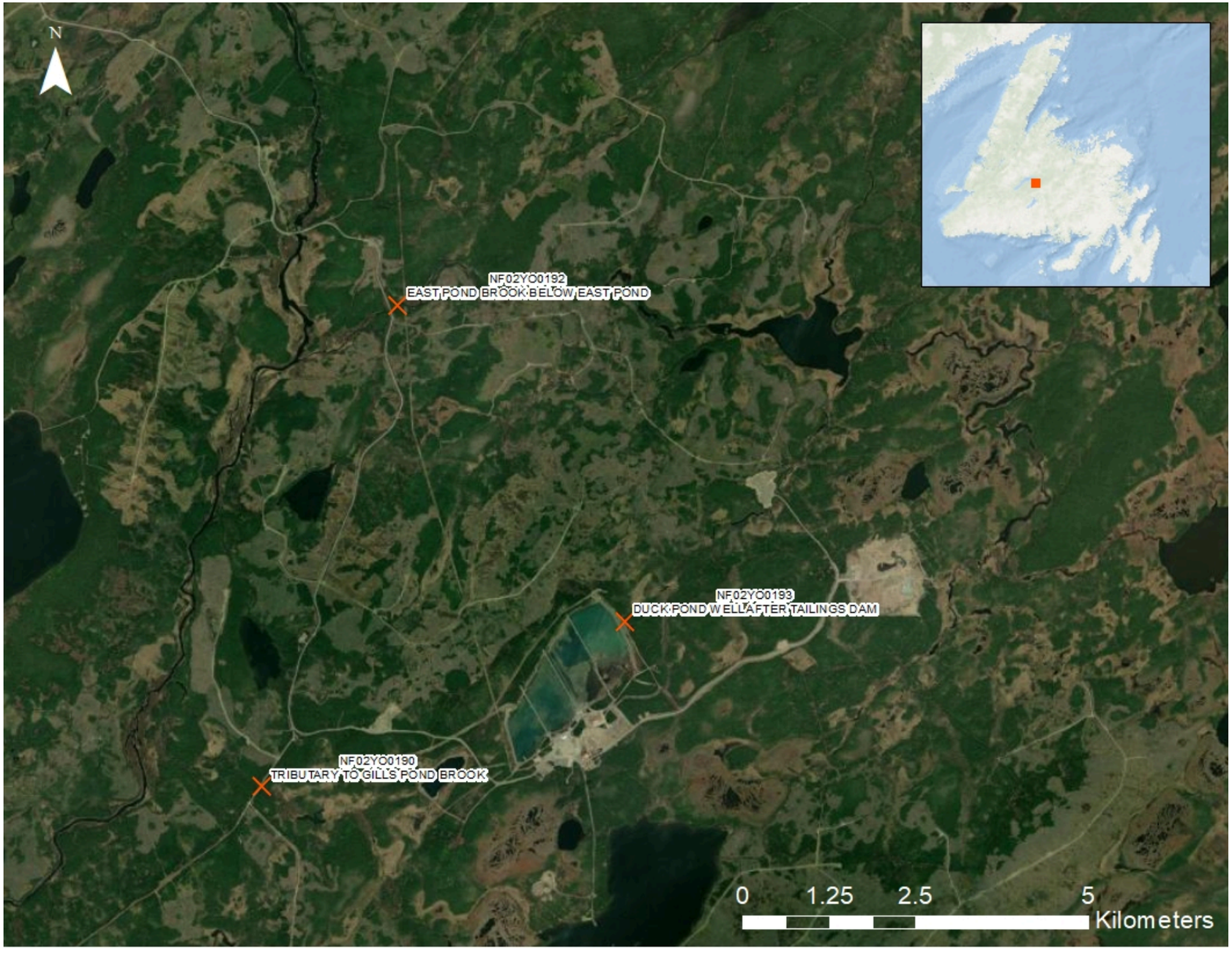
Real Time Water Quality Deployment Report
TECK: Duck Pond Operations
NF02YO0190 & NF02YO0192

2025-07-23 to 2025-11-13

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



TECK: Duck Pond Operations

This report will review the water quality data for the following two real-time water quality monitoring stations at TECK Duck Pond Operations: Tributary to Gill's Pond Brook and East Pond Brook below East Pond, for the duration of 2025-07-23 through to 2025-11-13.

These stations are a part of the Real-Time Water Quality Network. The stations are maintained by the Department of Environment, Conservation and Climate Change, Water Resources Management Division (WRMD). WRMD staff are responsible for the maintenance and calibration of the water quality instruments deployed at these sites. The data recorded by the real-time water quality stations is available on WRMD's website.

For the purposes of this report, air temperature and total precipitation data were used from the weather station located in Millertown. The data was retrieved from https://climate.weather.gc.ca/

Newfoundland Labrador

Quality Assurance and Quality Control

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
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
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
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 turbidity sensor at East Pond Brook below East Pond station failed on July 30. The erroneous data was removed from the dataset.
- The sonde at Tributary to Gill's station was switched out on October 23, while the sonde at East Pond Brook was not switched out until November 13th. Additional pages are included throughout the report to display the East Pond Brook station data from October 23-November 13, 2025.

Quality Assurance and Quality Control

Deployment Period Rankings

QAQC Rankings

Station	Parameter	Deployment Rank	Grab Sample Rank	Removal Rank
East Pond Brook	Dissolved Oxygen (mg/l)	Excellent	—	Excellent
East Pond Brook	pH	Good	Poor	Fair
East Pond Brook	Specific Conductivity (µS/cm)	Poor	Fair	Fair
East Pond Brook	Temperature (°C)	Excellent	—	Good
East Pond Brook	Turbidity (NTU)	Excellent	Excellent	—
Tributary to Gill's	Dissolved Oxygen (mg/l)	Excellent	—	Excellent
Tributary to Gill's	pH	Good	Good	Good
Tributary to Gill's	Specific Conductivity (µS/cm)	Good	Fair	Poor
Tributary to Gill's	Temperature (°C)	Excellent	—	Good
Tributary to Gill's	Turbidity (NTU)	Excellent	Excellent	Excellent

Upon deployment, most parameters at both stations were ranked as good or excellent, indicating minimal discrepancies between field sonde readings and QAQC sonde measurements. Specific conductivity at East Pond Brook was ranked as poor, which is likely a result of deteriorating sensor performance on the QAQC sonde, or differences in placement of field sonde versus QAQC sonde.

When comparing field sonde measurements to QAQC sonde measurements at the time of removal, most parameters were ranked as good or excellent at both stations, except for specific conductivity and pH at East Pond Brook which ranked as fair, and specific conductivity at Tributary to Gill's Pond Brook which ranked as poor. The fair and poor ranking for specific conductivity is again, likely a result of deteriorating sensor performance on the QAQC sonde, or differences in placement of field sonde versus QAQC sonde. The fair ranking for pH is likely a result of insufficient time for the sondes to equilibrate before recording initial measurements. At East Pond Brook, there is no field sonde value, and thus no ranking for turbidity upon removal due to sensor failure throughout the deployment.

Upon deployment, grab sample rankings ranged from excellent to poor. pH at East Pond Brook ranked poor which can be attributed to insufficient time for the field sonde to equilibrate before recording initial measurements. Specific conductivity at both stations ranked as fair, which can be a result of difference in placement of field sonde versus sampling location.

