



Lakewatch

The Alberta Lake Management Society
Volunteer Lake Monitoring Program

Lac Bellevue Report

2024

Updated November 20, 2025

Lakewatch is made possible
with support from:



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 Kevin Onsyk for their commitment to collecting data at Lac Bellevue. 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 Onsyk were instrumental in planning and organizing the field program. This report was prepared by Brittany Onsyk and Bradley Peter.

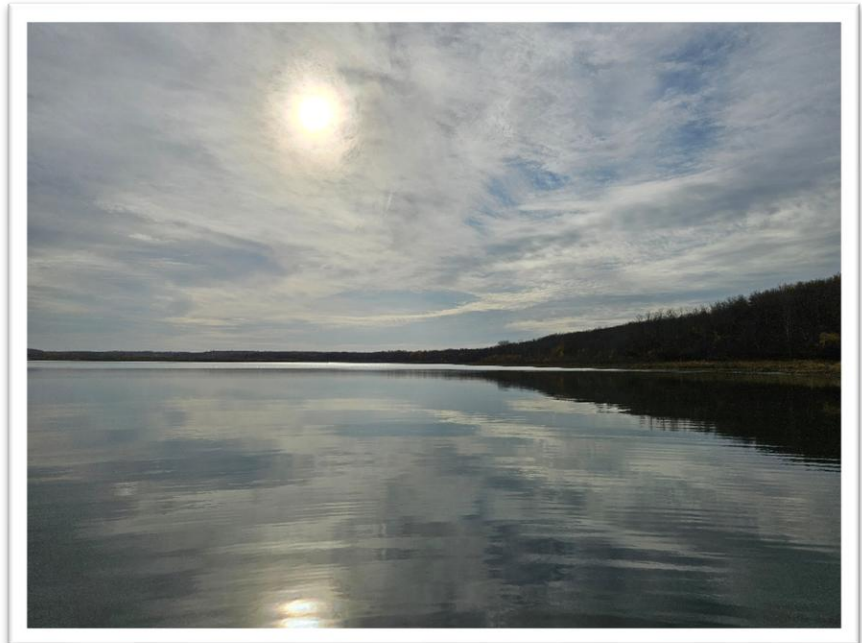
BEFORE READING THIS REPORT,
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INTRODUCTION TO LIMNOLOGY](#)

LAC BELLEVUE

Lac Bellevue is located about 200 km northeast of the city of Edmonton and 20 km south of St. Paul. The lake falls within the North Saskatchewan River Watershed, and is approximately 4 km north of the North Saskatchewan River. The lake has a surface area of 4.6 km² with a historical maximum depth of 15 m. However, declining water levels (Figure 7) have decreased the maximum depth to approximately 11 m.

Lac Bellevue lies within the dry mixedwood subregion of the boreal forest natural region¹, is in a transitional mosaic of developed pastures and deciduous upland forests. The shoreline is relatively intact forest, with agricultural pasture and cropland surrounding the lake. There are four camping-recreational facilities, as well as cottages on the south side of the lake. Fishing is a popular pastime, and sport fish include Northern Pike, Walleye, and Yellow Perch (although Northern Pike populations are at risk).²

Lac Bellevue has a small drainage basin that is about six times the size of the lake (approximately 30 km² to 5 km², respectfully).³ Lakes with smaller drainage basins may be more sensitive to climate variations as there is less area surrounding the lake to drain into it, and a larger area susceptible to evaporation.⁴



Sampling at Lac Bellevue, October 2024.

¹ Government of Alberta. 2006. Natural Regions and Subregions of Alberta.

² Government of Alberta. 2018. Lac Bellevue FIN Summary.

³ J.J. Gibson, S.J. Birks, Y. Yi, M.C. Moncur, P.M. McEachern. 2016. Stable isotope mass balance of fifty lakes in central Alberta: Assessing the role of water balance parameters in determining trophic status and lake level.

⁴ Alberta Environment. 2006. Cold Lake-Beaver River Surface Water Quantity and Aquatic Resources State of the Basin 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 Bellevue was 20 µg/L (Table 2), falling into the mesotrophic, or moderately productive trophic classification. TP ranged from a minimum of 15 µg/L on July 16, to a maximum of 24 µg/L on October 16 (Figure 1).

