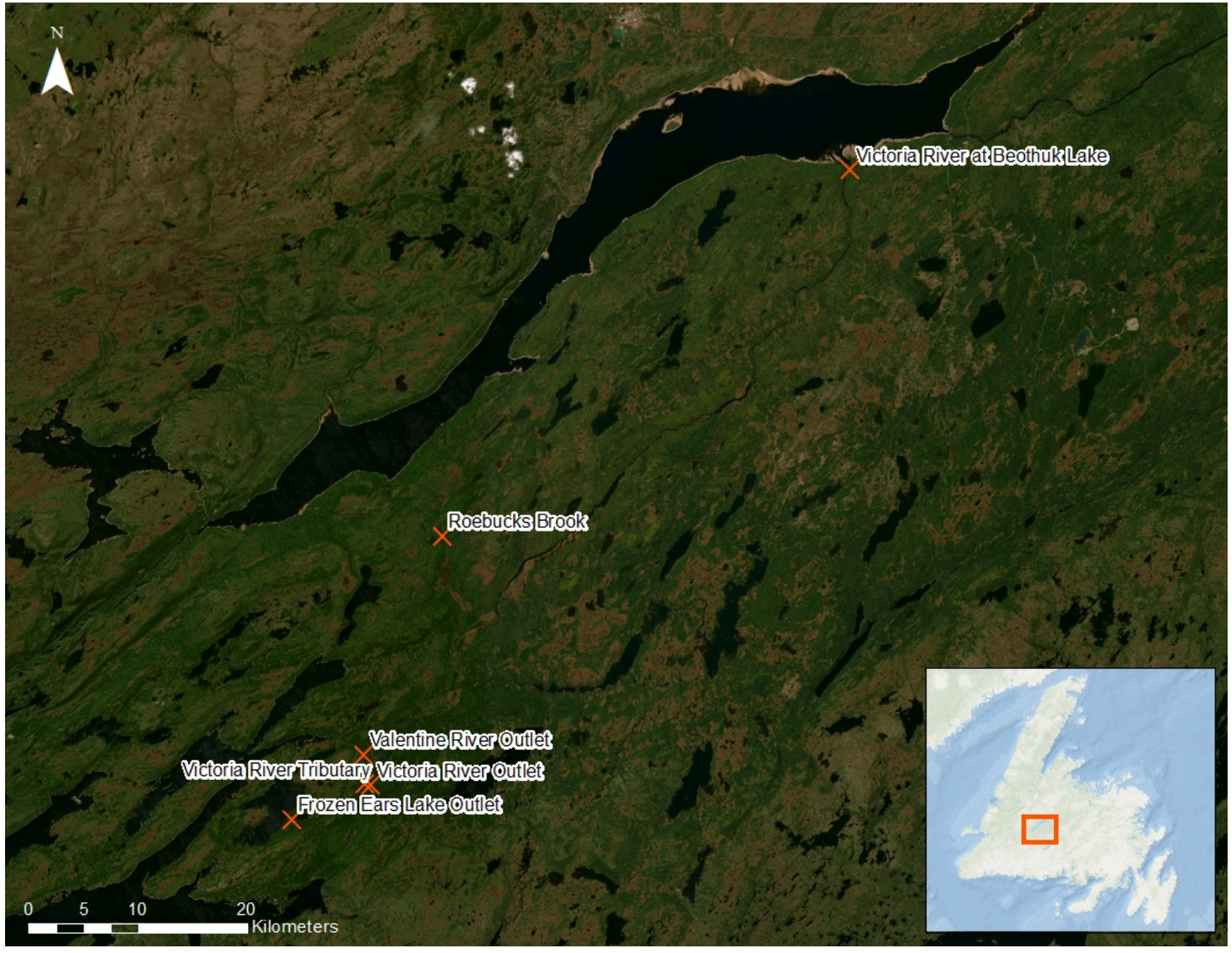
# Real Time Water Quality Deployment Report
# Equinox Gold: Valentine Gold Mine Network

2025-08-11 to 2025-09-17

Government of Newfoundland & Labrador
Department of Environment, Conservation & 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 Outlet.

This report covers the monitoring period from 2025-07-21 to 2025-09-17 for Frozen Ears Lake Outlet station, and 2025-08-11 to 2025-09-17 for the other 5 surface water stations.

| 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

- The Frozen Ears Lake Outlet station follows a slightly different schedule than the other stations. It is located on site and requires an onsite escort for access, whereas the remaining five stations are easily accessible along the access road. As a result, the Frozen Ears Outlet deployment period began on July 21, 2025, while the other stations began on August 11, 2025.

## 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, most parameters across all stations ranked *good* or *excellent*, indicating minimal differences between the field and QA/QC sonde measurements. pH at the Victoria River at Beothuk Lake station ranked *fair*, which is likely due to insufficient equilibration time for the field sonde prior to recording initial measurements. Dissolved oxygen at Frozen Ears Lake Outlet station ranked *marginal*. Given the poor ranking upon removal, this may indicate sensor deterioration.

Grab sample rankings collected during deployment ranged from *fair* to *excellent*. pH ranked *fair* at Victoria River at Beothuk Lake, Roebucks Brook, Victoria River Tributary, and Victoria River 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 the initial grab sample measurements.

Upon removal, the majority of parameters at all stations ranked *good* or *excellent*, indicating minimal differences between field and QA/QC sonde measurements and suggesting stable sensor performance throughout the deployment period. Dissolved oxygen ranked *poor* at Frozen Ears Lake Outlet, and *fair* at Victoria River Outlet, and Victoria River Tributary. This is likely attributable to sensor deterioration on the QA/QC sonde, given the consistent pattern observed across multiple stations. Specific conductivity ranked *poor* at Roebucks Brook, which is likely due to differences in sampling location between the QA/QC and field sondes.

