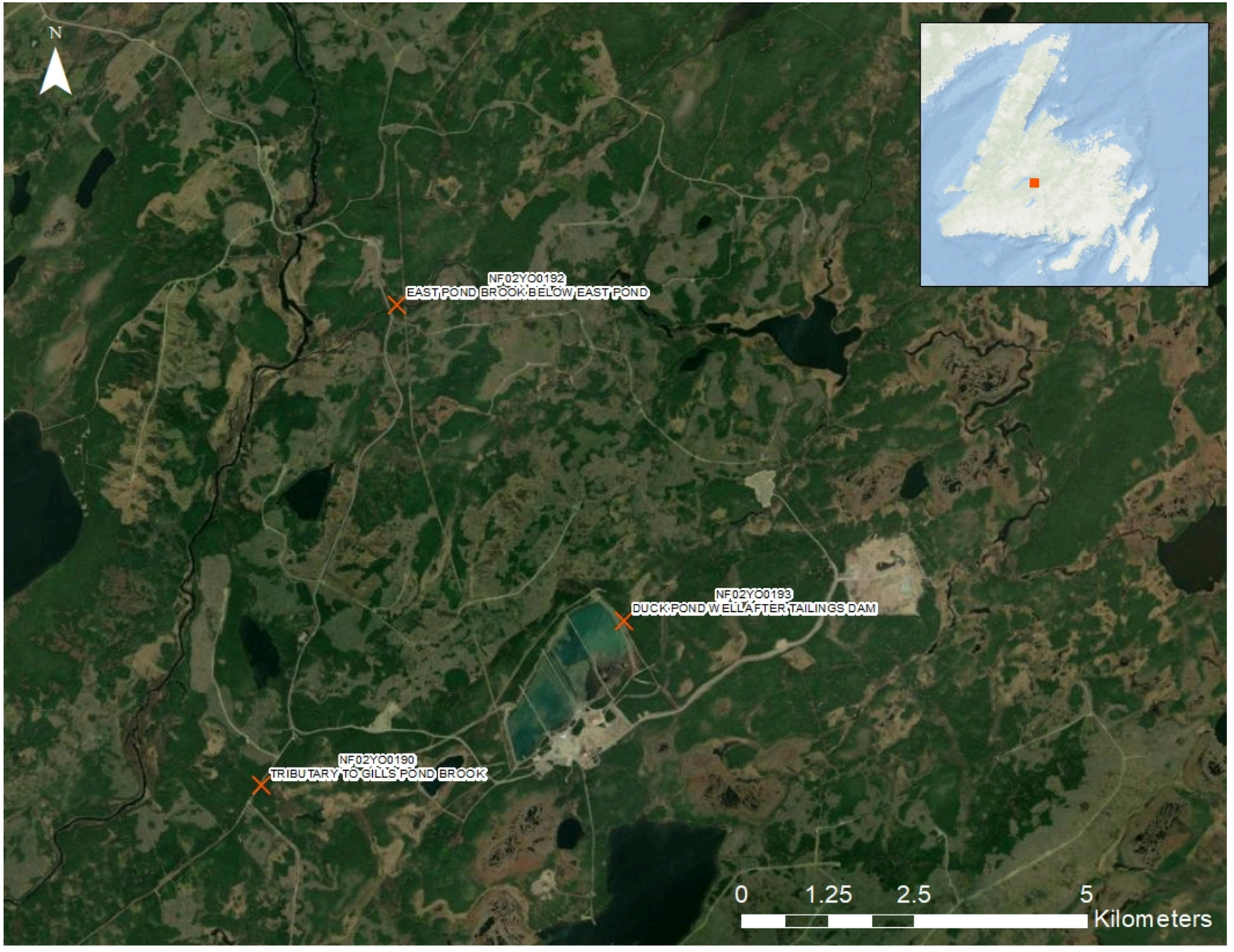
Real Time Water Quality Deployment Report
TECK: Duck Pond Operations
NF02YO0190 & NF02YO0192

2025-05-29 to 2025-07-22

Government of Newfoundland & Labrador
Department of Environment & 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 2025-05-29 through to 2025-07-22. The HL7 sondes were removed from the field over the winter to avoid ice damage to the sondes. This is the initial deployment of the 2025 season.

These stations are a part of the Real-Time Water Quality Network. The stations are maintained by the Department of Environment 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.

Issues Encountered During Deployment Period

There is a gap in the data at Tributary to Gill's Pond Brook from July 19 to July 22. Water levels dropped at the site and the sonde was temporarily out of the water resulting in erroneous data, which was removed from the dataset.

