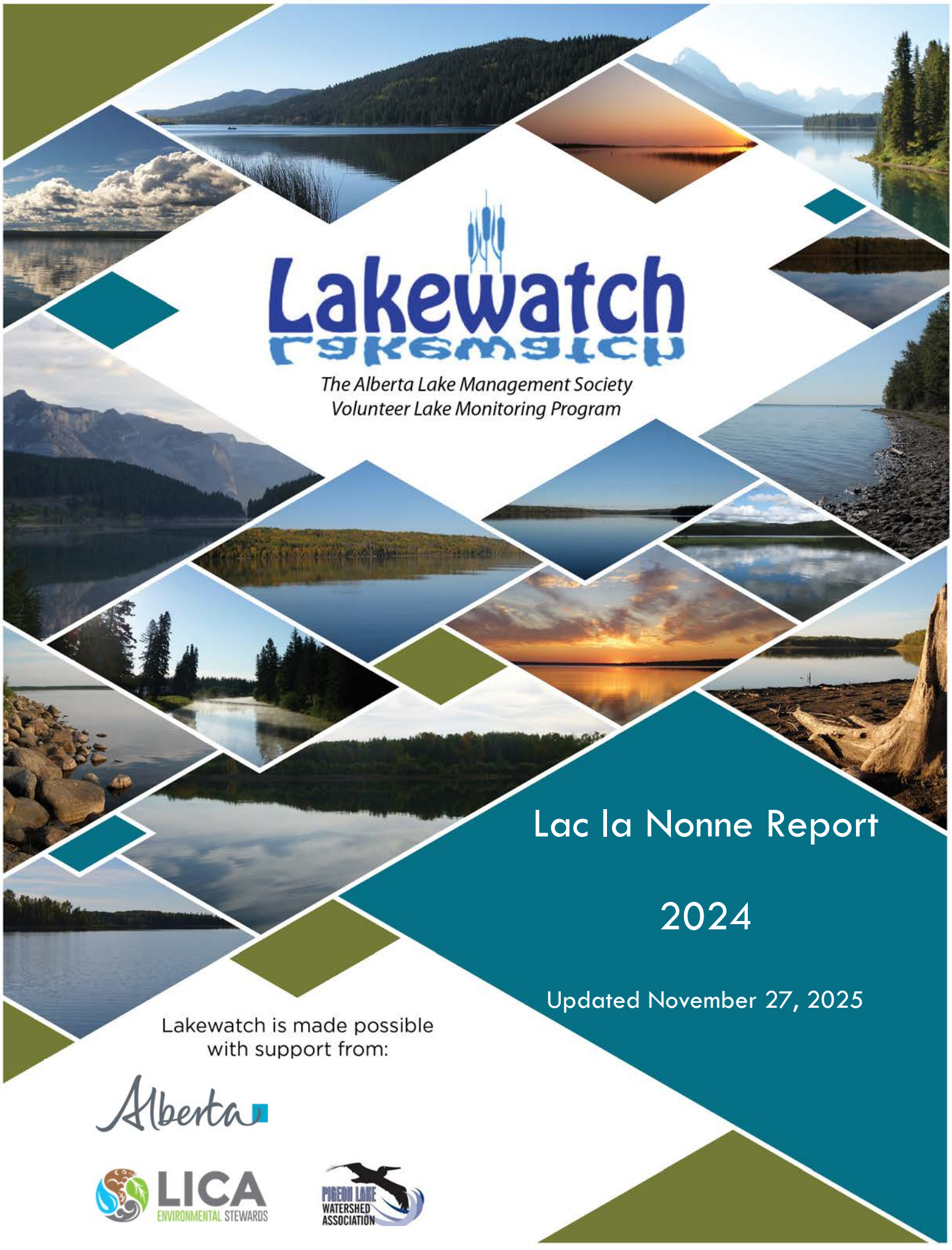


Lakewatch

The Alberta Lake Management Society
Volunteer Lake Monitoring Program

Lac la Nonne Report

2024

Updated November 27, 2025

Lakewatch is made possible with support from:

Alberta

LICA ENVIRONMENTAL STEWARDS

PIGEON LAKE WATERSHED ASSOCIATION

ALBERTA LAKE MANAGEMENT SOCIETY'S LAKEWATCH PROGRAM

LakeWatch has several important objectives, one of which is to collect and interpret water quality data from Alberta's Lakes. Equally important is educating lake users about aquatic environments, encouraging public involvement in lake management, and facilitating cooperation and partnerships between government, industry, the scientific community and lake users. LakeWatch reports are designed to summarize basic lake data in understandable terms for the widest audience, and are not meant to be a complete synopsis of information about specific lakes. Additional information is available for many lakes that have been included in LakeWatch, and readers requiring more information are encouraged to seek those sources.

ALMS would like to thank all who express interest in Alberta's aquatic environments, and particularly those who have participated in the LakeWatch program. These leaders in stewardship give us hope that our water resources will not be the limiting factor in the health of our environment.

If you require data from this report, please contact ALMS for the raw data files.

ACKNOWLEDGEMENTS

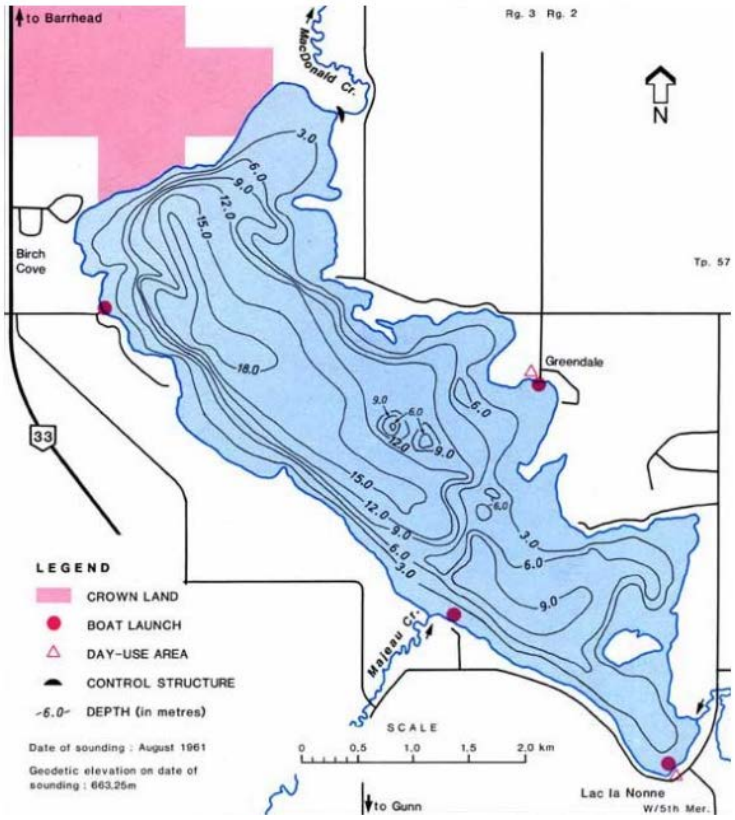
The LakeWatch program is made possible through the dedication of its volunteers. A special thanks to Rod Kause for their commitment to collecting data at Lac la Nonne. We would also like to thank Katherine Cundict and Jordyn Lajeunesse, who were summer technicians in 2024. Executive Director Bradley Peter and Program Manager Brittany Onysyk were instrumental in planning and organizing the field program. This report was prepared by Brittany Onysyk and Bradley Peter.

BEFORE READING THIS REPORT, CHECK OUT A BRIEF INTRODUCTION TO LIMNOLOGY

LAC LA NONNE

Lac la Nonne is located about 90 km northwest of Edmonton in the counties of Barrhead and Lac Ste. Anne. The nearest populated centre is the Town of Barrhead 20 km north. Lac la Nonne is within the Athabasca River Watershed. The lake is a highly developed and popular recreational lake.

Lac La Nonne is a moderately sized and deep lake, with a surface area of approximately 13 km^2, a maximum depth 19.8 m, and an average depth of 7.8 m.[1] Lac La Nonne's watershed is large (299 km^2) and includes Nakamun Lake and Majeau Lake to the south. The watershed to lake ratio is 22:1.



Bathymetric map of Lac la Nonne obtained from the Atlas of Alberta Lakes.

Lac la Nonne is surrounded by numerous residential subdivisions and campgrounds/resorts, as well as the Lac la Nonne Natural Area on the north end of the lake. Agricultural land surrounds the lake and composes much of the watershed. Much of the north and west of the lake is intact forest.

A severe toxic cyanobacteria bloom in August 2002 prompted public concern over water quality, and two local watershed stewardship groups were formed; the Lac La Nonne Enhancement and Protection Association and the Lac La Nonne Watershed Stewardship Society. They have been very active in implementing beneficial management practices, educating the watershed community, and organizing data collection. In 2006, the Lac La Nonne Watershed Society undertook a State of the Watershed Report, summarizing information for the historical and current condition of the watershed and making recommendations for maintaining and improving lake and watershed health.[2] This report can be accessed here.

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[1] Michell, P and E. Prepas. 1990. Atlas of Alberta Lakes.

[2] Aquality. 2006. Lac La Nonne State of the Watershed Report.

WATER CHEMISTRY

ALMS measures a suite of water chemistry parameters. Phosphorus, nitrogen, and chlorophyll-a are important because they are indicators of eutrophication, or excess nutrients, which can lead to harmful algal/cyanobacteria blooms. One direct measure of harmful cyanobacteria blooms are Microcystins, a common group of toxins produced by cyanobacteria. See Table 2 for a complete list of parameters.

