake. Exceedances are highlighted in red.

			NE Bay	NW Bay	NORTH Deep	SOUTH Deep	SW Bay	SE Bay	NE Bay	NW Bay	NORTH Deep	SOUTH Deep	SW Bay	SE Bay
			Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
			Summer	Summer	Summer	Summer	Summer	Summer	Fall	Fall	Fall	Fall	Fall	Fall
			2024-08-07	2024-08-07	2024-08-07	2024-08-07	2024-08-07	2024-08-07	2024-10-10	2024-10-10	2024-10-10	2024-10-10	2024-10-10	2024-10-10
Parameter Name	**Unit**	**D.L.**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**	**Result Text**
Aluminum, total	mg/L	0.0030	0.0195	0.0177	0.0093	0.0086	0.0186	0.0085	0.0080	0.0082	0.0105	0.0085	0.0079	0.0092
Antimony, total	mg/L	0.00010	0.00014	0.00014	<0.00010	<0.00010	0.00014	0.00013	0.00012	0.00012	0.00013	0.00013	0.00012	0.00013
Arsenic, total	mg/L	0.00010	0.00194	0.00192	0.00243	0.00238	0.00191	0.00201	0.00202	0.00197	0.00201	0.00201	0.00203	0.00200
Barium, total	mg/L	0.00010	0.0508	0.0455	0.0758	0.0680	0.0436	0.0535	0.0536	0.0529	0.0535	0.0535	0.0535	0.0530
Beryllium, total	mg/L	0.000100	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth, total	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron, total	mg/L	0.010	0.068	0.068	0.068	0.067	0.071	0.077	0.072	0.076	0.076	0.077	0.076	0.078
Cadmium, total	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium, total	mg/L	0.050	46.0	44.4	55.9	54.9	45.8	57.7	49.8	53.7	54.5	57.7	55.0	58.6
Cesium, total	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-	-	-	-
Chromium, total	mg/L	0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, total	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper, total	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron, total	mg/L	0.010	0.041	0.037	0.082	0.083	0.039	0.033	0.031	0.031	0.032	0.033	0.032	0.032
Lead, total	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium, total	mg/L	0.0010	0.0335	0.0333	0.0324	0.0327	0.0339	0.0336	0.0322	0.0361	0.0333	0.0336	0.0339	0.0336
Magnesium, total	mg/L	0.100	26.6	25.8	24.7	26.1	25.6	24.8	24.3	25.0	24.3	24.8	24.6	25.0
Manganese, total	mg/L	0.00010	0.0642	0.0248	1.0900	0.1600	0.0249	0.1880	0.1960	0.1900	0.1920	0.1880	0.1880	0.1860
Mercury, total	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum,	mg/L	0.000050	0.000695	0.000612	0.000121	0.000140	0.000679	0.000541	0.000528	0.000528	0.000553	0.000541	0.000536	0.000537
Nickel, total	mg/L	0.00050	0.00058	0.00058	0.00066	0.00063	0.00063	0.00083	0.00080	0.00076	0.00071	0.00083	0.00075	0.00076
Phosphorus, total	mg/L	0.300	<0.050	<0.050	0.717	0.596	0.060	<0.300	0.1040	0.0981	0.0966	0.0957	0.0945	0.0960
Potassium, total	mg/L	0.050	4.84	4.77	5.01	4.98	4.72	4.58	4.84	4.72	4.78	4.58	4.75	4.64
Rubidium, total	mg/L	0.00020	0.00146	0.00154	0.00164	0.00163	0.00148	-	-	-	-	-	-	-
Selenium, total	mg/L	0.000050	0.000060	<0.000050	0.000352	0.00181	0.000076	<0.000050	0.000120	0.000078	0.000068	<0.000050	0.000063	0.000089
Silicon, total	mg/L	0.10	0.84	0.77	2.81	2.30	0.81	1.06	1.08	1.09	1.08	1.06	1.05	1.05
Silver, total	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000013	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, total	mg/L	0.050	55.0	55.3	54.6	54.8	54.6	59.9	59.6	59.0	58.7	59.9	59.2	60.5
Strontium, total	mg/L	0.00020	0.521	0.521	0.556	0.540	0.529	0.615	0.568	0.584	0.600	0.615	0.592	0.637
Tellurium, total	mg/L	0.00020	78.5	78.5	60.9	60.9	83.0	-	-	-	-	-	-	-
Thallium, total	mg/L	0.000010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium, total	mg/L	0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-	-	-	-
Tin, total	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium, total	mg/L	0.00030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Uranium, total	mg/L	0.000010	0.00047	<0.00030	0.00031	<0.00030	0.00036	0.000431	0.000429	0.000433	0.000419	0.000431	0.000442	0.000433
Vanadium, total	mg/L	0.00050	0.000456	0.000471	0.000215	0.000228	0.000519	0.00095	0.00091	0.00092	0.00088	0.00095	0.00086	0.00091
Zinc, total	mg/L	0.0030	0.00077	0.00074	0.00093	0.00099	0.00075	0.0037	<0.0030	<0.0030	<0.0030	0.0037	<0.0030	<0.0030
Zirconium, total	mg/L	0.00020	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	-	-	-	-	-	-	-