The average chlorophyll-*a* concentration in 2024 was 8.8 µg/L (Table 2), also falling into the mesotrophic classification. Chlorophyll-*a* was lowest at 2.4 µg/L on June 14 and peaked at 15.7 µg/L on October 16 (Figure 1).

The average total Kjeldahl nitrogen (TKN) concentration in 2024 was 1.2 mg/L (Table 2). TKN was stable throughout the summer (Figure 1).

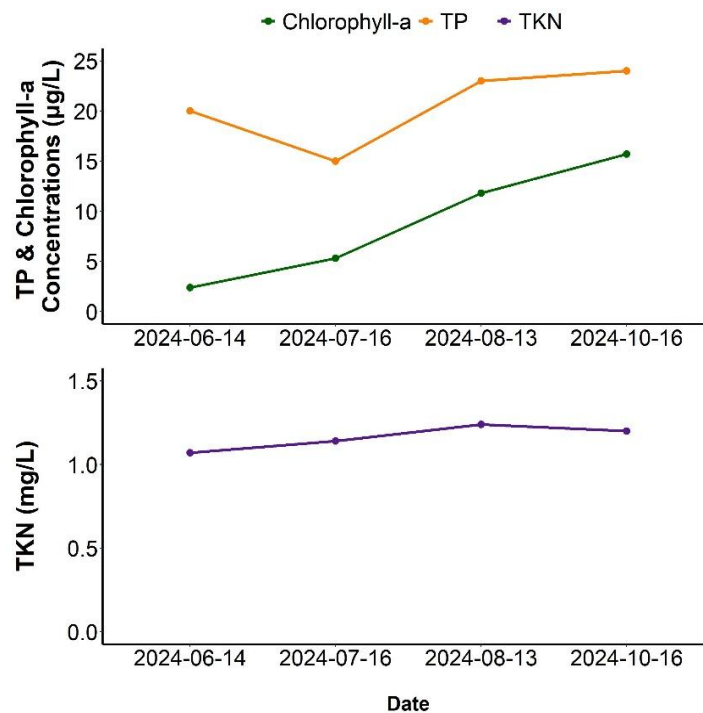


Figure 1. Total Phosphorus, Chlorophyll-*a*, and Total Kjeldahl Nitrogen concentrations measured over the course of the summer at Lac Bellevue in 2024.

Average pH was measured as 8.77 in 2024, buffered by moderate alkalinity (368 mg/L CaCO₃) and bicarbonate (365 mg/L HCO₃⁻). Aside from bicarbonate, magnesium was higher than all other major ions, and contributed to an average conductivity of 675 μS/cm (Figure 2, top; Table 2). Lac Bellevue falls into the mid-high ion concentration range compared to other LakeWatch lakes sampled in 2024 (Figure 2, bottom).