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	Marginal	Excellent
East Pond Brook	Specific Conductivity (µS/cm)	Good	Good	Fair
East Pond Brook	Temperature (°C)	Excellent	—	Good
East Pond Brook	Turbidity (NTU)	Excellent	Excellent	Excellent
Tributary to Gill's	Dissolved Oxygen (mg/l)	Excellent	—	Good
Tributary to Gill's	pH	Good	Good	Fair
Tributary to Gill's	Specific Conductivity (µS/cm)	Good	Good	Good
Tributary to Gill's	Temperature (°C)	Good	—	Excellent
Tributary to Gill's	Turbidity (NTU)	Excellent	Excellent	Excellent

Upon deployment, all parameters at both stations were ranked as good or excellent, indicating minimal discrepancies between field sonde readings and QAQC sonde measurements.

When comparing field sonde measurements to QAQC sonde measurements at the time of removal, all parameters were ranked as good or excellent at both stations, except for specific conductivity at East Pond Brook and pH at Tributary to Gill's Pond Brook, which both ranked as fair. The fair ranking can be attributed to difference in location between field sonde and QAQC sonde, or insufficient time for the sondes to equilibrate before recording initial measurements.

Upon deployment, grab sample rankings were good or excellent for all parameters at both stations, except for pH at East Pond Brook which ranked as marginal. The fair ranking may be attributed to differences in sampling location or depth compared to the field sonde, or to insufficient equilibration time before initial readings.

Water Temperature

(°C)

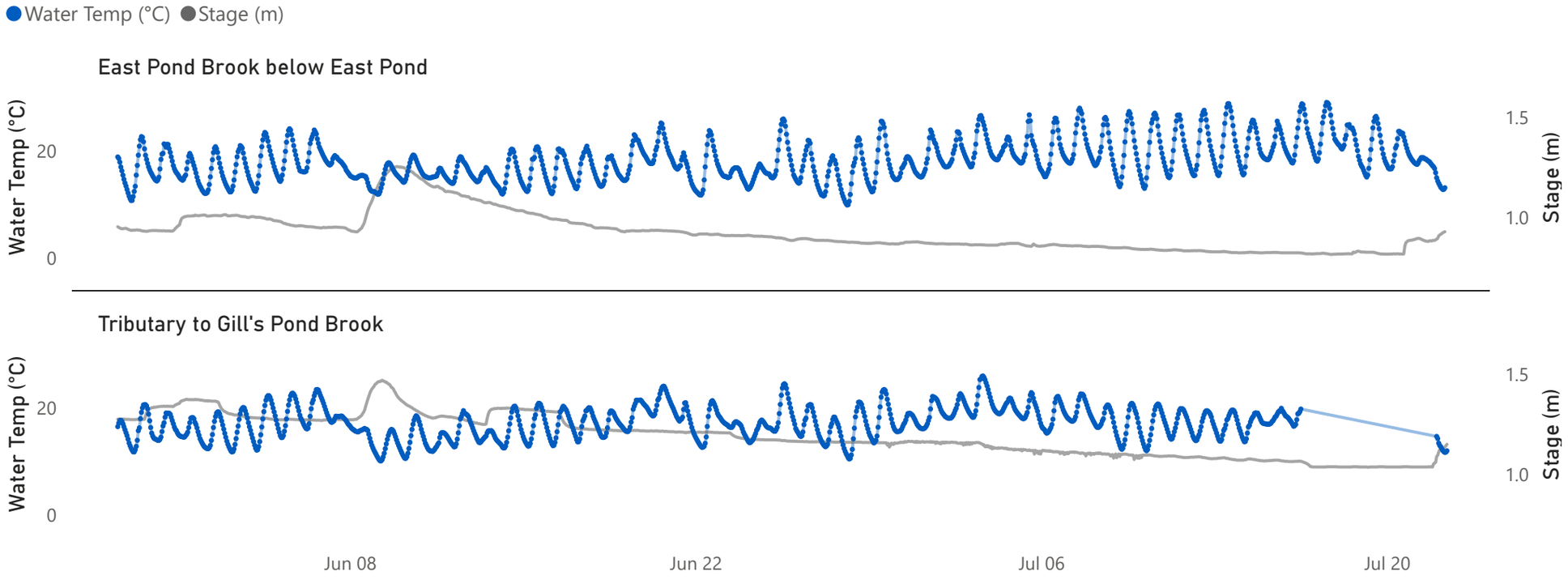
Water temperature plays a crucial role in wildlife health, as many organisms rely on air and water conditions to regulate their body temperatures. Additionally, water temperature affects other key parameters, such as dissolved oxygen levels and specific conductivity.

Water temperature data for this deployment was collected from 2025-05-29 until 2025-07-22. The minimum water temperature at East Pond Brook was 9.86°C and occurred on 2025-06-28, while the maximum water temperature, 29.04°C, occurred on 2025-07-17. The minimum water temperature at Tributary to Gill's Pond Brook was 10.07°C and occurred on 2025-06-09, while the maximum water temperature, 25.93°C, occurred on 2025-07-03. East Pond Brook below East Pond is a rapid waterway with minimal canopy cover. Tributary to Gill's Pond Brook is a narrower waterbody and during the summer months is mostly covered by tree canopy.

