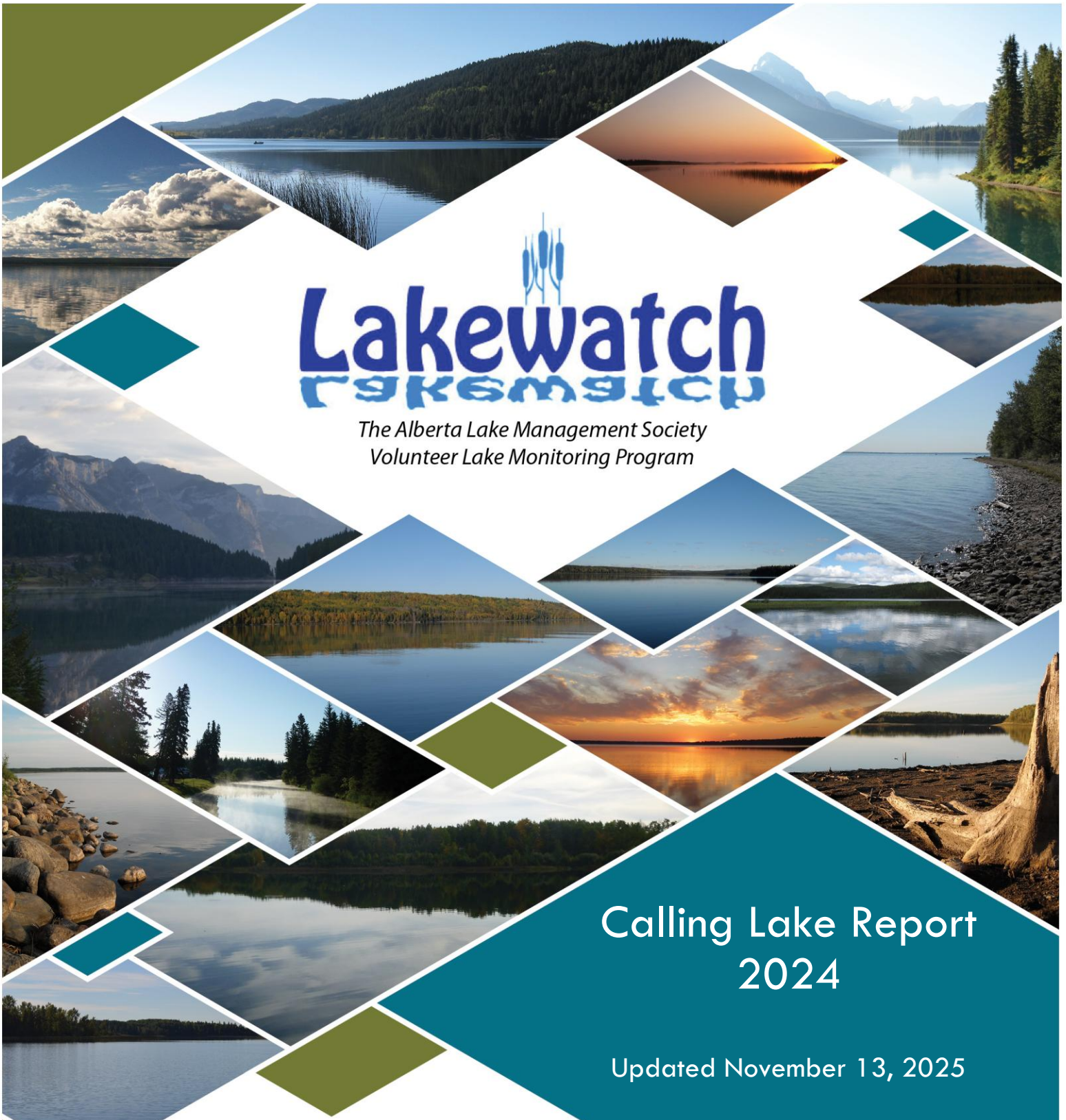


Lakewatch

The Alberta Lake Management Society
Volunteer Lake Monitoring Program

Calling Lake Report 2024

Updated November 13, 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

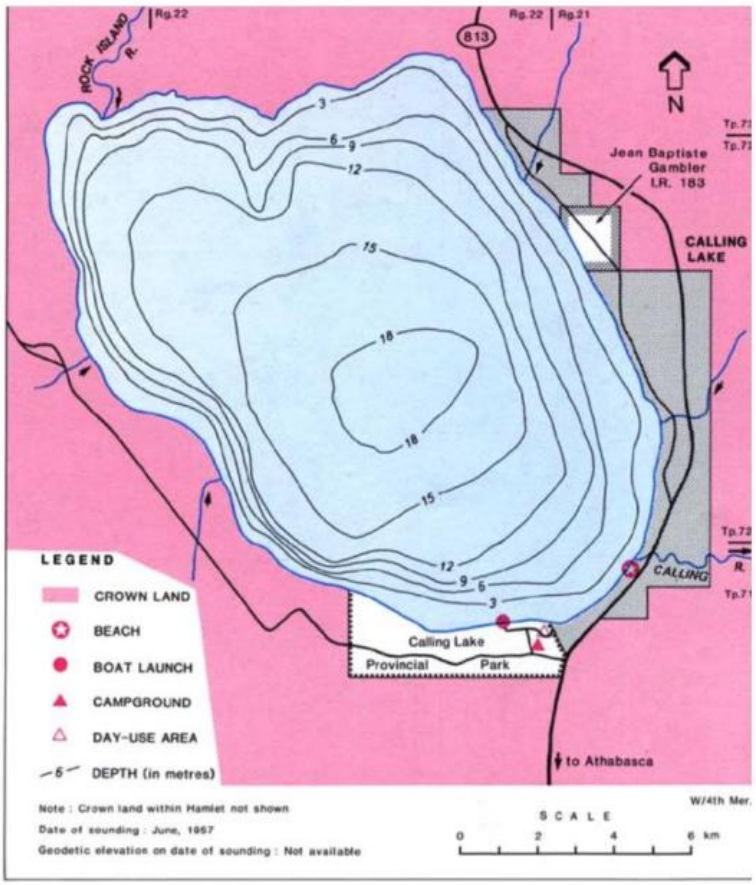
The LakeWatch program is made possible through the dedication of its volunteers. A special thanks to Owen Larson, Bert, and Ron for their commitment to collecting data at Calling Lake. We would also like to thank Katherine Cundict and Jordyn Lajeunesse, who were summer technicians in 2024. Executive 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