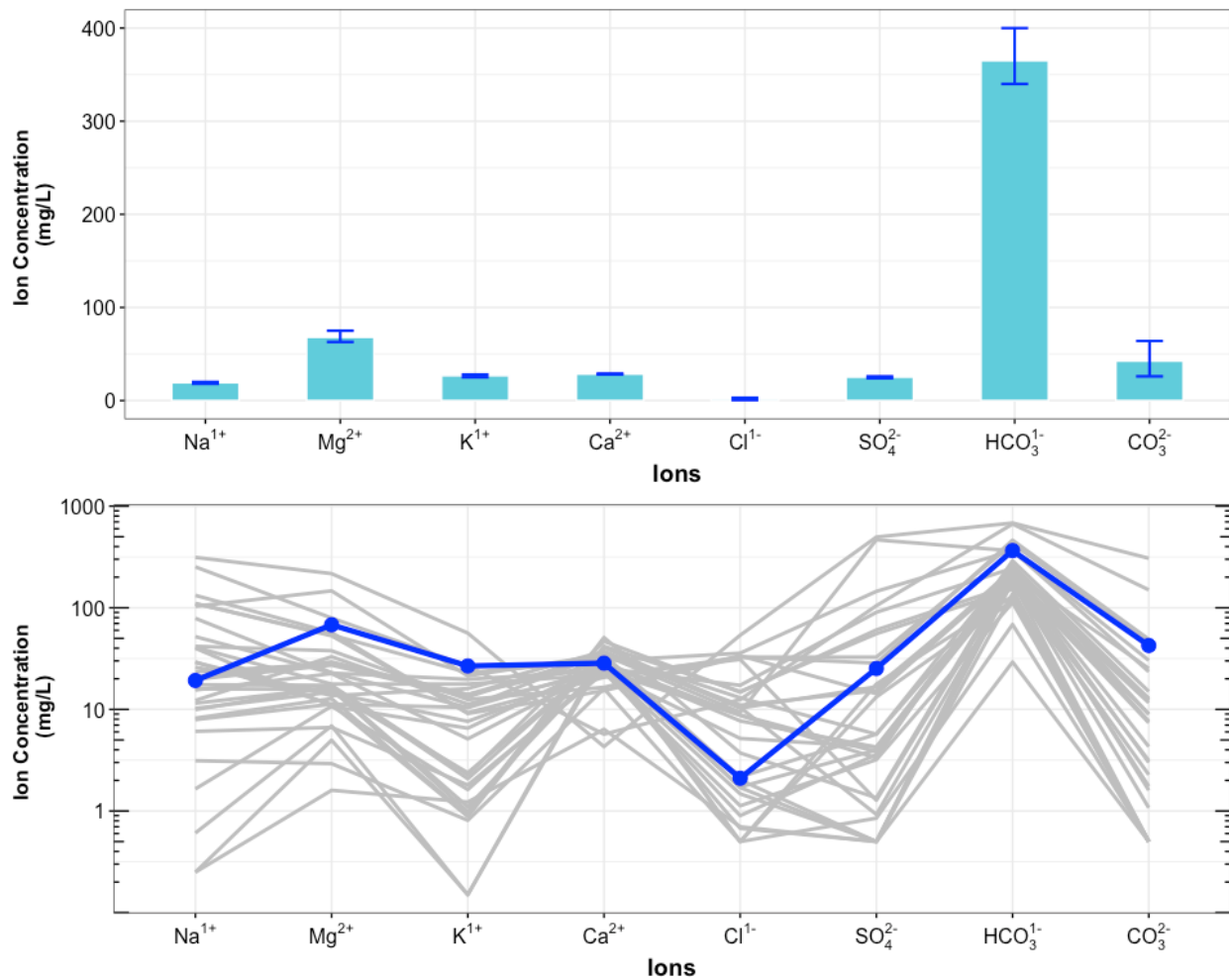


Figure 2. Average levels of cations (sodium = Na¹⁺, magnesium = Mg²⁺, potassium = K¹⁺, calcium = Ca²⁺) and anions (chloride = Cl¹⁻, sulphate = SO₄²⁻, bicarbonate = HCO₃¹⁻, carbonate = CO₃²⁻) from four measurements over the course of the summer at Lac Bellevue. Top) bars indicate range of values measured, and bottom) Schoeller diagram of average ion levels at Lac Bellevue (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 measured at Lac Bellevue in 2024 (Table 3). No metals exceeded the CCME chronic guideline for the protection of aquatic life in 2024.⁵

⁵ Canadian Water Quality Guidelines. 2019. Canadian Council of Ministers of the Environment. <https://ccme.ca/en/resources#>. Accessed October 29, 2025.

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 Bellevue in 2024 was 7.9 m, corresponding to a Secchi depth of 3.95 m (Table 2). Euphotic depth varied over the season, ranging from as shallow as 5 m on October 16 to as deep as 9.8 m on June 14 (lake bottom) (Figure 3).