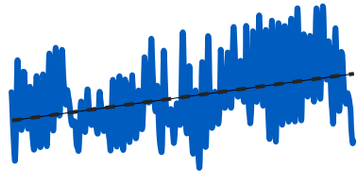
Throughout this deployment period, a natural diurnal pattern was evident, with warmer temperatures during daylight hours and cooler temperatures at night. A slight increasing trend was observed at both stations, which would be expected during the seasonal transition into summer.

There is a gap in the data at Tributary to Gill's Pond Brook from July 19 to July 22. Water levels dropped at the site and the sonde was temporarily out of the water resulting in erroneous data.

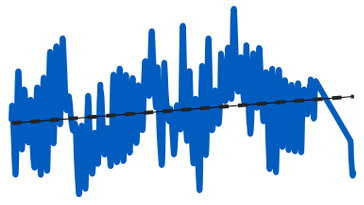
East Pond Brook Below East Pond		Tributary to Gill's Pond Brook	
18.26 Average	17.83 Median	17.17 Average	17.23 Median
9.86 Minimum	29.04 Maximum	10.07 Minimum	25.93 Maximum



East Pond Brook Trendline



Tributary to Gill's 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.

pH at East Pond Brook ranged between 6.62 to 7.02 pH units, while pH at Tributary to Gill's Pond Brook ranged between 5.60 to 7.75 pH units. Daily fluctuations in pH are typical and are often influenced by temperature changes, precipitation and the respiration of aquatic plants.

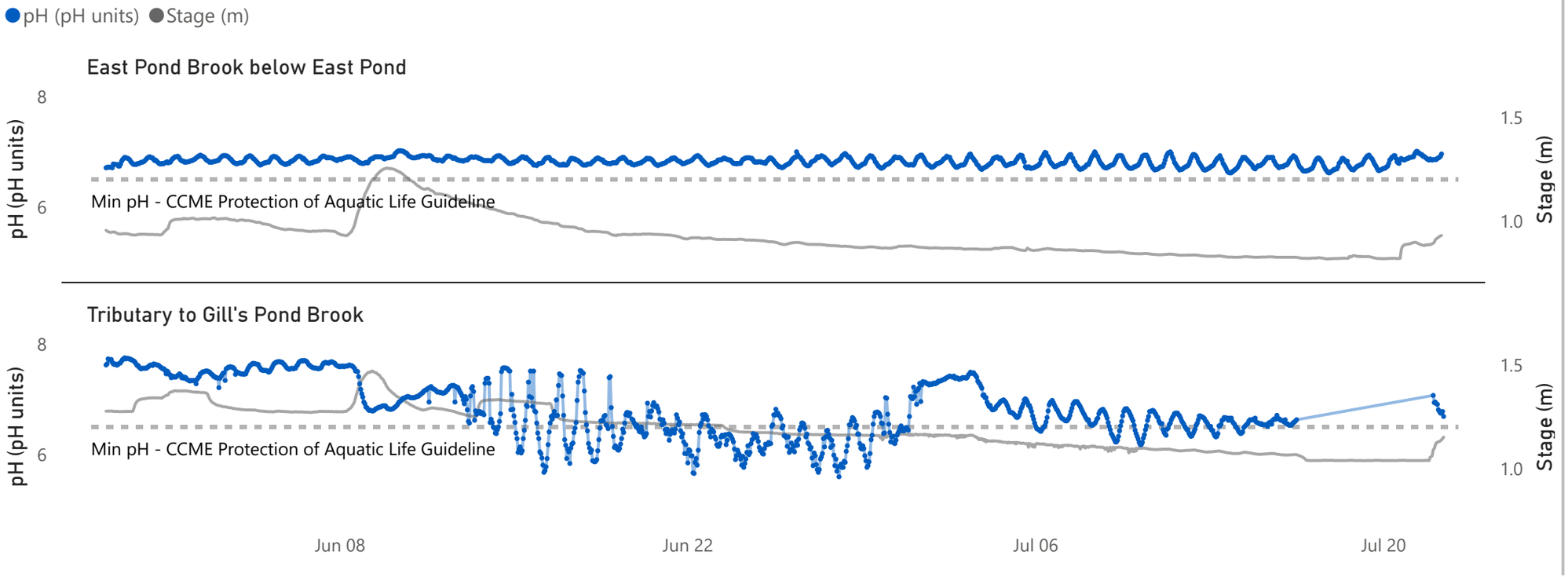
At East Pond Brook, pH was generally stable throughout the deployment period, with 100% of recorded values remaining within the CCME guidelines. In contrast, the Tributary to Gill's Pond Brook displayed much greater variability, with pH initially near 7.7 before experiencing a sharp decline during a stage increase, followed by substantial fluctuations in mid-June. 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.

