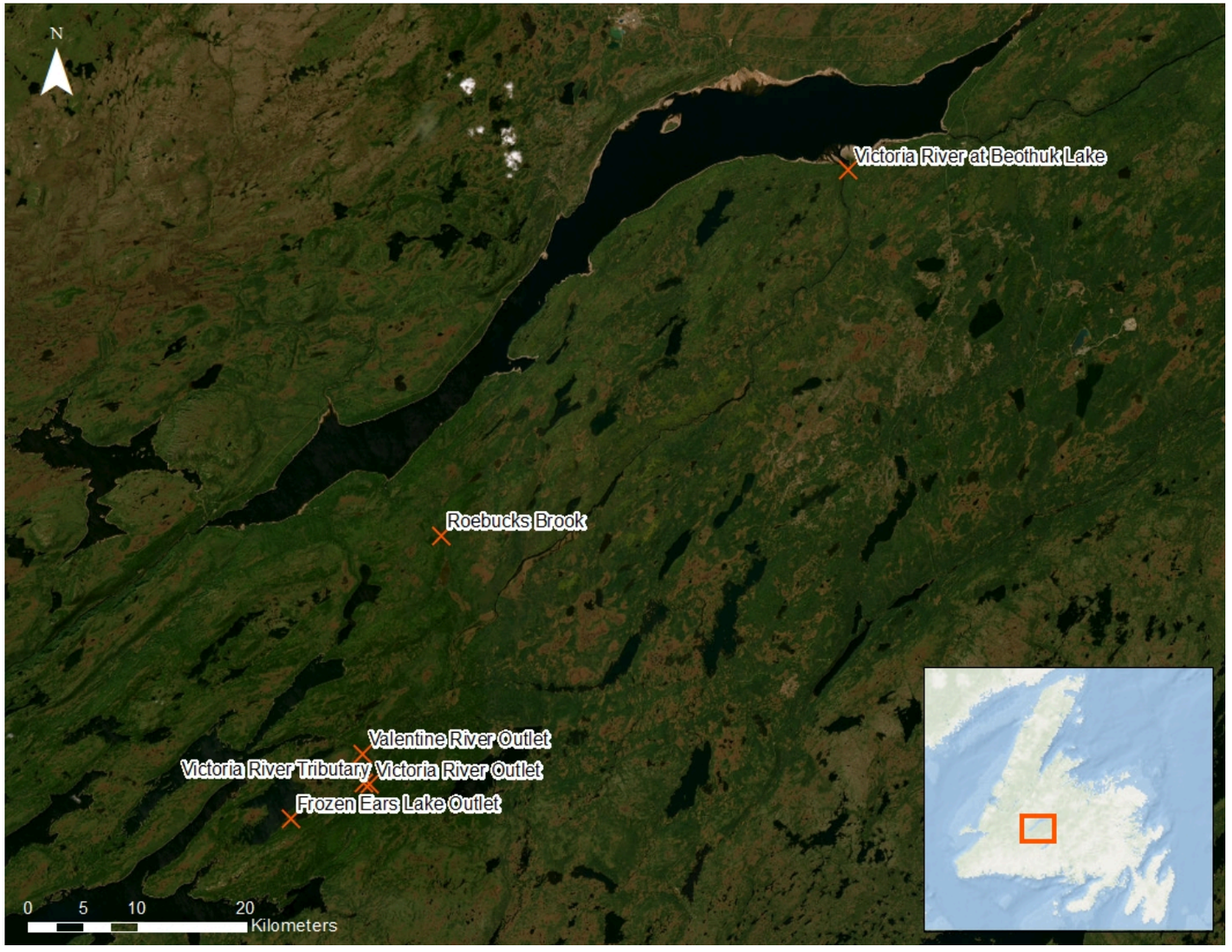
Real Time Water Quality Deployment Report
Equinox Gold: Valentine Gold Mine Network

2025-06-05 to 2025-08-11

Government of Newfoundland & Labrador
Department of Environment, Conservation and Climate Change
Water Resources Management Division

Valentine Gold Mine Network



The Water Resources Management Division (WRMD), in collaboration with Equinox Gold (formerly Calibre/Marathon Gold) maintain fourteen real-time water quality (RTWQ) and water quantity monitoring stations. These stations are part of a real-time network designed to monitor, process, and share water quality and quantity data with both WRMD and Equinox Gold, supporting the evaluation and management of water resources. The network also provides early detection of potential or emerging water issues, allowing for prompt response and implementation of mitigation measures.

Six of these stations focus on surface water and will be addressed in this report. The remaining eight stations are groundwater monitoring wells which are reported annually. The six surface water stations are located at Victoria River at Beothuk Lake, Roebucks Brook at Access Road, Valentine River Outlet, Victoria River Tributary, Victoria River Outlet, and Frozen Ears Lake Outlet.

This report covers the monitoring period from 2025-06-04 to 2025-08-11 for all stations, except for the Frozen Ears Lake Outlet station, where the deployment period ended on 2025-07-21. The Frozen Ears Lake Outlet station operated on a slightly different schedule than the other stations. This station is located on site and requires an onsite escort for access, whereas the remaining five stations are readily accessible along the access road. Consequently, the Frozen Ears Lake Outlet deployment period ended on 2025-07-21, while the other stations ended on 2025-08-11.

Station Name	Station Number	Latitutde	Longitude
Frozen Ear Lake Outlet	NF02YN0052	48.39	-57.14
Victoria River Outlet	NF02YN0047	48.41	-57.07
Victoria River Tributary	NF02YN0050	48.41	-57.08
Valentine River Outlet	NF02YN0048	48.42	-57.08
Roebucks Brook	NF02YN0049	48.54	-57.01
Victoria River at Beothuk Lake	NF02YN0051	48.74	-56.68

Quality Assurance and Quality Control Procedures

As part of the Quality Assurance and Quality Control protocol (QA/QC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey. With the exception of water quantity data (stage), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Corrected data can be obtained upon request.

Parameter	Excellent	Good	Fair	Marginal	Poor
pH	≤ ± 0.2 units	≤ ± 0.21 - 0.5 units	≤ ± 0.51 - 0.8 units	≤ ± 0.81 - 1 units	> ± 1 units
Water Temperature	≤ ± 0.2°C	≤ ± 0.21 - 0.5°C	≤ ± 0.51 - 0.8°C	≤ ± 0.81 - 1°C	> ± 1°C
Dissolved oxygen	≤ ± 0.3 mg/L	≤ ± 0.31 -0.5 mg/L	≤ ± 0.51 - 0.8 mg/L	≤ ± 0.81 - 1 mg/L	> ± 1 mg/L
Turbidity	≤ ± 2 turbidity units or ≤ ± 5%, whichever is greater	≤ ± 2.1-5 turbidity units or ≤ ± 5.1-10 %, whichever is greater	≤ ± 5.1-8 turbidity units or ≤ ± 10.1-15 %, whichever is greater	≤ ± 8.1-10 turbidity units or ≤ ± 15.1-20 %, whichever is greater	> ± 10 turbidity units or > ± 20 %, whichever is greater
Specific Conductance	≤ ± 3 µS/cm or ≤ ± 3%, whichever is greater	≤ ± 3.1-10 µS/cm or ≤ ± 3.1-10%, whichever is greater	≤ ± 10 - 15 µS/cm or ≤ ± 10.1-15 %, whichever is greater	≤ ± 15.1 - 20 µS/cm or ≤ ± 15.1-20 %, whichever is greater	> ± 20 µS/cm or > ± 20 %, whichever is greater

At deployment and removal, a QA/QC Sonde is temporarily deployed adjacent to the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments**.** Based on the degree of difference between parameters recorded by the Field Sonde and QA/QC Sonde at deployment and at removal, a qualitative statement is made on the data quality. There are a few circumstances which may cause QA/QC rankings below excellent, including the placement of the QA/QC sonde in relation to the field sonde, the amount of time each sonde was given to stabilize before readings were recorded, and deteriorating performance of one of the sensors.