### QAQC Rankings

| Station | Parameter | Deployment Rank | Grab Sample Deployment | Removal Rank |
|---|---|---|---|---|
| Frozen Ears Lake Outlet | Dissolved Oxygen (mg/l) | Marginal | - | Poor |
| Frozen Ears Lake Outlet | pH | Excellent | Fair | Excellent |
| Frozen Ears Lake Outlet | Specific Conductivity (µS/cm) | Good | Good | Excellent |
| Frozen Ears Lake Outlet | Temperature (°C) | Good | - | Good |
| Frozen Ears Lake Outlet | Turbidity (NTU) | Good | Good | Excellent |
| Roebucks Brook | Dissolved Oxygen (mg/l) | Good | - | Good |
| Roebucks Brook | pH | Good | Fair | Excellent |
| Roebucks Brook | Specific Conductivity (µS/cm) | Good | Excellent | Poor |
| Roebucks Brook | Temperature (°C) | Excellent | - | Excellent |
| Roebucks Brook | Turbidity (NTU) | Good | Excellent | Good |
| Valentine River Outlet | Dissolved Oxygen (mg/l) | Excellent | - | Excellent |
| 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 | - | Good |
| Victoria River at Beothuk Lake | pH | Fair | Fair | Excellent |
| Victoria River at Beothuk Lake | Specific Conductivity (µS/cm) | Excellent | Excellent | Excellent |
| Victoria River at Beothuk Lake | Temperature (°C) | Good | - | Excellent |
| Victoria River at Beothuk Lake | Turbidity (NTU) | Excellent | Excellent | Excellent |
| Victoria River Outlet | Dissolved Oxygen (mg/l) | Good | - | Fair |
| Victoria River Outlet | pH | Excellent | Fair | Excellent |
| Victoria River Outlet | Specific Conductivity (µS/cm) | Excellent | Excellent | Excellent |
| Victoria River Outlet | Temperature (°C) | Excellent | - | Excellent |
| Victoria River Outlet | Turbidity (NTU) | Excellent | Good | Excellent |
| Victoria River Tributary | Dissolved Oxygen (mg/l) | Good | - | Fair |
| Victoria River Tributary | pH | Excellent | Fair | Good |
| Victoria River Tributary | Specific Conductivity (µS/cm) | Excellent | Good | Excellent |
| Victoria River Tributary | Temperature (°C) | Good | - | 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 | 18.97 | 18.62 | 11.35 | 32.00 |
| Roebucks Brook | 16.95 | 16.65 | 10.06 | 27.21 |
| Valentine River Outlet | 18.19 | 17.79 | 10.58 | 28.94 |
| Victoria River at Beothuk Lake | 18.60 | 18.38 | 11.76 | 29.12 |
| Victoria River Outlet | 18.17 | 18.01 | 11.53 | 27.11 |
| Victoria River Tributary | 16.81 | 16.51 | 10.07 | 25.96 |

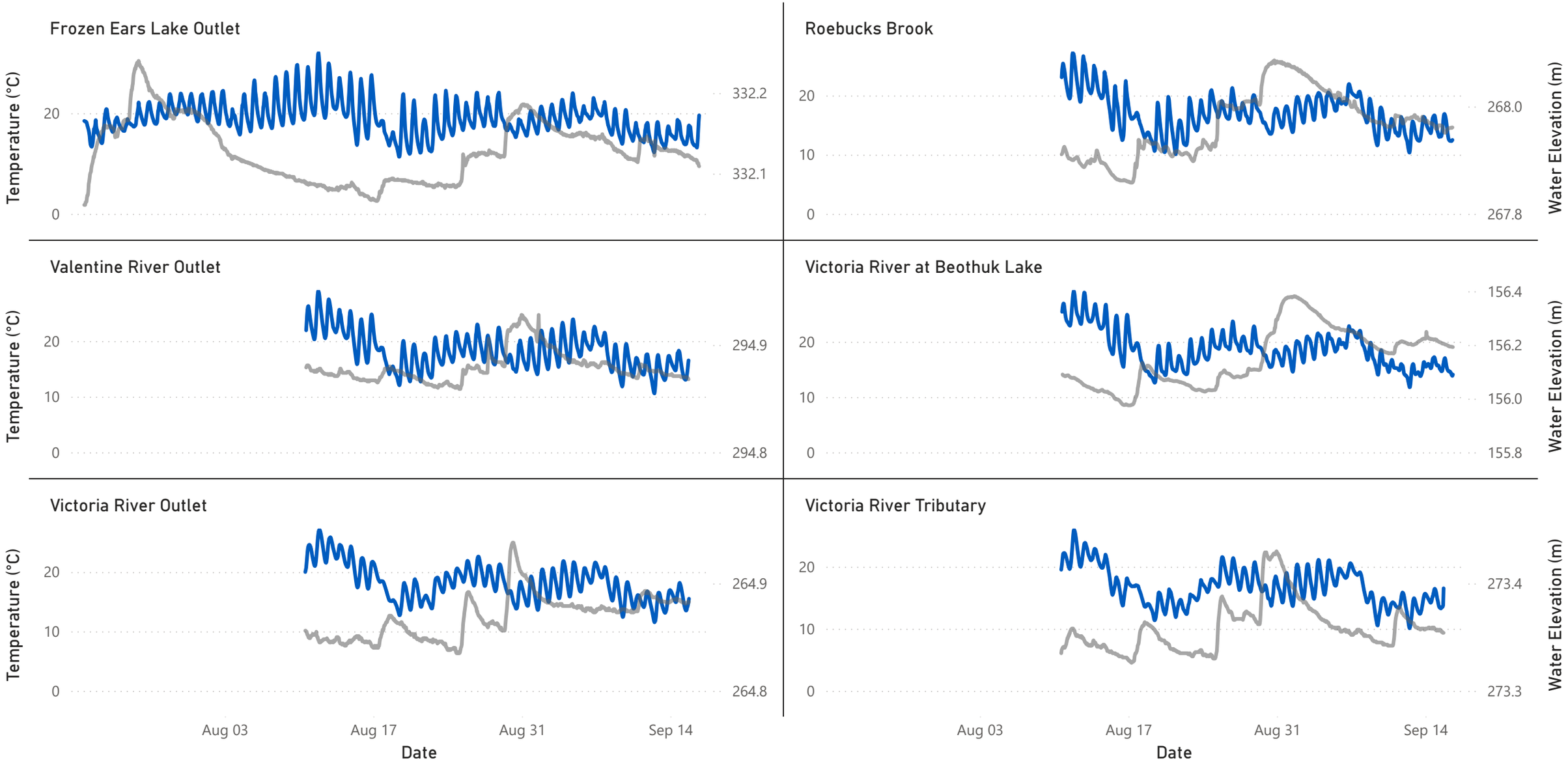
Water temperature is a critical parameter for wildlife, as many organisms cannot regulate their own body temperatures and instead depend on surrounding air and water conditions. Water temperature can be influenced by industrial inputs or alterations to natural environments, such as the removal of trees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