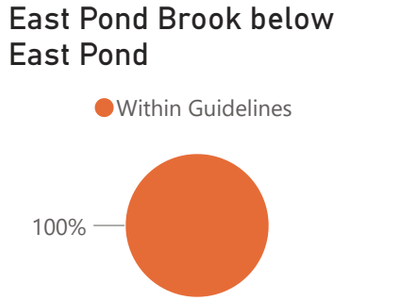
East Pond Brook Below East Pond

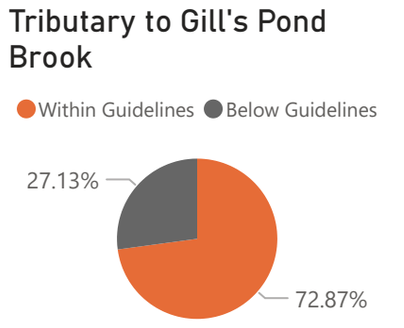
6.83 Average	6.83 Median
6.62 Minimum	7.02 Maximum

Tributary to Gill's Pond Brook

6.84 Average	6.76 Median
5.60 Minimum	7.75 Maximum







Specific Conductivity

(µS/cm)

Newfoundland Labrador

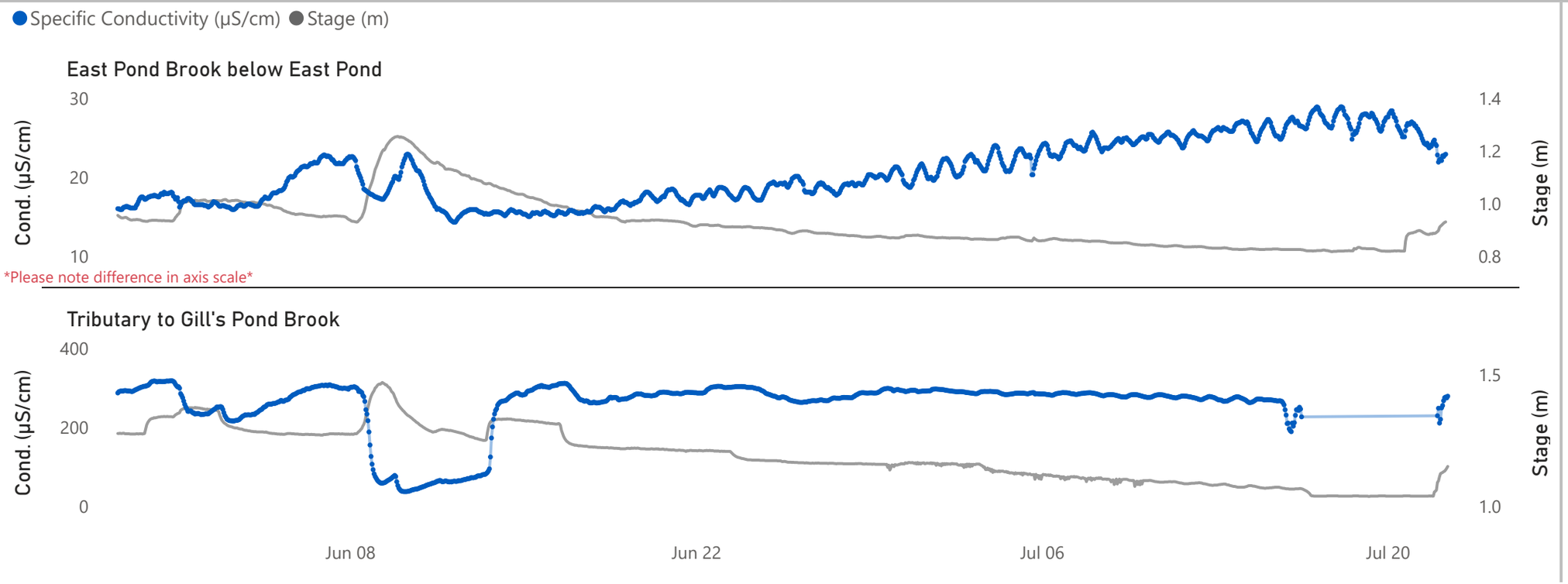
East Pond Brook Below East Pond		Tributary to Gill's Pond Brook	
20.56 Average	19.90 Median	257.20 Average	280.70 Median
14.30 Minimum	28.90 Maximum	36.90 Minimum	317.40 Maximum

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 ranged between 14.30 µS/cm to 28.90 µS/cm, and remained generally low throughout the deployment period. Small fluctuations can be associated with precipitation events, like June 8th. The gradual increasing trend may be attributed to rising atmospheric temperatures, which increases evaporation and lead to higher dissolved ion concentrations in the stream.