The temperature sensor on any sonde is the most important. All other parameters can be divided into subgroups of: temperature dependent, temperature compensated, and temperature independent. Due to the temperature sensor's location on the sonde, the entire sonde must be at a constant temperature before the temperature sensor will stabilize. The values may take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray the water body.

Additionally, grab samples are collected during deployment to compare pH, specific conductivity and turbidity values between the field instrument and grab samples. Variability in results may be attributed to differences in the sampling location or depth relative to the sonde's deployment site or insufficient equilibration time for the sonde when initial field data was collected.

Deployment Period Notes

- A data gap is present at the Valentine River Outlet station from July 13 to July 21. Water levels steadily declined during the deployment period, causing the sonde to become temporarily exposed and record erroneous measurements. These data were therefore removed from the dataset.
- No hydrometric data is available for the Frozen Ears Lake Outlet station during this deployment period. Due to GPS malfunctions, the station was not transmitting data in real time. While water quality data was successfully retrieved from the instrument's internal log file, corresponding hydrometric data is unavailable.

Hydrometric Data

Water Resources Management Division hydrometric (stage and flow) data is quality controlled on a less frequent basis than water quality data due to differences in protocols. The hydrometric data shown in this report is provisional and has not undergone quality control checks.

QAQC
Deployment Rankings

During deployment, the majority of parameters across all stations ranked *good* or *excellent*, indicating minimal discrepancies between the field sondes and the QA/QC sonde. pH ranked *marginal* at Frozen Ears Lake Outlet and *fair* at Victoria River Tributary, which is likely attributed to insufficient equilibration time prior to recording initial measurements. There is no QAQC data for Victoria River Outlet during deployment so no comparison rankings are available.

Grab sample rankings during deployment were predominantly *good* to *excellent* across all stations. pH ranked *marginal* at Frozen Ears Lake Outlet and *fair* at Victoria River Tributary, and specific conductivity ranked *fair* at Frozen Ears Lake Outlet. These lower rankings are likely influenced by differences in sampling depth or location relative to the deployed field sonde, as well as insufficient equilibration time prior to recording initial measurements.

Upon removal, most parameters across all stations ranked *good* or *excellent*, suggesting stable sensor performance throughout the deployment period. Dissolved oxygen ranked *fair* at Valentine River Outlet, Victoria River at Beothuk Lake, and Victoria River Tributary, and marginal at Roebucks Brook, indicating minor discrepancies between field and QAQC measurements. Given the consistency of these lower rankings across multiple stations, these differences are likely attributable to sensor deterioration or calibration drift on the QAQC sonde rather than site-specific issues.

QAQC Rankings

Station	Parameter	Deployment Rank	Grab Sample Deployment	Removal Rank
Frozen Ear Lake Outlet	Dissolved Oxygen (mg/l)	Excellent	-	Good
Frozen Ear Lake Outlet	pH	Marginal	Marginal	Good
Frozen Ear Lake Outlet	Specific Conductivity (µS/cm)	Excellent	Fair	Good
Frozen Ear Lake Outlet	Temperature (°C)	Good	-	Excellent
Frozen Ear Lake Outlet	Turbidity (NTU)	Excellent	Excellent	Good
Roebucks Brook	Dissolved Oxygen (mg/l)	Excellent	-	Marginal
Roebucks Brook	pH	Good	Good	Excellent
Roebucks Brook	Specific Conductivity (µS/cm)	Excellent	Excellent	Good
Roebucks Brook	Temperature (°C)	Excellent	-	Excellent
Roebucks Brook	Turbidity (NTU)	Excellent	Excellent	Good
Valentine River Outlet	Dissolved Oxygen (mg/l)	Excellent	-	Fair
Valentine River Outlet	pH	Excellent	Excellent	Good
Valentine River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Valentine River Outlet	Temperature (°C)	Excellent	-	Excellent
Valentine River Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Dissolved Oxygen (mg/l)	Excellent	-	Fair
Victoria River at Beothuk Lake	pH	Good	Excellent	Good
Victoria River at Beothuk Lake	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Temperature (°C)	Excellent	-	Excellent
Victoria River at Beothuk Lake	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River Outlet	Dissolved Oxygen (mg/l)	-	-	Good
Victoria River Outlet	pH	-	Good	Good
Victoria River Outlet	Specific Conductivity (µS/cm)	-	Excellent	Excellent
Victoria River Outlet	Temperature (°C)	-	-	Excellent
Victoria River Outlet	Turbidity (NTU)	-	Excellent	Excellent
Victoria River Tributary	Dissolved Oxygen (mg/l)	Excellent	-	Fair
Victoria River Tributary	pH	Fair	Fair	Good
Victoria River Tributary	Specific Conductivity (µS/cm)	Excellent	Good	Excellent
Victoria River Tributary	Temperature (°C)	Excellent	-	Excellent
Victoria River Tributary	Turbidity (NTU)	Excellent	Excellent	Excellent

Water Temperature

Newfoundland Labrador

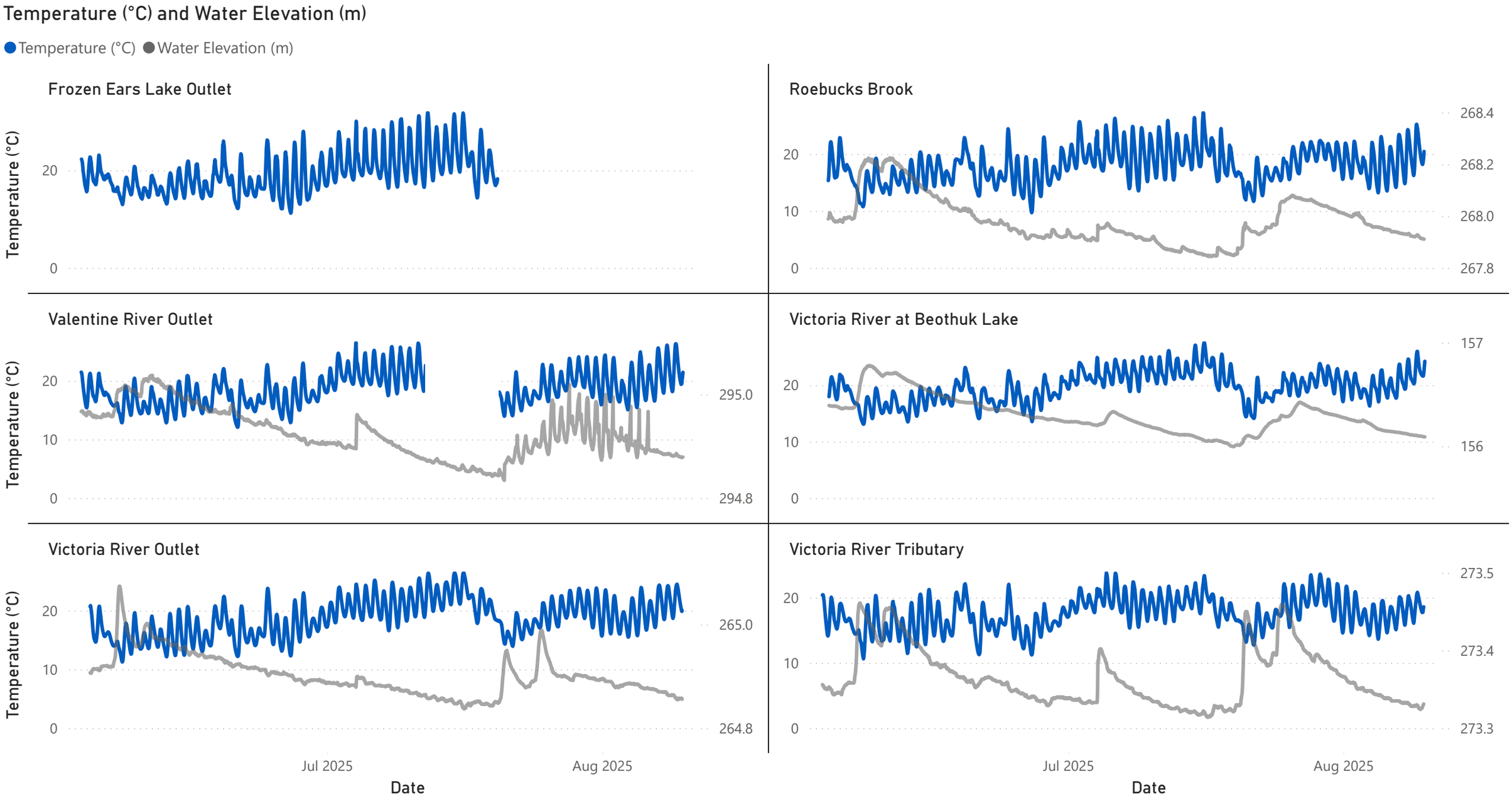
Deployment Period Statistics (°C)

