



Lakewatch

The Alberta Lake Management Society
Volunteer Lake Monitoring Program

Elinor Lake Report

2024

Updated November 13, 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 Sid Kinasewich for their commitment to collecting data at Elinor 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 Onsyk were instrumental in planning and organizing the field program. This report was prepared by Brittany Onsyk and Bradley Peter.

BEFORE READING THIS REPORT,
CHECK OUT [A BRIEF
INTRODUCTION TO LIMNOLOGY](#)

ELINOR LAKE

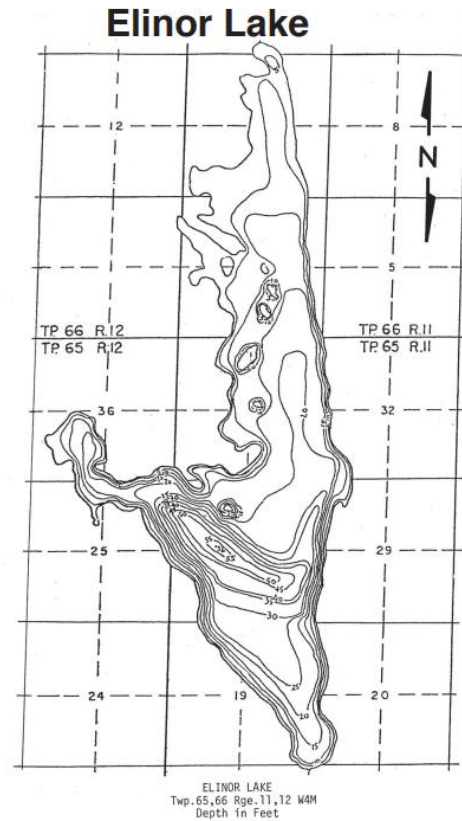
Elinor Lake is a large lake located approximately 25 km southeast of Lac La Biche, in the Beaver River Basin. It is rumored that, like many other lakes in this region with female names, this lake was named after a woman who was romantically involved with a French-Canadian voyager making his way up the Beaver River in the 1800s.¹

Elinor Lake lies within the Central Mixedwood natural sub-region², and most of the shoreline is densely forested and remains undeveloped. The only development is along the southeast shore, where a collection of seasonal lots and the Elinor Lake Resort are located. The resort area is made up mostly of residential properties, and both the seasonal lots and the resort have access to a small boat-launch which provides recreational access to the lake. The lake is also just west of Lakeland Provincial Park and the Lakeland Provincial Park Recreation Area, which both provide opportunities to experience neighboring lakes and the surrounding environment.


The lake has a surface area of 9.33 km². Its complex shape results in over 30 km of shoreline. The maximum depth of the lake has been recorded at about 18 m, although most of the lake is much shallower, with a mean depth of 5.2 m.³ The drainage basin is only about 3 times the size of the lake, which is relatively small for a lake of this size.

Fishing is a common activity here year-round, and sportfish species recorded here include Yellow Perch (*Perca flavescens*), Northern Pike (*Esox lucius*), Walleye (*Sander vitreus*), and Lake Whitefish (*Coregonus clupeaformis*)³. The lake is home to pelicans, grebes, loons, various shorebirds, and bald eagles. Other common recreational activities on the lake are swimming, paddle boarding, canoeing, and kayaking.

A Level 2 Biological Nutrient Removal (BNR) sewage treatment plant exists on the southeast shore of Elinor Lake. This plant provides potable water and wastewater services to the Elinor Lake Resort. As well, many residents in the surrounding area collect potable water directly from the



Bathymetric map of Elinor Lake.



treatment plant. After passing through the plant, the treated wastewater enters a wetland, which connects via an unnamed creek to Matthews Lake which ultimately drains into Elinor Lake. Transit time of the treated water back to Elinor Lake is estimated at 7 years (pers. comm.).

¹ Wayback archive-it place names of Alberta.

² Strong, W.L. and K.R. Leggat. (1981). Ecoregions of Alberta. Alta. En. Nat. Resour., Resour. Eval. Plan. Div., Edmonton.

³ Lac La Biche County. 2023 Elinor Lake Water Quality 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 Elinor Lake was 34 µg/L (Table 2), falling into the eutrophic, or productive trophic classification. TP ranged from a minimum of 26 µg/L on July 22, to a maximum of 43 µg/L on June 25 (Figure 1).