Water temperatures across the network remained steady, with a slight decreasing trend throughout the deployment period. A natural daily cycle was also observed, with higher temperatures during the day and lower temperatures at night.

# Water Temperature Station Graphs

Temperature (°C) and Water Elevation (m)

● Temperature (°C) ● Water Elevation (m)



# pH

Newfoundland Labrador

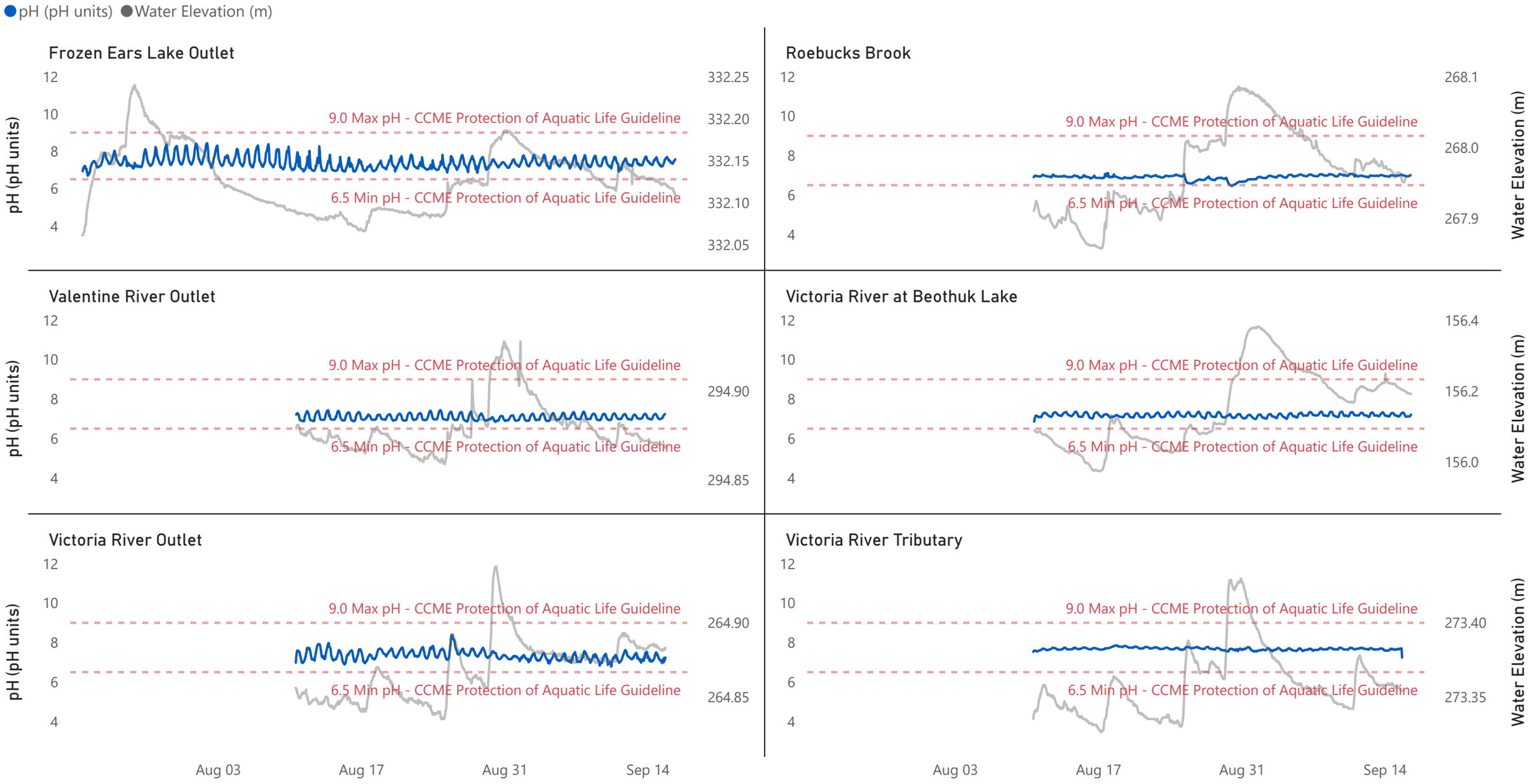
**Deployment Period Statistics (pH Units)**

| Station Name | Average | Median | Minimum | Maximum |
|---|---|---|---|---|
| Frozen Ears Lake Outlet | 7.40 | 7.34 | 6.69 | 8.43 |
| Roebucks Brook | 6.91 | 6.94 | 6.45 | 7.12 |
| Valentine River Outlet | 7.08 | 7.02 | 6.84 | 7.44 |
| Victoria River at Beothuk Lake | 7.18 | 7.17 | 6.86 | 7.36 |
| Victoria River Outlet | 7.34 | 7.31 | 6.78 | 8.40 |
| Victoria River Tributary | 7.68 | 7.68 | 7.24 | 7.86 |

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. pH at most stations remained within the CCME Guidelines for the Protection of Aquatic Life throughout the deployment period, except for a very brief dip below the minimum guideline value at Roebucks Brook.