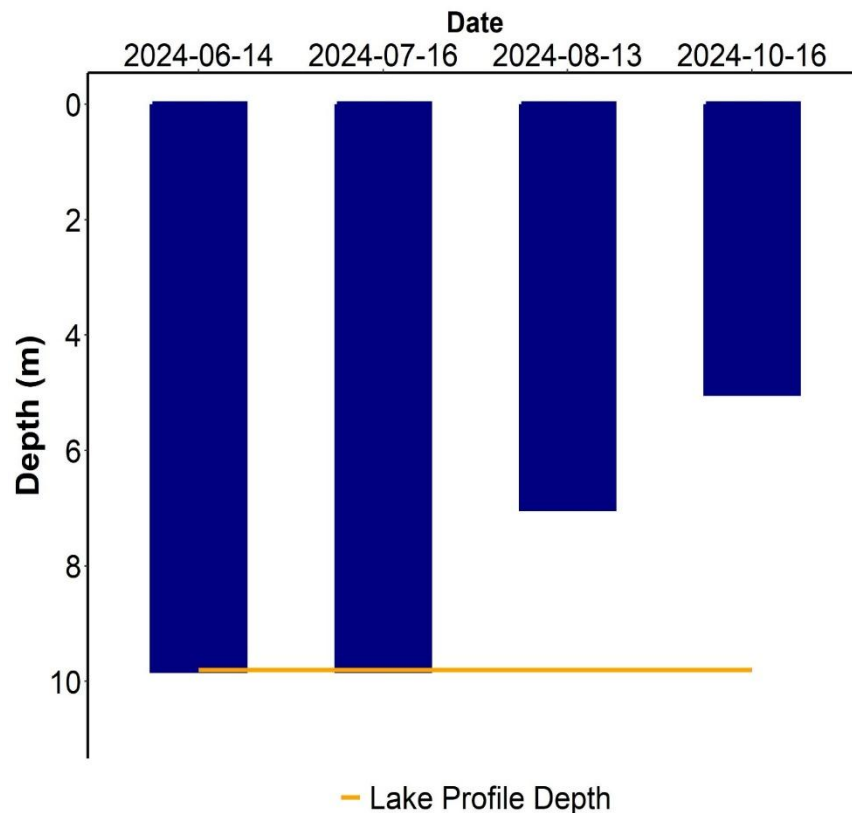


Figure 3. Euphotic depth values measured over the course of the summer at Lac Bellevue in 2024.



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 at Lac Bellevue varied throughout the summer, with the July 16 sampling date having the warmest temperatures at 21.45°C (Figure 4). The lake showed very minor stratification on the July 16 sampling trip, where the temperature decreased by more than one degree at about 5 m. The lake was well mixed during all sampling events, reflected by a consistent temperature profile to the bottom of the lake (Figure 4).

Lac Bellevue was well oxygenated in the surface waters on all sampling dates, measuring above the CCME guidelines of 6.5 mg/L dissolved oxygen⁶ (Figure 4). During the July 16 and August 13 sampling events, dissolved oxygen can be seen decreasing at approximately 7 m, and approaching 0 mg/L near the bottom of the lake (Figure 4). It is likely that the lake was experiencing turnover events⁷ in June and October, where lake water was well mixed and both sampling events showed well-oxygenated waters.

⁶ Canadian Water Quality Guidelines for the Protection of Aquatic Life, Dissolved Oxygen (Freshwater). 1999. Canadian Council of Ministers of the Environment. <https://ccme.ca/en/res/dissolved-oxygen-freshwater-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>.

⁷ Clean Lakes Alliance. Lake Turnover. <https://www.cleanlakesalliance.org/lake-turnover/>