The average total phosphorus (TP) concentration in 2024 for Lac La Nonne was 317 µg/L (Table 2), falling into the hypereutrophic, or very highly productive trophic classification. This value is near the highest of all previously observed historical averages going back to 1983 (Table 2). TP ranged from a minimum of 270 µg/L on June 28 to a maximum of 360 µg/L on August 30 (Figure 1).

The average chlorophyll-*a* concentration in 2024 was 173 µg/L (Table 2), similarly falling into the hypereutrophic classification. Chlorophyll-*a* was lowest at 15.7 µg/L on June 28 and peaked at 438 µg/L on July 29 (Figure 1).

The average Total Kjeldahl Nitrogen (TKN) concentration in 2024 was 1.5 mg/L (Table 2). TKN was stale throughout the summer (Figure 1).

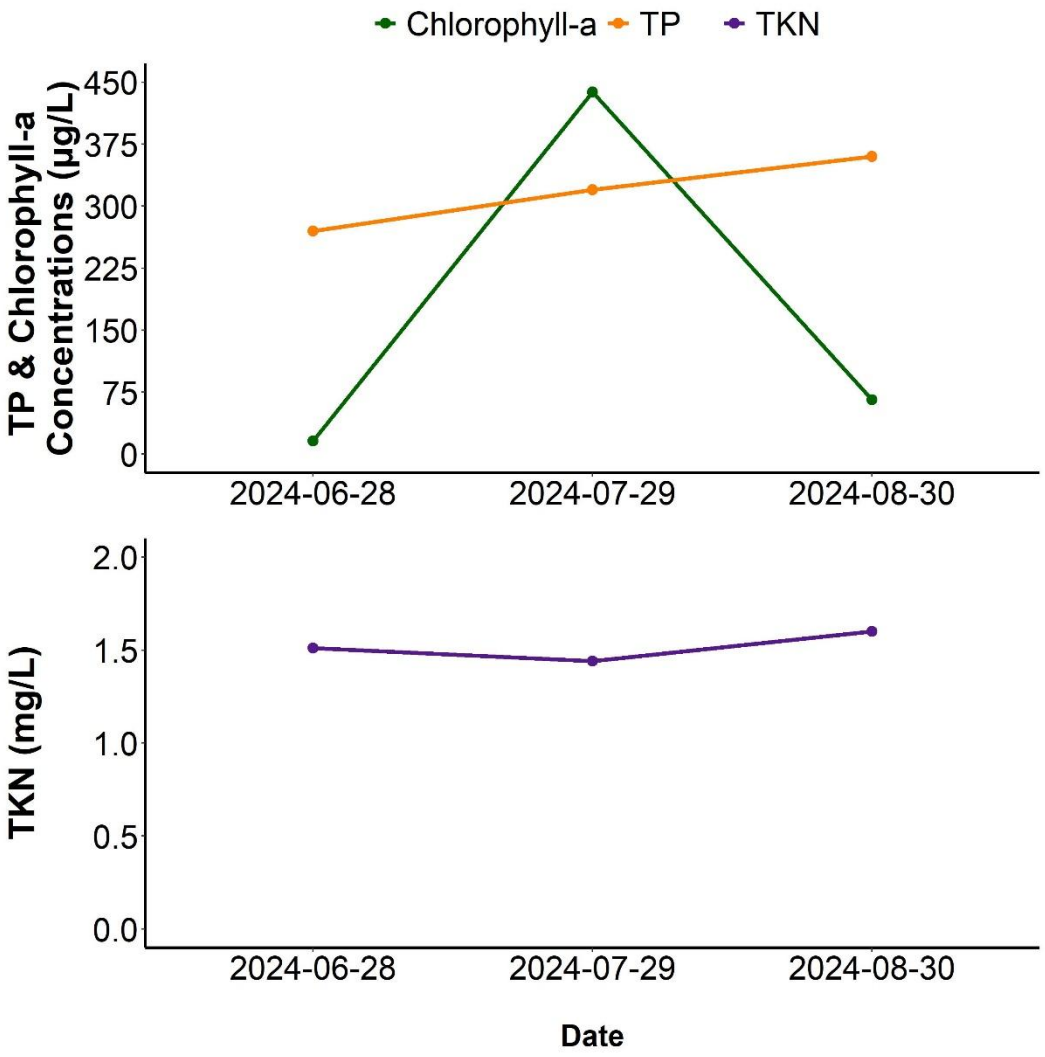

Figure 1. Total Phosphorus, Chlorophyll-*a*, and Total Kjeldahl Nitrogen concentrations measured over the course of the summer at Lac La Nonne in 2024.

Average pH was measured as 8.33 in 2024, buffered by moderate alkalinity (180 mg/L $CaCO_3$) and bicarbonate (217 mg/L HCO_3). Aside from bicarbonate, sodium and calcium were higher than all other major ions, and together contributed to a moderate conductivity of 410 µS/cm (Figure 2, top; Table 2). Lac La Nonne is in the moderate to low end range of ion levels, compared to other LakeWatch lakes sampled in 2024, apart from calcium, being at a relatively higher level (Figure 2, bottom).

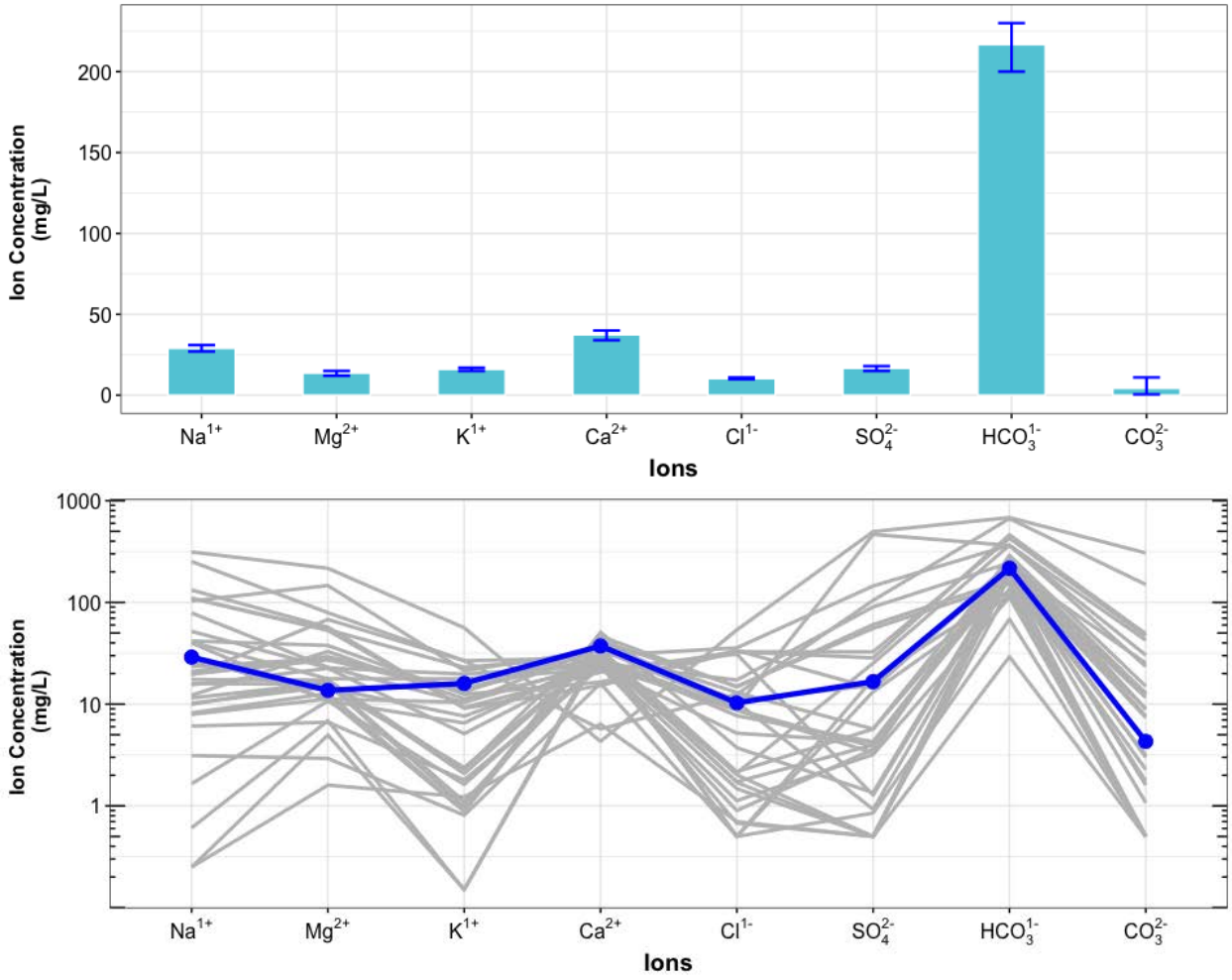

Figure 2. Average levels of cations (sodium = Na^{1+}, magnesium = Mg^{2+}, potassium = K^{1+}, calcium = Ca^{2+}) and anions (chloride = Cl^{1-}, sulphate = SO_4^{2-}, bicarbonate = HCO_3^{1-}, carbonate = CO_3^{2-}) from measurements over the course of the summer at Lac La Nonne. Top) bars indicate range of values measured, and bottom) Schoeller diagram of average ion levels at Lac La Nonne (blue line) compared to 26 lake basins (gray lines) sampled through the LakeWatch program in 2024 (note log10 scale on y-axis of bottom figure).