# pH Station Graphs



# Specific Conductivity

Newfoundland Labrador

| Deployment Period Statistics (µS/cm) | | | | |
|---|---|---|---|---|
| **Station Name** | **Average** | **Median** | **Minimum** | **Maximum** |
| **Frozen Ears Lake Outlet** | **79.95** | **80.33** | **58.04** | **92.23** |
| **Roebucks Brook** | **36.40** | **34.65** | **27.34** | **95.91** |
| **Valentine River Outlet** | **29.40** | **29.46** | **26.53** | **31.38** |
| **Victoria River at Beothuk Lake** | **39.41** | **39.12** | **35.19** | **43.40** |
| **Victoria River Outlet** | **43.44** | **40.64** | **27.48** | **80.48** |
| **Victoria River Tributary** | **133.86** | **133.62** | **79.20** | **164.68** |

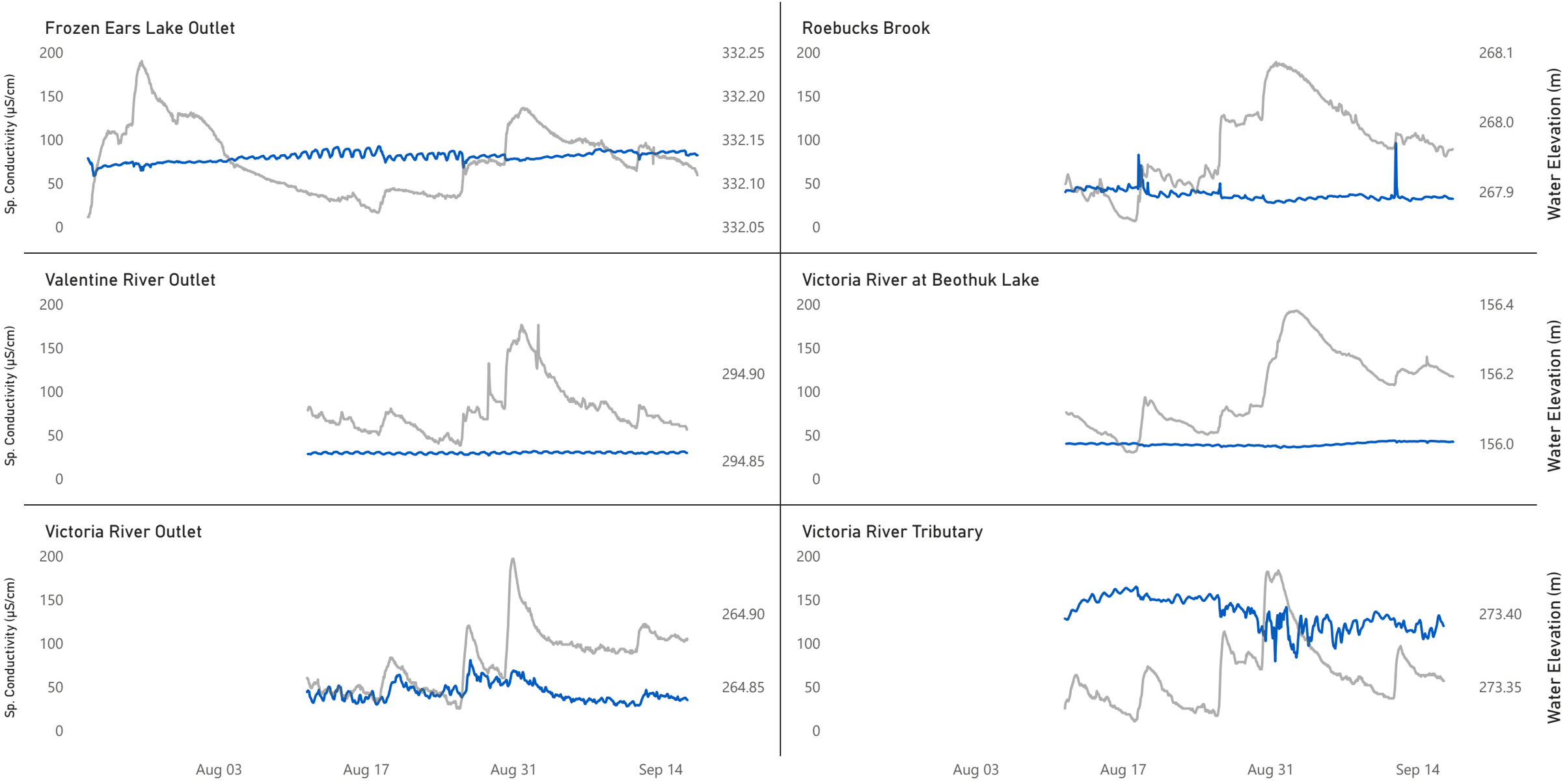
Specific conductivity is a common indicator of the concentration of dissolved ions in water, such as salts, acids, and bases. Higher concentrations of dissolved ions result in higher specific conductivity, while pure water exhibits low conductivity. Specific conductivity is often affected by precipitation. 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 across most stations; however, some variability was observed at Victoria River Tributary and Victoria River Outlet. Victoria River Outlet's proximity to a large embankment likely contributes to increased runoff entering the river near the sonde location. In addition, the sonde is situated in a soft, muddy substrate, making it more vulnerable to disturbance during precipitation events. Together, these factors likely explain the short-term increases in conductivity observed during rising water levels, as surface runoff introduces additional dissolved ions into the water column. In contrast, specific conductivity at Frozen Ears Lake Outlet generally decreased during high-water events, as illustrated by temporary declines in conductivity coinciding with increases in water elevation.