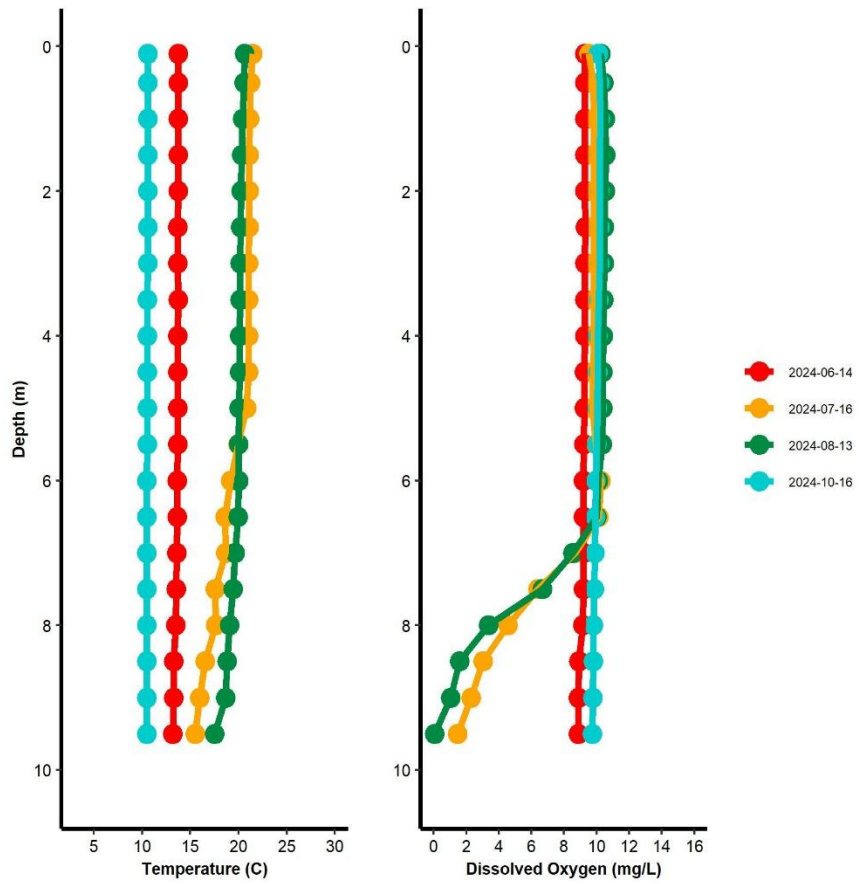


Figure 4. Temperature (°C) and dissolved oxygen (mg/L) profiles for Lac Bellevue measured over the course of the summer of 2024.



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 Bellevue fell below the recreational guideline of 10 µg/L⁸ during every sampling event in 2024. Despite low levels of microcystin detected during sampling events, caution should be observed in areas of the lake where significant cyanobacteria accumulation occurs.

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

Date	Microcystin Concentration (µg/L)
06/14/2024	0.26
07/16/2024	0.16
08/13/2024	0.1
10/16/2024	0.19
Average	0.18

⁸ 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 spiny water flea or zebra/quagga mussels were detected in Lac Bellevue 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 not collected at Lac Bellevue in 2024.

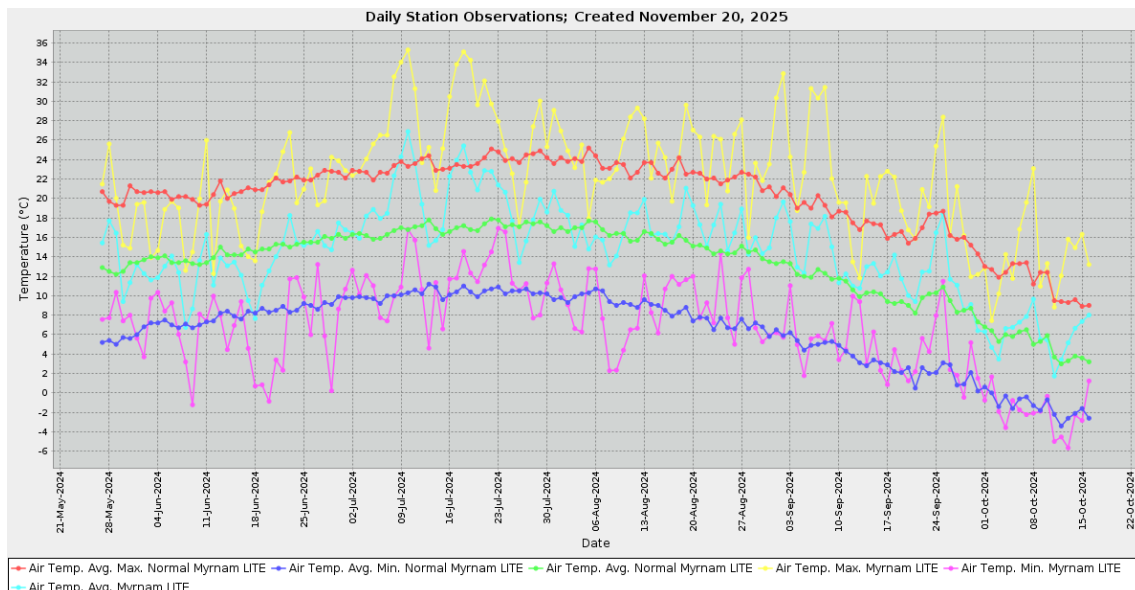
WEATHER AND LAKE STRATIFICATION

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. Solar radiation represents the amount of energy that reaches the earth's surface, and has implications for lake temperature & productivity.