Metals

Metals will naturally be present in aquatic environments due to in-lake processes or the erosion of rocks, or introduced to the environment from human activities such as urban, agricultural, or industrial developments. Many metals have a unique guideline as they may become toxic at higher concentrations. Where current metal data are not available, historical concentrations for 27 metals have been provided (Table 3).

Metals were not measured at Lac La Nonne in 2024. Historical data is provided in Table 3.

WATER CLARITY AND EUPHOTIC DEPTH

Water clarity is influenced by suspended materials, both living and dead, as well as dissolved colored compounds in the water column. During the melting of snow and ice in spring, lake water can become turbid (cloudy) from silt transported into the lake. Lake water usually clears in late spring, but then becomes more turbid with increased algal growth as the summer progresses. The easiest and most widely used measure of lake water clarity is the Secchi depth. Two times the Secchi depth equals the euphotic depth – the depth to which there is enough light for photosynthesis.

The average euphotic depth of Lac La Nonne in 2024 was 3.6 m, corresponding to an average Secchi depth of 1.8 m (Table 2). Euphotic depth varied over the season, ranging from as deep as 5 m on June 28 to 3.6 m on August 30 (Figure 3).

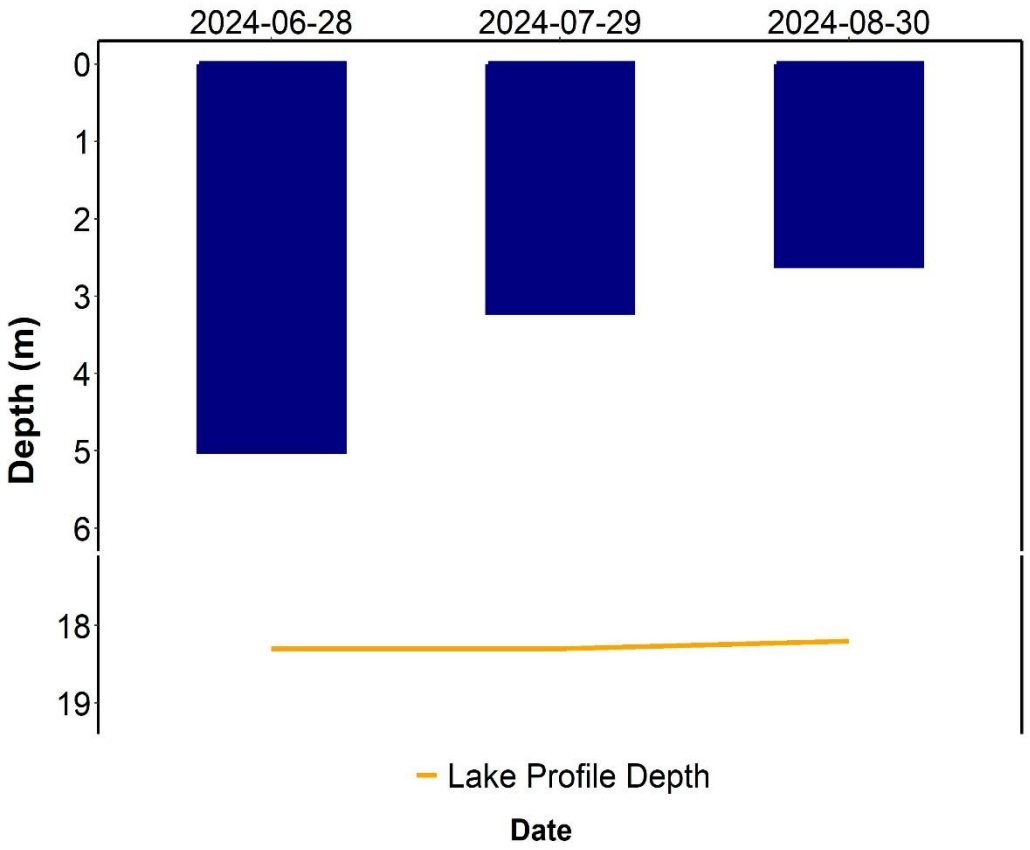

Figure 3. Euphotic depth values measured over the course of the summer at Lac La Nonne in 2024.

WATER TEMPERATURE AND DISSOLVED OXYGEN

Water temperature and dissolved oxygen (DO) profiles in the water column can provide information on water quality and fish habitat. The depth of the thermocline is important in determining the depth to which dissolved oxygen from the surface can be mixed. Please refer to the end of this report for descriptions of technical terms.

Surface temperatures of Lac la Nonne varied throughout the summer, with the July 29 sampling trip having the warmest temperatures at 19.66°C (Figure 4). The lake was weakly stratified during each sampling trip. The weak stratification and temperatures > 10°C near the bottom water temperatures near the bottom of the lake indicate that the lake mixes completely throughout the summer, despite its depth.

Lac La Nonne was well oxygenated in the surface waters on all sampling dates, measuring above the CCME guidelines of 6.5 mg/L dissolved oxygen[3] (Figure 4). Dissolved oxygen began to deplete below the weak thermocline (about 9 m), leading to anoxic conditions (< 1 mg/L dissolved oxygen) near the bottom of the lake.

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[3] Canadian Council of Ministers of the Environment. 1999. Canadian water quality guidelines for the protection of aquatic life: Dissolved oxygen (freshwater).

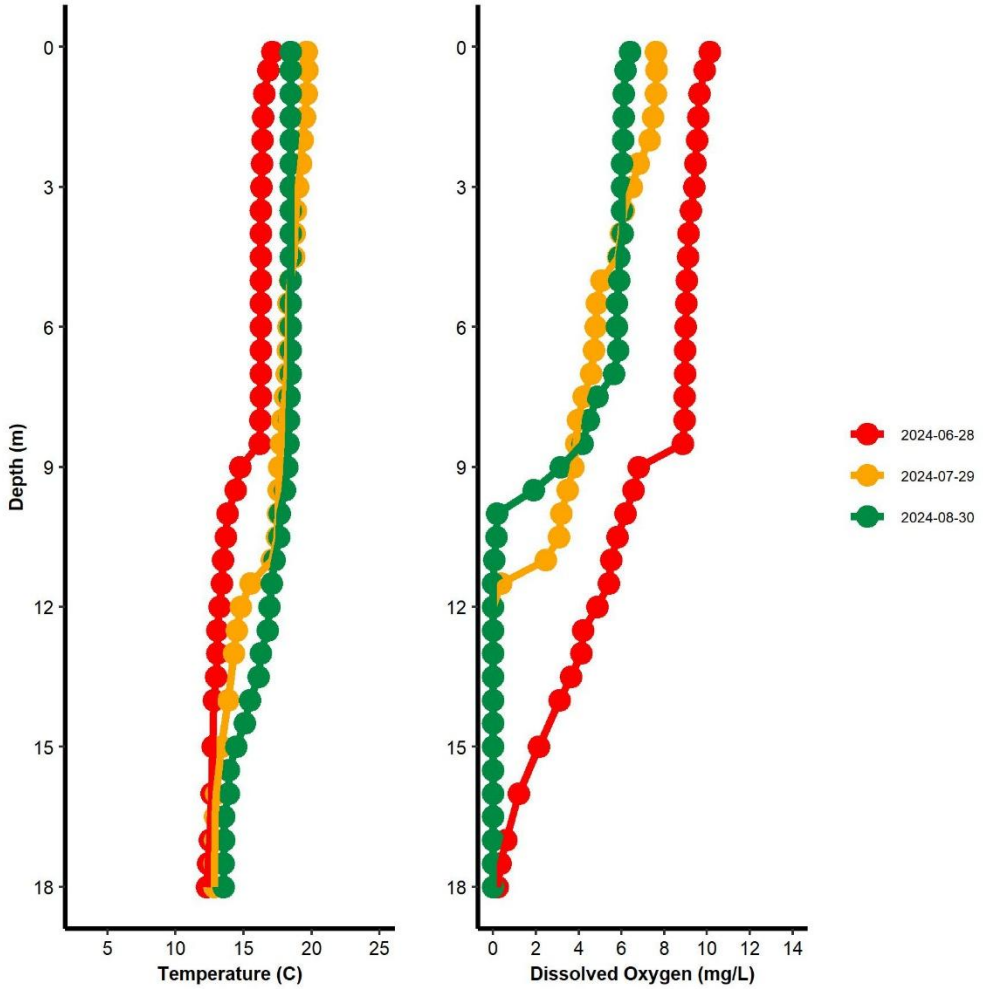


Figure 4. Temperature (°C) and dissolved oxygen (mg/L) profiles for Lac La Nonne measured over the course of the summer of 2024.

MICROCYSTIN

Microcystins are toxins produced by cyanobacteria (blue-green algae) which, when ingested, can cause severe liver damage. Microcystins are produced by many species of cyanobacteria which are common to Alberta's Lakes, and are thought to be one of the most common cyanobacteria toxins. In Alberta, recreational guidelines for microcystin are set at 10 µg/L. Blue-green algae advisories are managed by Alberta Health Services. Recreating in algal blooms, even if microcystin concentrations are not above guidelines, is not recommended.

Microcystin levels in Lac La Nonne fell below the recreational guideline of 10 µg/L[4] during every sampling event in 2024. However, levels in August were elevated and suggest that areas of the lake may contain microcystin levels which could be harmful to human health. Recreating in or near cyanobacteria blooms should be avoided.

Table 1. Microcystin concentrations measured four times at Lac La Nonne in 2024.

Date	Microcystin Concentration (µg/L)
06/28/2024	0.32
07/29/2024	1.76
08/30/2024	6.49
Average	**2.86**

[4] Health Canada. 2022. Guidelines for Canadian Recreational Water Quality.