Water Temperature

(°C)

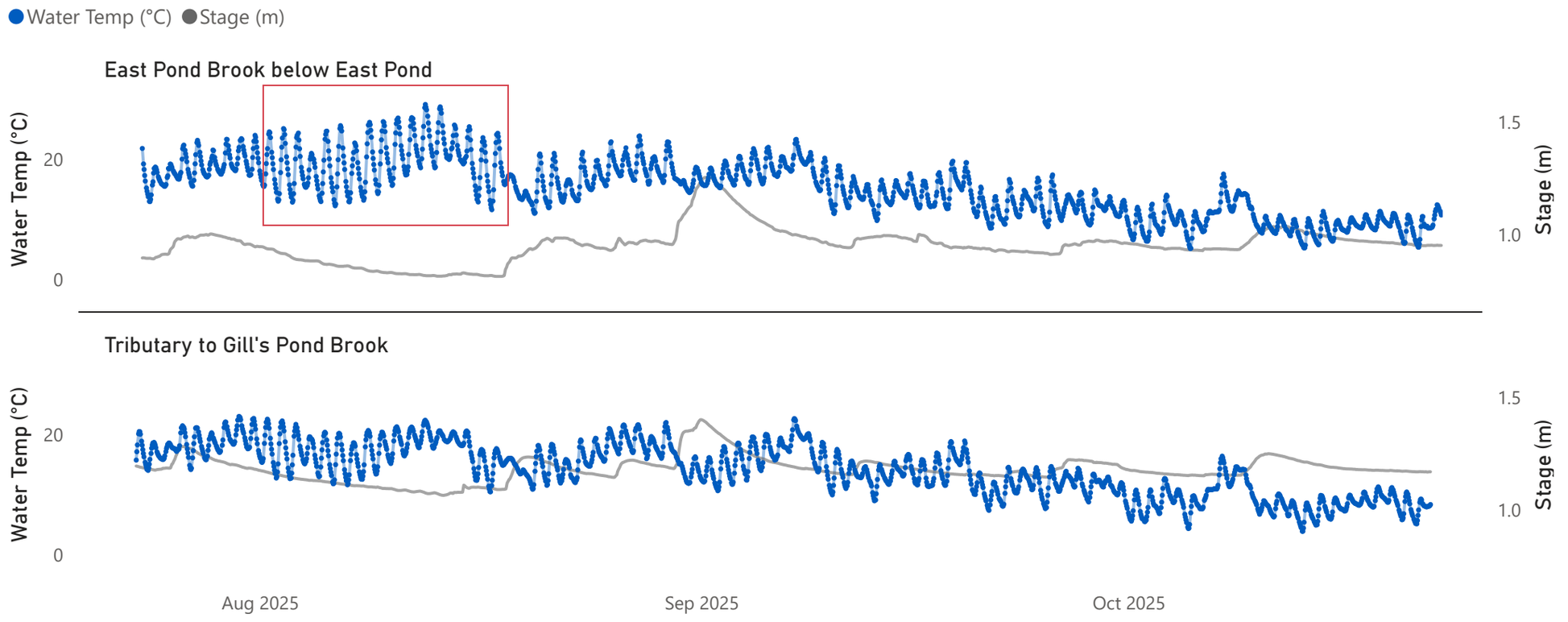
Newfoundland Labrador

East Pond Brook Below East Pond		Tributary to Gill's Pond Brook	
15.18 Average	15.35 Median	14.19 Average	14.25 Median
5.13 Minimum	29.22 Maximum	3.90 Minimum	23.09 Maximum

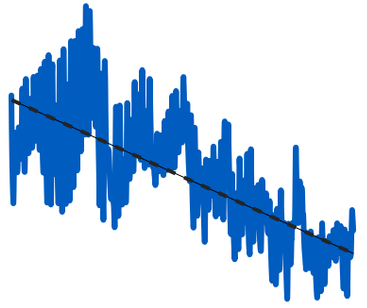
Water temperature plays a crucial role in wildlife health, as many organisms rely on air and water conditions to regulate their body temperatures. Additionally, water temperature affects other key parameters, such as dissolved oxygen levels and specific conductivity.

Throughout this deployment period, a natural diurnal pattern was evident, with warmer temperatures during daylight hours and cooler temperatures at night. A slight decreasing trend was observed at both stations September onwards, which would be expected during the seasonal transition to fall.

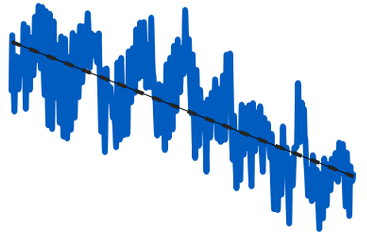
Throughout August, East Pond Brook showed a wider temperature range and higher maximum temperatures (outlined in the red box below), which may indicate that the sonde was sitting in a shallow pool of water that was more susceptible to environmental changes. East Pond Brook below East Pond is a fast-flowing waterway with minimal canopy cover, which can contribute to higher water temperatures. In contrast, the Tributary to Gill's Pond Brook is a narrower waterbody that is mostly shaded by tree canopy during the summer months, resulting in slightly lower water temperatures



East Pond Brook Trendline



Tributary to Gill's Trendline



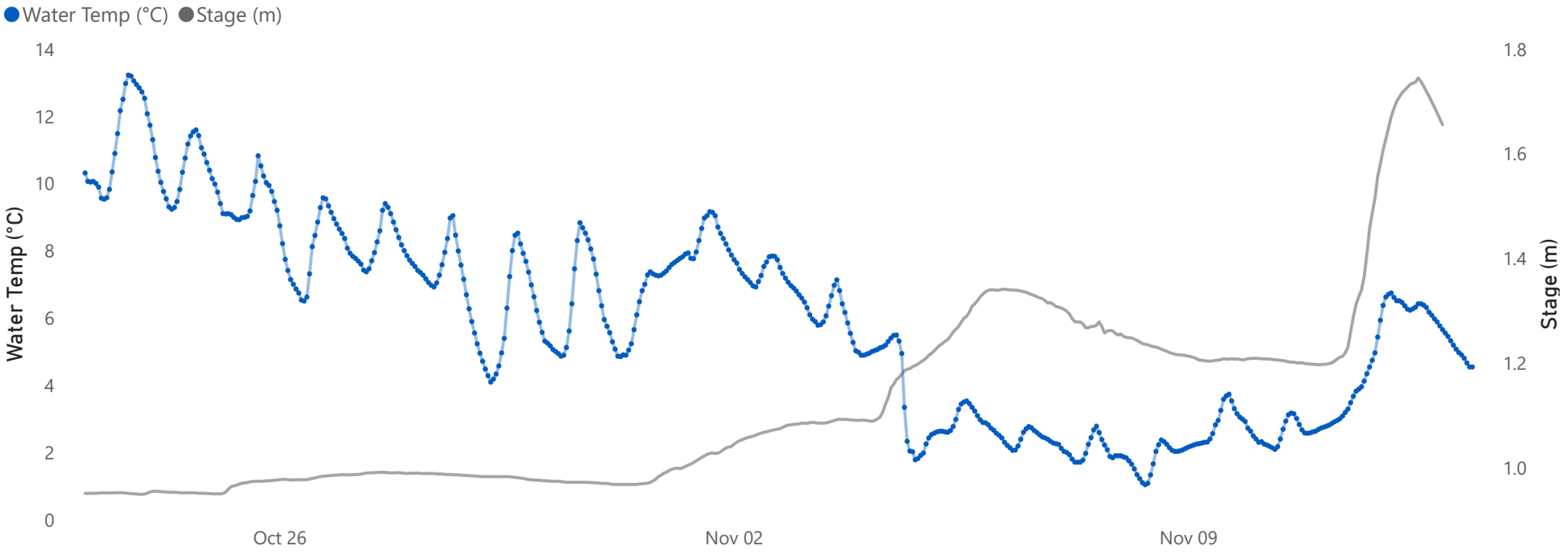
East Pond Brook
October 23 - November 13, 2025
Water Temperature
(°C)

East Pond Brook Below East Pond

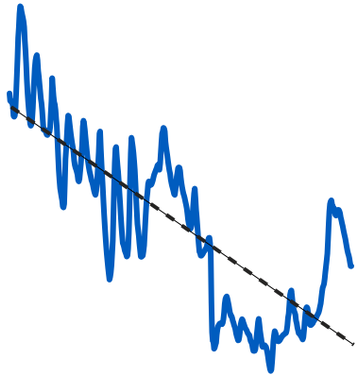
5.89 Average	6.10 Median
1.05 Minimum	13.23 Maximum

Water temperature at East Pond Brook station continued trending downward for the remainder of the deployment period. A precipitation event caused a stage increase and decrease in water temperature around November 4.