CALLING LAKE

Calling Lake is located in the Municipal District of Opportunity No. 17, approximately 200 km north of the city of Edmonton, in the Athabasca River watershed. The hamlet of Calling Lake and the Jean Baptiste Gambler 183 (part of Bigstone Cree Nation) are located on the lake's eastern shore.

The lake's name is a translation of the Cree words ᑭᑐᐤ ᐊᑲᐦᐃᑲᐣ (Kitow Sâkahikan) Sâkâhikan which refers to the loud noises heard when the lake freezes over.[1] The Calling Lake area has been inhabited for thousands of years; archaeological digs have discovered remnants of a hunter-gatherer band dating as far back as 6000 B.C.[2] In recent history, the area was inhabited by the Woodland Cree and early fur traders, who used the lake to catch their winter supply of fish.[3] Calling Lake Provincial Park was established in 1971 on 741 ha of land on the southern shore of the lake.



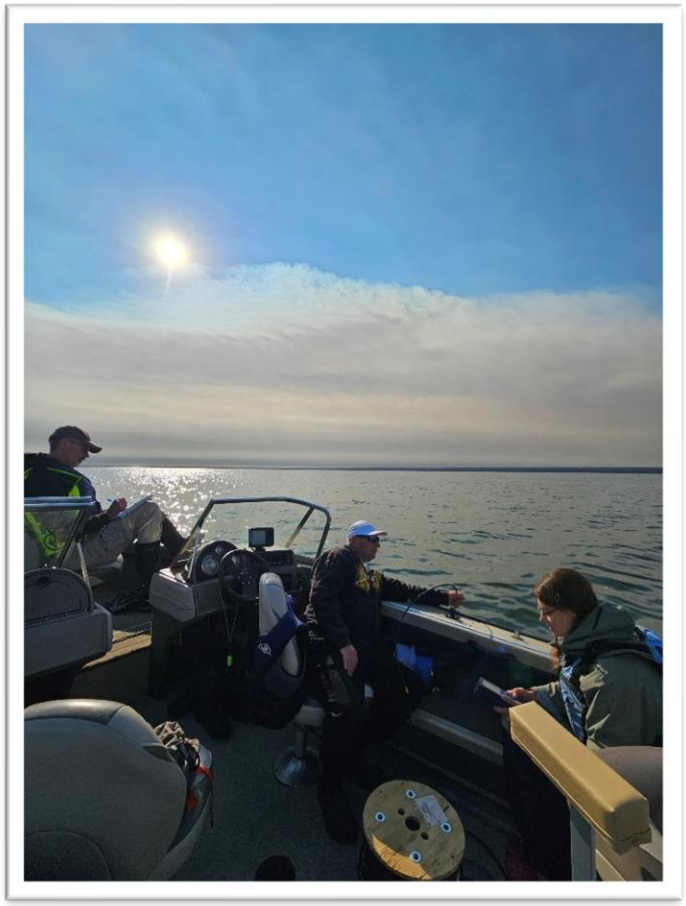
Bathymetric map of Calling Lake obtained from Mitchell and Prepas, 1990.

Calling Lake lies within the central mixedwood subregion of the boreal forest natural region.[4] A large portion of Calling Lake's drainage basin is covered by wetlands, with the remainder forested with a mixture of aspen, balsam poplar, white spruce, black spruce, and jack pine. Only a few small areas southwest of the lake are being farmed. The main human activities in the watershed include forestry and oil and gas exploration and extraction. Calling Lake Provincial Park is a popular summer vacation area used for camping, fishing, motor boating, swimming, and canoeing.

The main sport fish found in the lake are northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), and burbot (*Lota lota*).[5]

Calling Lake has a large drainage basin covering an area of 1,092 km^2, mostly to the north of the lake.[6] The main outlet, the Calling River, flows from the southeast end of the lake to the Athabasca River, approximately 25 km downstream. Calling Lake has a surface area of 138 km^2, making it one of Alberta's larger lakes, with a moderate maximum depth of 18.3 m in the centre of the basin.

Historically, the Municipal District of Opportunity No. 17, on behalf of the Hamlet of Calling Lake, had approval to operate two wastewater lagoons – one of which emptied twice a year into Two Mile Creek which flows into Calling Lake. This practice was followed from 1984 to about 2022.[7] It should be noted that human waste is very high in nutrients, including nitrogen and phosphorus, including harmful bacteria.[8]



Sampling at Calling Lake, September 2024. Photo by Brittany Onysyk.