INVASIVE SPECIES

Dreissenid mussels pose a significant concern for Alberta because they impair the function of water conveyance infrastructure and adversely impact the aquatic environment. These invasive mussels can change lake conditions which can then lead to toxic cyanobacteria blooms, decrease the amount of nutrients needed for fish and other native species, and cause millions of dollars in annual costs for repair and maintenance of water-operated infrastructure and facilities. Spiny water flea pose a concern for Alberta because they alter the abundance and diversity of native zooplankton, as they are aggressive zooplankton predators. Through over-predation, they will impact higher trophic levels such as fish. They also disrupt fishing equipment by attaching in large numbers to fishing lines.

Monitoring for aquatic invasive species involved sampling with a 63 µm plankton net. This monitoring is designed to detect juvenile Dreissenid mussel veligers and spiny water flea. No mussels or spiny water flea were detected at Lac La Nonne in 2024.

Eurasian watermilfoil is a non-native aquatic plant that poses a threat to aquatic habitats in Alberta because it grows in dense mats preventing light penetration through the water column, reduces oxygen levels when the dense mats decompose, and outcompetes native aquatic plants. Eurasian watermilfoil can look similar to the native Northern watermilfoil, thus genetic analysis is ideal for suspect watermilfoil species identification.

Watermilfoil was collected from Lac la Nonne on June 6. The specimen was confirmed to be Northern Watermilfoil (*Myriophyllum sibiricum*).

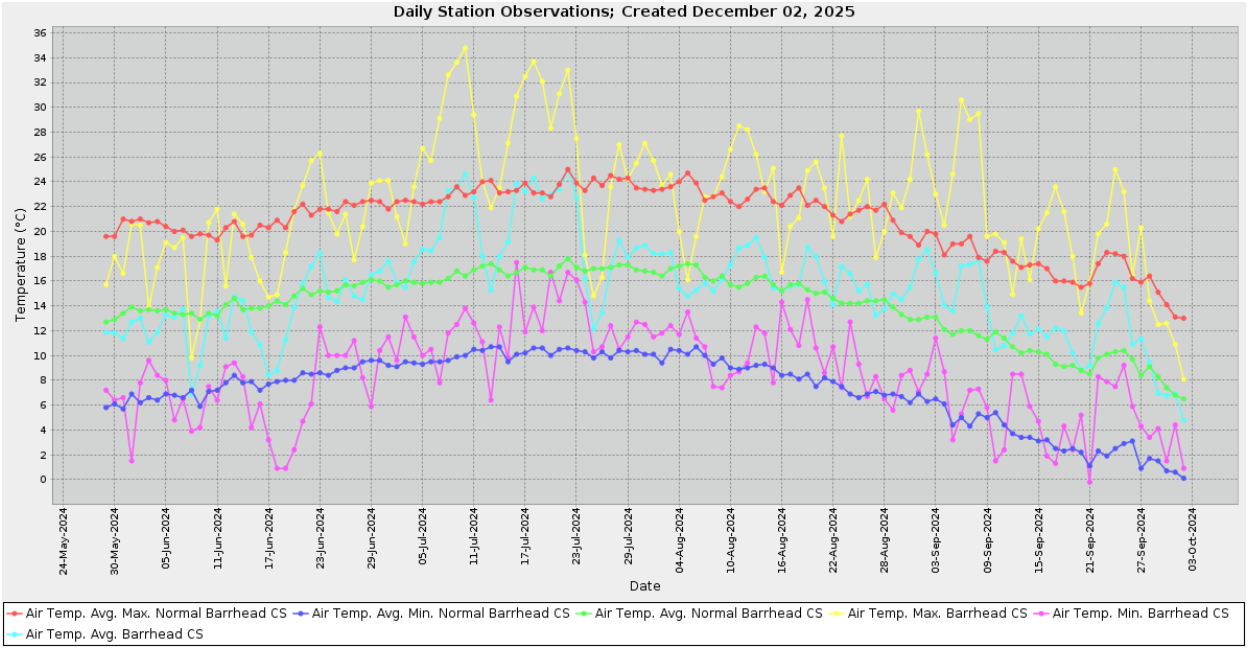
WEATHER AND LAKE STRATIFICATION

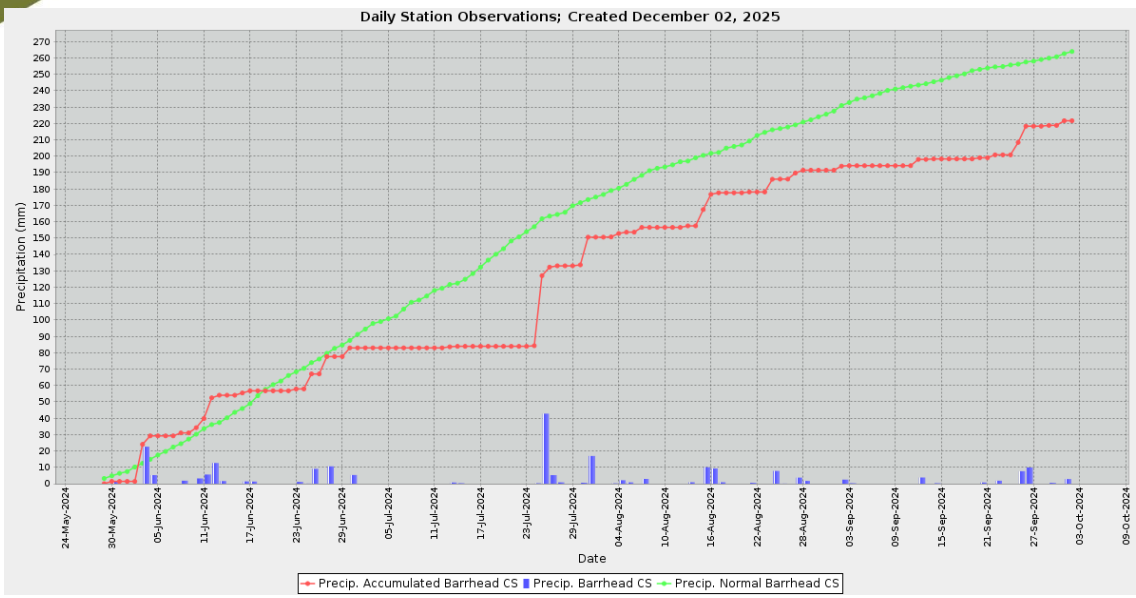
Air temperature will directly impact lake temperatures, and result in different temperature layers (stratification) throughout the lake, depending on its depth. Wind will also impact the degree to which a lake mixes, and how it will stratify. The amount of precipitation that falls within a lake's watershed will have important implications, depending on the context of the watershed and the amount of precipitation that has fallen. Solar radiation represents the amount of energy that reaches the earth's surface, and has implications for lake temperature & productivity.

In 2024, Lac la Nonne experienced a warmer and windier summer compared to normal, with about normal accumulated precipitation (Figure 5). Although it was warmer overall, the beginning of the sampling season was unseasonably cool, with the month of June falling below average temperatures, with the average temperature being 13.2°C. June 18 also broke the record for coolest temperature recorded at 0.9°C. July was the warmest month, with the average temperature being 19.7°C. 2024 also broke heat records on numerous days in July and September, including the hottest day recorded on July 10 at 34.8°C. August and September were warmer than average months, with the average temperature being 16.3°C and 12.8°C, respectfully.

Lac la Nonne received slightly less precipitation than it normally receives throughout the summer months. The actual precipitation in 2024 was 220 mm total, versus a normal amount of 260 mm (Figure 5).

Strong winds were also observed throughout the sampling season.





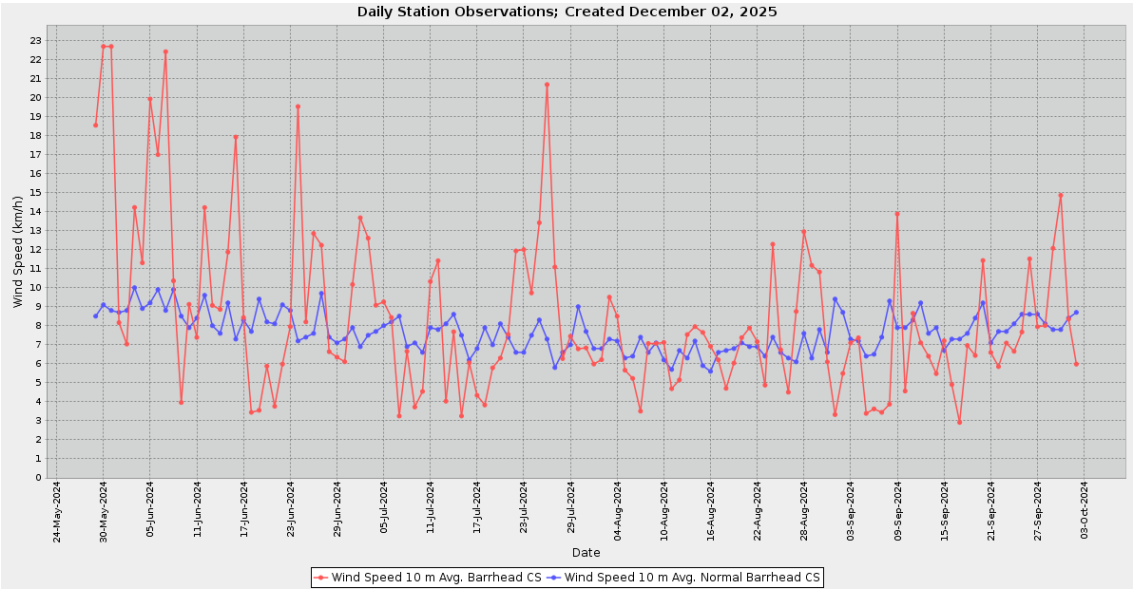


Figure 5. Air temperature (°C), wind speed (km/h), and precipitation (mm) measured from Barrhead CS weather station northwest of Lac la Nonne. Weather data provided by Agriculture, Forestry and Rural Economic Development, Alberta Climate Information Service (ACIS) https://acis.alberta.ca.