East Pond Brook Water Temperature Oct.23-Nov.13



East Pond Brook Trendline



pH
(pH Units)

pH relates to the free hydrogen ions in water and it is a measure of acidity in water. According to the Canadian Council of Ministers of the Environment (CCME) Freshwater Aquatic Life Guidelines, the recommended pH range for aquatic health is between 6.5 and 9.0. However, many rivers in Newfoundland and Labrador are naturally more acidic due to the local geology. Water parameter maps can be found on the Water Resources Management website. Rainwater, naturally lower in pH, can briefly dilute the water and cause a temporary drop in pH, but levels generally return to normal within a few days to weeks.

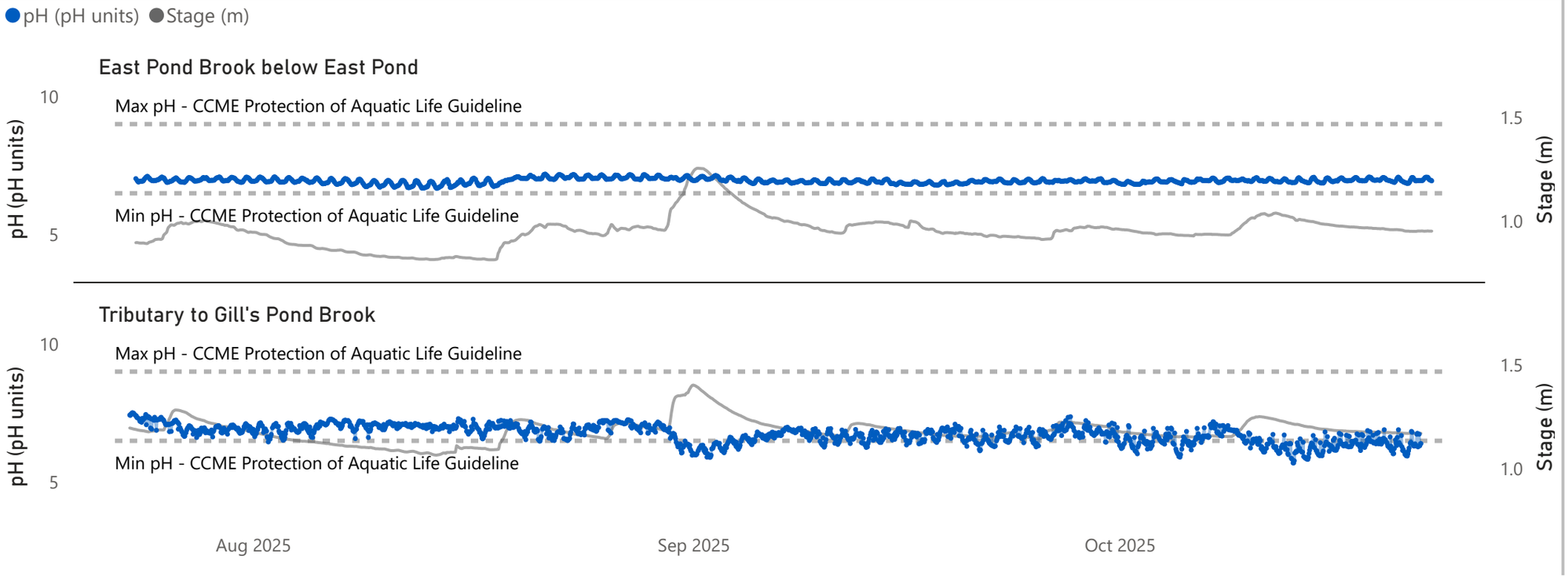
Daily fluctuations in pH are typical and are often influenced by temperature changes, precipitation and the respiration of aquatic plants. At East Pond Brook, pH was generally stable throughout the deployment period, with 100% of recorded values remaining within the CCME guidelines. In contrast, Tributary to Gill's Pond Brook displayed much greater variability. This variability may reflect changes in runoff, but could also be influenced by sensor performance or deployment conditions, particularly when the instrument rests in shallow or poorly mixed pools during low-flow periods. While the majority of pH measurements at this site were within CCME guidelines, there were several dips below the minimum threshold.

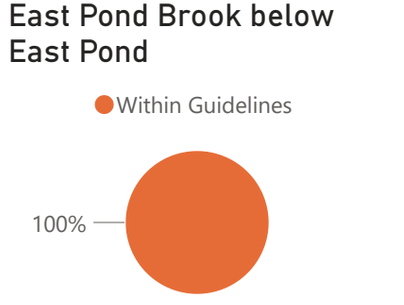
East Pond Brook Below East Pond

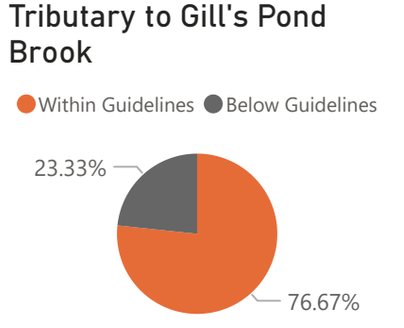
6.95 Average	6.95 Median
6.68 Minimum	7.19 Maximum

Tributary to Gill's Pond Brook

6.74 Average	6.78 Median
5.70 Minimum	7.51 Maximum







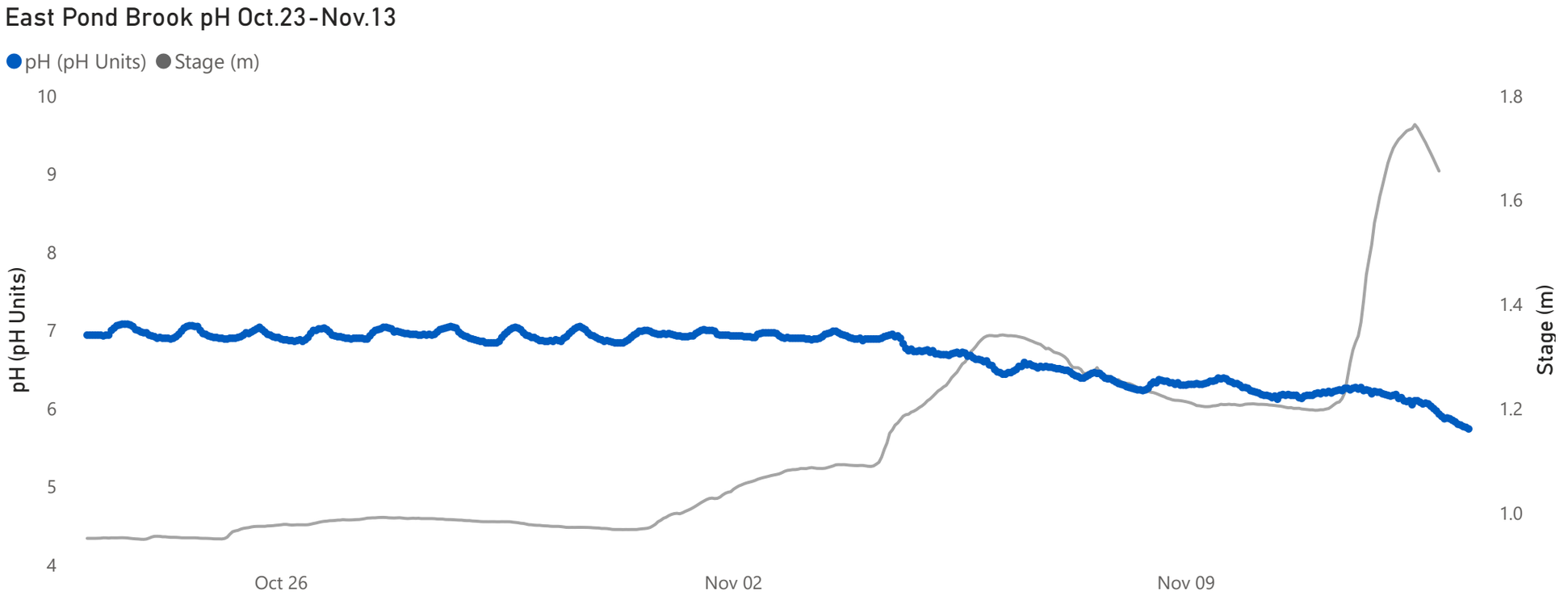
East Pond Brook
October 23 - November 13, 2025
pH
(pH Units)