Station Name	Average	Median	Minimum	Maximum
Frozen Ears Lake Outlet	19.53	18.75	11.21	31.85
Roebucks Brook	18.02	17.81	9.69	27.27
Valentine River Outlet	18.70	18.38	12.07	26.52
Victoria River at Beothuk Lake	19.70	19.68	13.07	27.53
Victoria River Outlet	18.80	18.74	11.25	26.46
Victoria River Tributary	17.54	17.60	10.61	23.81

Water temperature is a critical parameter for wildlife, as many organisms cannot regulate their own body temperatures and instead depend on surrounding air and water conditions. Water temperature can be influenced by industrial inputs or alterations to natural environments, such as the removal of trees and vegetation, which eliminates the protective canopy they provide. Additionally, water temperature impacts other monitored parameters, including dissolved oxygen and specific conductivity.

Water temperatures remained steady throughout the deployment period at all stations. A natural daily cycle was also observed, with higher temperatures during the day and lower temperatures at night.

Water Temperature Station Graphs



pH

Deployment Period Statistics (pH Units)

Station Name	Average	Median	Minimum	Maximum
Frozen Ears Lake Outlet	7.21	7.21	6.65	7.73
Roebucks Brook	6.97	6.99	6.28	7.68
Valentine River Outlet	7.01	7.00	6.51	7.41
Victoria River at Beothuk Lake	7.43	7.44	7.09	7.68
Victoria River Outlet	7.05	7.00	6.70	7.71
Victoria River Tributary	7.44	7.43	7.21	7.64

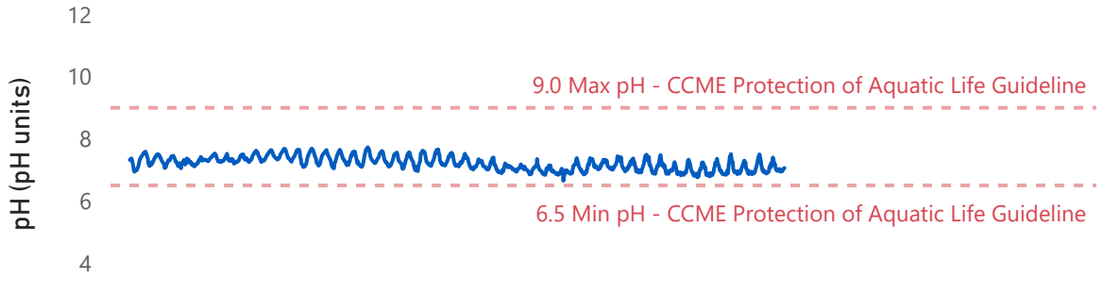
pH relates to the free hydrogen ions in water, and it is a measure of acidity in water. pH is a critical parameter because it influences the solubility of minerals and chemicals, the availability of nutrients, and the biological processes that occur in aquatic ecosystems. The Canadian Council of Ministers of the Environment (CCME) Freshwater Aquatic Life guideline provides a basis by which to judge the overall health of the brook. Their freshwater guidelines recommend a minimum pH of 6.5 and a maximum pH of 9.0; however, many rivers in Newfoundland and Labrador are naturally more acidic due to the local geology.

pH remained stable and consistent at all stations, with small fluctuations likely resulting from precipitation events. Rainwater, with its naturally lower pH, temporarily dilutes the water column, causing a short-term decrease in pH. However, pH levels typically return to baseline within a few days to weeks. Median pH values were slightly higher at the Victoria River at Beothuk Lake and Victoria River Tributary stations, but remained comparable across all stations.

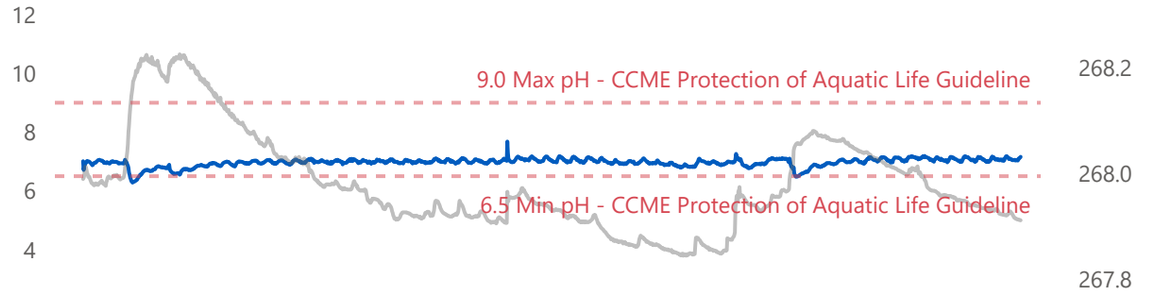
pH at most stations remained within the CCME Guidelines for the Protection of Aquatic Life for the duration of the deployment period. Brief, periodic decreases below the minimum guideline value were observed at Roebucks Brook. These decreases coincided with periods of elevated water levels and precipitation events and returned to background levels above the guideline threshold in the days following the events.