WATER LEVELS

There are many factors influencing water quantity. Some of these factors include the size of the lake's drainage basin, precipitation, evaporation, water consumption, ground water influences, and the efficiency of the outlet channel structure at removing water from the lake. Requests for water quantity monitoring should go through Alberta Environment and Parks Monitoring and Science division.

Water levels at Lac la Nonne have fluctuated between 664.4 masl and 662.3 masl (Figure 6). In 2024, water levels were at about 663.45 masl (Figure 7), which falls within the historical average (Figure 6).

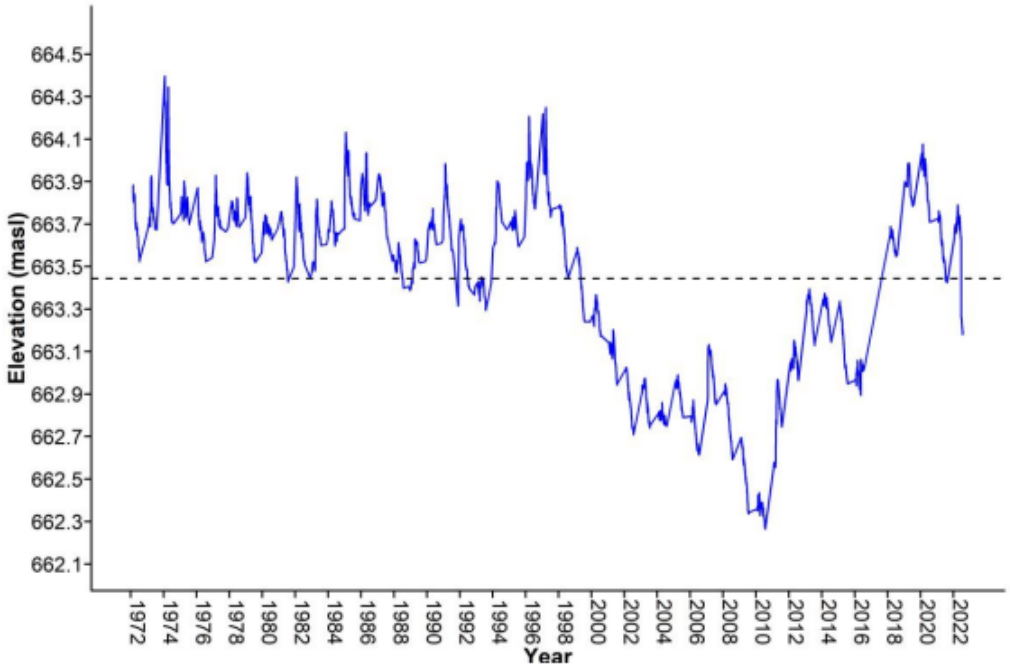


Figure 6. Historical water levels measured at Lac la Nonne Lake in metres above sea level (masl) from 1972-2022. Obtained from Environment Canada (https://wateroffice.ec.gc.ca/).

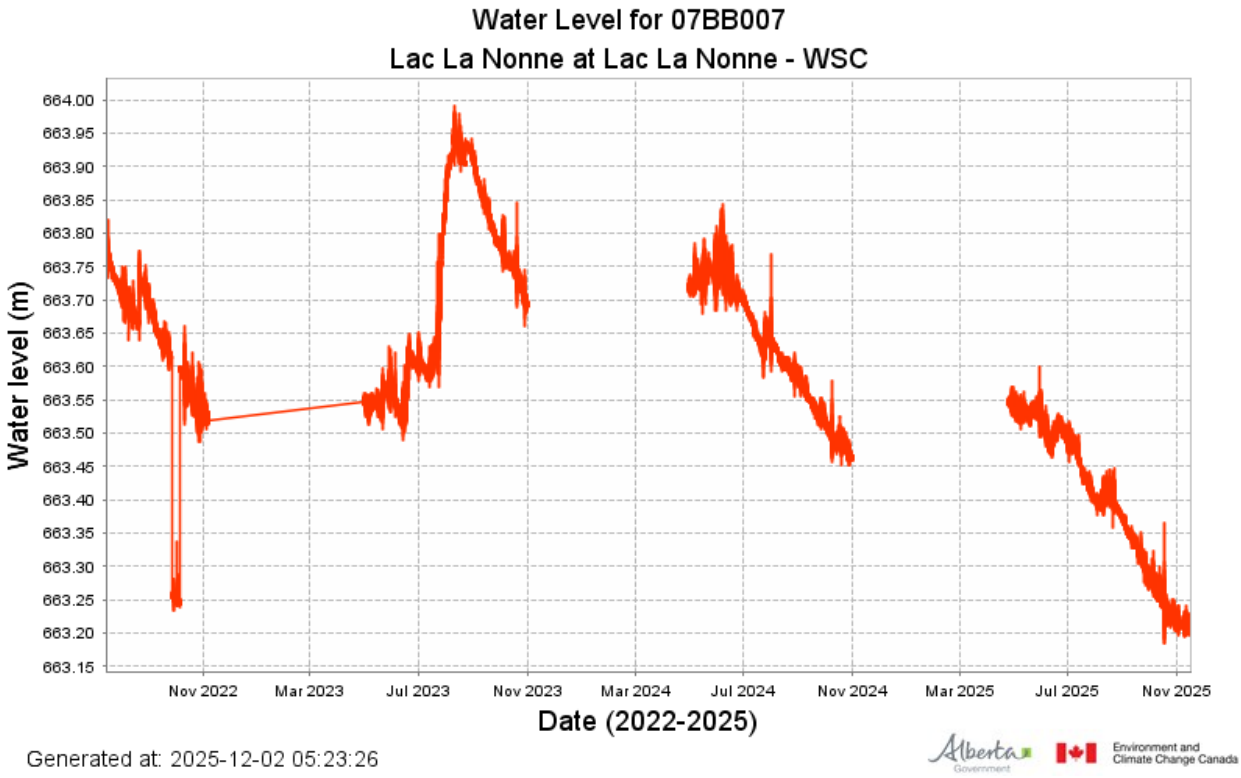


Figure 7. Water levels measured at Lac la Nonne in metres above sea level (masl) from 2022-2025. Obtained from Alberta Environment and Parks Real-Time Hydrometric Data (https://rivers.alberta.ca/).

Table 2. Average Secchi depth and water chemistry values for Lac La Nonne.

Parameter	1983	1988	1989	1990	2002	2003	2004
TP (µg/L)	300	168	175	252	167	149	149
TDP (µg/L)	191	104	128	-	98	101	111
Chlorophyll-a (µg/L)	108.0	55.5	28.0	120.7	43.0	28.2	45.7
Secchi depth (m)	0.60	1.89	2.28	1.47	0.70	2.08	2.39
TKN (mg/L)	2.6	2	1.7	-	3.4	1.6	1.9
NO_2-N and NO_3-N (µg/L)	13	20	18	10	3	24	42
NH_3-N (µg/L)	15	82	-	-	6	92	283
DOC (mg/L)	-	17	16	-	-	-	16
Ca^{2+} (mg/L)	30	33	32	30	-	-	-
Mg^{2+}(mg/L)	9	10	10	10	-	-	-
Na^{+} (mg/L)	17	17	17	15	-	21	22
K^{+} (mg/L)	9	10	10	10	-	11	12
SO_4^{2-} (mg/L)	12	13	14	11	-	13	14
Cl^{-} (mg/L)	2	3	3	3	-	4	5
$CO\sim_3^{2-}$ (mg/L)	-	-	-	-	-	9.8	-
HCO_3^{2-} (mg/L)	-	-	-	-	-	180.2	177.67
pH	8.7	8.38	8.37	9.33	-	8.77	8.11
Conductivity (µS/cm)	292	316	312	298	-	-	317
Hardness (mg/L)	112	123	118	117	-	-	-
TDS (mg/L)	162	175	173	170	-	188	174
Microcystin (µg/L)	-	-	-	-	-	-	-
Total Alkalinity (mg/L CaCO3)	138	149	151	150	-	161	145

Parameter	2008	2011	2014	2015	2020	2022	2024
TP (µg/L)	155	213	219	204	332	275	317
TDP (µg/L)	95	157	36	152	300	228	247
Chlorophyll-a (µg/L)	35.8	30.4	62.8	24.8	74.8	55.0	173.1
Secchi depth (m)	1.78	1.98	1.35	2.80	1.87	2.39	1.80
TKN (mg/L)	1.8	1.8	2.1	1.8	2.5	2.1	1.5
NO_2-N and NO_3-N (µg/L)	12	7	228	-	9	11	17
NH_3-N (µg/L)	79	-	-	-	63	46	86
DOC (mg/L)	16	16	18	17	18	17	16
Ca^{2+} (mg/L)	-	-	-	28	36	36	37
Mg^{2+}(mg/L)	-	-	-	12	12	12	14
Na^{+} (mg/L)	23	24	27	26	27	26	29
K^{+} (mg/L)	12	12	15	14	15	15	16
SO_4^{2-} (mg/L)	8	7	14	16	18	20	17
Cl^{-} (mg/L)	5	6	7	7	10	10	10
$CO\sim_3^{2-}$ (mg/L)	13.5	7.8	19.8	5.8	8	13.2	4.3
HCO_3^{2-} (mg/L)	173	174.5	154.25	190	180	190	216.67
pH	8.65	8.77	8.99	8.57	8.63	8.64	8.33
Conductivity (µS/cm)	330	337	348	364	378	392	410
Hardness (mg/L)	-	-	-	-	140	140	147
TDS (mg/L)	184	180	214	204	218	228	237
Microcystin (µg/L)	1.09	0.79	1.69	3.22	2.35	3.86	2.86
Total Alkalinity (mg/L CaCO3)	157	157	160	170	160	180	180

Table 3. Concentrations of metals measured in Lac La Nonne. The CCME heavy metal Guidelines for the Protection of Freshwater Aquatic Life (unless otherwise indicated) are presented for reference. Note that metal sample collection method changed in 2016 from composite to single surface grab at the profile location.