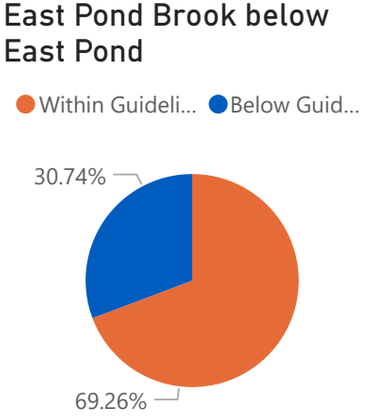
Newfoundland Labrador

East Pond Brook Below East Pond

6.69 Average	6.89 Median
5.74 Minimum	7.08 Maximum

pH at East Pond Brook station was steady until around November 3rd, where a slight decreasing trend began. This decreasing trend coincides with an increase in stage from a precipitation event. pH values drifted below the CCME minimum guideline (6.5pH units) during the period of stage increase.





Specific Conductivity

(µS/cm)

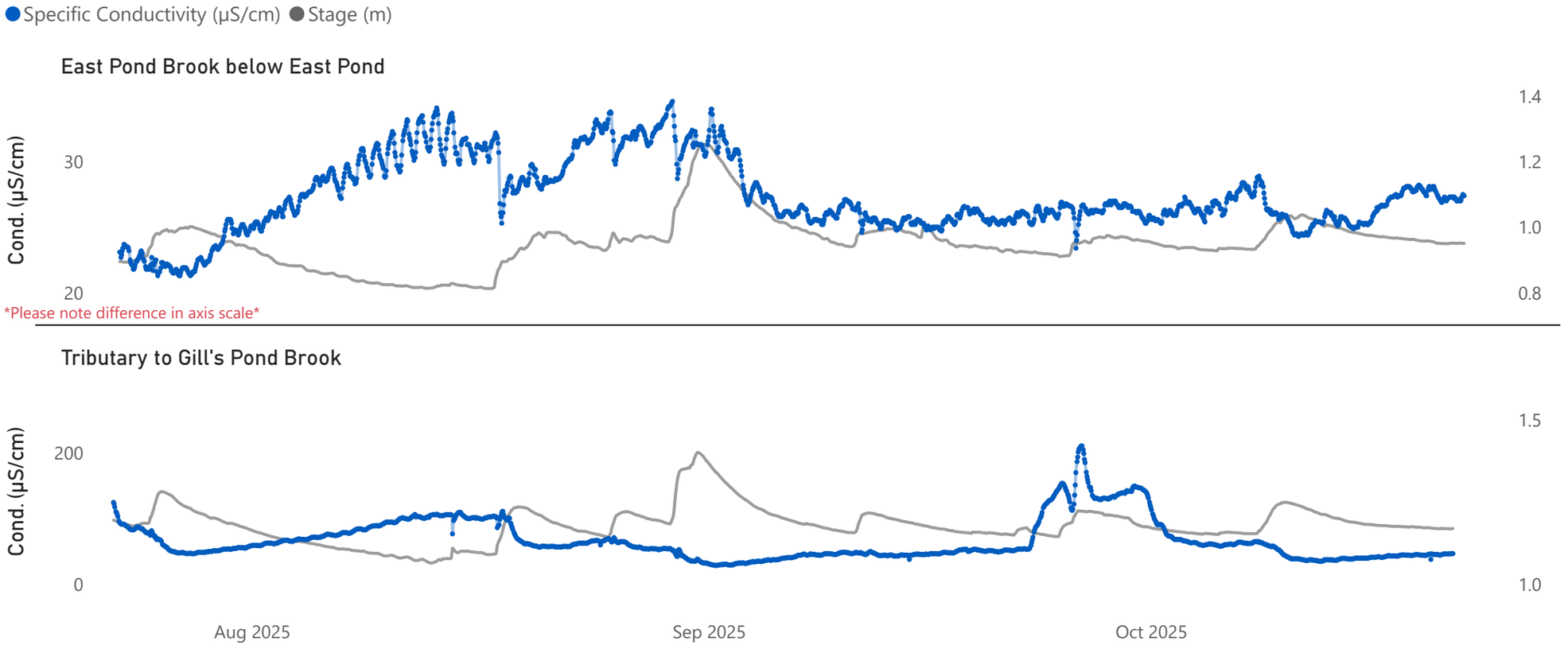
Newfoundland Labrador

East Pond Brook Below East Pond		Tributary to Gill's Pond Brook	
27.33 Average	26.60 Median	66.23 Average	57.00 Median
21.30 Minimum	34.60 Maximum	28.50 Minimum	210.80 Maximum

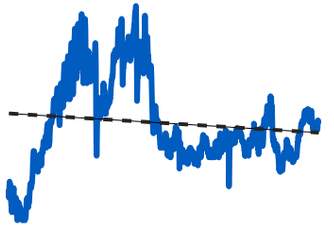
Conductivity relates to the ability of an electric charge to pass through a solution. Pure water has low conductance and water with dissolved ions has higher conductance. Specific conductance is corrected to 25°C to allow comparison across variable temperatures. Specific conductivity is often affected by precipitation, as rainwater often has a lower conductivity and can temporarily dilute the water column, resulting in a short-term decrease in conductivity.

Specific conductivity at East Pond Brook remained generally low and stable throughout the deployment period. Small fluctuations can be associated with precipitation events. Specific conductivity at Tributary to Gill's was also generally stable but showed clear sensitivity to precipitation events as can be seen on the graph below. Both stations exhibited a slight decreasing trend in conductivity, likely attributed to an increase in precipitation.

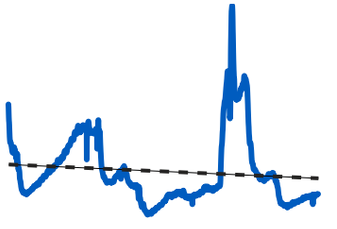
Conductivity is generally higher at Tributary to Gills Pond Brook than at East Pond Brook. Tributary to Gills is a smaller watercourse located downstream of site activities, which may be contributing to elevated conductivity levels. In contrast, East Pond Brook is a larger, open watercourse selected as a reference station and has no upstream industrial activity that could influence conductivity.



East Pond Brook Trendline



Tributary to Gill's Trendline



East Pond Brook
October 23- November 13
Specific Conductivity
(µS/cm)