pH Station Graphs

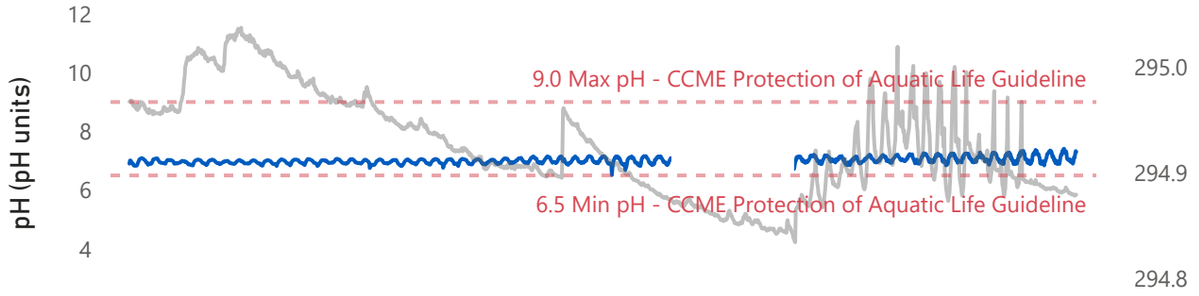
Frozen Ears Lake Outlet



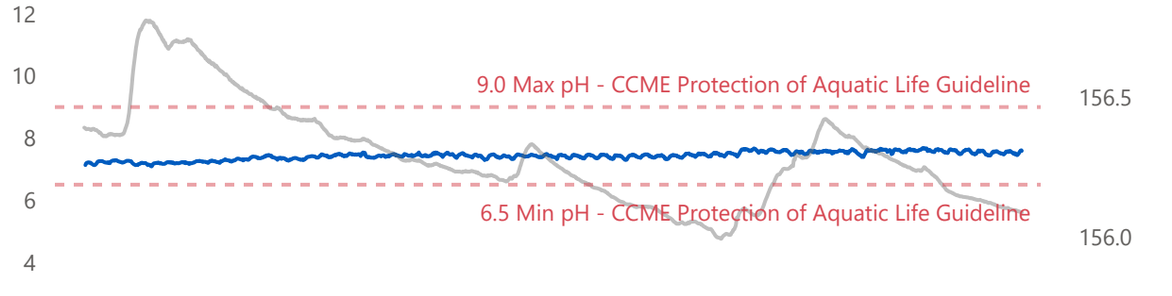
Roebucks Brook



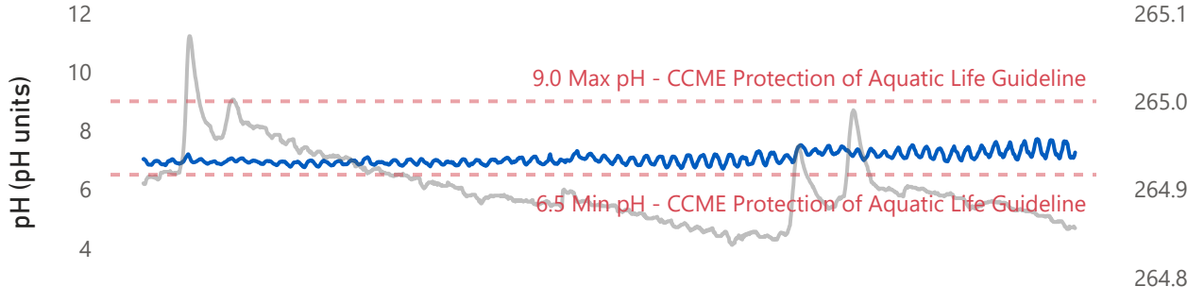
Valentine River Outlet



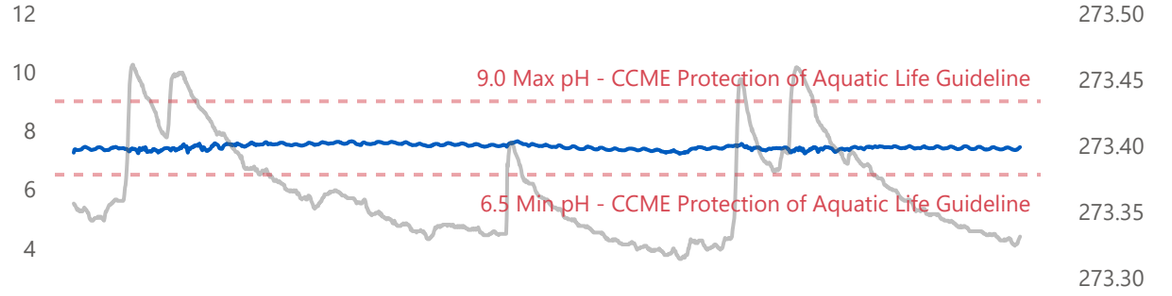
Victoria River at Beothuk Lake



Victoria River Outlet



Victoria River Tributary



Specific Conductivity

Newfoundland Labrador

Deployment Period Statistics (µS/cm)

Station Name	Average	Median	Minimum	Maximum
Frozen Ears Lake Outlet	59.18	57.55	43.20	84.20
Roebucks Brook	34.09	33.14	17.92	85.14
Valentine River Outlet	27.14	26.99	21.15	30.25
Victoria River at Beothuk Lake	31.59	30.40	25.74	41.54
Victoria River Outlet	34.45	30.08	22.54	73.89
Victoria River Tributary	124.32	122.70	51.62	179.18

Specific conductivity is a common indicator of the concentration of dissolved ions in water, such as salts, acids, and bases. Higher concentrations of dissolved ions result in higher specific conductivity, while pure water exhibits low conductivity. Specific conductivity is often affected by precipitation. During precipitation events, rainwater can temporarily dilute the water column, resulting in a short-term decrease in conductivity. However, high precipitation events can also cause a temporary increase in conductivity if sediment from the bottom of the waterbody is disturbed around the sensor or if runoff carrying dissolved ions enters the water column.

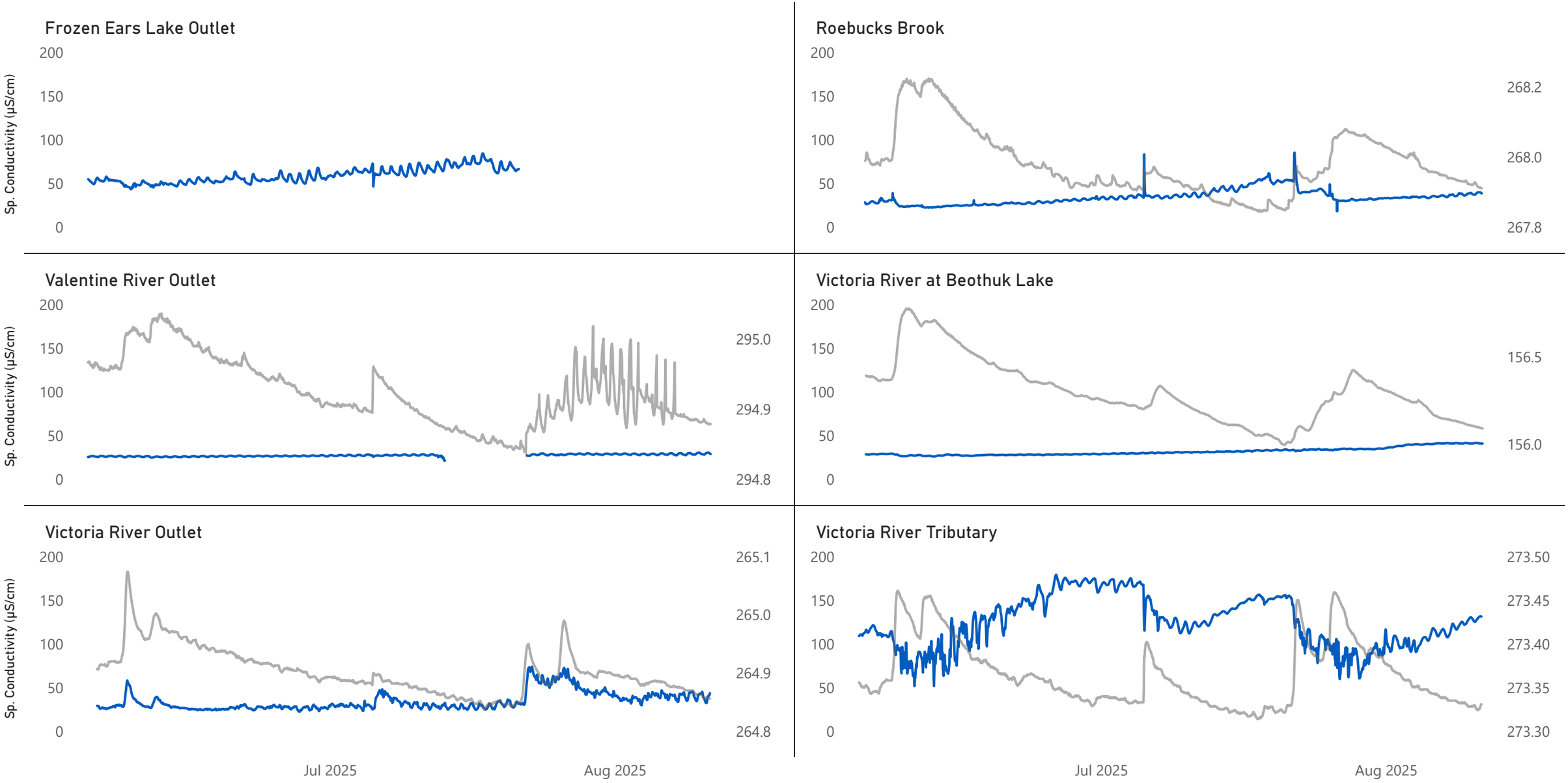
Conductivity remained relatively low and stable at Roebucks Brook, Frozen Ears Lake Outlet, Valentine River Outlet, and Victoria River at Beothuk Lake. In contrast, Victoria River Tributary exhibited noticeably higher and more variable conductivity, while Victoria River Outlet, though similar in values to the other stations, also showed greater variability. Across all stations, a slight upward trend in conductivity corresponded with decreasing water elevation over the deployment period, consistent with evaporative concentration processes. As water levels decrease through evaporation, dissolved ions become more concentrated, resulting in elevated conductivity values.