The average chlorophyll-*a* concentration in 2024 was 18.7 µg/L (Table 2), similarly falling into the eutrophic classification. Chlorophyll-*a* was lowest at 10.8 µg/L on July 22 and peaked at 26.6 µg/L on June 25 (Figure 1).

The average total Kjeldahl nitrogen (TKN) concentration was 1.1 mg/L (Table 2). TKN levels were relatively stable all summer (Figure 1).

Both TP and chlorophyll-*a* values have increased since Elinor Lake was last sampled in 2015. TKN has been relatively stable since 2015 (Table 2).

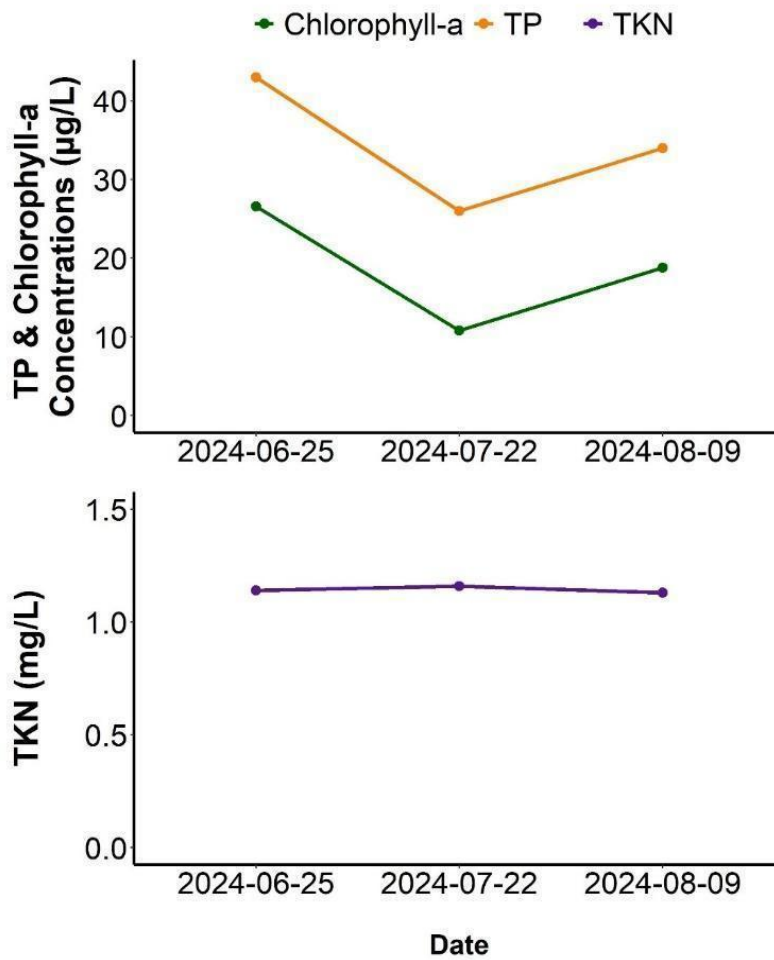


Figure 1. Total Phosphorus, Chlorophyll-*a*, and Total Kjeldahl Nitrogen concentrations measured over the course of the summer at Elinor Lake in 2024.

Average pH was measured as 8.64 in 2024, buffered by a low alkalinity (237 mg/L CaCO₃) and bicarbonate (263 mg/L HCO₃⁻). Calcium and magnesium measured slightly higher than the other major ions, and together with bicarbonate contributed to an average conductivity of 443 µS/cm (Figure 2, top; Table 2).

Total Ion Concentration at Elinor Lake falls in the middle of all lakes measured in 2024 (Figure 2, bottom).