# Specific Conductivity Station Graphs

Newfoundland Labrador

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



# Dissolved Oxygen

## Deployment Period Statistics

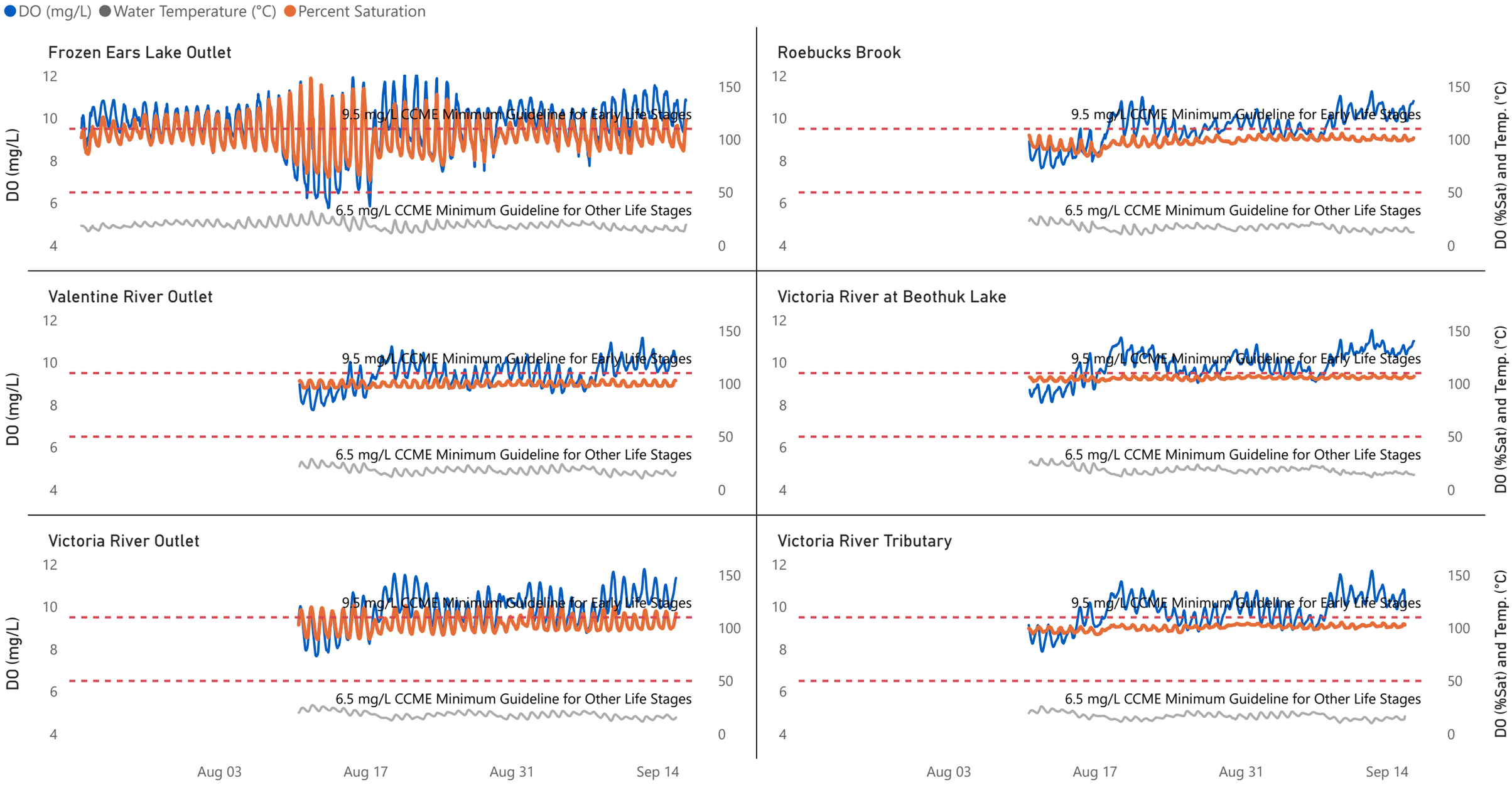
| Station Name | Average (mg/L) | Average (% Sat.) | Median (mg/L) | Median (% Sat.) | Minimum (mg/L) | Minimum (% Sat.) | Maximum (mg/L) | Maximum (% Sat.) |
|---|---|---|---|---|---|---|---|---|
| Frozen Ears Lake Outlet | 9.67 | 104.44 | 9.88 | 103.90 | 5.76 | 61.30 | 12.04 | 157.80 |
| Roebucks Brook | 9.53 | 98.09 | 9.59 | 99.30 | 7.64 | 84.10 | 11.27 | 105.80 |
| Valentine River Outlet | 9.42 | 99.50 | 9.43 | 98.90 | 7.75 | 95.60 | 11.17 | 105.10 |
| Victoria River at Beothuk Lake | 9.90 | 105.37 | 9.93 | 105.40 | 8.10 | 101.60 | 11.53 | 108.70 |
| Victoria River Outlet | 9.92 | 104.88 | 9.99 | 103.70 | 7.66 | 89.00 | 11.78 | 121.90 |
| Victoria River Tributary | 9.78 | 100.42 | 9.84 | 100.80 | 7.88 | 93.90 | 11.70 | 105.20 |

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.

Daily fluctuations in DO concentrations were observed at all stations throughout the deployment period and were primarily driven by temperature variability and the photosynthetic and respiratory activity of aquatic plants. DO concentrations remained relatively stable and consistent at most stations; however, pronounced daily fluctuations were observed at the Frozen Ears Lake Outlet station. This station 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.

Throughout the monitoring period, DO concentrations remained above the Canadian Council of Ministers of the Environment (CCME) guideline for the protection of other life stages (6.5 mg/L), except for a brief dip below at 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.

# Dissolved Oxygen Station Graphs



# Turbidity

**Deployment Period Statistics (NTU)**

| Station Name | Correction | Average | Median | Minimum | Maximum |
|---|---|---|---|---|---|
| Frozen Ears Lake Outlet | [+0.30] | 0.34 | 0.30 | 0.00 | 3.48 |
| Roebucks Brook | [+0.28] | 7.85 | 1.97 | 0.00 | 753.57 |
| Valentine River Outlet | [+0.10] | 0.34 | 0.25 | 0.00 | 2.99 |
| Victoria River at Beothuk Lake | [+1.20] | 0.49 | 0.52 | 0.00 | 0.96 |
| Victoria River Outlet | [+0.43] | 0.55 | 0.56 | 0.00 | 0.99 |
| Victoria River Tributary | [+0.24] | 0.77 | 0.41 | 0.00 | 5.93 |

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.