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[1] https://callinglake.ca/history/stepping-through-time/
[2] Athabasca Historical Society, D. Gregory and Athabasca University. (1986). Athabasca Landing: An illustrated history. Athabasca Hist. Soc., Athabasca.
[3] Finlay, J. and C. Finaly. (1987). Parks in Alberta: A guide to peaks, ponds, parklands & prairies. Hurtig Publ., Edmonton.
[4] Strong, W.L. and K.R. Leggat. (1981). Ecoregions of Alberta. Alta. En. Nat. Resour., Resour. Eval. Plan. Div., Edmonton.
[5] Angler's Atlas. https://www.anglersatlas.com/place/101830/calling-lake
[6] Mitchell, P. and E. Prepas. (1990). Atlas of Alberta Lakes, University of Alberta Press. Retrieved from http://sunsite.ualberta.ca/projects/alberta-lakes/
[7] https://callinglake.ca/calling-lake-society/watermatters/
[8] https://www.sciencedirect.com/science/article/pii/S0048969724074631
[9] A Brief Introduction to Limnology. ALMS. https://alms.ca/wp-content/uploads/2017/11/Lakewatch-Report-Limnology-Section.pdf

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 Calling Lake was 46 µg/L (Table 2), falling into the eutrophic, or high productivity, trophic classification. This value falls within the range of historical averages. TP ranged from a minimum of 21 µg/L on July 10 to a maximum of 71 µg/L on September 6 (Figure 1).

The average chlorophyll-*a* concentration in 2024 was 19.6 µg/L (Table 2), also falling into the eutrophic trophic classification.[9] Following a similar pattern to TP, chlorophyll-*a* was lowest at 6.8 µg/L on July 10 and peaked at 49.1 µg/L on September 6 (Figure 1).

The average total Kjeldahl nitrogen (TKN) concentration in 2024 was 0.7 mg/L (Table 2), remaining relatively stable at about 0.5 mg/L from June to August, and increasing to just over 1 mg/L in September (Figure 1).

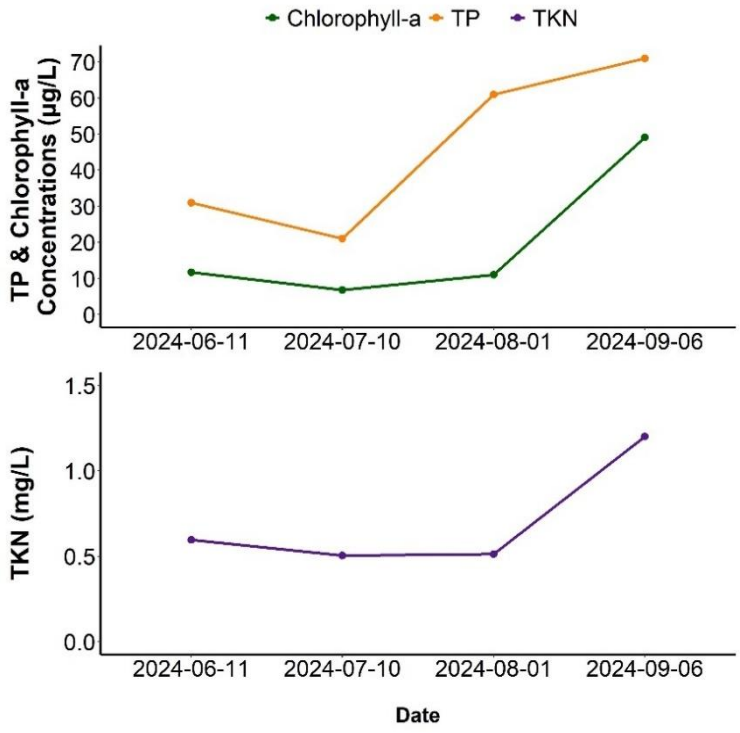

Figure 1. Total Phosphorus, Chlorophyll-*a*, and Total Kjeldahl Nitrogen concentrations measured over the course of the summer at Calling Lake in 2024.

Average pH was measured as 7.71 in 2024, buffered by low alkalinity (92 mg/L $CaCO_3$) and bicarbonate (112 mg/L HCO_3). Aside from bicarbonate, only calcium was appreciably higher than all other major ions, and all ions together contributed to a low conductivity of 175 µS/cm (Figure 2, top; Table 2). Calling Lake displays lower ion levels compared to other LakeWatch lakes sampled in 2024 (Figure 2, bottom).