Around July 21, a distinct spike in conductivity was observed at Victoria River Outlet, coinciding with a temporary rise in water elevation, likely due to a precipitation event. The stations proximity to a large embankment may contribute to increased runoff entering the river near the sonde location. Additionally, the sonde is positioned within a soft, muddy substrate, making it more susceptible to disturbance during periods of elevated flow. These factors likely account for the short-term increases in conductivity observed during water level rises, as surface runoff introduces additional dissolved ions into the water column.

Specific Conductivity Station Graphs

Newfoundland Labrador

● Specific Conductivity (µS/cm) ● Water Elevation (m)



Dissolved Oxygen

Deployment Period Statistics

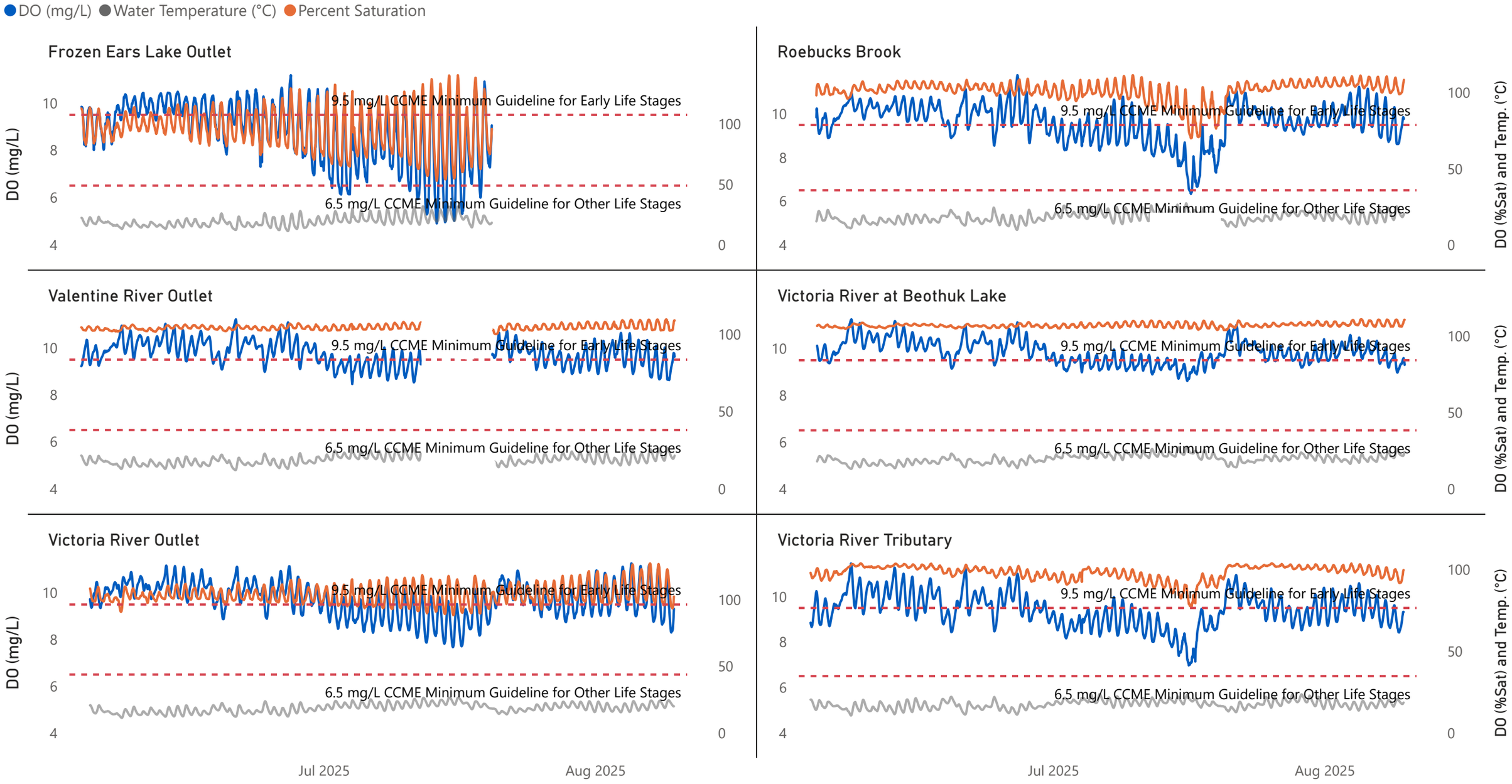
Station Name	Average (mg/L)	Average (% Sat.)	Median (mg/L)	Median (% Sat.)	Minimum (mg/L)	Minimum (% Sat.)	Maximum (mg/L)	Maximum (% Sat.)
Victoria River at Beothuk Lake	9.84	107.31	9.80	107.20	8.61	104.10	11.25	111.20
Valentine River Outlet	9.77	104.36	9.78	103.90	8.46	100.00	11.22	109.60
Victoria River Outlet	9.71	104.03	9.80	102.70	7.67	88.40	11.26	127.30
Victoria River Tributary	9.41	98.14	9.41	99.30	6.97	77.40	11.46	103.80
Roebucks Brook	9.62	101.33	9.75	102.70	6.33	70.00	11.79	111.60
Frozen Ears Lake Outlet	8.78	95.82	9.13	96.15	4.90	53.00	11.18	140.70

Dissolved oxygen (DO) is crucial for supporting aquatic life, and the CCME (Canadian Council of Ministers of the Environment) Freshwater Aquatic Life guidelines establish reference values to evaluate waterway health. The minimum DO guideline is 9.5 mg/L for early life stages in cold water species and 6.5 mg/L for other life stages. DO concentrations can fluctuate due to factors such as water temperature, atmospheric pressure, and the presence of other dissolved substances. Warmer water typically holds less dissolved oxygen than cooler water.

Throughout the deployment period, daily fluctuations in DO concentrations were observed at all stations, primarily influenced by temperature variation and the photosynthetic/respiratory activity of aquatic plants. DO concentrations remained above the CCME guideline for the protection of other life stages (6.5 mg/L) for the entirety of the deployment period, except for brief dips below at Roebucks Brook and Frozen Ears Lake Outlet. Concentrations generally hovered around or slightly below the guideline for the protection of early life stages (9.5 mg/L) for much of the deployment period, which is expected given the water temperatures typically observed during this time of year.

DO was highly variable throughout the deployment period at Frozen Ears Lake Outlet station. This site is an exposed area with no vegetation cover, characterized by shallow, slow-moving water, and is particularly sensitive to air temperature changes. Additionally, DO at this station may be influenced by reduced aeration and/or stagnant pools of water due to low water levels, as well as potentially significant biological activity during the summer. These conditions lead to significant pronounced diurnal variations in DO levels, as illustrated in the figure on the next page.