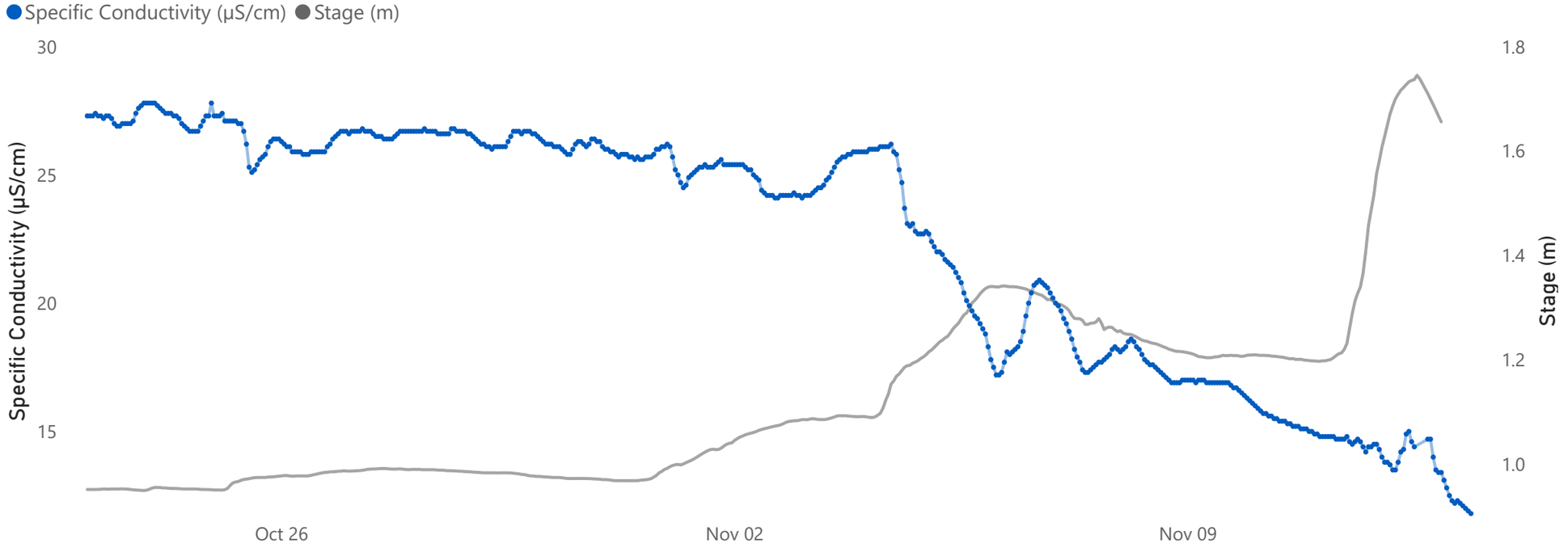
Newfoundland Labrador

East Pond Brook Below East Pond

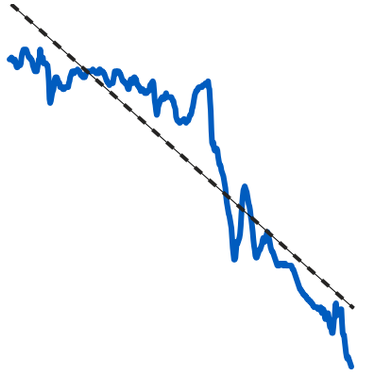
22.47 Average	25.30 Median
11.80 Minimum	27.80 Maximum

Specific conductivity at East Pond Brook station continued trending downward for the remainder of the deployment period.

East Pond Brook Specific Conductivity Oct.23-Nov.13



East Pond Brook Trendline



Dissolved Oxygen

(mg/L and % Sat)

Dissolved oxygen (DO) in water is crucial for aquatic life. The CCME Freshwater Aquatic Life Guidelines provide benchmarks to assess waterway health, with the minimum DO guideline being 9.5 mg/L for early life stages in cold water and 6.5 mg/L for other life stages. DO is influenced by water temperature, with colder water able to retain higher DO concentrations. This inverse relationship can be observed on the graphs below, as well as daily fluctuations that can be attributed to changes in temperature and respiration of aquatic plants.

The lowest DO values at both stations were observed during a period of increased water temperature (around August 13). During this time, the sondes were likely in shallow pools or low water levels, making the measurements more susceptible to environmental temperature influences.

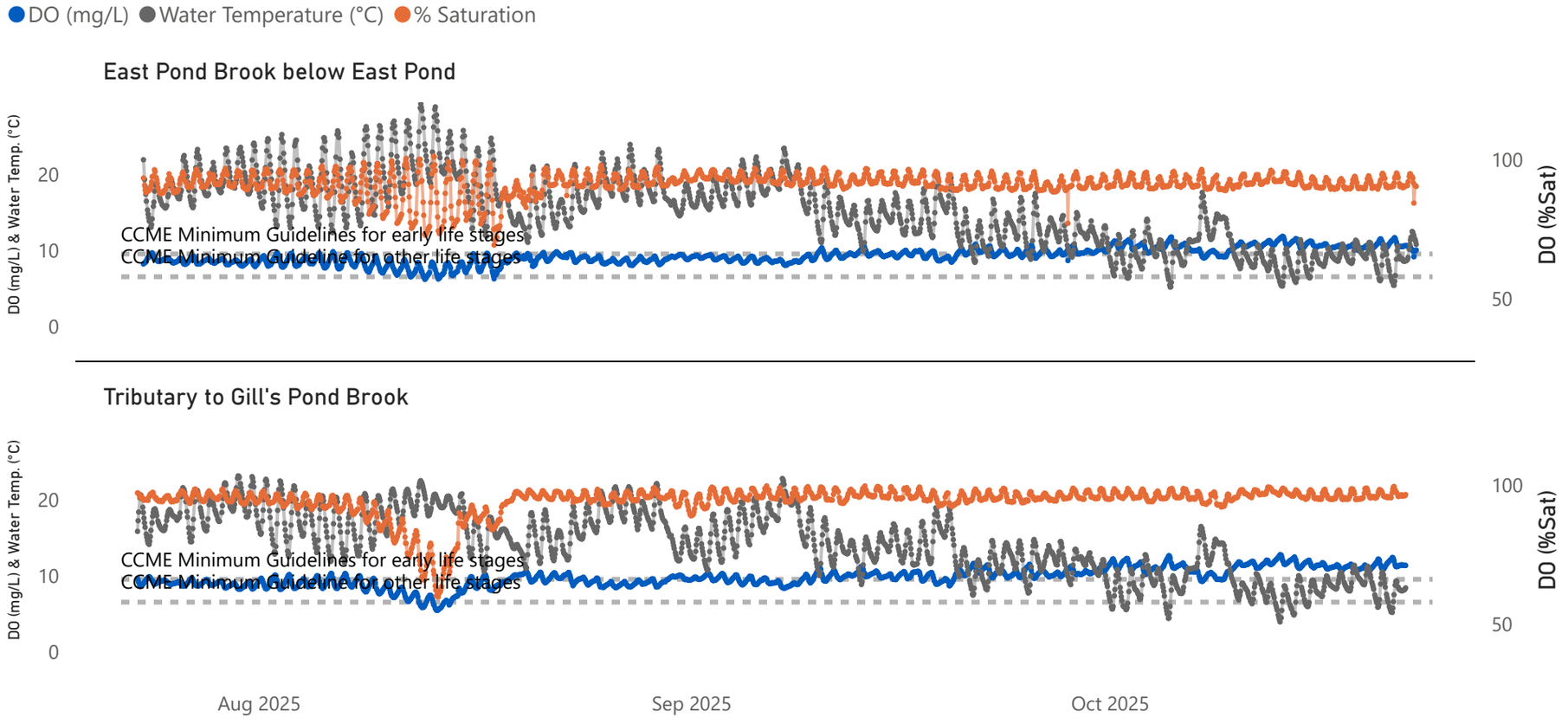
Concentrations at both stations remained above the minimum guideline for the protection of other life stages for the majority of the deployment. Values hovered around the minimum guideline value for the protection of early life stages throughout the deployment, staying above the value for approximately half the deployment.