Specific conductivity at Tributary to Gill's Pond Brook ranged between 36.90 µS/cm and 317.40 µS/cm. Conductivity was generally stable but showed clear sensitivity to precipitation events. For example, the June 8th rainfall produced a notable temporary decrease in conductivity.

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

Dissolved Oxygen

(mg/L and % Sat)

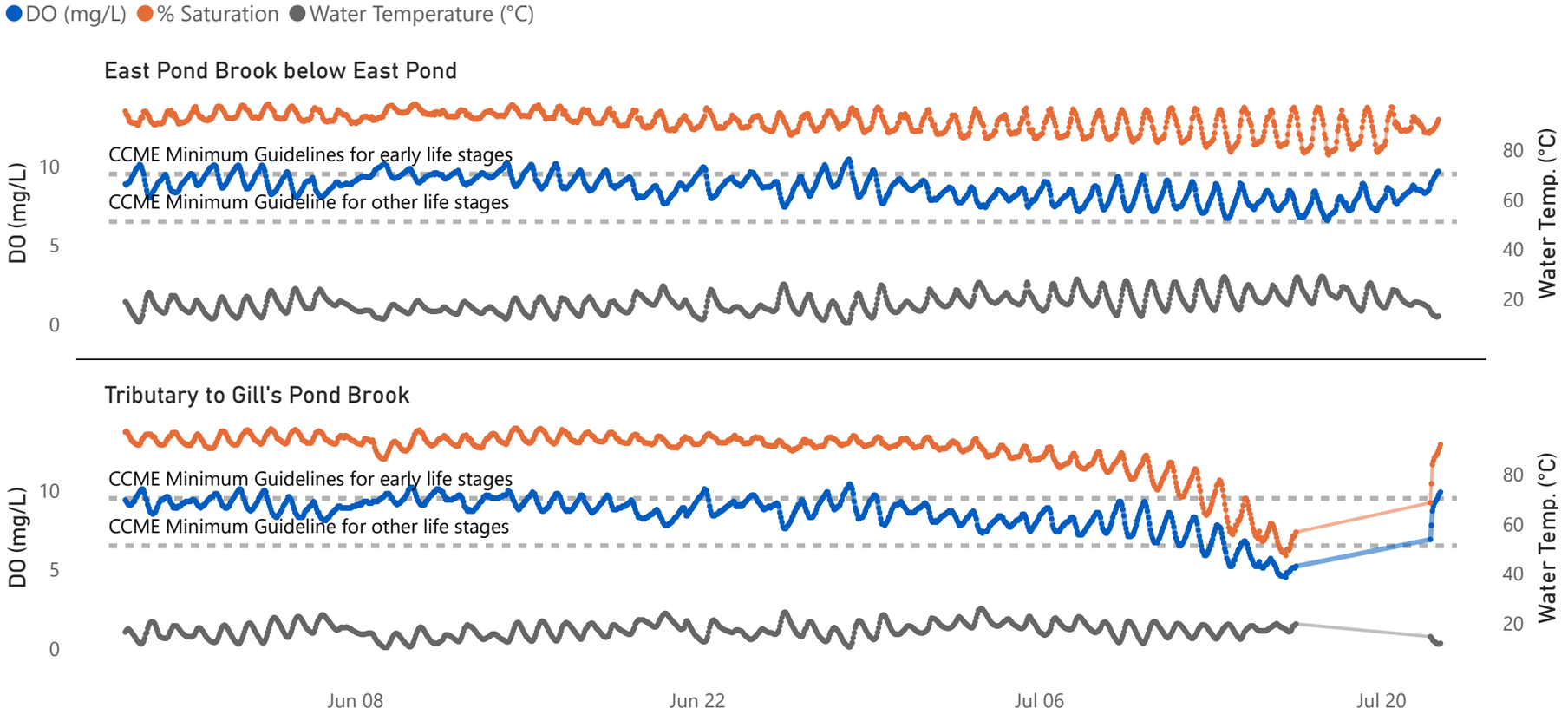
Newfoundland Labrador

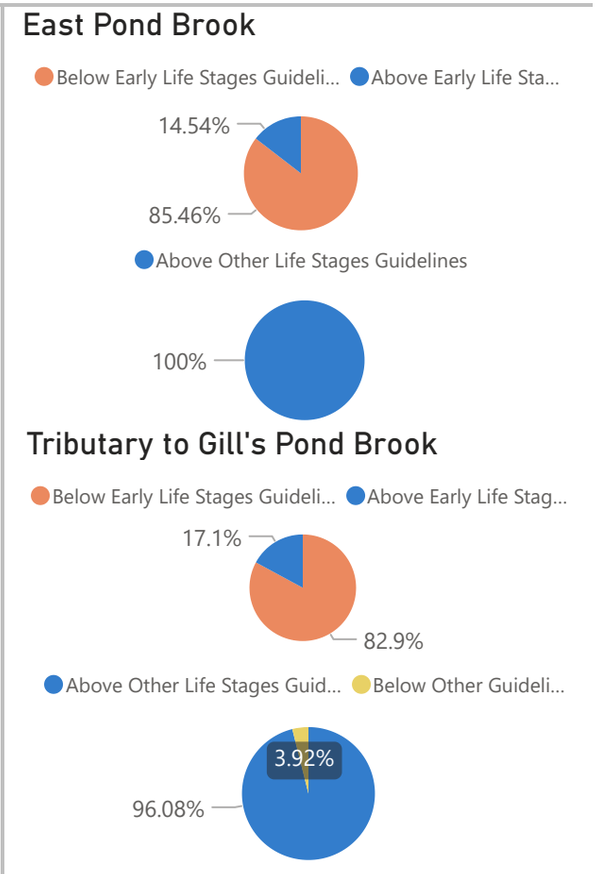
East Pond Brook Below East Pond		Tributary to Gill's Pond Brook	
8.61 Average	8.68 Median	8.57 Average	8.90 Median
6.57 Minimum	10.44 Maximum	4.50 Minimum	10.40 Maximum

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 levels are 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.

DO at East Pond Brook ranged between 6.57 mg/L and 10.44 mg/L. Concentrations remained above the minimum guideline for the protection of other life stages but were mostly below the minimum guideline for early life stages throughout the deployment.