Dissolved Oxygen Station Graphs



Turbidity

Deployment Period Statistics (NTU)				
Station Name	**Average**	**Median**	**Minimum**	**Maximum**
Frozen Ears Lake Outlet	**0.58**	**0.53**	**0.02**	**15.43**
Roebucks Brook	**5.74**	**2.26**	**0.27**	**1,101.80**
Valentine River Outlet	**0.10**	**0.10**	**0.00**	**0.41**
Victoria River at Beothuk Lake	**0.52**	**0.44**	**0.12**	**1.82**
Victoria River Outlet	**0.30**	**0.16**	**0.00**	**3.61**
Victoria River Tributary	**0.37**	**0.25**	**0.05**	**3.99**

Turbidity, a measure of water cloudiness, often increases during precipitation events as runoff carries silt and debris into the waterbody. High turbidity values can reduce light penetration for aquatic plants, disrupt benthic habitats and potentially harm fish gills or damage monitoring equipment.

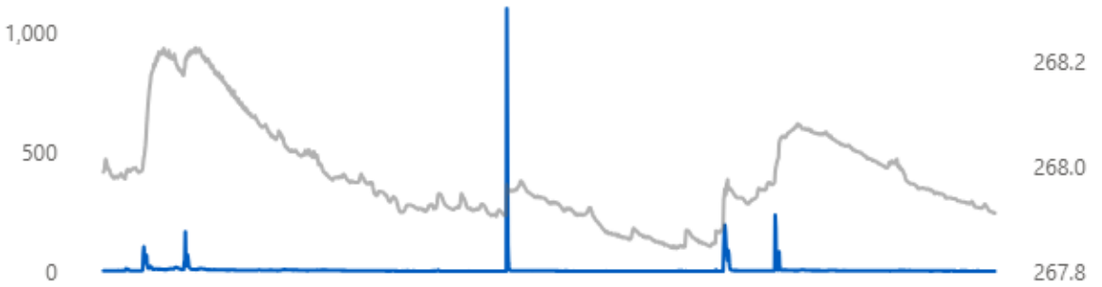
During the deployment period, turbidity generally remained low across all stations, reflecting clear and pristine water conditions. Increases in water elevation caused by precipitation events led to temporary turbidity spikes, which typically returned to baseline levels within a few days. Median turbidity values were similar across stations, except slightly higher at Roebucks Brook. The elevated background turbidity and occasional spikes at Roebucks Brook are likely due to the sonde being positioned downstream of a bridge crossing a dirt access road. These spikes correspond with runoff from the road during high water events, but values generally return to baseline shortly thereafter.

Turbidity Station Graphs

Turbidity (NTU) Water Elevation (m)

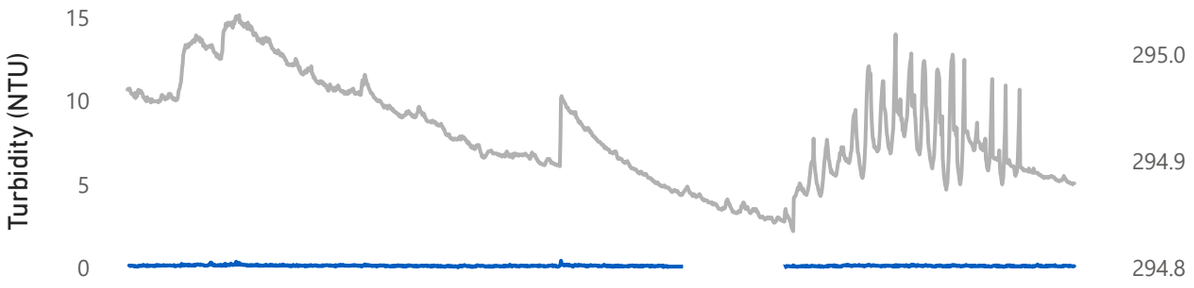
Frozen Ears Lake Outlet

Roebucks Brook

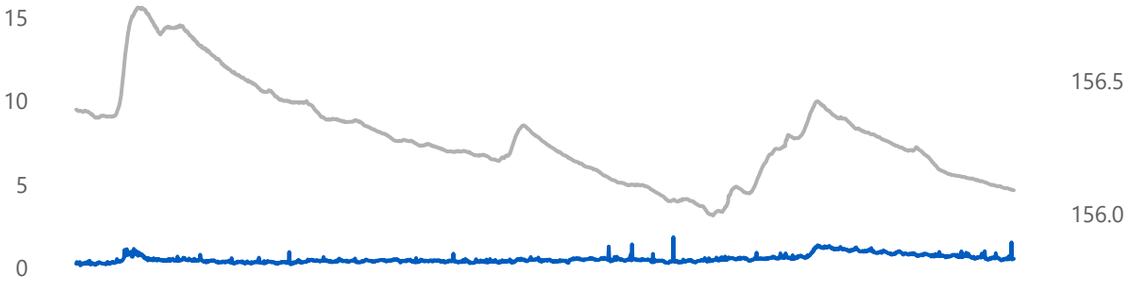


*Please note change in scale

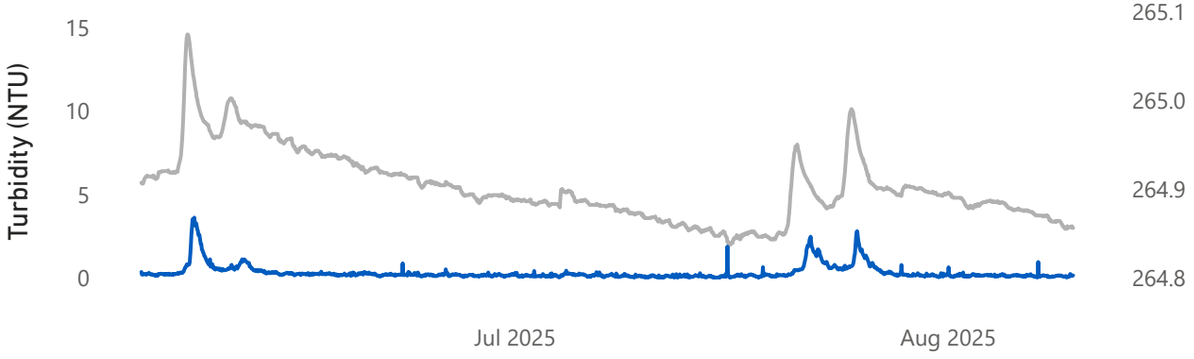
Valentine River Outlet



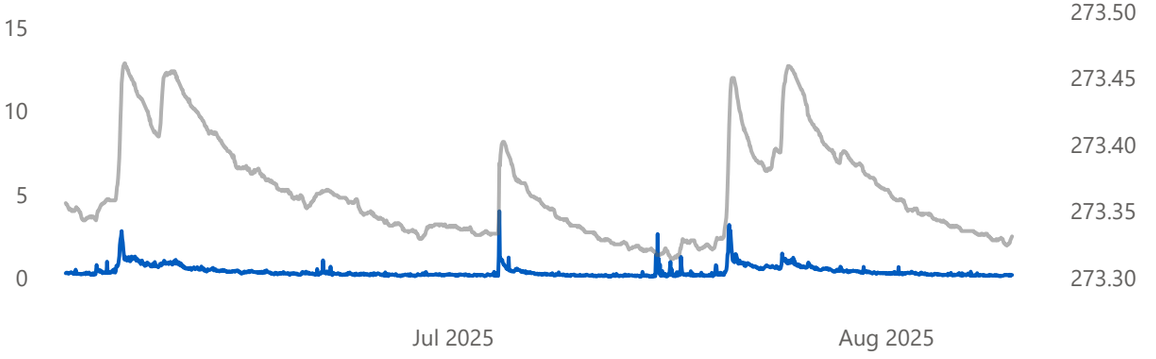
Victoria River at Beothuk Lake



Victoria River Outlet



Victoria River Tributary



Water Elevation

Newfoundland Labrador

Deployment Period Statistics (m)

Station Name	Minimum	Maximum	Average	Median
Roebucks Brook	267.84	268.23	267.98	267.96
Valentine River Outlet	294.83	295.04	294.93	294.92
Victoria River at Beothuk Lake	156.00	156.78	156.30	156.27
Victoria River Outlet	264.84	265.07	264.90	264.89
Victoria River Tributary	273.31	273.46	273.36	273.36

Water elevation provides an estimate of the water level at a monitoring station and plays a vital role in analyzing trends in water quality data, particularly for parameters such as specific conductivity, pH, and turbidity. Water elevation generally rises during precipitation events as rainwater and runoff enter the water column. By monitoring water elevation alongside precipitation events, we can better interpret our data, distinguish whether an elevation increase is caused by rainfall or potential industrial activities, and assess its impact on water quality. Precipitation data was obtained from the Valentine Gold Project meteorological (MET) station, which is located on-site and maintained collaboratively by WRMD and Equinox Gold.