In 2024, Lac Bellevue 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 cold and wet, with the month of June being cooler than normal, and breaking the record for coldest temperature recorded on both June 18 and 20. The lowest temperature recorded was on June 20 at -0.5°C . August was the warmest month, with the average temperature being 18.8°C . Although August was the warmest month overall, numerous days in July and September broke heat records when the temperature passed 30°C , including the hottest day recorded on July 10 at 35.3°C . September was also a warmer than average month, with the average temperature being 18°C .

Lac Bellevue received about normal precipitation in the summer of 2024 (217 mm total). Precipitation fell regularly throughout the season, although numerous days experienced heavy precipitation where over 20 mm would fall in 24 hours.

Strong winds were also observed throughout the sampling season.



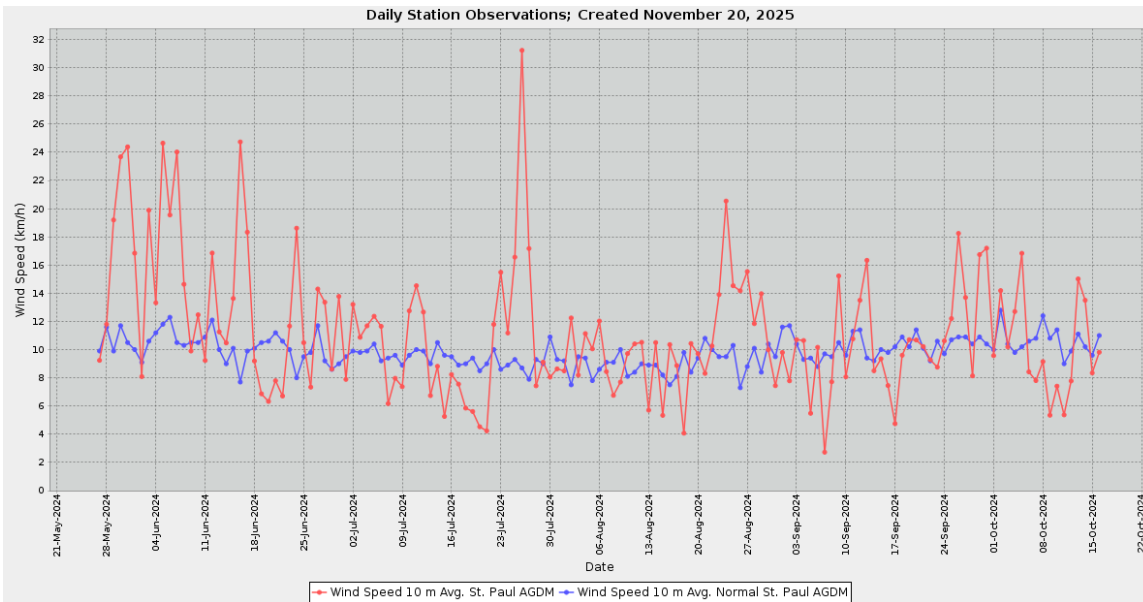
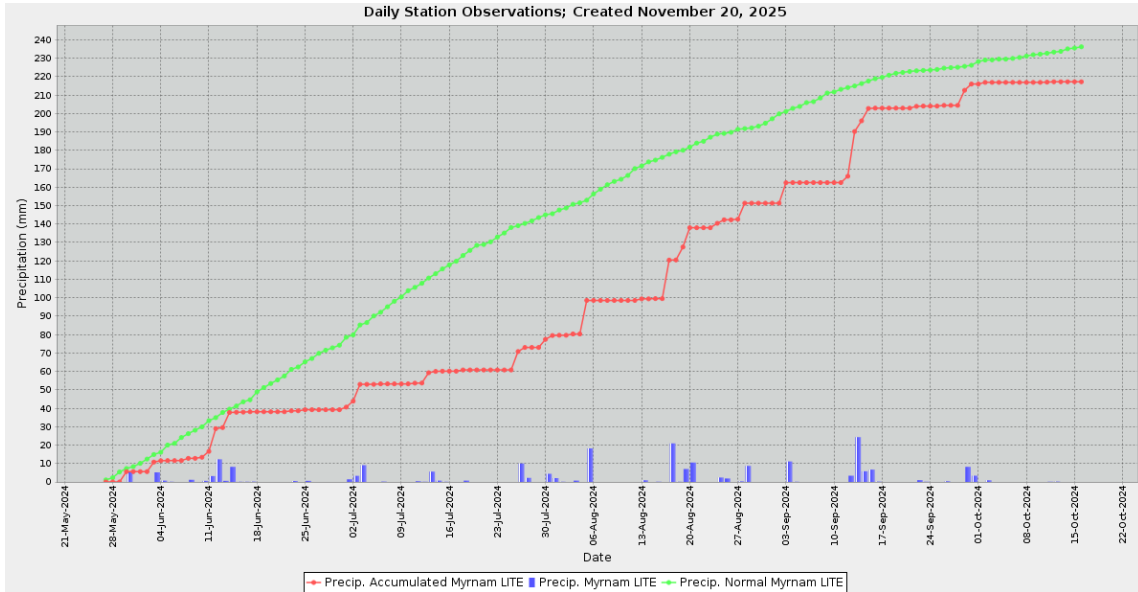