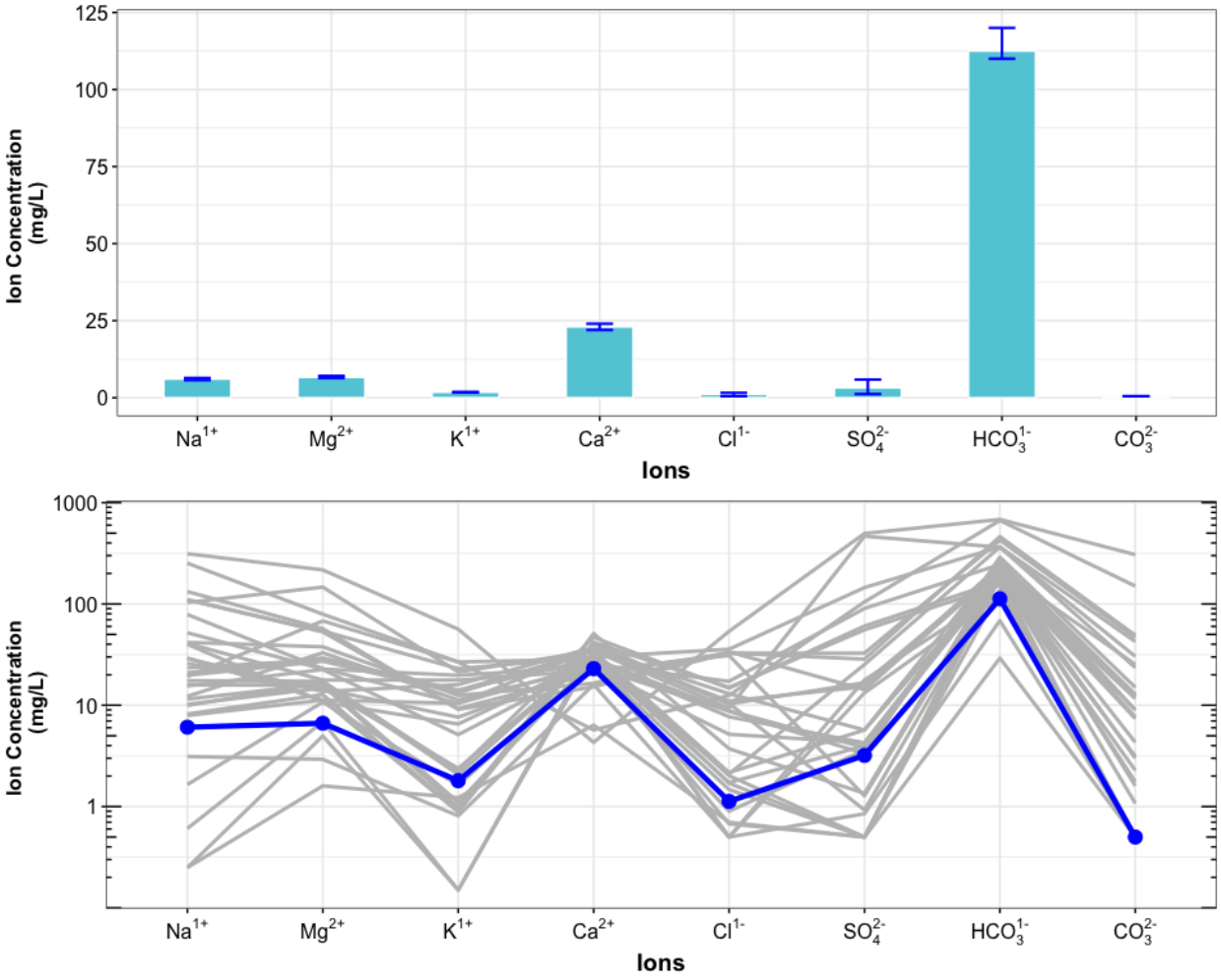

Figure 2. Average levels of cations (sodium = Na^{1+}, magnesium = Mg^{2+}, potassium = K^{1+}, calcium = Ca^{2+}) and anions (chloride = Cl^{1-}, sulphate = SO_4^{2-}, bicarbonate = HCO_3^{1-}, carbonate = CO_3^{2-}) from 4 measurements over the course of the summer at Calling Lake. Top) bars indicate range of values measured, and bottom) Schoeller diagram of average ion levels at Calling Lake (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 Calling Lake in 2024. Table 3 displays historical metal concentrations, where available.

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 Calling Lake in 2024 was 5.84 m, corresponding to an average Secchi depth of 2.92 m (Table 2). Euphotic depth varied over the season, ranging from as shallow as 5 m on July 10 to as deep as 7 m on June 11 (Figure 3).