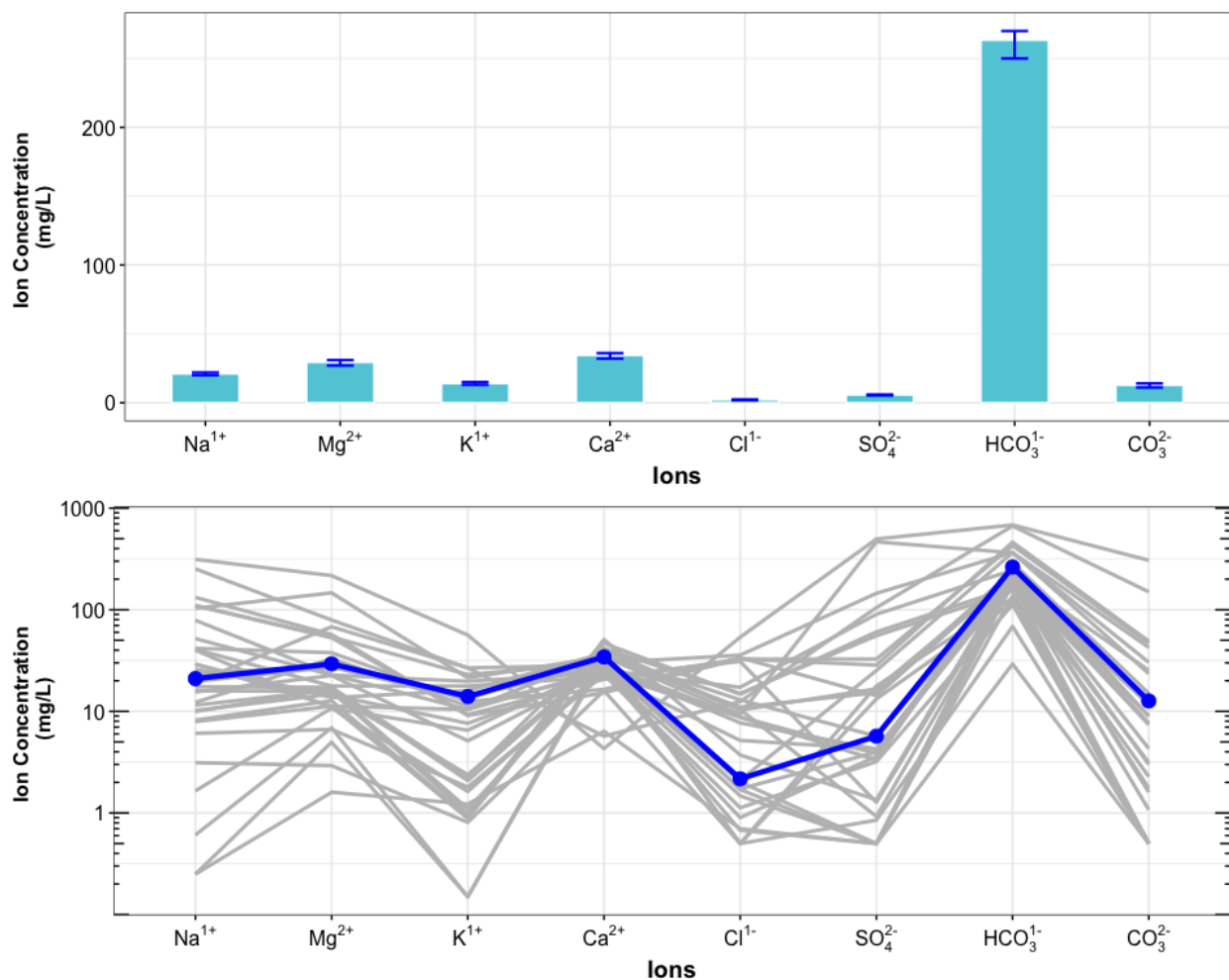


Figure 2. Average levels of cations (sodium = Na¹⁺, magnesium = Mg²⁺, potassium = K¹⁺, calcium = Ca²⁺) and anions (chloride = Cl¹⁻, sulphate = SO₄²⁻, bicarbonate = HCO₃¹⁻, carbonate = CO₃²⁻) measured over the course of the summer at Elinor Lake. Top) bars indicate range of values measured, and bottom) Schoeller diagram of average ion levels at Elinor 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 measured at Elinor Lake in 2024 (Table 3). No metals exceeded the CCME chronic guideline for the protection of aquatic life in 2024.⁴

⁴ 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 Elinor Lake in 2024 was 5.37 m, corresponding to a Secchi depth of 2.68 m (Table 2). Euphotic depth varied over the season, ranging from as low as 4.3 m on June 25 to as deep as 6.8 m on July 22 (Figure 3).