Figure 5. Air temperature ($^{\circ}\text{C}$) and precipitation (cm) measured from Myrnam weather station southeast of Lac Bellevue. Wind speed (km/h) measured from St Paul weather station northeast of Lac Bellevue. Weather data provided by Agriculture, Forestry and Rural Economic Development, Alberta 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 Bellevue have been steadily declining over the observational record only available for 1969-2002 (Figure 6). There is no current water level data available for Lac Bellevue.

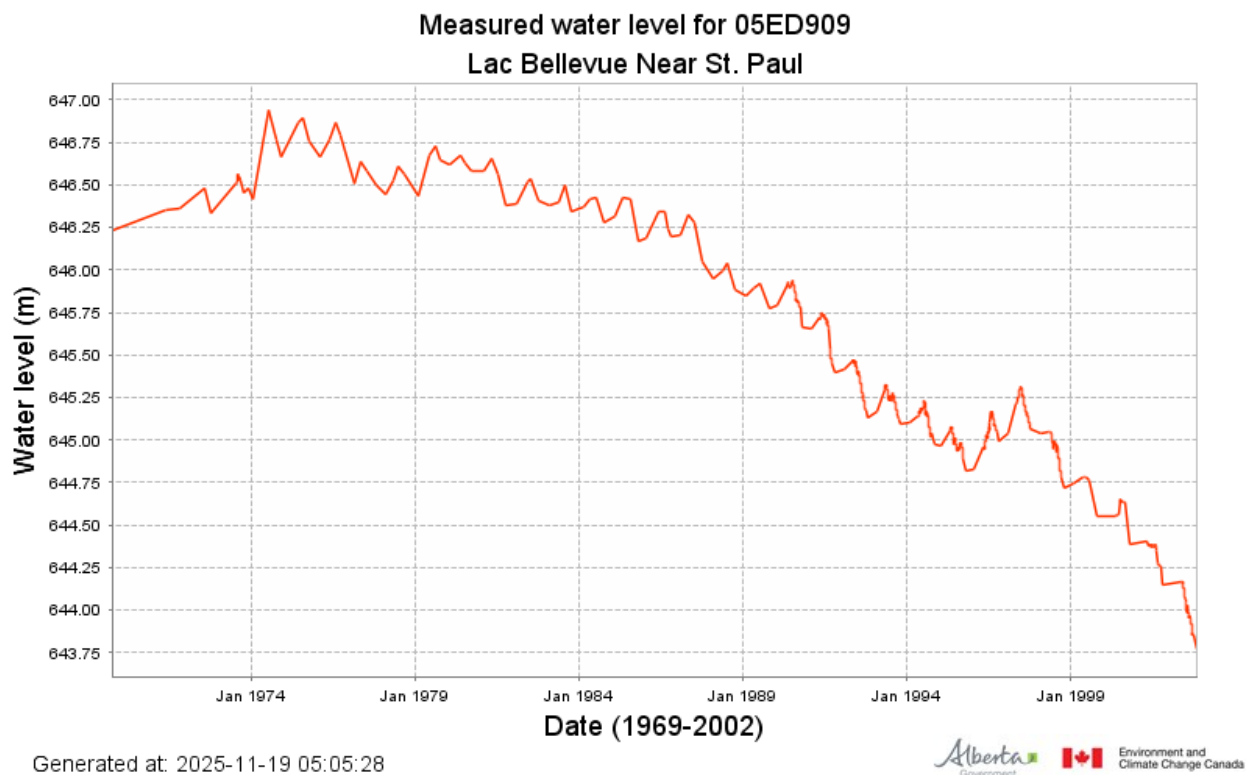


Figure 6. Water levels measured at Lac Bellevue in metres above sea level from 1969-2002. Data retrieved from Environment Canada and Alberta Environment and Parks Real-Time Hydrometric Data (<https://wateroffice.ec.gc.ca/> or rivers.alberta.ca).

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

Parameter	2007	2017	2024
TP ($\mu\text{g/L}$)	30	34	20
TDP ($\mu\text{g/L}$)	13	8	12
Chlorophyll-a ($\mu\text{g/L}$)	5.9	10.2	8.8
Secchi depth (m)	4.06	4.85	4.15
TKN (mg/L)	1.1	1.2	1.2
NO ₂ -N and NO ₃ -N ($\mu\text{g/L}$)	8	2	4
NH ₃ -N ($\mu\text{g/L}$)	-	35	17
DOC (mg/L)	13	14	13
Ca ²⁺ (mg/L)	-	27	28
Mg ²⁺ (mg/L)	-	65	68
Na ⁺ (mg/L)	19	18	19
K ⁺ (mg/L)	20	26	27
SO ₄ ²⁻ (mg/L)	7	20	25
Cl ⁻ (mg/L)	2	3	2
CO ₃ ²⁻ (mg/L)	24.0	29.8	42.5