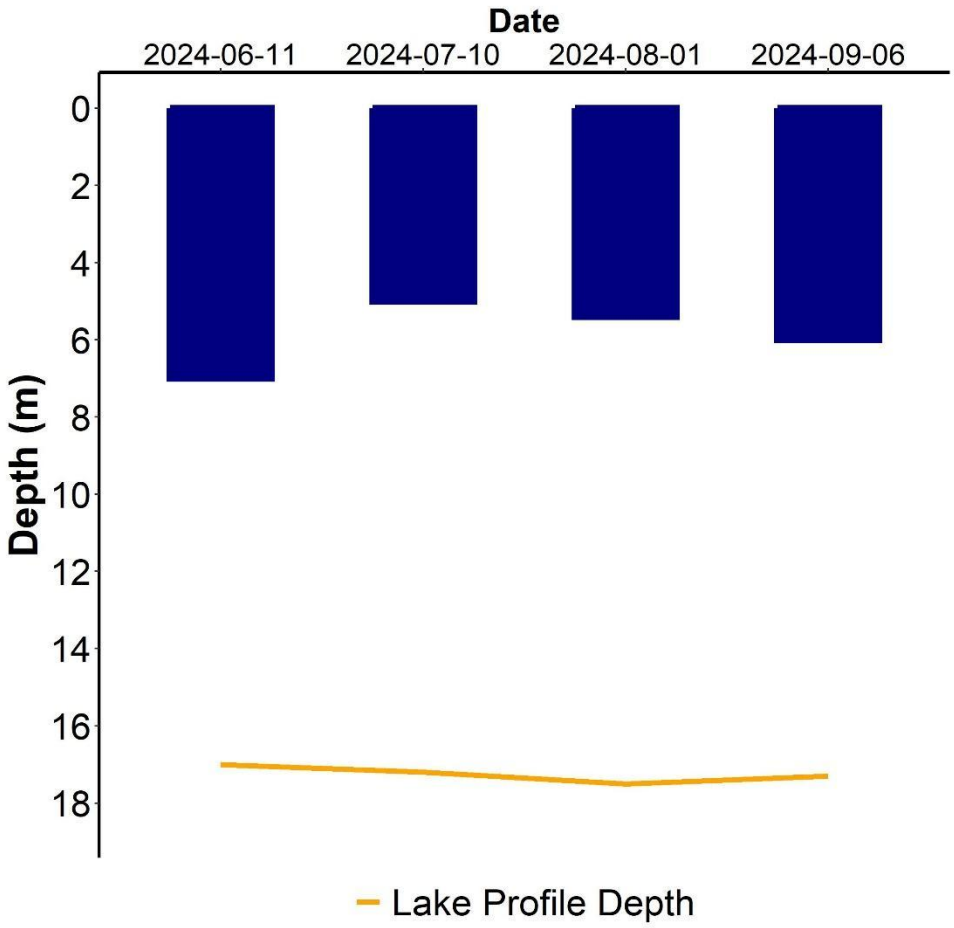

Figure 3. Euphotic depth values measured four times over the course of the summer at Calling Lake in 2024.

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 (water temperature changes by more than one degree within one meter) 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 Calling Lake varied throughout the summer, with the July 10 sampling event having the warmest temperatures at 21.45°C (Figure 4). The lake showed only minor stratification on the July 10 sampling trip, where the temperature decreased by more than one degree from 1 m to 2 m, and then remained relatively constant until 12 m. The lake was well mixed during all other sampling events, reflected by a steady temperature Profile to the bottom of the lake (17.5 m) (Figure 4).

Calling Lake was well oxygenated in the surface waters on all sampling dates, measuring above the CCME guidelines of 6.5 mg/L dissolved oxygen[10] (Figure 4). The June 11 sampling event had the highest dissolved oxygen levels at 11.12 mg/L near the surface. During the July 10 sampling event, oxygen levels dropped then rose again from 0-2 m, indicating a algae bloom may have been occurring near the surface. Due to the lake being poorly stratified (well mixed), oxygen levels remained relatively stable during all sampling events, with the exception of July 10. This sampling trip may have occurred following a warm and/or relatively calm period in the summer. In deeper waters, dissolved oxygen concentrations dropped significantly, with levels approaching 0 mg/L during the July and September sampling events.

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

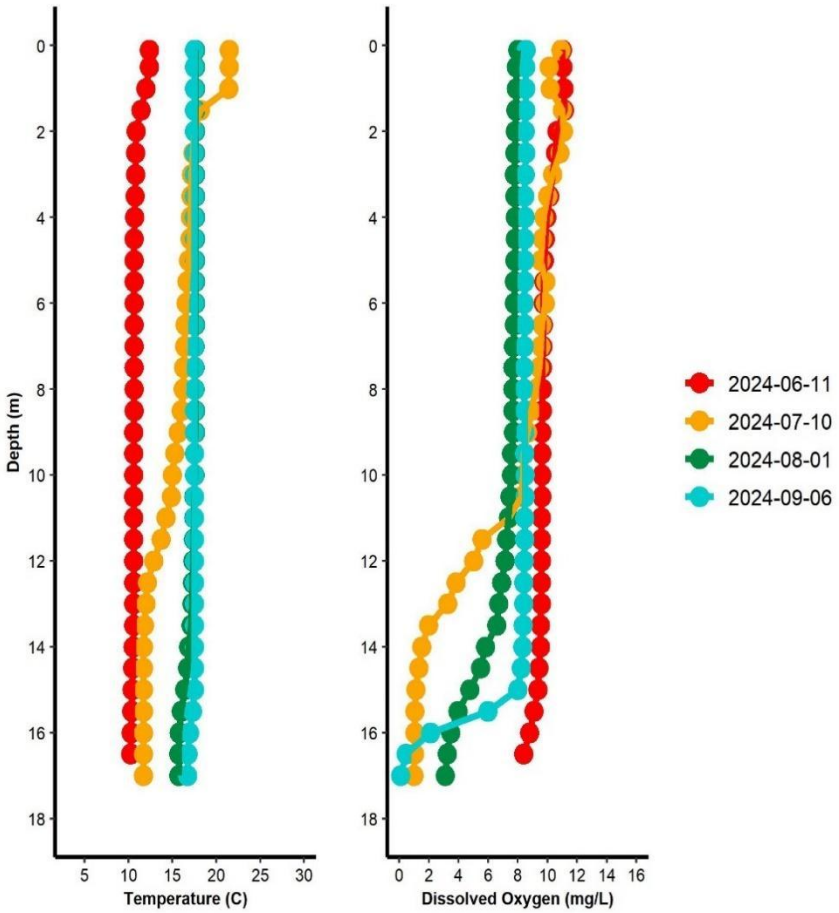


Figure 4. Temperature (°C) and dissolved oxygen (mg/L) profiles for Calling Lake measured four times over the course of the summer of 2024.

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 Calling Lake fell below the recreational guideline of 10 µg/L[11] during every sampling event in 2024. In addition, microcystin levels during the June 11, July 10, and August 1 sampling events were below the laboratory detection limit of 0.10 µg/L. A value of 0.05 µg/L is assigned to each date that is below detection in order to calculate an average. Even though low levels of microcystin were detected, caution should always be observed when recreating around cyanobacteria.

Table 1. Microcystin concentrations measured four times at Calling Lake in 2024.