DO at Tributary to Gill's Pond Brook ranged between 4.50 mg/L and 10.40 mg/L. The lowest values were likely influenced by low flow and stagnant water conditions, which reduce aeration and promote oxygen depletion. DO concentrations remained above the minimum guideline for other life stages for much of the deployment period but were predominantly below the guideline for early life stages.





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.

At East Pond Brook, turbidity ranged between 0.00 NTU and 322.40 NTU. For the majority of the deployment period, values were low and stable. There are several incidences where turbidity gradually rose then rapidly declined. This is likely a result of debris accumulating in the protective casing around the turbidity sensor, causing erroneous values. The debris then flushes out causing the rapid decrease in values. The median of 0.7NTU is a representative value of turbidity in East Pond Brook.

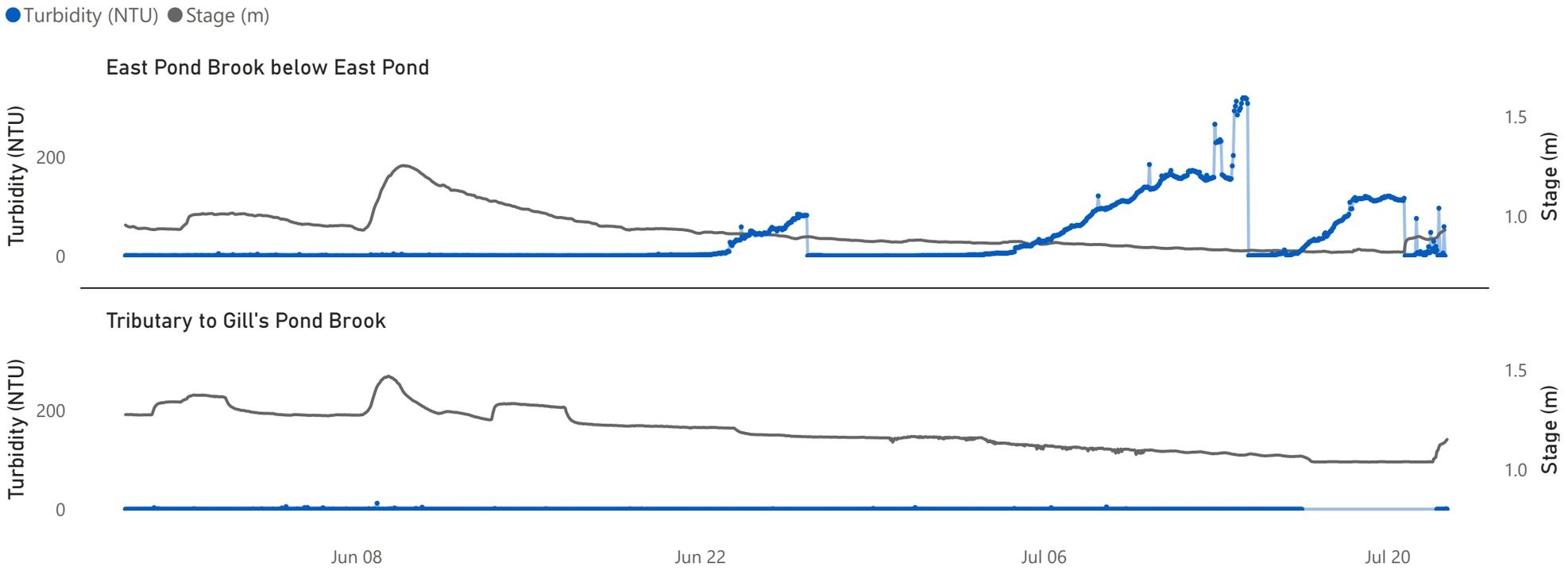
At Tributary to Gill's Pond Brook, Turbidity ranged between 0.00 NTU and 12.00 NTU. Values remained low and stable throughout the deployment period.