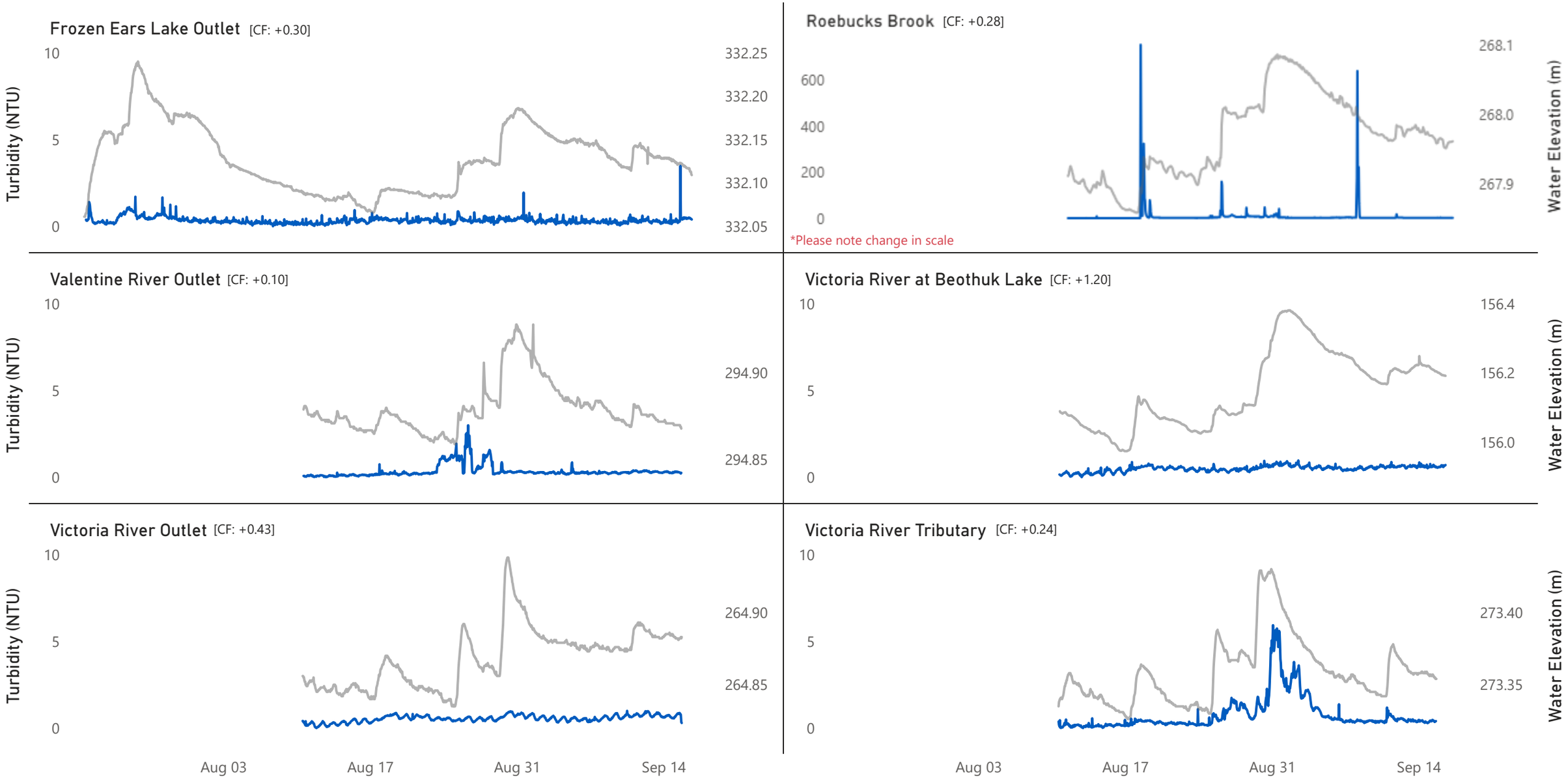
During the deployment period, turbidity generally remained low across all stations, reflecting clear and pristine water conditions. Increases in water elevation caused by precipitation events led to temporary turbidity spikes, which typically returned to baseline levels within a few days. Median turbidity values were similar across stations, except slightly higher at Roebucks Brook. The 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 (typically from precipitation), but values generally return to baseline shortly thereafter.

A correction factor was applied to turbidity data at all stations to address negative turbidity values recorded during the deployment. The correction was calculated by setting the lowest measured value to zero and adding this offset to all remaining values within each dataset. Although the corrected values may not represent absolute turbidity concentrations, the data are considered suitable for evaluating relative trends and examining relationships with other water quality parameters. The applied correction factor (in NTU) for each station is provided in square brackets next to the station name in the table above and is also indicated on the graphs on the following page.

# Turbidity Station Graphs

Newfoundland Labrador

● Turbidity (NTU) ● Water Elevation (m)



# Water Elevation

Newfoundland Labrador

**Deployment Period Statistics (m)**

| Station Name | Minimum | Maximum | Average | Median |
|---|---|---|---|---|
| Frozen Ears Lake Outlet | 332.06 | 332.24 | 332.13 | 332.13 |
| Roebucks Brook | 267.86 | 268.09 | 267.97 | 267.97 |
| Valentine River Outlet | 294.86 | 294.93 | 294.88 | 294.88 |
| Victoria River at Beothuk Lake | 155.98 | 156.38 | 156.15 | 156.12 |
| Victoria River Outlet | 264.84 | 264.94 | 264.87 | 264.87 |
| Victoria River Tributary | 273.33 | 273.43 | 273.36 | 273.36 |