Table 16. Secchi depth measurements (m) in Summerside Lake.

Survey Date	Sample Location of Secchi Depth Measurements (m)					
	NE Bay	NW Bay	North Deep	South Deep	SW Bay	SE Bay
2022-05-25	2	2.65	2.5	2.5	2.7	2.5
2022-06-2	2.75	2.2	2.95	2.7	2.9	2.7
2023-05-10	2.67	2.7	2.7	3.0	2.35	3.0
2023-05-12	2.6	2.5	3.0	3.2	3.0	2.5
2023-08-11	2.25	1.5	2	1.7	1.7	1.5
2023-08-21			2.10	1.90		
2024-05-13	2.5	1.4	1.25	1.25	1.1	1.35
2024-06-12	-	-	4.9	5.5	-	-
2024-06-25	-	-	1.75	1.8	-	-
2024-07-03	0.75	0.6	0.75	0.75	0.8	0.75
2024-07-9	-	-	0.9	0.75	-	-
2024-07-23	-	-	2.9	2.7	-	-
2024-08-07	1.25	1.25	1.25	1.25	1.25	1.25
2024-08-20	-	-	1.5	1.5	-	-
2024-10-10	3.3	2.65	4	4.4	2.15	3.4

Appendix D Zooplankton Data

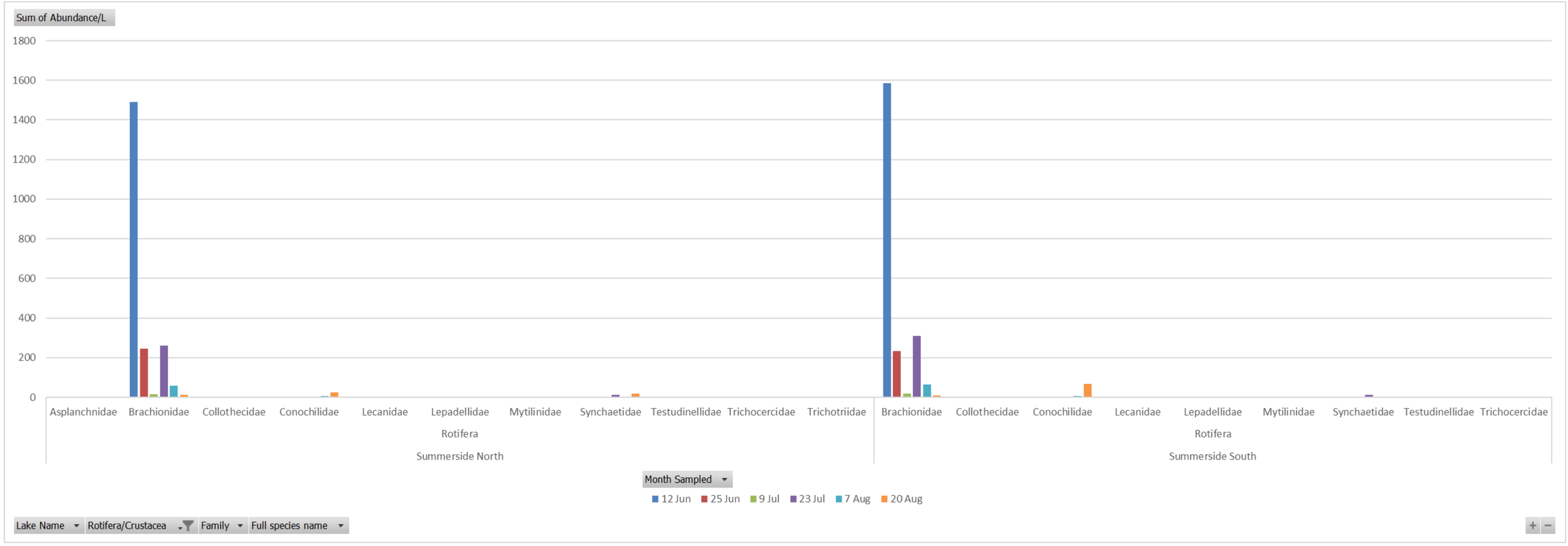


Figure 9. Comparison of the overall Rotifera zooplankton abundance for the Summerside Lake north and south sites, 2024.

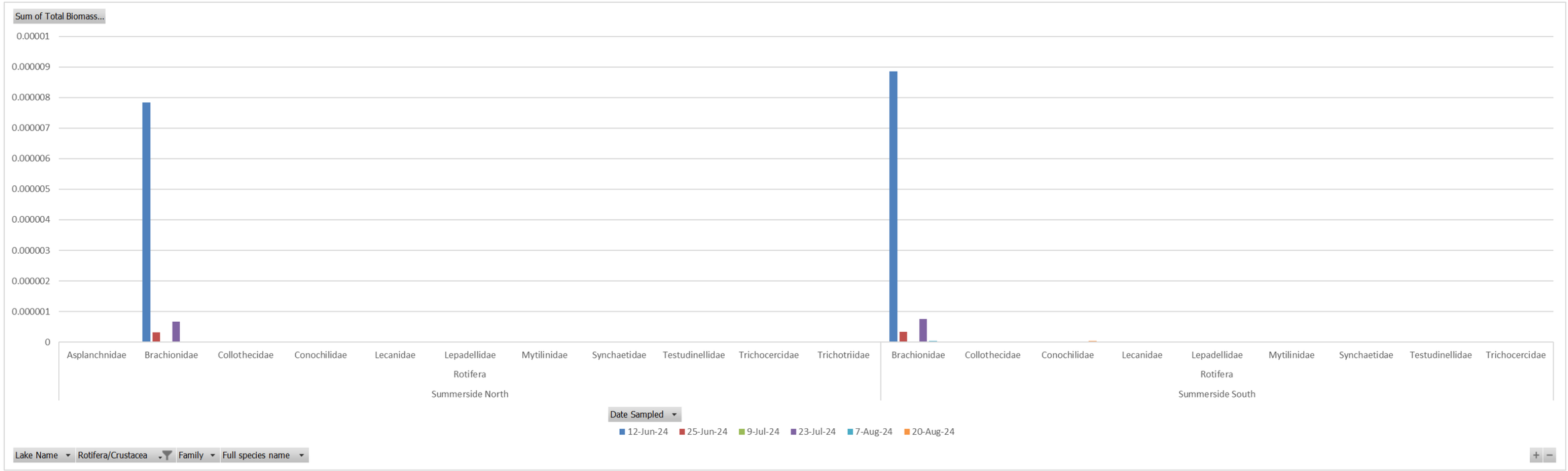


Figure 10. Comparison of the overall Rotifera zooplankton biomass for the Summerside Lake north and south sites, 2024.