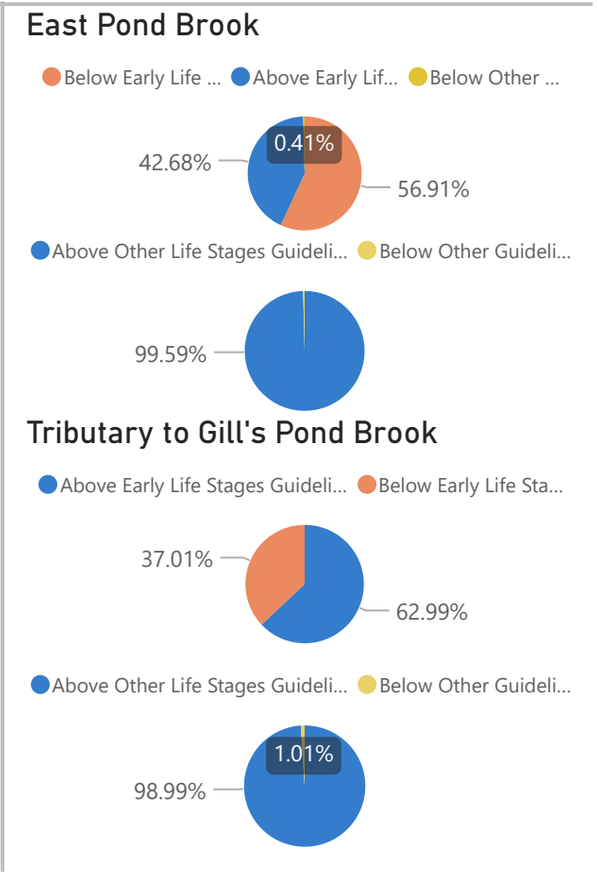
East Pond Brook Below East Pond

9.24 Average	9.19 Median
6.16 Minimum	11.82 Maximum

Tributary to Gill's Pond Brook

9.75 Average	9.72 Median
5.26 Minimum	12.79 Maximum





East Pond Brook
October 23 - November 13, 2025
Dissolved Oxygen
(mg/L & %Saturation)

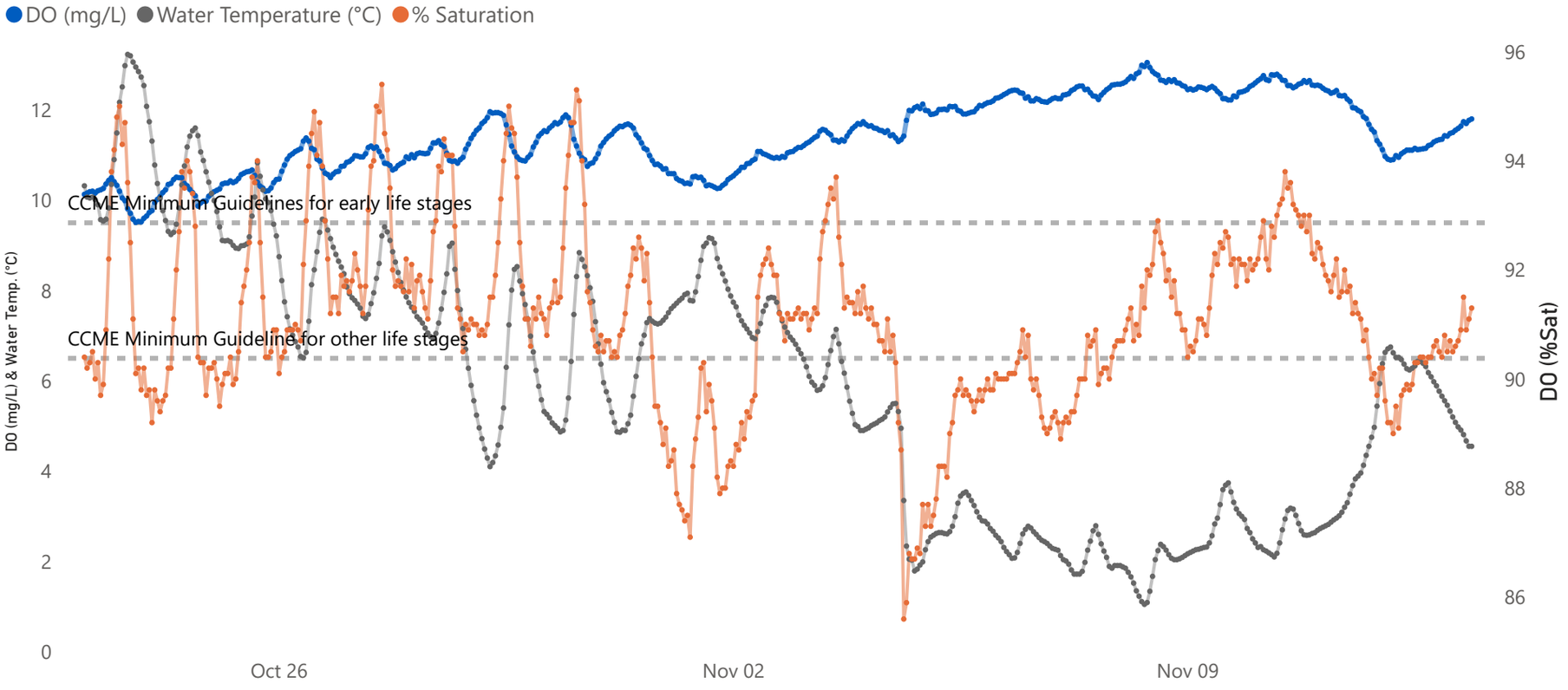
Newfoundland Labrador

East Pond Brook Below East Pond

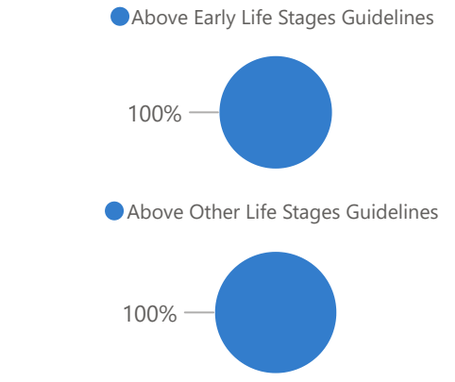
11.42 Average	11.34 Median
9.51 Minimum	13.05 Maximum

Dissolved oxygen at East Pond Brook remained generally steady for the remainder of the deployment.

East Pond Brook Dissolved Oxygen: Oct23-Nov13



East Pond Brook



Turbidity
(NTU)

Turbidity, or water cloudiness, often increases during precipitation events when runoff carries silt and debris into the waterbody. Elevated turbidity can block light from reaching aquatic plants, disrupt benthic habitats, and harm fish gills or equipment. Turbidity spikes are often associated with precipitation events or sediment passing by the sensor during measurements. Precipitation can disturb bottom substrate or carry run-off into the water body, temporarily increasing turbidity.

The turbidity sensor at East Pond Brook malfunctioned and failed on July 30. The erroneous data was removed from the dataset. At East Pond Brook, turbidity ranged between 0.00 NTU and 4.10 NTU between July 23 to July 30.

At Tributary to Gill's Pond Brook, Turbidity ranged between 0.00 NTU and 34.81 NTU. Values remained low and stable throughout the deployment period with minor spikes most commonly associated with stage increases during precipitation events.