Date	Microcystin Concentration (µg/L)
06/11/2024	< 0.1
07/10/2024	< 0.1
08/01/2024	< 0.1
09/06/2024	0.19
Average	0.09

[11] 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 at three sample sites to look for juvenile mussel veligers and spiny water flea in each lake sampled. In 2024, no mussels or spiny water flea were detected at Calling Lake.

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.

No suspect watermilfoil was observed or collected from Calling Lake in 2024.

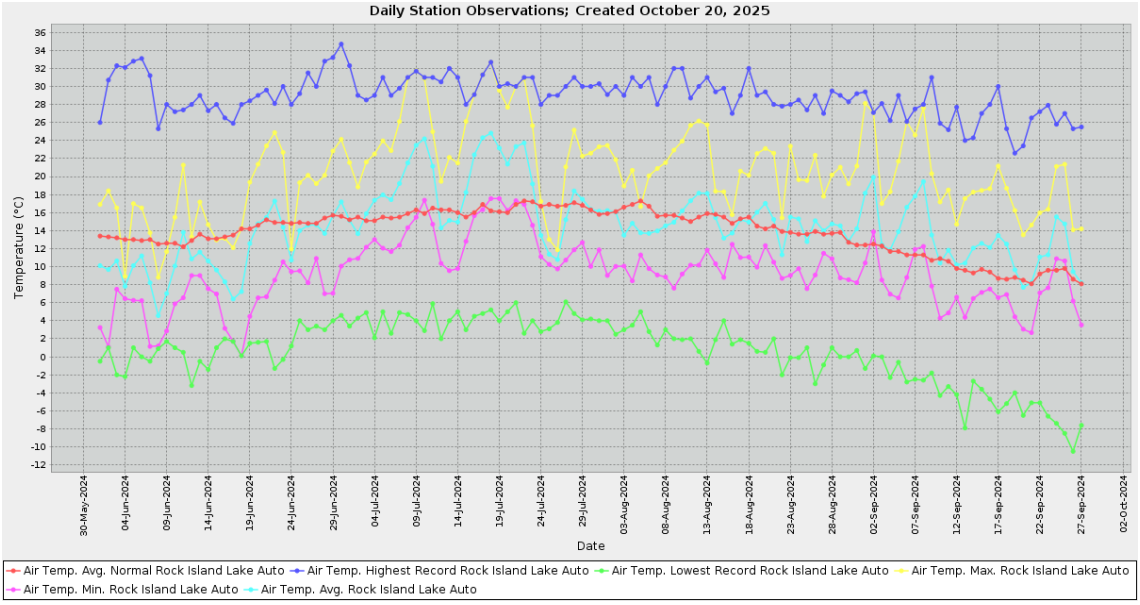
WEATHER AND LAKE STRATIFICATION

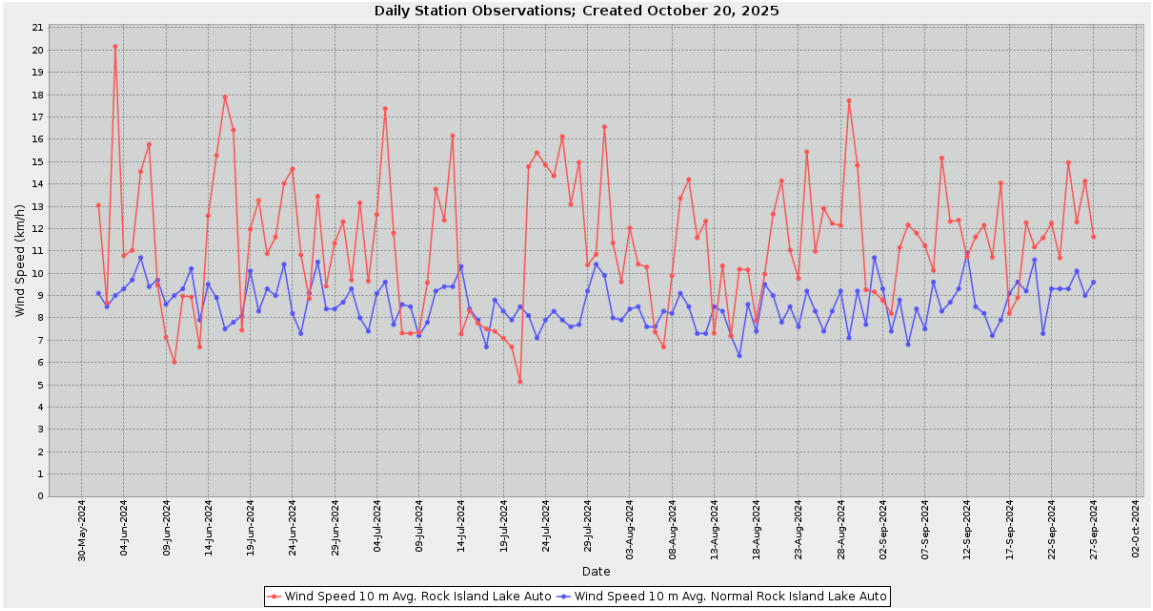
Air temperature will directly impact lake temperatures, and result in different temperature layers (stratification) throughout the lake, depending on its depth. Wind will also impact the degree to which a lake mixes, and how it will stratify. The amount of precipitation that falls within a lake's watershed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

In 2024, Calling Lake experienced a warmer and windier summer compared to normal, with about normal accumulated precipitation (Figure 6). Although it was warmer overall, the beginning of the sampling season was unseasonably cold and wet, with the month of June breaking or near breaking the lowest temperatures on record on numerous days. The lowest temperature was recorded on June 18 at 0.1°C. July was the warmest month, with the maximum temperature recorded breaking heat records on July 18 at 32.7°C. September was also a warmer month, with the average temperature being 12.7°C. The warmer than average temperatures in September may have contributed to a late-season bloom, where the highest levels of chlorophyll-a were observed (Figure 1).