Water elevation at all six stations fluctuated and exhibited a decreasing trend throughout the deployment period. The decreasing trend is likely the result of rising air temperatures causing increased evaporation from the water column, combined with limited rainfall to replenish the system. The station graphs on the following page demonstrates the effect of precipitation events on elevation, showing distinct elevation spikes occurring during or shortly after rainfall, like around July 5th.

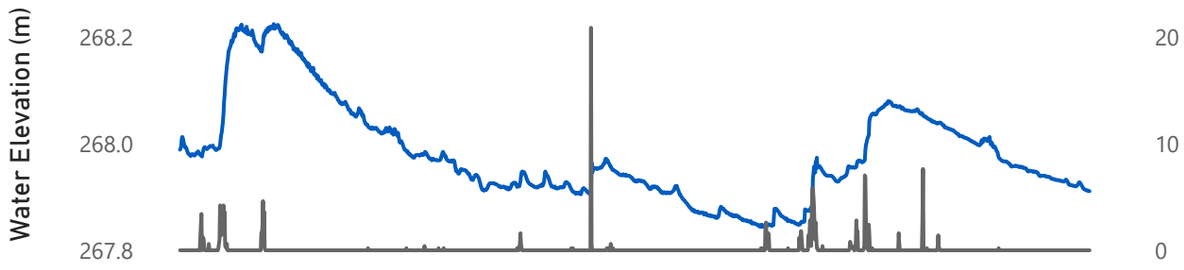
There is no water elevation data for Frozen Ears Outlet station for this deployment period.

Water Elevation Station Graphs

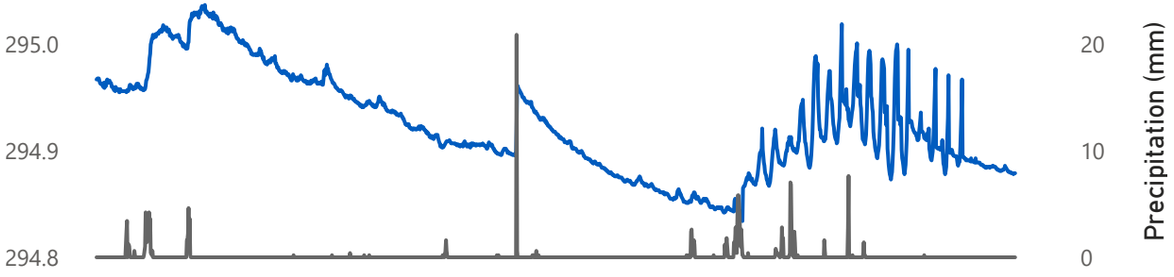
Newfoundland Labrador

● Water Elevation (m) ● Precipitation (mm)