Secchi depth and therefore euphotic depth measurements were substantially lower in 2024 than what was previously recorded in 2015. In 2015, Secchi depth was 4.09 m, resulting in a euphotic depth of 8.18 m that year (Table 2).

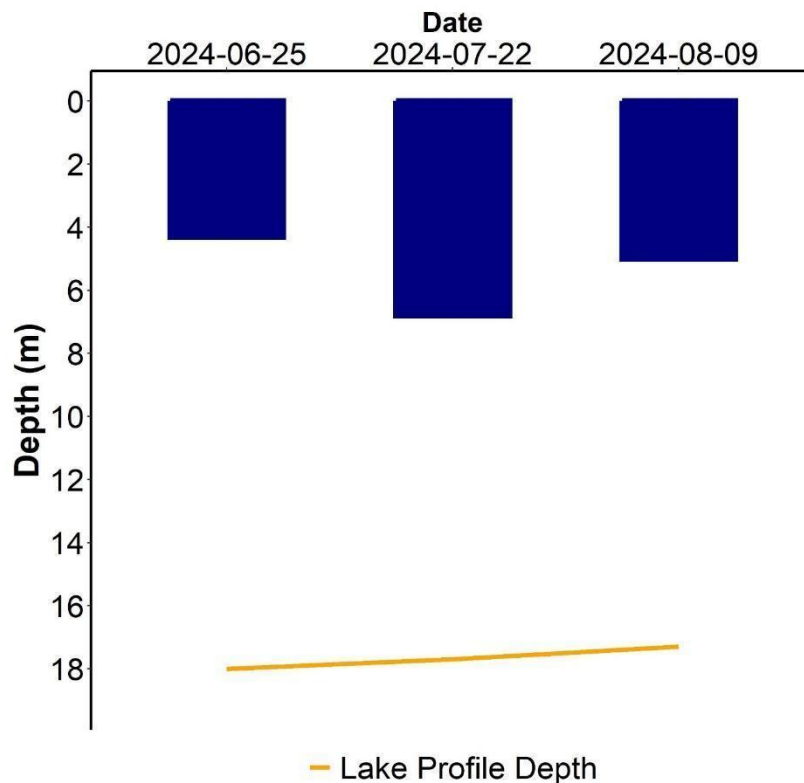


Figure 3. Euphotic depth values measured over the course of the summer at Elinor Lake in 2024.



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 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 Elinor Lake varied throughout the summer, with the July 22 sampling date having the warmest temperatures at 25.46°C (Figure 4). The lake showed weak stratification during the June and August sampling trips, indicating that lake turn-over may have been occurring during sampling. Lake turn-over generally happens in spring and fall and is characterized by similar lake temperatures from top to bottom, which leads to well-oxygenated water throughout the water column⁵. Elinor Lake showed stronger stratification (warm surface temperature, and cooler bottom temperature) during the July sampling trip, where air temperatures were warmest (Figure 5). During each sampling event, the bottom layer of water (hypolimnion) approached 4°C.

Elinor Lake 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 all sampling events, dissolved oxygen can be seen decreasing at the thermocline, or mixing depth, at approximately 4 m (Figure 4). The lake was well-oxygenated during the June sampling event, likely due to spring turnover. Dissolved oxygen observed during July and August sampling trips followed the weak temperature stratification, with warmer surface water holding more oxygen than the cooler bottom water.

⁵ Clean Lakes Alliance. Lake Turnover. <https://www.cleanlakesalliance.org/lake-turnover/>

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>. Accessed October 29, 2025.