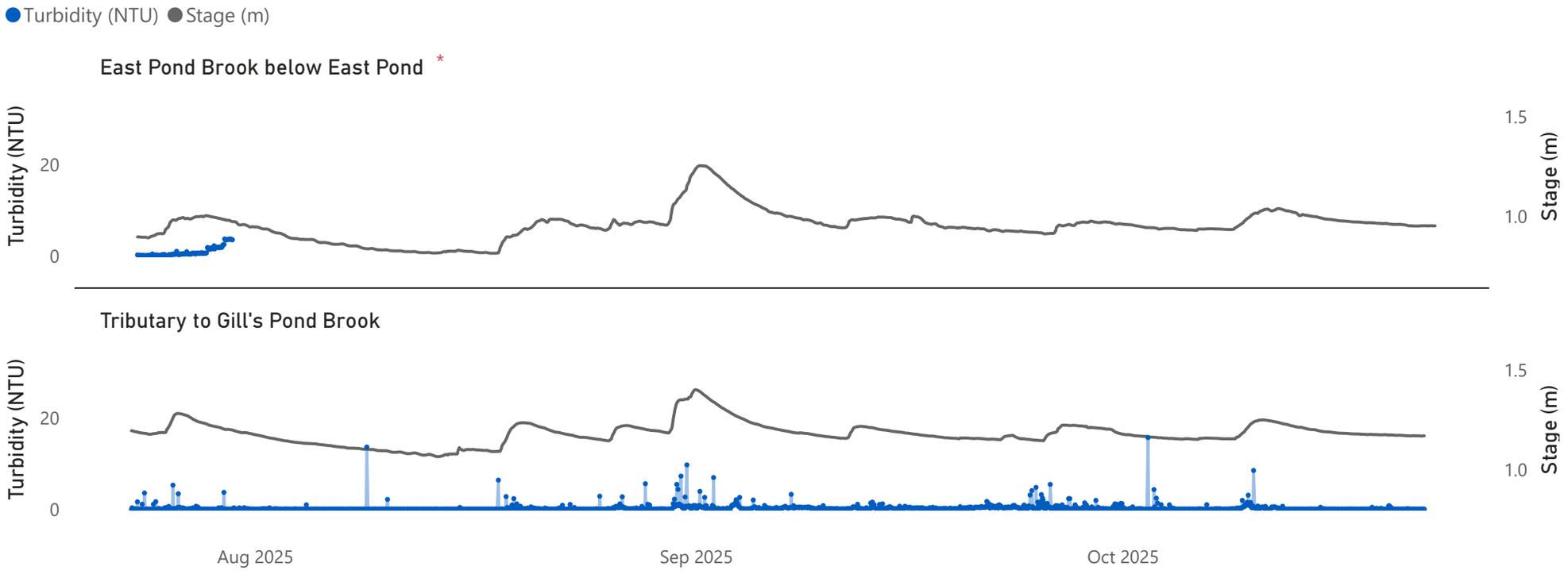
East Pond Brook Below East Pond*

0.88 Average	0.40 Median
0.00 Minimum	4.10 Maximum

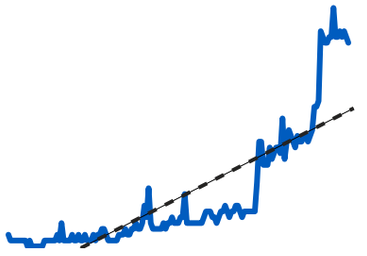
Tributary to Gill's Pond Brook

0.26 Average	0.00 Median
0.00 Minimum	34.81 Maximum

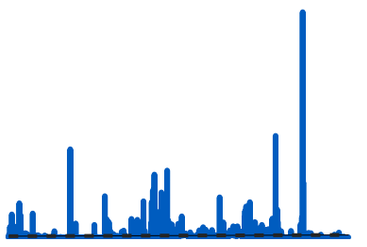
*Limited data due to sensor failure



East Pond Brook Trendline



Tributary to Gill's Trendline



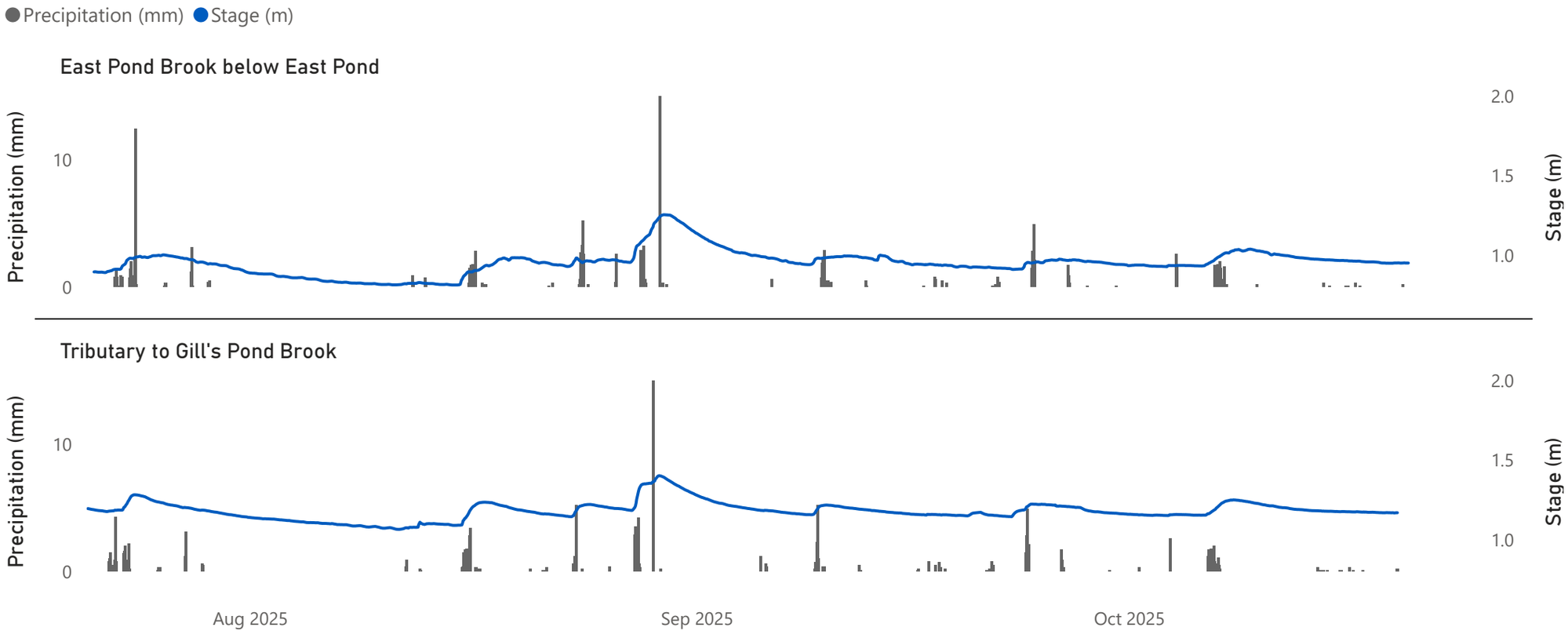
Stage
(m)

Stage 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. Stage generally rises during precipitation events as rainwater and runoff enter the water column. By monitoring stage alongside precipitation events, we can better interpret our data, distinguish whether a stage increase is caused by rainfall or potential industrial activities, and assess its impact on water quality. Precipitation data was retrieved from the Millertown, NL meteorological station.

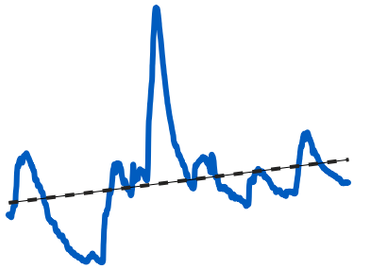
Stage ranged between 0.81m to 1.25m at East Pond Brook, and between 1.06m to 1.40m at Tributary to Gill's Pond Brook. Stage remained stable across the deployment period, with small increases coinciding with precipitation events, such as August 31.

There is an overall slight increasing trend observed at both stations throughout the deployment period. This pattern can be attributed to an increase in precipitation events.

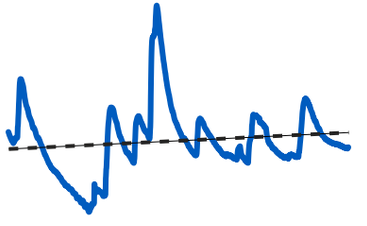
East Pond Brook Below East Pond		Tributary to Gill's Pond Brook	
0.95 Average	0.95 Median	1.18 Average	1.18 Median
0.81 Minimum	1.25 Maximum	1.06 Minimum	1.40 Maximum



East Pond Brook Trendline



Tributary to Gill's Trendline



East Pond Brook
October 23 - November 13, 2025
Stage (m)