Calling Lake received a normal amount of precipitation (297 mm total for the summer). However, the precipitation occurred in short bursts over the summer months. Over 60 mm of rain fell in the first 2 weeks of June (20% of the entire year), followed by another wet week from July 24-27 where over 67 mm of rain fell (22% of the entire year). Very little precipitation fell in the late weeks of summer.

Strong winds and warm temperatures likely prevented the lake from stratifying for much of the summer.





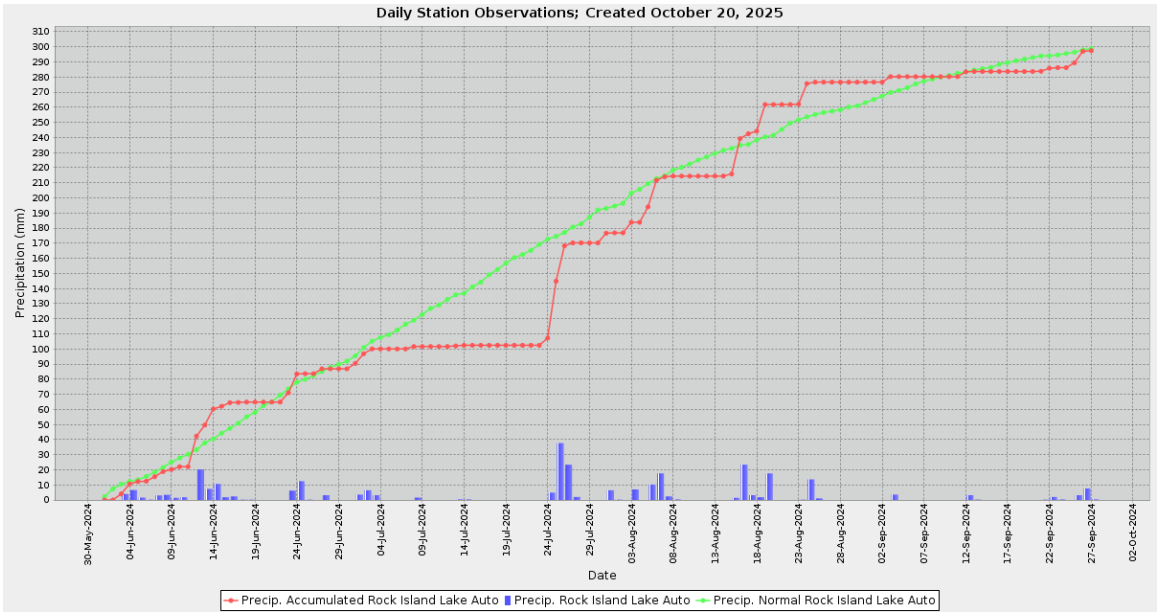


Figure 6. Air temperature (°C), wind speed (km/h), and precipitation (cm) measured from Rock Island Lake Auto weather station northwest of Calling Lake. Weather data provided by Agriculture, Forestry and Rural Economic Development, Alberta Climate Information Service (ACIS) https://acis.alberta.ca (retrieved October, 2025).

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 Calling Lake have been declining for the past few years (Figure 7). In 2024, lake levels were about 0.2 m lower than the previous year on record.