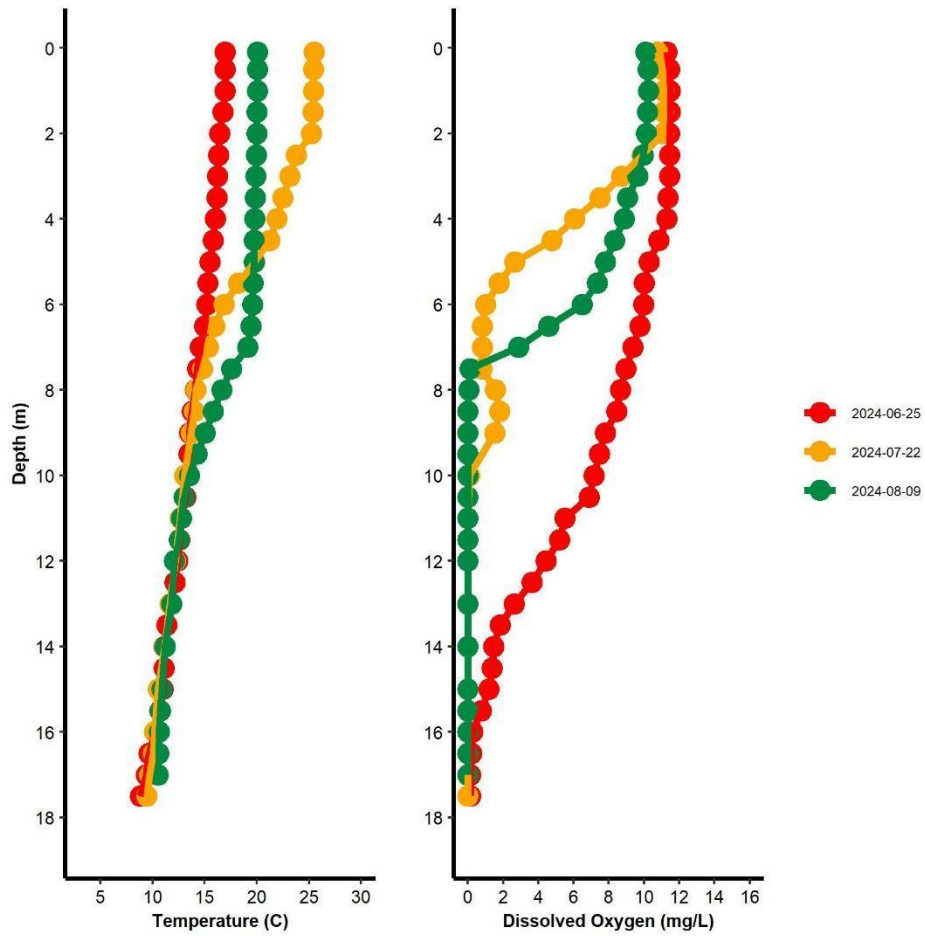


Figure 4. Temperature (°C) and dissolved oxygen (mg/L) profiles for Elinor Lake measured over the course of the summer of 2024.



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 Elinor Lake fell below the recreational guideline of 10 µg/L⁷ during every sampling event in 2024.

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

Date	Microcystin Concentration (µg/L)
06/25/2024	0.17
07/22/2024	1
08/09/2024	0.9
Average	0.69

⁷ 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 Elinor Lake 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 Elinor Lake in 2024.