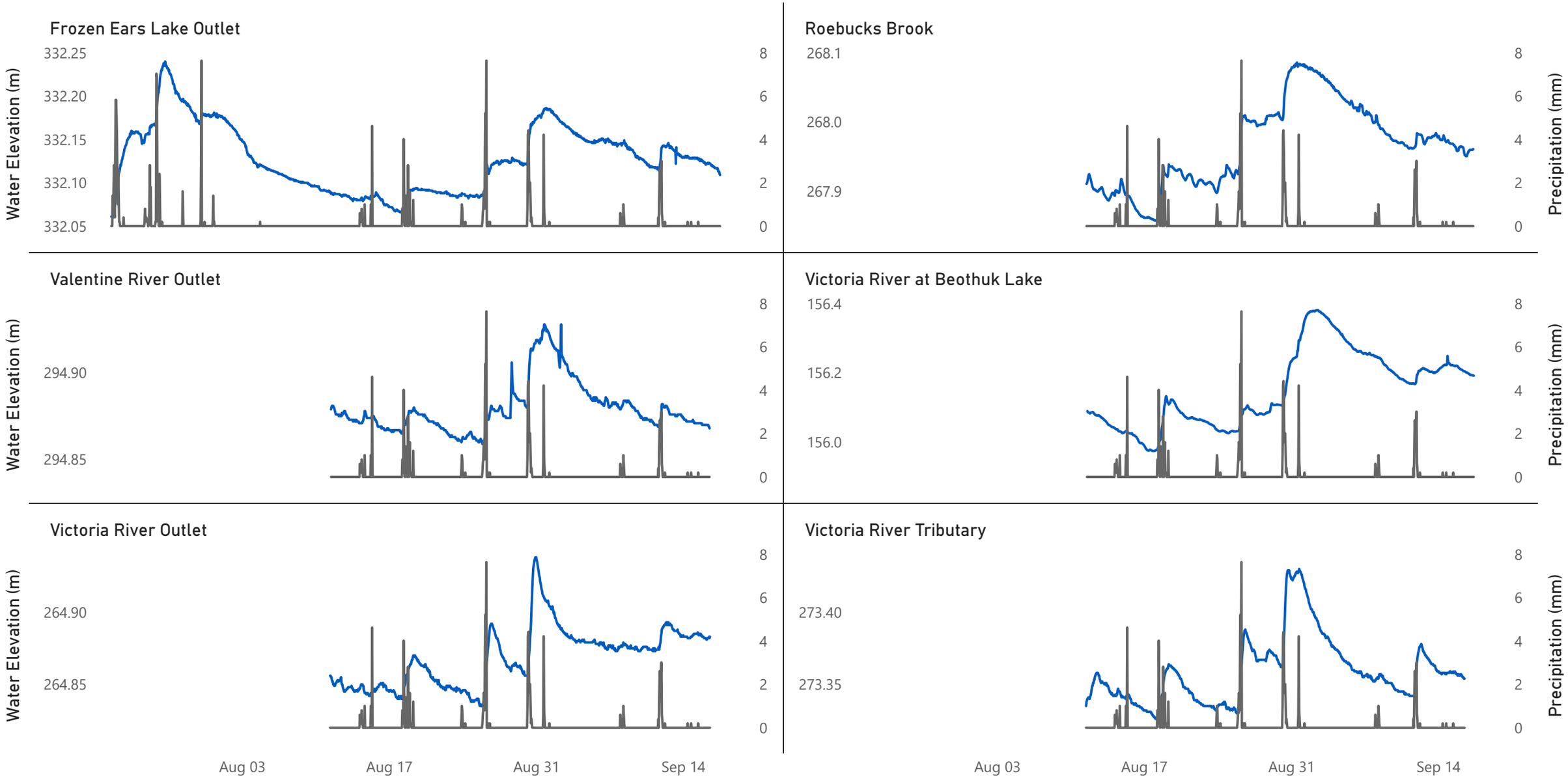
Water elevation provides an estimate of the water level at a monitoring station and plays a vital role in analyzing trends in water quality data, particularly for parameters such as specific conductivity, pH, and turbidity. Water elevation generally rises during precipitation events as rainwater and 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 remained relatively stable with a slightly increasing trend throughout the deployment period. 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.

# Water Elevation Station Graphs

Newfoundland Labrador

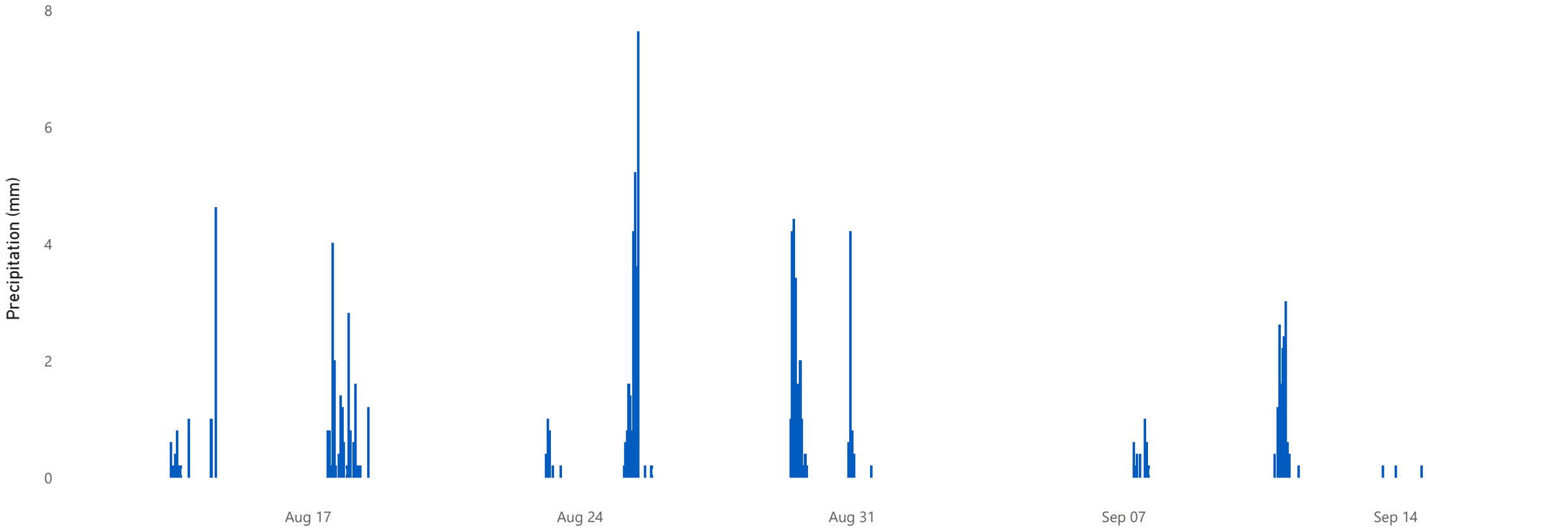
● Water Elevation (m) ● Precipitation (mm)