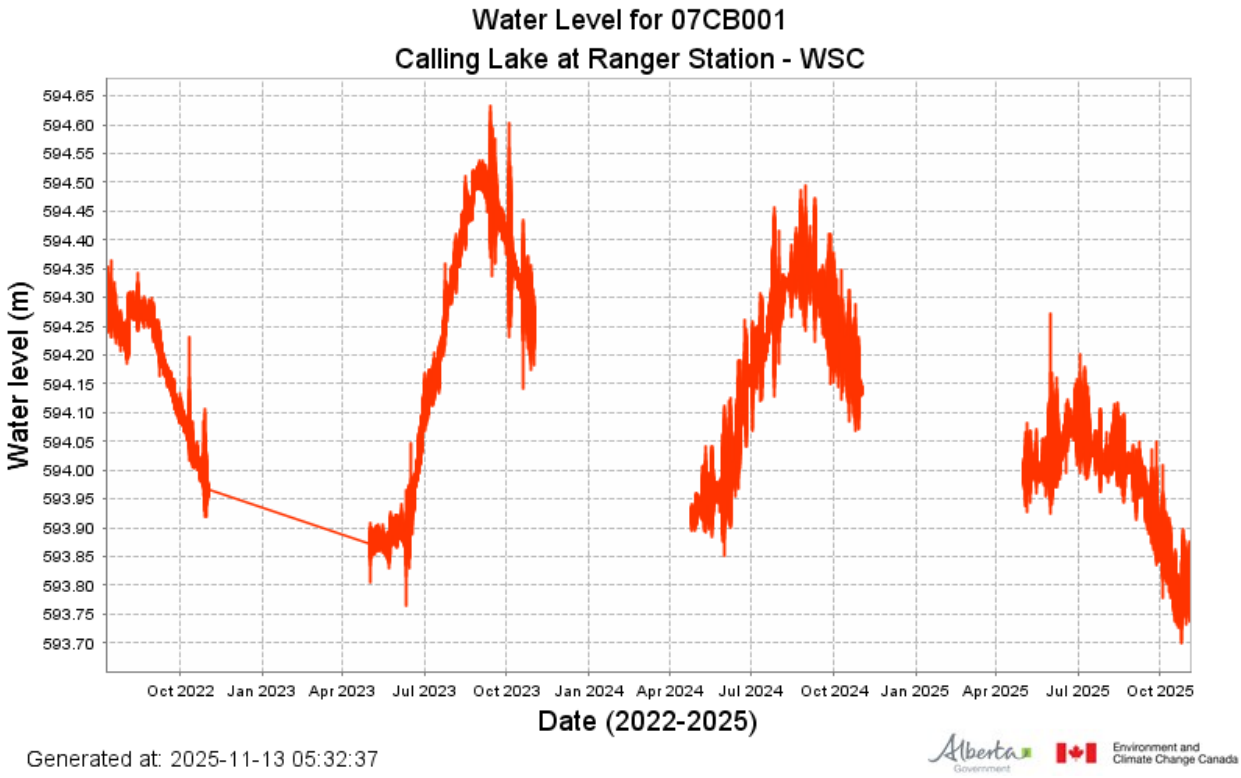


Figure 7. Water levels measured at Calling Lake in metres above sea level (masl) from 2022-2025. Data retrieved from Environment Canada and Alberta Environment and Parks Real-Time Hydrometric Data (https://wateroffice.ec.gc.ca/).

Table 2. Average Secchi depth and water chemistry values for Calling Lake. Historical values are given for reference. The number of sample trips is inconsistent between years.

Parameter	1987	1988	2000	2010	2011	2017	2018	2019	2021	2023	2024
TP (µg/L)	71	50	41	42	76	57	55	38	50	57	46
TDP (µg/L)	17	19	12	11	43	25	22	16	13	12	18
Chlorophyll-a (µg/L)	31.7	19.1	18.2	16.5	20.7	20.5	26.2	16.4	54.8	59.7	19.6
Secchi depth (m)	2.07	2.72	2.80	2.38	2.85	2.20	2.35	2.85	2.20	1.70	2.92
TKN (mg/L)	0.8	0.8	0.7	0.9	1.0	0.9	0.9	0.8	1.2	1.2	0.7
NO_2-N and NO_3-N (µg/L)	4	6	4	4	17	15	3	6	3	5	2
NH_3-N (µg/L)	-	-	16	-	127	42	48	53	22	27	28
DOC (mg/L)	10	10	12	11	11	11	12	11	12	10	10
Ca^{2+} (mg/L)	21	22	22	-	-	25	24	25	23	24	23
Mg^{2+}(mg/L)	6	6	6	-	-	7	7	7	6	7	7
Na^{+} (mg/L)	5	5	5	7	5	7	6	6	6	6	6
K^{+} (mg/L)	2	2	2	2	2	2	2	2	2	2	2
SO_4^{2-} (mg/L)	3	4	3	7	3	3	4	2	4	3	3
Cl^{-} (mg/L)	1	1	1	1	1	2	2	2	2	1	1
CO_3^{2-} (mg/L)	-	-	2.5	-	1.4	1.4	0.7	0.5	0.5	0.9	0.5
HCO_3^{2-} (mg/L)	-	-	105	111	110.6	110	110	120	102.5	122.5	112.5
pH	7.99	7.27	8.19	8.20	8.26	8.24	8.25	8.22	7.95	7.72	7.71
Conductivity (µS/cm)	167	168	176	182	184	187	188	192	180	180	175
Hardness (mg/L)	77	79	-	-	-	92	89	91	84	88	85
TDS (mg/L)	88	-	91	94	95	107	105	102	102	108	102
Microcystin (µg/L)	-	-	-	0.71	0.08	0.12	0.06	0.19	0.11	0.1	0.09
Total Alkalinity (mg/L CaCO3)	82	82	86	91	92	92	92	96	85	101	92

Table 3. Concentrations of metals measured in Calling Lake. 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	2017	Guidelines
Aluminum (µg/L)	6.25	100[a]
Antimony (µg/L)	0.036	/
Arsenic (µg/L)	0.73	5
Barium (µg/L)	34.8	/
Beryllium (µg/L)	0.0027	100[c,d]
Bismuth (µg/L)	0.0015	/
Boron (µg/L)	24.1	1500
Cadmium (µg/L)	0.005	0.36[b]
Chromium (µg/L)	0.05	/
Cobalt (µg/L)	0.0225	500, 1000[c,d]
Copper (µg/L)	0.135	4[b]
Iron (µg/L)	84.15	300
Lead (µg/L)	0.03	7[b]
Lithium (µg/L)	7.5	[d]
Manganese (µg/L)	39.75	130[e]
Molybdenum (µg/L)	0.092	73
Nickel (µg/L)	0.015	150[b]
Selenium (µg/L)	0.1	1
Silver (µg/L)	0.002	0.25
Strontium (µg/L)	129	/
Thallium (µg/L)	0.0045	0.8
Thorium (µg/L)	0.004	/
Tin (µg/L)	0.03	/
Titanium (µg/L)	1.16	/
Uranium (µg/L)	0.02	15
Vanadium (µg/L)	0.11	100[c,d]
Zinc (µg/L)	0.6	30[f]

Values represent means of total recoverable metal concentrations.
[a] Based on pH ≥ 6.5
[b] Based on 2016 avg. water hardness (as CaCO3) 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 CaCO3) and avg. pH
[f] Based on 2016 avg. water hardness (as CaCO3), avg. pH, and avg. DOC with CCME equation
A forward slash (/) indicates an absence of data or guidelines.