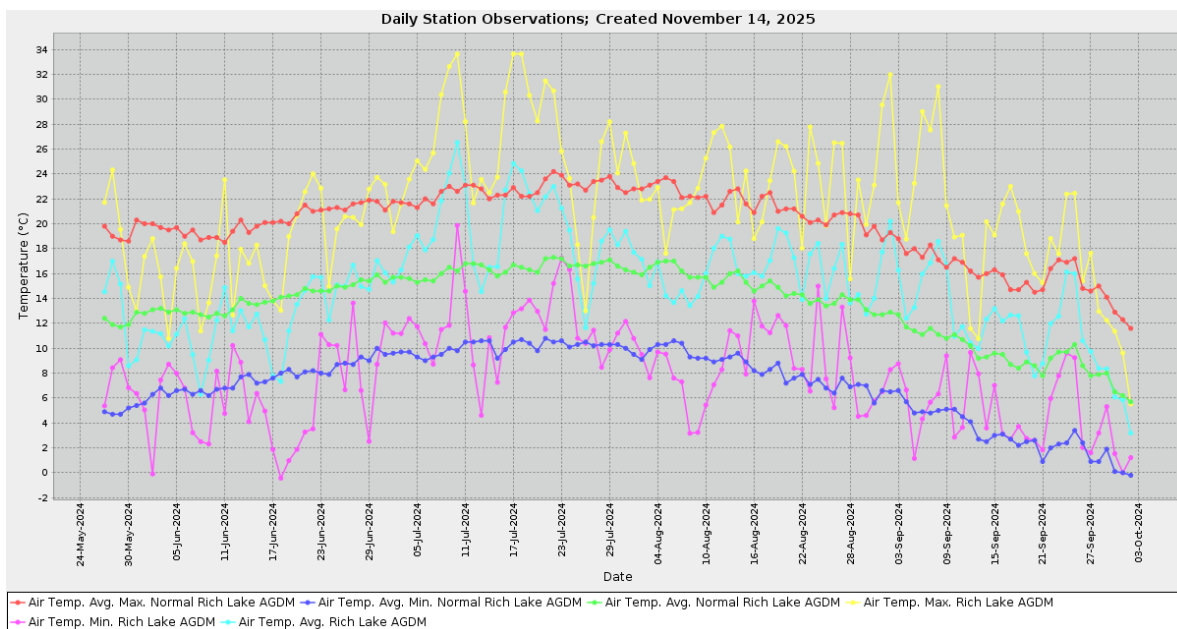
WEATHER AND LAKE STRATIFICATION

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

In 2024, Elinor Lake experienced a warmer and windier summer compared to normal, with less than 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 2 and 18. The lowest temperature recorded was on June 18 at -0.4°C . July was the warmest month, with the average temperature being 25.97°C . 2024 also broke numerous heat records, including the hottest day recorded on July 17 and 18 at 33.6°C . September was also a warmer than average month, with the average temperature being 19.97°C .

Elinor Lake received less than normal precipitation in the summer of 2024 (250 mm total). June was unseasonably wet, with over 47 mm of precipitation falling in the first two weeks of the month. Limited precipitation occurred in short bursts over the remaining summer months, with the exception of 40 mm of rain falling July 26-27.

Strong winds were also observed throughout the sampling season.