Metals	2003	2004	2014	2015	Guidelines
Aluminum (µg/L)	-	16.95	18.8	26.33	100[a]
Antimony (µg/L)	-	3.034	0.054	0.059	/
Arsenic (µg/L)	-	1.52	0.97	1	5
Barium (µg/L)	-	48.7	43.5	62.5	/
Beryllium (µg/L)	-	0.0082	0.004	0.004	100[c,d]
Bismuth (µg/L)	-	5e-04	5e-04	0.0052	/
Boron (µg/L)	-	56.7	50.2	66.2	1500
Cadmium (µg/L)	-	0.009	0.012	0.001	0.36[b]
Chromium (µg/L)	-	0.24	0.45	0.2733	/
Cobalt (µg/L)	-	0.09605	0.02	0.037	500, 1000[c,d]
Copper (µg/L)	-	0.53	0.26	0.303	4[b]
Iron (µg/L)	-	5.25	18.1	19.97	300
Lead (µg/L)	0.163	0.112	0.041	0.023	7[b]
Lithium (µg/L)	-	13.55	11.6	16.03	2500[d]
Manganese (µg/L)	-	34.1	20.1	79.57	130[e]
Molybdenum (µg/L)	-	0.236	0.109	0.121	73
Nickel (µg/L)	-	0.165	0.004	0.183	150[b]
Selenium (µg/L)	-	0.575	0.1	0.03	1
Silver (µg/L)	-	0.0651	0.001	0.0017	0.25
Strontium (µg/L)	-	153	169	178.7	/
Thallium (µg/L)	-	0.5001	0.0016	0.0013	0.8
Thorium (µg/L)	-	0.002	0	0.002	/
Tin (µg/L)	-	0.05	0.02	0.03	/
Titanium (µg/L)	-	0.97	1.44	2.06	/
Uranium (µg/L)	-	0.164	0.106	0.114	15
Vanadium (µg/L)	-	0.429	0.32	0.233	100[c,d]
Zinc (µg/L)	-	7.35	0.9	0.32	30[f]

Values represent means of total recoverable metal concentrations.
[a] Based on pH ≥ 6.5
[b] Based on 2016 avg. water hardness (as $CaCO_3$) with CCME equation
[c] Based on CCME Guidelines for Agricultural use (Livestock).
[d] Based on CCME Guidelines for Agricultural Use (Irrigation).
[e] Based on CCME Manganese variable calculation (https://ccme.ca/en/chemical/129#_aql_fresh_concentration) using 2016 avg. water hardness (as $CaCO_3$) and avg. pH
[f] Based on 2016 avg. water hardness (as $CaCO_3$), avg. pH, and avg. DOC with CCME equation
A forward slash (/) indicates an absence of data or guidelines.

LONG TERM TRENDS

Trend analysis was conducted on the parameters total phosphorus (TP), chlorophyll-*a*, total dissolved solids (TDS), and Secchi depth to look for changes over time in Lac La Nonne. In sum, a significant increasing trend was detected in TP and total dissolved solids. No significant trend was detected in chlorophyll-*a* or Secchi depth. Data is presented below as both line and box-and-whisker plots. Detailed methods are available in the ALMS Guide to Trend Analysis on Alberta Lakes.

Table 4. Summary table of trend analysis on Lac La Nonne Lake data from 1983 to 2024.

Parameter	Date Range	Direction of Significant Change
Total Phosphorus	1983-2024	Increasing
Chlorophyll-*a*	1983-2024	No Change
Total Dissolved Solids	1983-2024	Increasing
Secchi Depth	1983-2024	No Change

Definitions

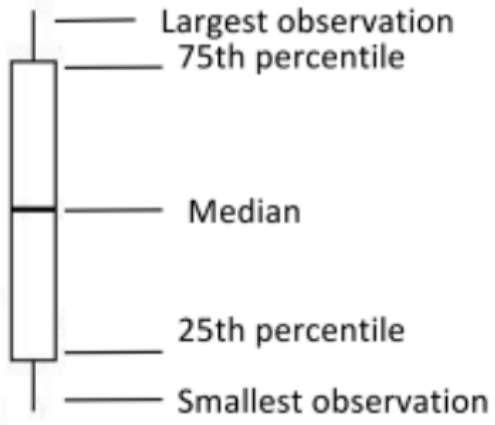
Median: the value in a range of ordered numbers that falls in the middle.

Trend: a general direction in which something is changing.

Monotonic trend: a gradual change in a single direction.

Statistically significant: The likelihood that a relationship between variables is caused by something other than random chance. This is indicated by a p-value of <0.05. Variability: the extent by which data is inconsistent or scattered.

Box and Whisker Plot: a box-and-whisker plot, or boxplot, is a way of displaying all of our annual data. The median splits the data in half. The 75th percentile is the upper quartile of the data, and the 25th percentile is the lower quartile of the data. The top and bottom points are the largest and smallest observations.



Total Phosphorus (TP)

Trend analysis of TP over time showed it has significantly increased in Lac La Nonne since 1983 (Tau = 0.4185, $p < 0.001$).

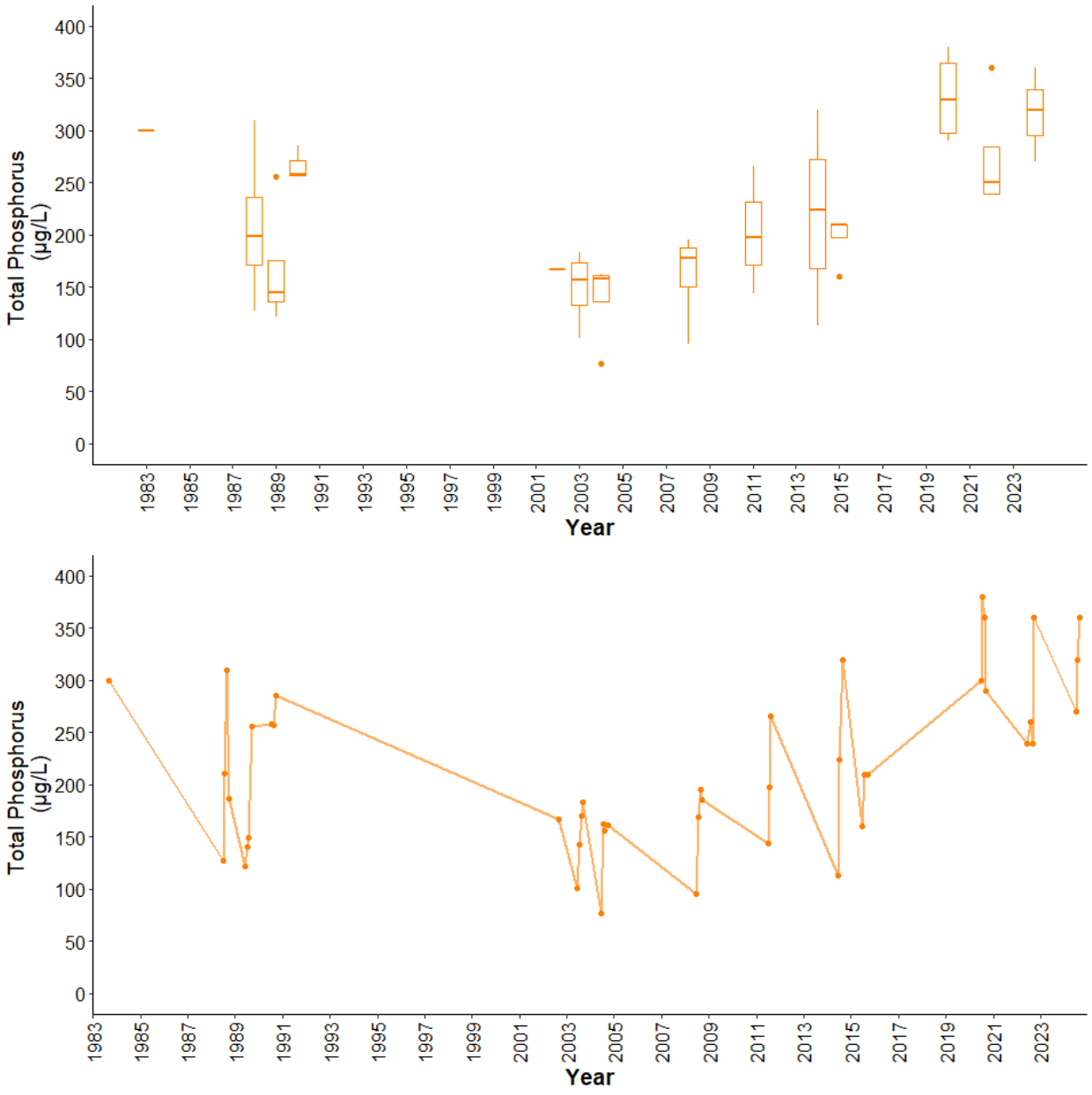


Figure 7. Monthly total phosphorus (TP) concentrations measured between June and September over the long term sampling dates between 1983 and 2024 (n = 46). The value closest to the 15th day of the month was chosen to represent the monthly value in cases with multiple monthly samples.