# Precipitation Data

## Retrieved from the Valentine Gold Project MET Station

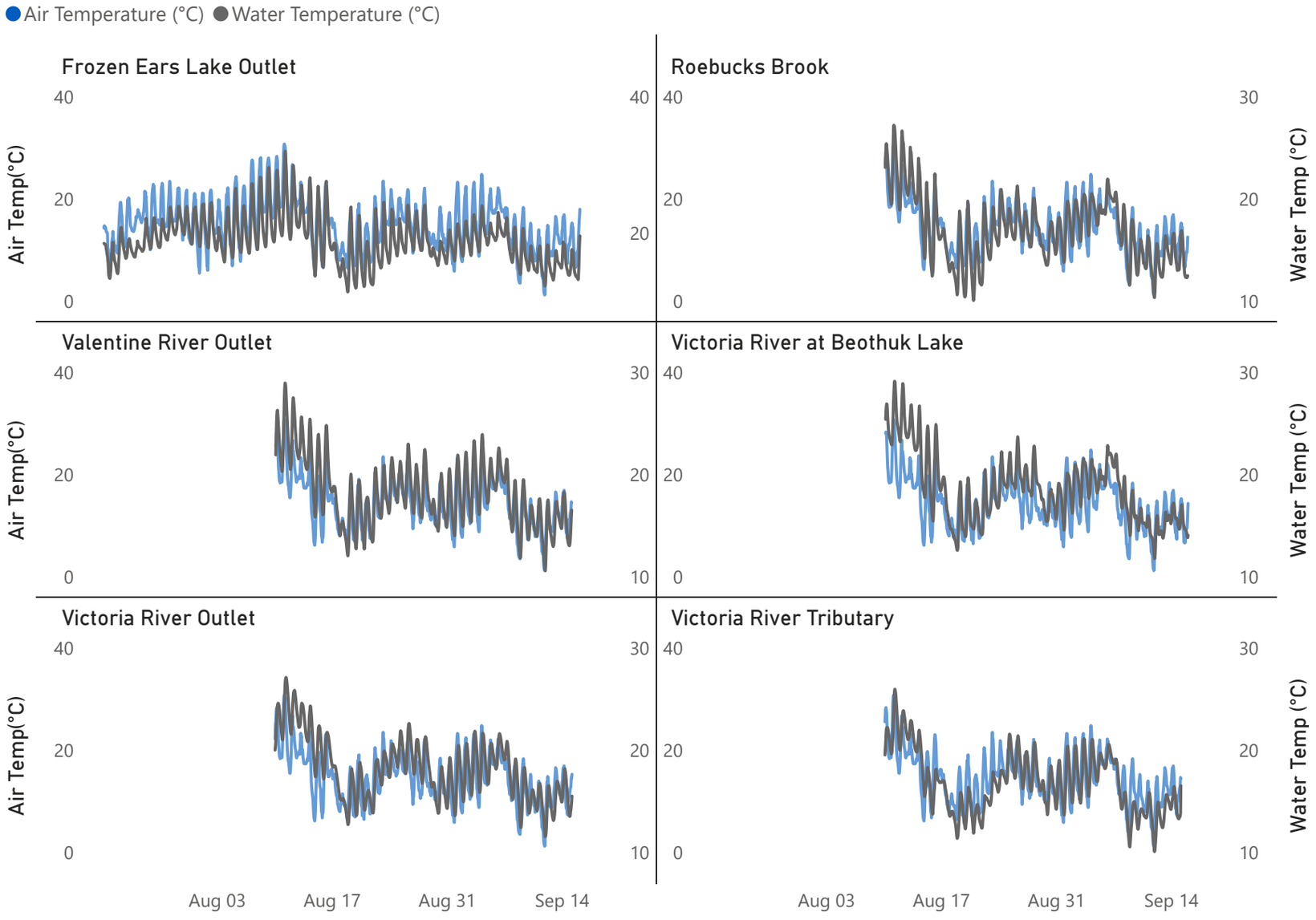
| 0.12 | 0.00 | 0.00 | 7.64 | 102.91 |
|---|---|---|---|---|
| Average (mm/hr) | Minimum (mm/hr) | Median (mm/hr) | Maximum (mm/hr) | Total Precip. (mm) |

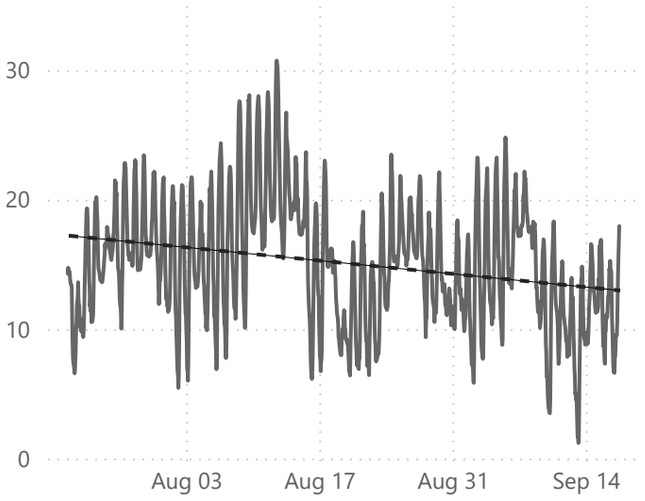


# Air Temperature Data

## Retrieved from the Valentine Gold Project MET Station

Newfoundland Labrador




| 14.65 | 14.67 |
|---|---|
| Average (°C) | Median (°C) |
| 1.20 | 30.74 |
| Minimum (°C) | Maximum (°C) |