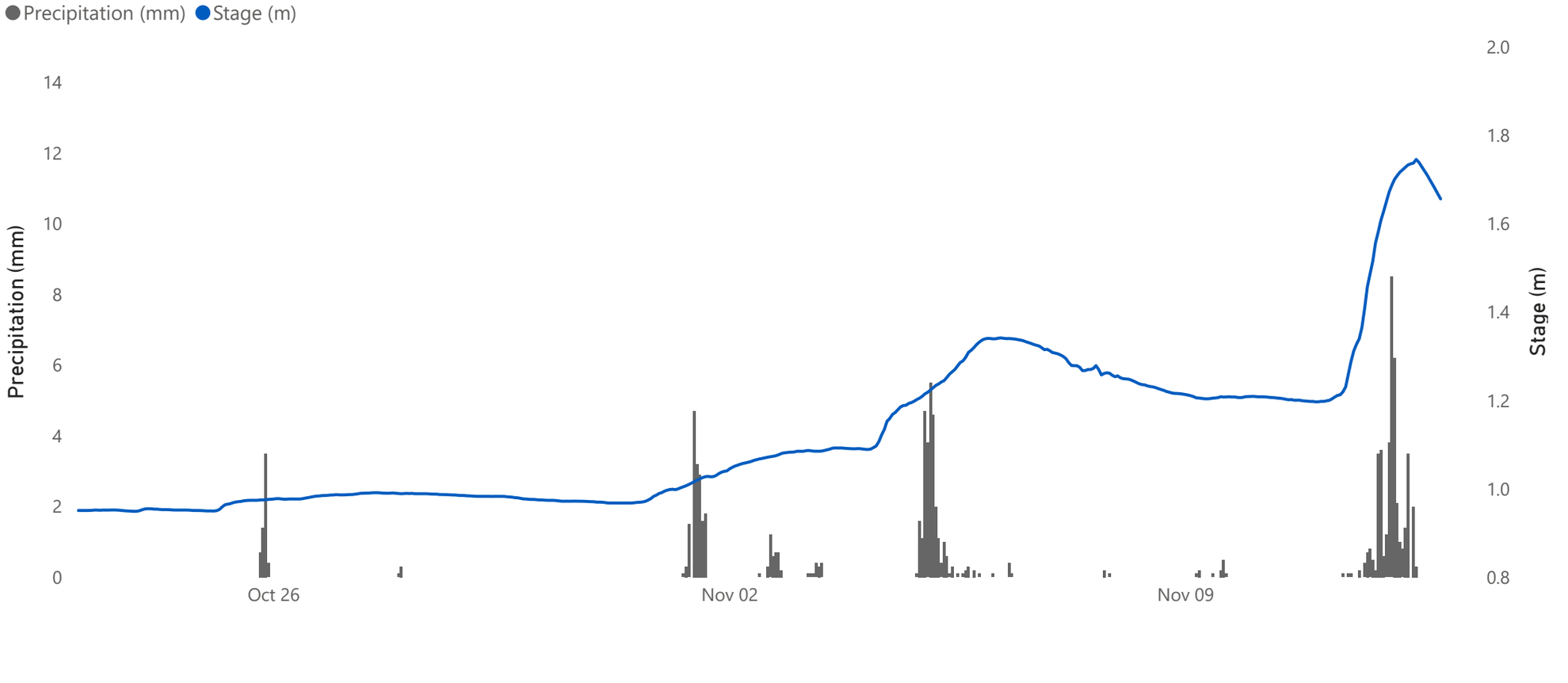
Newfoundland Labrador

East Pond Brook Below East Pond

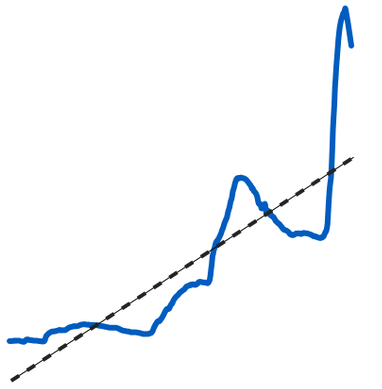
1.12 Average	1.07 Median
0.95 Minimum	1.75 Maximum

Stage at East Pond Brook remained relatively stable for the remainder of the deployment period. Stage increased as a result of precipitation events after November 2.

East Pond Brook Stage (m): Oct 23 - Nov 13



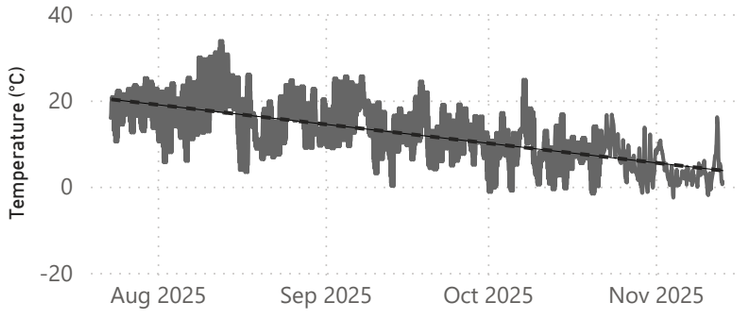
East Pond Brook Trendline



Meteorological and Hydrometric Data

Millertown, NL MET Station Data

Air Temperature Recorded at Millertown MET Station

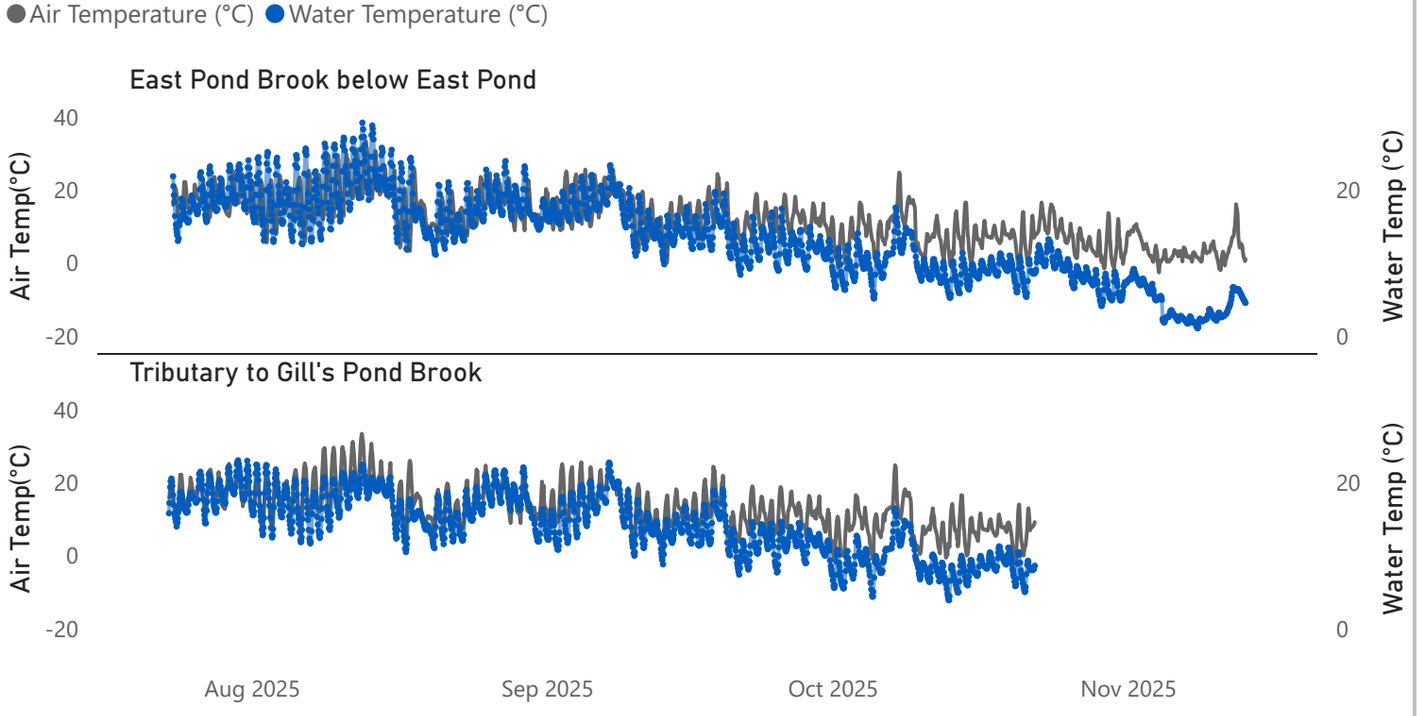


Air Temperature Data Statistics

12.70 Average (°C)	12.40 Median (°C)
-2.60 Minimum (°C)	33.80 Maximum (°C)

Precipitation Data Statistics

0.11 Average (mm/hr)	0.00 Median (mm/hr)
0.00 Minimum (mm/hr)	22.90 Maximum (mm/hr)



Precipitation Recorded at Millertown, NL MET Station