HCO ₃ ²⁻ (mg/L)	363	355	365
pH	8.75	8.82	8.77
Conductivity ($\mu\text{S/cm}$)	594	620	675
Hardness (mg/L)	-	335	350
TDS (mg/L)	-	368	395
Microcystin ($\mu\text{g/L}$)	0.24	0.28	0.18
Total Alkalinity (mg/L CaCO ₃)	337	342	368

Table 3. Concentrations of metals measured in Lac Bellevue. 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	2024	Guidelines
Aluminum (µg/L)	3.9	17.6	100 ^a
Antimony (µg/L)	0.101	0.121	/
Arsenic (µg/L)	2.53	3.43	5
Barium (µg/L)	82.1	95.6	/
Beryllium (µg/L)	0.0015	0.0015	100 ^{c,d}
Bismuth (µg/L)	0.0015	0.0015	/
Boron (µg/L)	87.3	89.9	1500
Cadmium (µg/L)	0.005	0.005	0.36 ^b
Chromium (µg/L)	0.05	0.05	/
Cobalt (µg/L)	0.1055	0.196	500, 1000 ^{c,d}
Copper (µg/L)	0.54	0.49	4 ^b
Iron (µg/L)	6.6	19.6	300
Lead (µg/L)	0.013	0.025	7 ^b
Lithium (µg/L)	75.85	77.8	^d
Manganese (µg/L)	8.05	3.32	130 ^e
Molybdenum (µg/L)	1.275	1.64	73
Nickel (µg/L)	0.465	0.65	150 ^b
Selenium (µg/L)	0.15	0.1	1
Silver (µg/L)	0.0013	0.001	0.25
Strontium (µg/L)	222.5	257	/
Thallium (µg/L)	0.0015	0.001	0.8
Thorium (µg/L)	0.004	0.015	/
Tin (µg/L)	0.03	0.03	/
Titanium (µg/L)	0.865	1.26	/
Uranium (µg/L)	2.17	2.63	15
Vanadium (µg/L)	0.886	1.57	100 ^{c,d}
Zinc (µg/L)	0.85	1	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#_aqf_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.