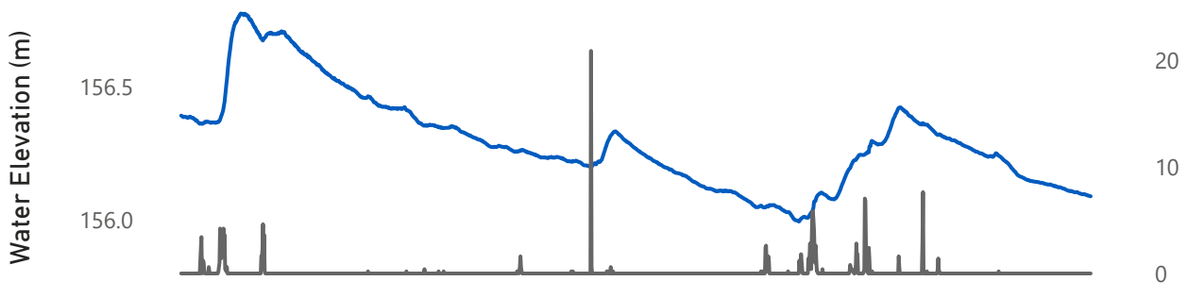
Roebucks Brook



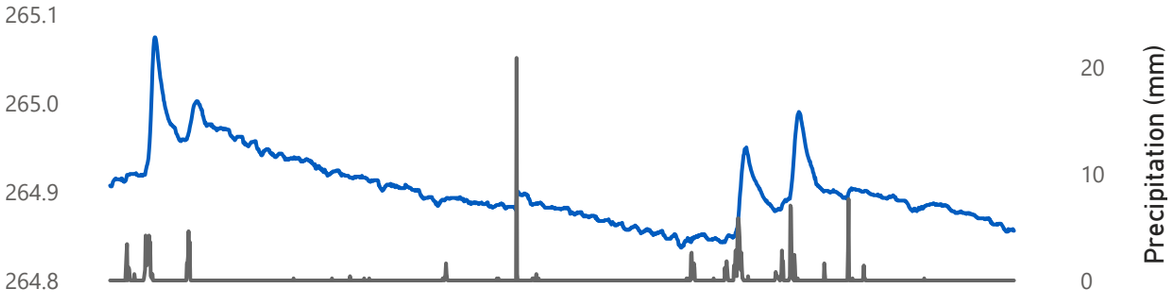
Valentine River Outlet



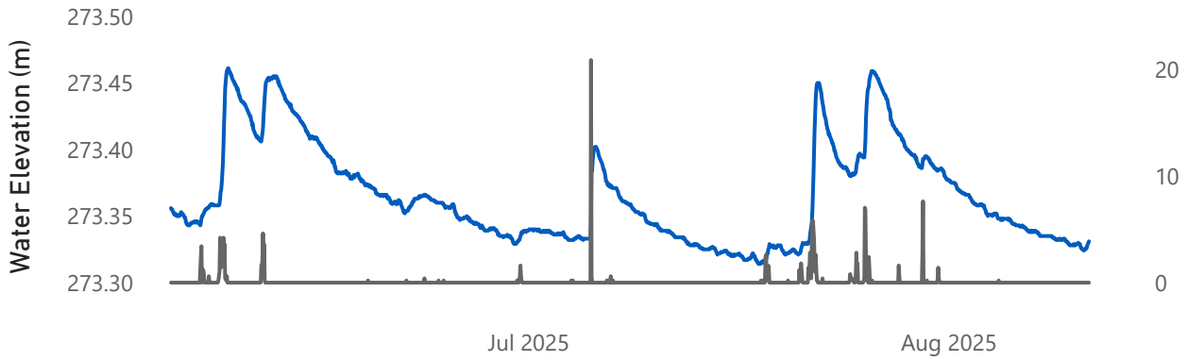
Victoria River at Beothuk Lake



Victoria River Outlet



Victoria River Tributary



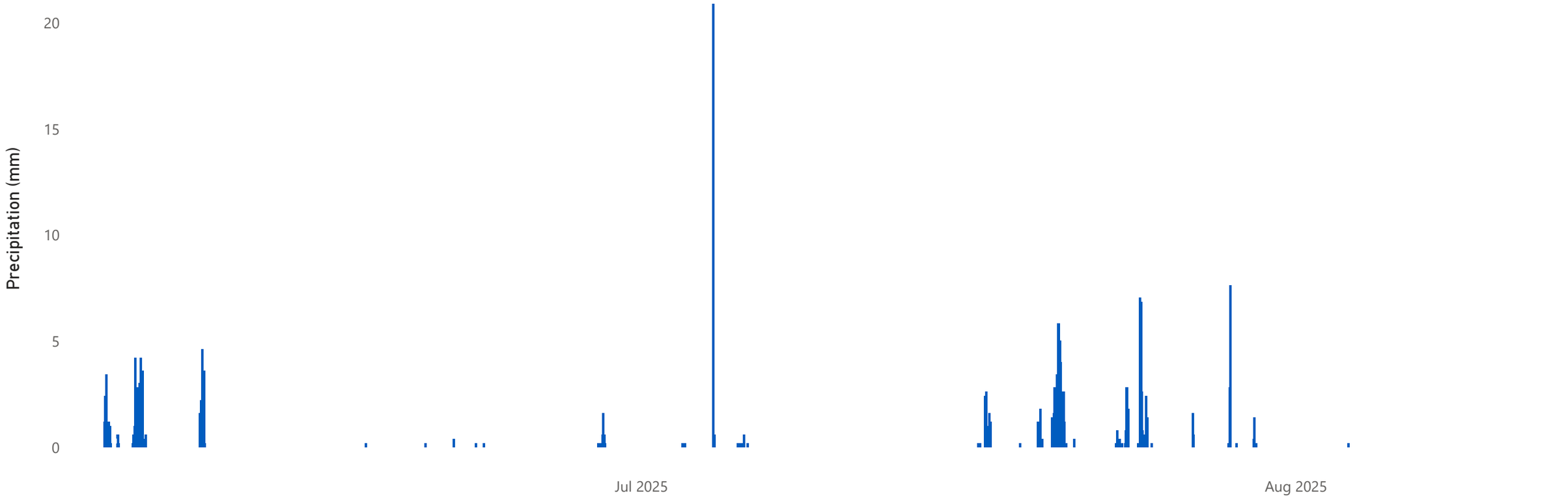
Frozen Ears Outlet

- No water elevation data available for this deployment period

Precipitation Data

Retrieved from the Valentine Gold Project MET Station

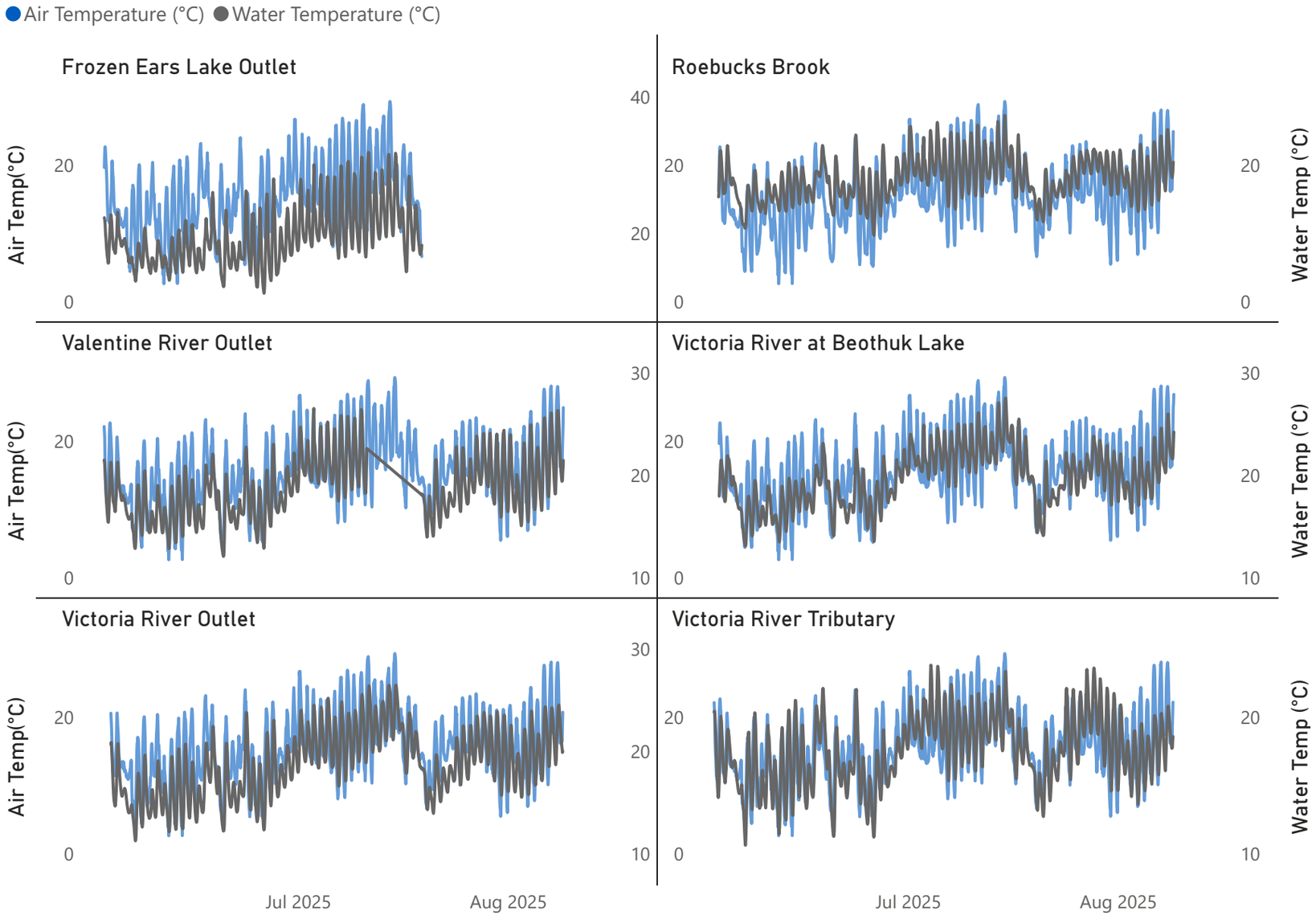
0.11	0.00	0.00	20.90	182.91
Average (mm/hr)	Minimum (mm/hr)	Median (mm/hr)	Maximum (mm/hr)	Total Precip. (mm)

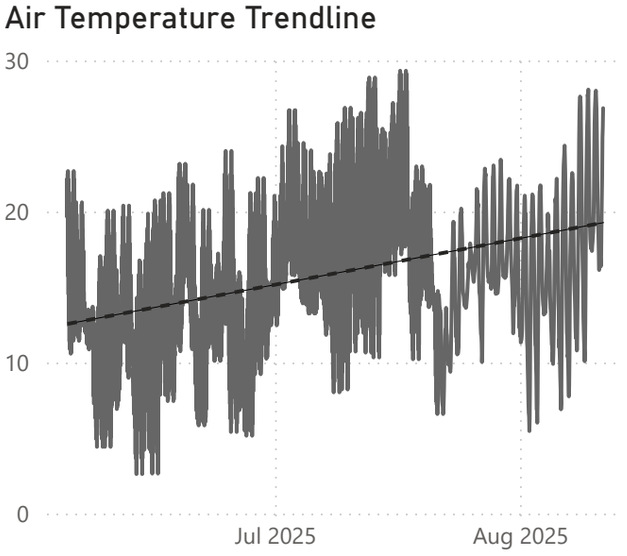


Air Temperature Data

Retrieved from the Valentine Gold Project MET Station

Newfoundland Labrador





15.57	15.34
Average (°C)	Median (°C)
2.61	29.32
Minimum (°C)	Maximum (°C)