East Pond Brook Below East Pond

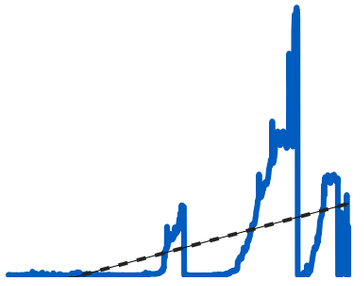
31.63 Average	0.70 Median
0.00 Minimum	322.40 Maximum

Tributary to Gill's Pond Brook

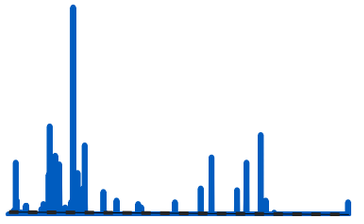
0.06 Average	0.00 Median
0.00 Minimum	12.00 Maximum



East Pond Brook Trendline



Tributary to Gill's Trendline



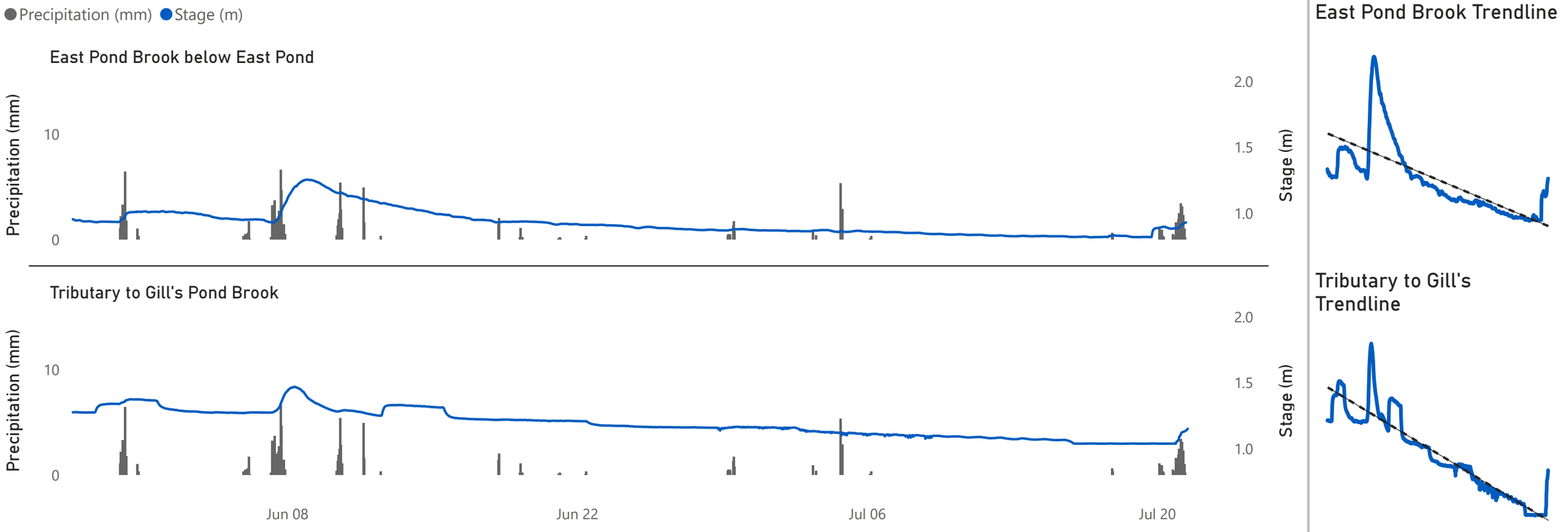
Stage
(m)

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 0.82 to 1.47 at East Pond Brook, and ranged between 1.04 to 1.47 at Tributary to Gill's Pond Brook. Stage remained stable across the deployment period, with small increases coinciding with precipitation events, such as June 8th.

There is an overall decreasing trend throughout the deployment period. This pattern can be attributed to rising atmospheric temperatures, which increase evaporation rates, combined with reduced precipitation that limits the recharge of waterbodies.