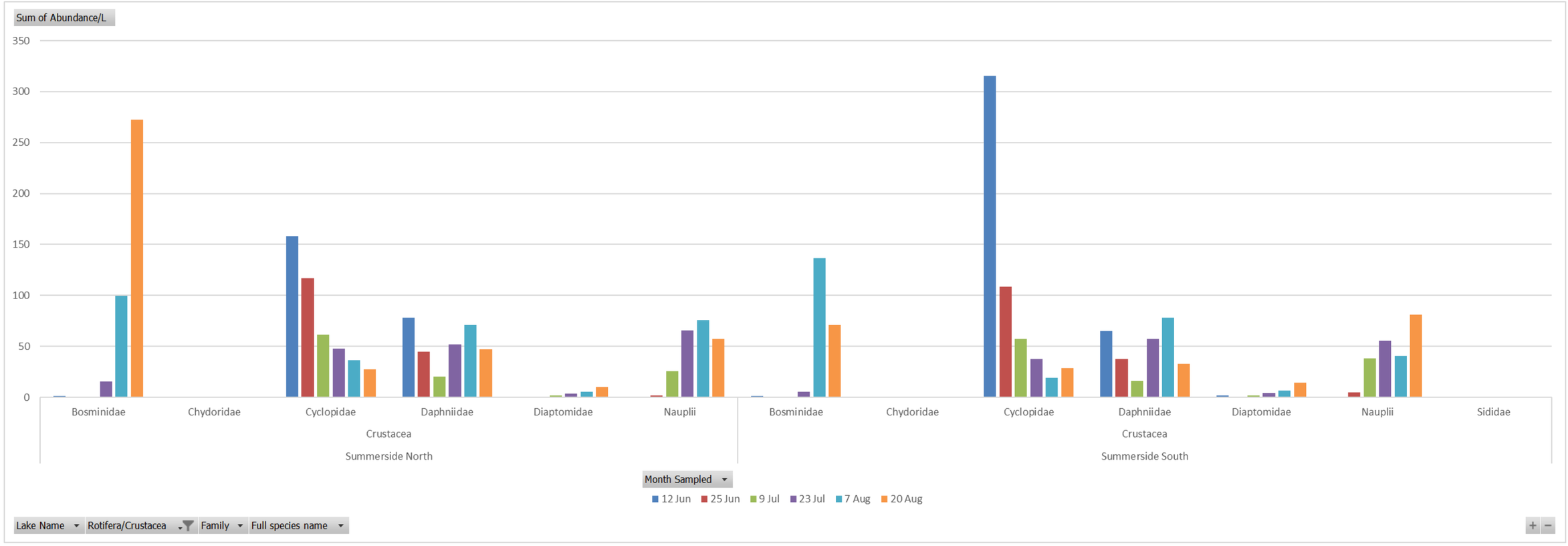


Figure 11. Comparison of the overall Crustacea zooplankton abundance for the Summerside Lake north and south sites, 2024.

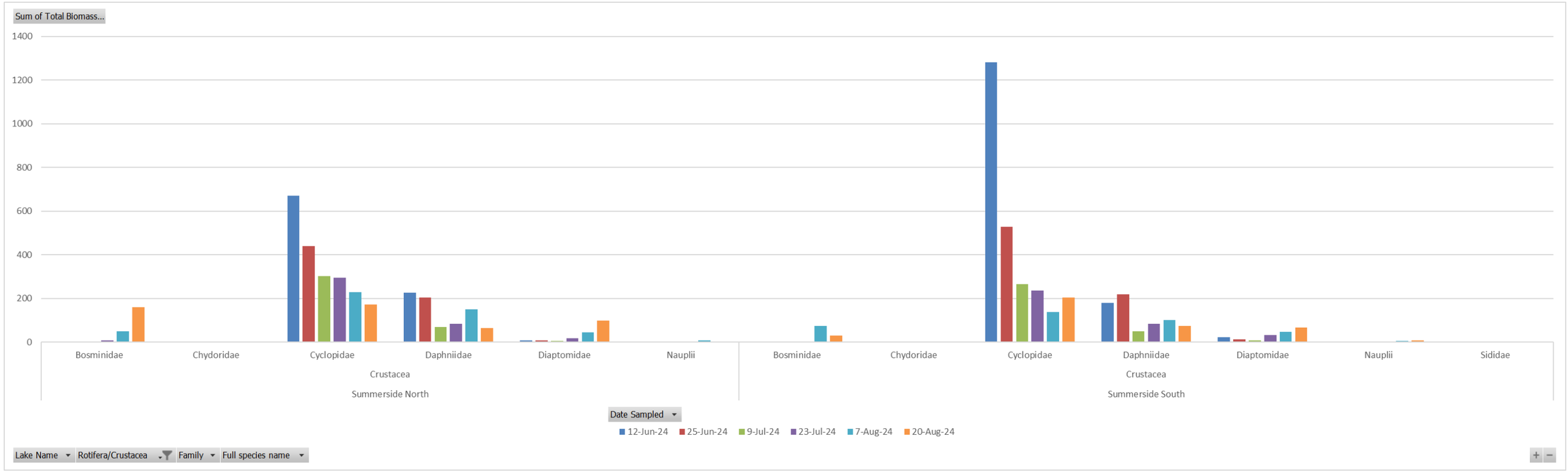


Figure 12. Comparison of the overall Crustacea zooplankton biomass for the Summerside Lake north and south sites, 2024.