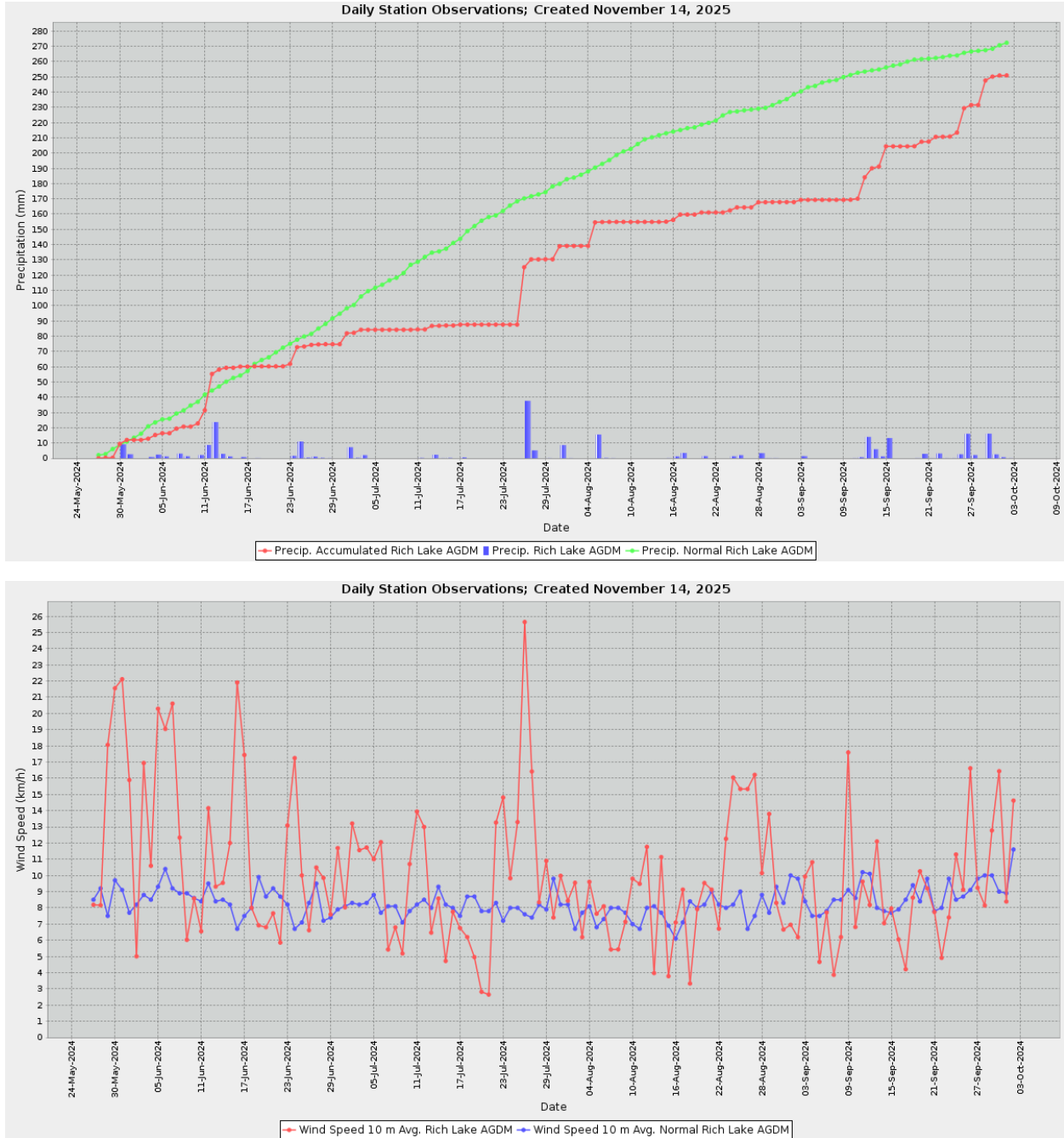


Figure 6. Air temperature ($^{\circ}\text{C}$), wind speed (km/h), and precipitation (cm) measured from Rich Lake weather station southwest of Elinor Lake. Weather data provided by Agriculture, Forestry and Rural Economic Development, Alberta Climate Information Service (ACIS) <https://acis.alberta.ca>.

Table 2. Average Secchi depth and water chemistry values for Elinor Lake.

Parameter	2015	2024
TP (µg/L)	15	34
TDP (µg/L)	8	10
Chlorophyll-a (µg/L)	3.7	18.7
Secchi depth (m)	4.09	2.68
TKN (mg/L)	1.2	1.1
NO ₂ -N and NO ₃ -N (µg/L)	-	4
NH ₃ -N (µg/L)	-	24
DOC (mg/L)	18	19
Ca ²⁺ (mg/L)	23	34
Mg ²⁺ (mg/L)	26	29
Na ⁺ (mg/L)	17	21
K ⁺ (mg/L)	12	14
SO ₄ ²⁻ (mg/L)	9	6
Cl ⁻ (mg/L)	2	2
CO ₃ ²⁻ (mg/L)	6.9	12.7
HCO ₃ ²⁻ (mg/L)	236	263
pH	8.56	8.64
Conductivity (µS/cm)	400	443
Hardness (mg/L)	-	207
TDS (mg/L)	214	250
Microcystin (µg/L)	0.05	0.69
Total Alkalinity (mg/L CaCO ₃)	206	237

Table 3. Concentrations of metals measured in Elinor 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	2015	2024	Guidelines
Aluminum (µg/L)	6.95	11.1	100 ^a
Antimony (µg/L)	0.022	0.045	/
Arsenic (µg/L)	0.76	0.94	5
Barium (µg/L)	39.1	51.9	/
Beryllium (µg/L)	0.004	0.0015	100 ^{c,d}
Bismuth (µg/L)	0.0043	0.0015	/
Boron (µg/L)	58.6	54.8	1500
Cadmium (µg/L)	0.005	0.005	0.36 ^b
Chromium (µg/L)	0.26	0.05	/
Cobalt (µg/L)	0.0135	0.051	500, 1000 ^{c,d}
Copper (µg/L)	0.25	0.25	4 ^b
Iron (µg/L)	8.5	8.3	300
Lead (µg/L)	0.024	0.014	7 ^b
Lithium (µg/L)	26.45	24.7	^d
Manganese (µg/L)	37.4	20.5	130 ^e
Molybdenum (µg/L)	0.02	0.023	73
Nickel (µg/L)	0.004	0.1	150 ^b
Selenium (µg/L)	0.06	0.1	1
Silver (µg/L)	0.001	0.001	0.25
Strontium (µg/L)	129	161	/
Thallium (µg/L)	4e-04	0.001	0.8
Thorium (µg/L)	0.007	0.036	/
Tin (µg/L)	0.03	0.22	/
Titanium (µg/L)	0.445	0.85	/
Uranium (µg/L)	0.05	0.113	15
Vanadium (µg/L)	0.095	0.217	100 ^{c,d}
Zinc (µg/L)	0.35	0.8	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#_aq_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.