Chlorophyll-*a*

Trend analysis of chlorophyll-*a* showed no significant change in Lac La Nonne from 1983-2024 (Tau = -0.0079, *p* = 0.9718).

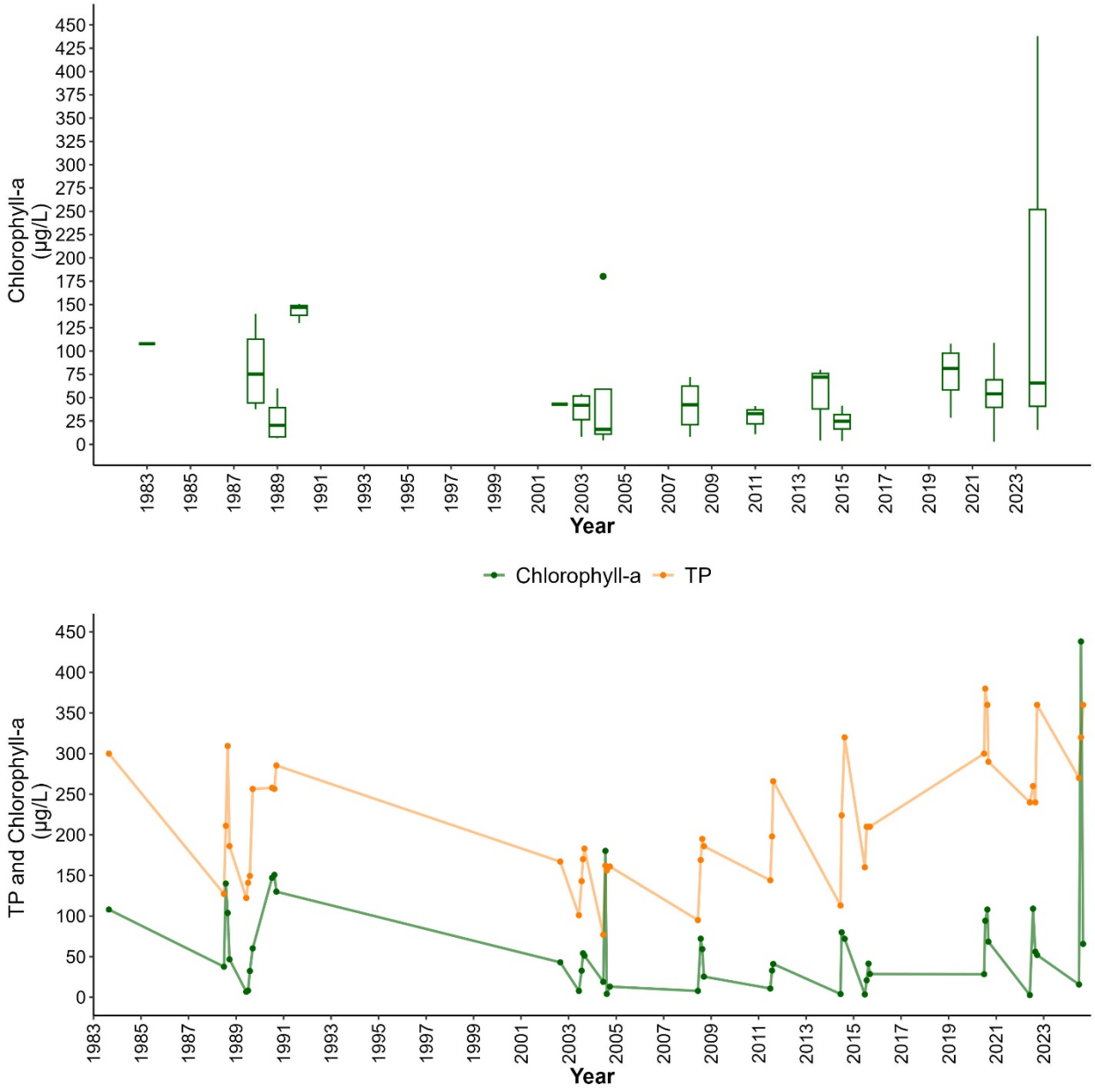


Figure 8. Monthly chlorophyll-*a* concentrations measured between June and September over the long term sampling dates between 1983 and 2024 (n = 46). The value closest to the 15th day of the month was chosen to represent the monthly value in cases with multiple monthly samples. Line graph is overlain by TP concentrations.

Total Dissolved Solids (TDS)

Trend analysis of TDS over time showed it has significantly increased in Lac La Nonne since 1983 (Tau = 0.7833, $p < 0.001$).

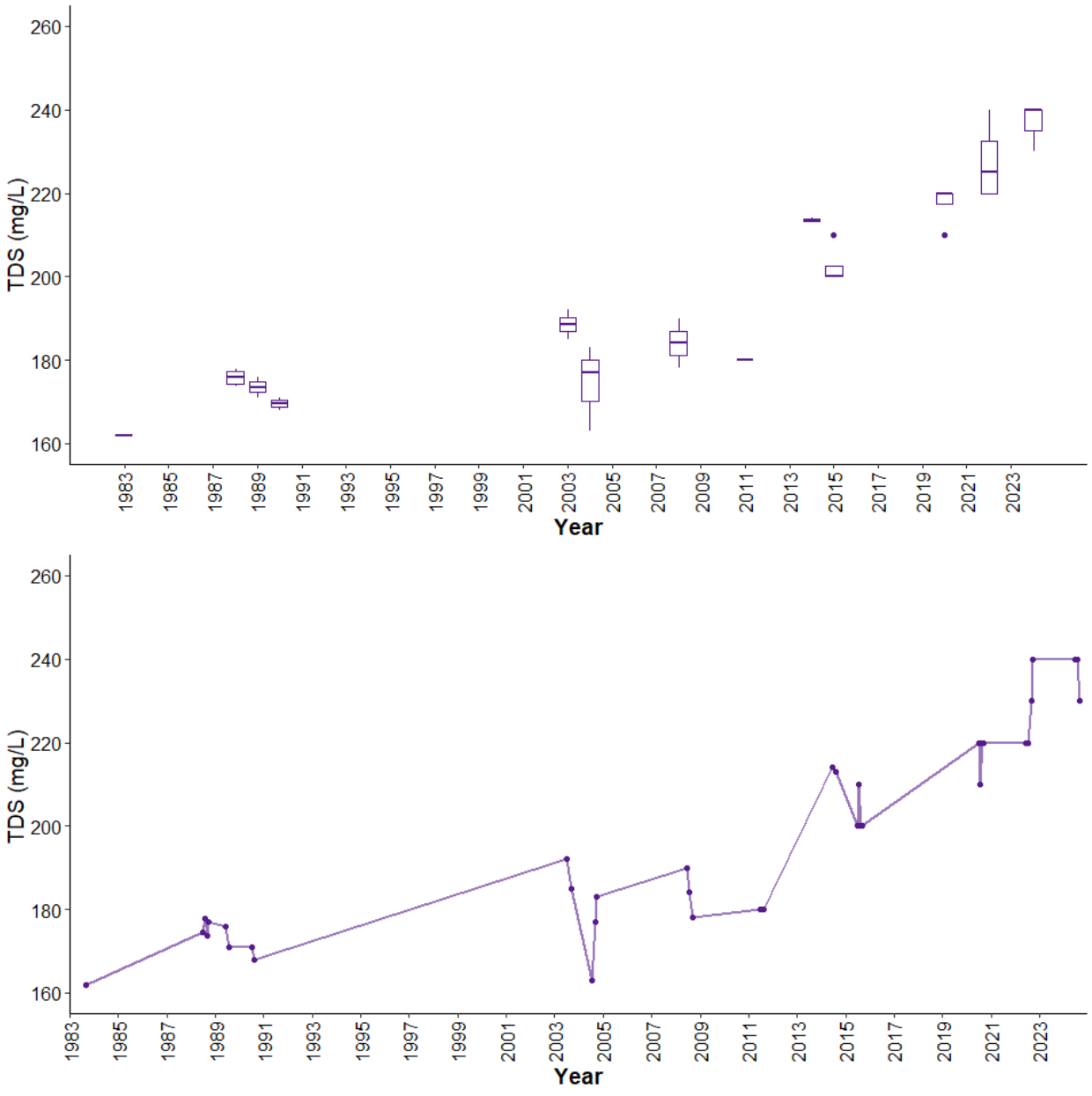


Figure 9. Monthly TDS values measured between June and September over the long term sampling dates between 1983 and 2024 (n = 36). The value closest to the 15th day of the month was chosen to represent the monthly value in cases with multiple monthly samples.

Trend analysis of major ions at Lac La Nonne indicates that all ions are increasing significantly (Figure 10). As many ions are moving in the same direction, it is likely that evaporative loss is driving the change in total dissolved solids in Lac la Nonne.