East Pond Brook Below East Pond		Tributary to Gill's Pond Brook	
0.93 Average	0.90 Median	1.19 Average	1.17 Median
0.82 Minimum	1.26 Maximum	1.04 Minimum	1.47 Maximum



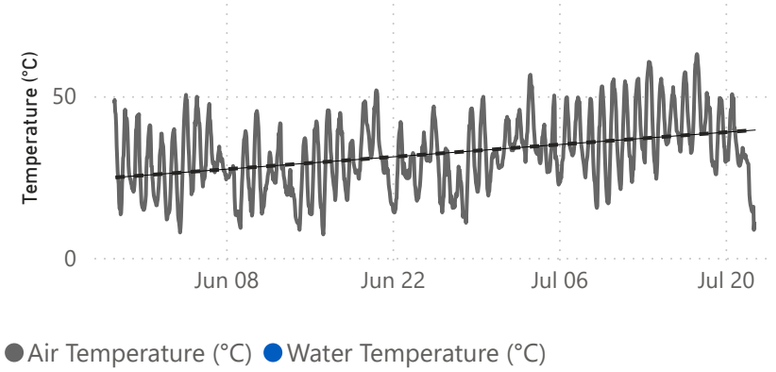
East Pond Brook Trendline

Tributary to Gill's Trendline

Meteorological and Hydrometric Data

Millertown, NL MET Station Data

Air Temperature Recorded at Millertown MET Station

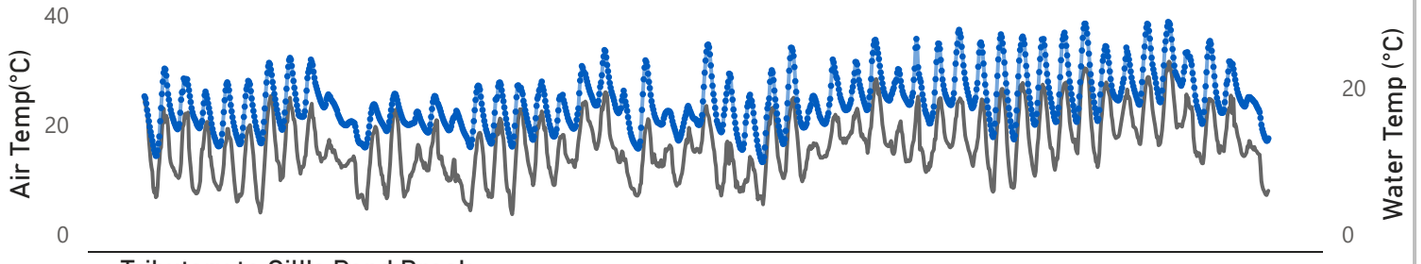


Air Temperature (°C) Water Temperature (°C)

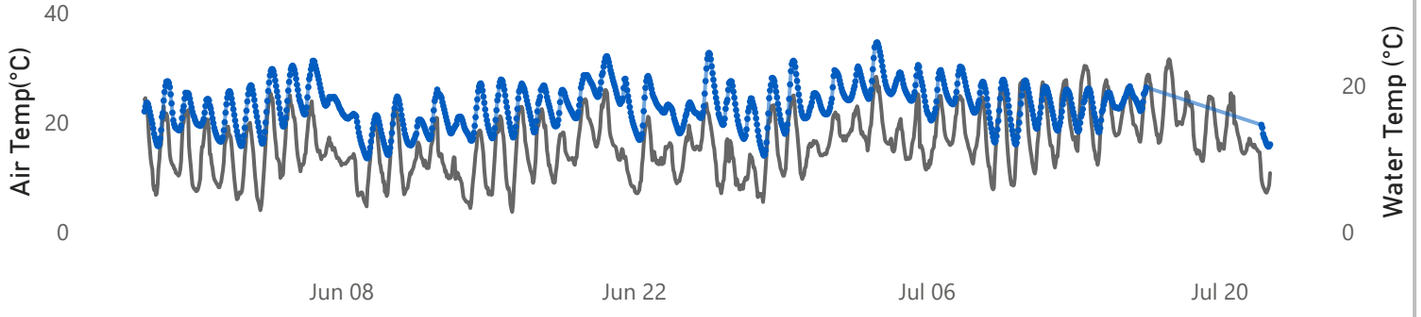
Air Temperature Data Statistics

16.09 Average (°C)	15.80 Median (°C)
3.60 Minimum (°C)	31.50 Maximum (°C)

East Pond Brook below East Pond



Tributary to Gill's Pond Brook



Precipitation Data Statistics

0.10 Average (mm/hr)	0.00 Median (mm/hr)
0.00 Minimum (mm/hr)	6.60 Maximum (mm/hr)

Precipitation Recorded at Millertown, NL MET Station