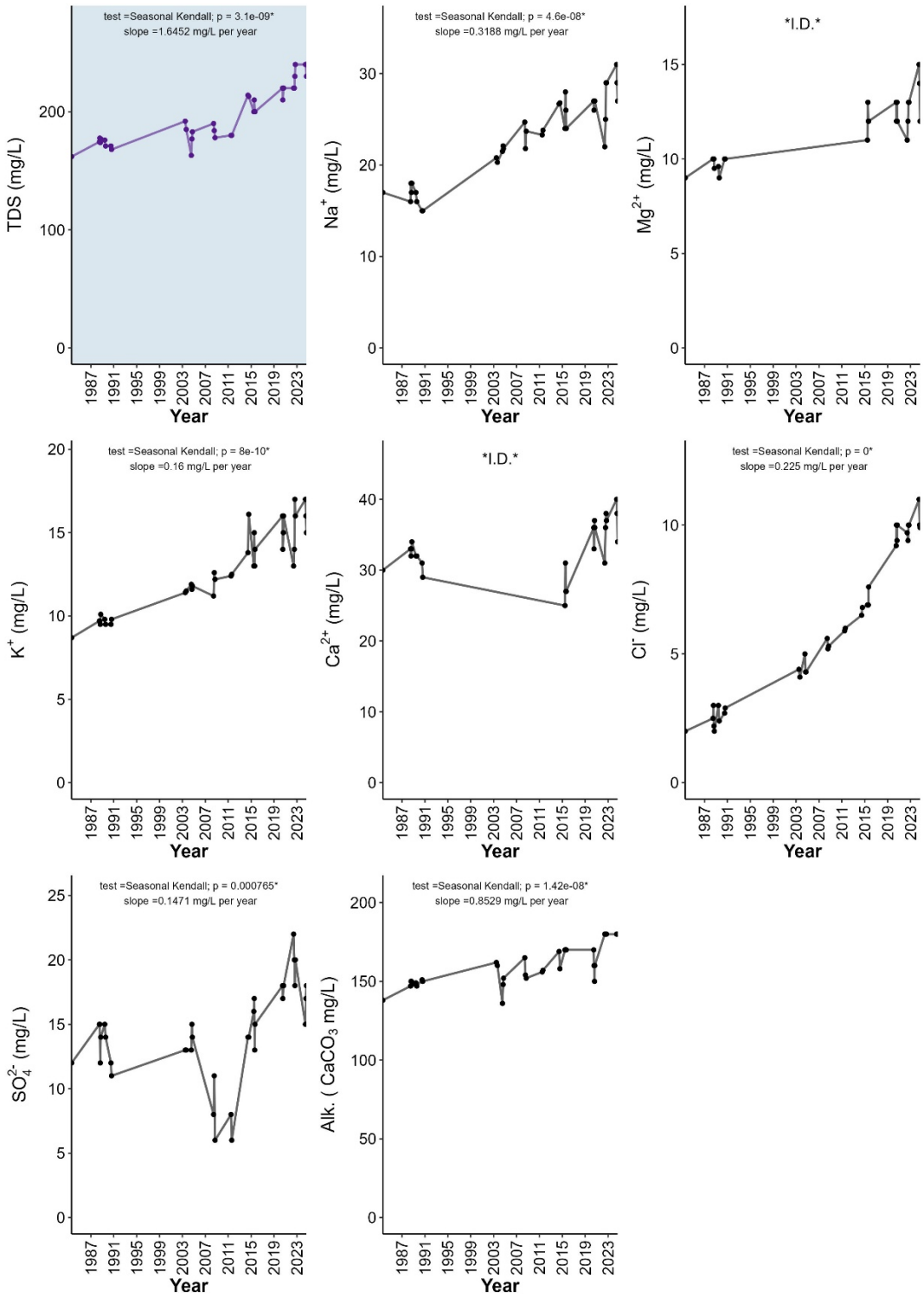


Figure 10. Concentrations of TDS (top left, blue panel), major ions (sodium = Na^+, magnesium = Mg^{2+}, potassium = K^+, calcium = Ca^{2+}, chloride = Cl^-, sulphate = SO_4^{2-}), and total alkalinity (Alk., as mg/L $CaCO_3$) measured monthly between June and September on sampling dates between 1983 and 2024. Also represented is the monotonic trend results for each parameter; test used (MK = Mann Kendall, SK = Seasonal Kendall), significance of test (*p*; assessed as significance when $p < 0.05$, marked with '*' if significant), and the slope of the trend. Test selection follows method outline in the ALMS Guide to Trend Analysis on Alberta Lakes. Note that some ions had insufficient data (I.D.) therefore trends were not calculated. The value closest to the 15th day of the month was chosen to represent the monthly value in cases with multiple monthly samples.

Secchi Depth

Trend analysis of Secchi depth over time showed no significant change in Lac La Nonne since 1983 (Tau = 0.154, p = 0.1561).

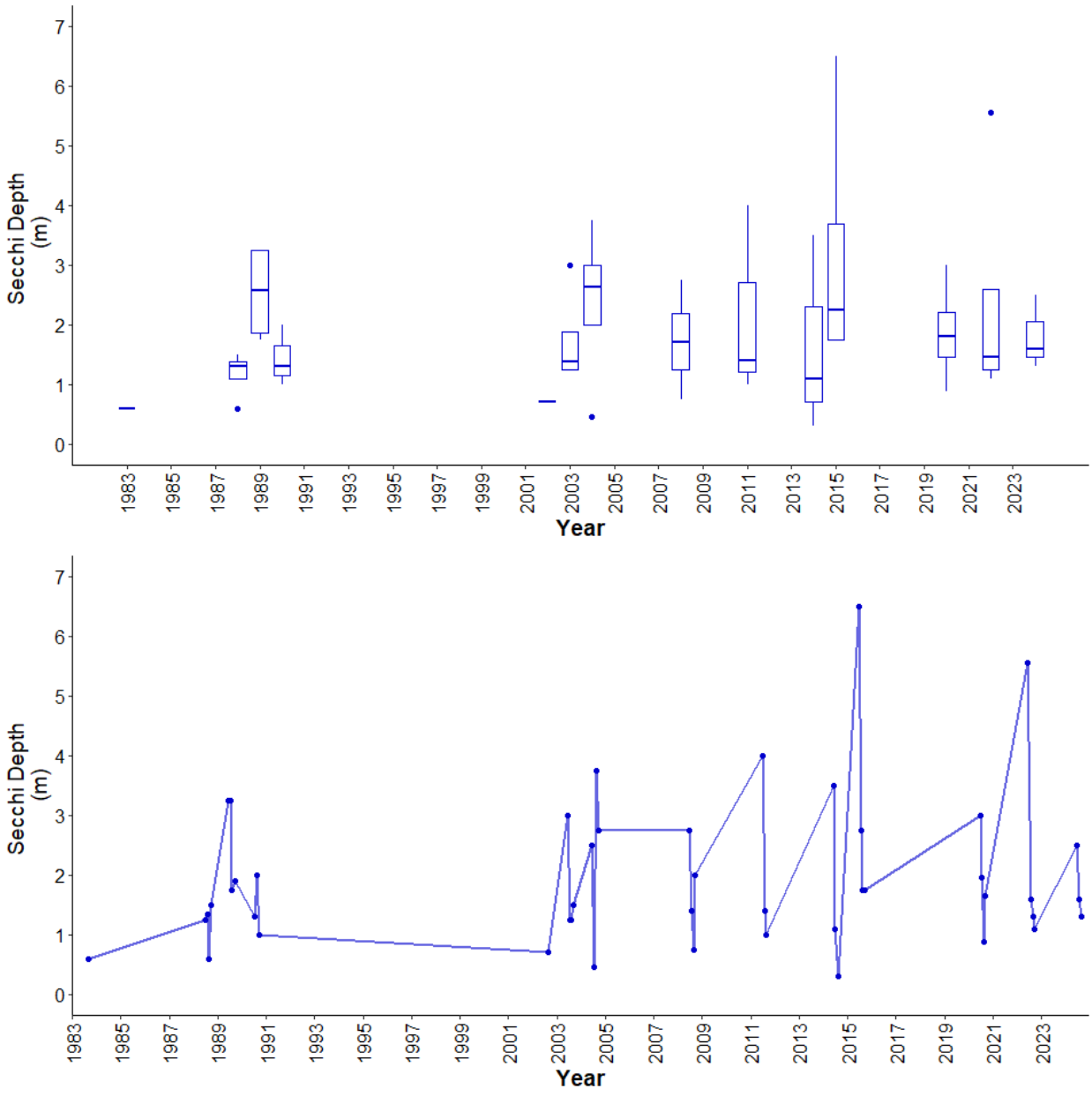


Figure 11. Monthly Secchi depth values measured between June and September over the long term sampling dates between 1983 and 2024 (n = 46). The value closest to the 15th day of the month was chosen to represent the monthly value in cases with multiple monthly samples.

Table 5. Results of trend tests using total phosphorus (TP), chlorophyll-*a*, total dissolved solids (TDS), and Secchi depth data from June to September for sampled years from 1983-2024 on Lac La Nonne Lake data.

Definition	Unit	Total Phosphorus (TP)	Chlorophyll-*a*	Total Dissolved Solids (TDS)	Secchi Depth
Statistical Method	-	Seasonal Kendall	Seasonal Kendall	Seasonal Kendall	Seasonal Kendall
The strength and direction (+ or -) of the trend between -1 and 1	Tau	0.4185	-0.0079	0.7833	0.154
The extent of the trend	Slope (units per Year)	3.5082	-0.001	1.6452	0.008
The statistic used to find significance of the trend	Z	3.6363	-0.0353	5.9247	1.4184
Number of samples included	n	46	46	36	46
The significance of the trend	*p*	< 0.001*	0.9718	< 0.001*	0.1561

*$p < 0.05$ is significant within 95%