Real-Time Water Quality Deployment Report

Teck: Duck Pond Operations

October 5, 2016 to November 17, 2016

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Environment and Climate Change
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

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Real-Time Water Quality Deployment Report
Rattling Brook Network
2016-10-05 to 2016-11-17

General

- Department of Environment and Climate Change staff monitors the real-time web pages consistently.
- East Pond Brook and Tributary to Gills Pond Brook will be referred to as EPB and TGPB, respectively, throughout this report.
- A telemetry failure at EPB station resulted in loss of data for a substantial portion of the deployment. A log file onboard the instrument was used to fill the majority of those gaps, however, flow could not be recovered.
- Unusual turbidity readings at TGPB station resulted in the omission for the full month. The unusual readings may have been the result of interference from turbulent flow just upstream of the sensor.
- A massive volume of precipitation on October 10th resulted in more than 150 mm of rain in 24 hours. This was the predominant driver of water quality events during this time period.
- Hydrometric data included in this report is provisional and used only for illustrative purposes. Corrected and finalized data may be retrieved from the Water Survey of Canada website (http://www.ec.gc.ca/rhc-wsc/)*.

Maintenance and Calibration of Instrument

- As part of the Quality Assurance and Quality Control protocol (QAQC), 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.
    - Upon deployment, a QA/QC Sonde is temporarily deployed *in situ*, adjacent to the Field Sonde. Depending on the degree of difference between each parameter from the Field and QAQC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
    - At the end of a deployment period, a freshly cleaned and calibrated QAQC Sonde is placed *in situ*, adjacent to the Field Sonde. Values are compared between all parameters and differences are ranked for placement in Table 1.

Table 1: Qualitative QAQC Ranking

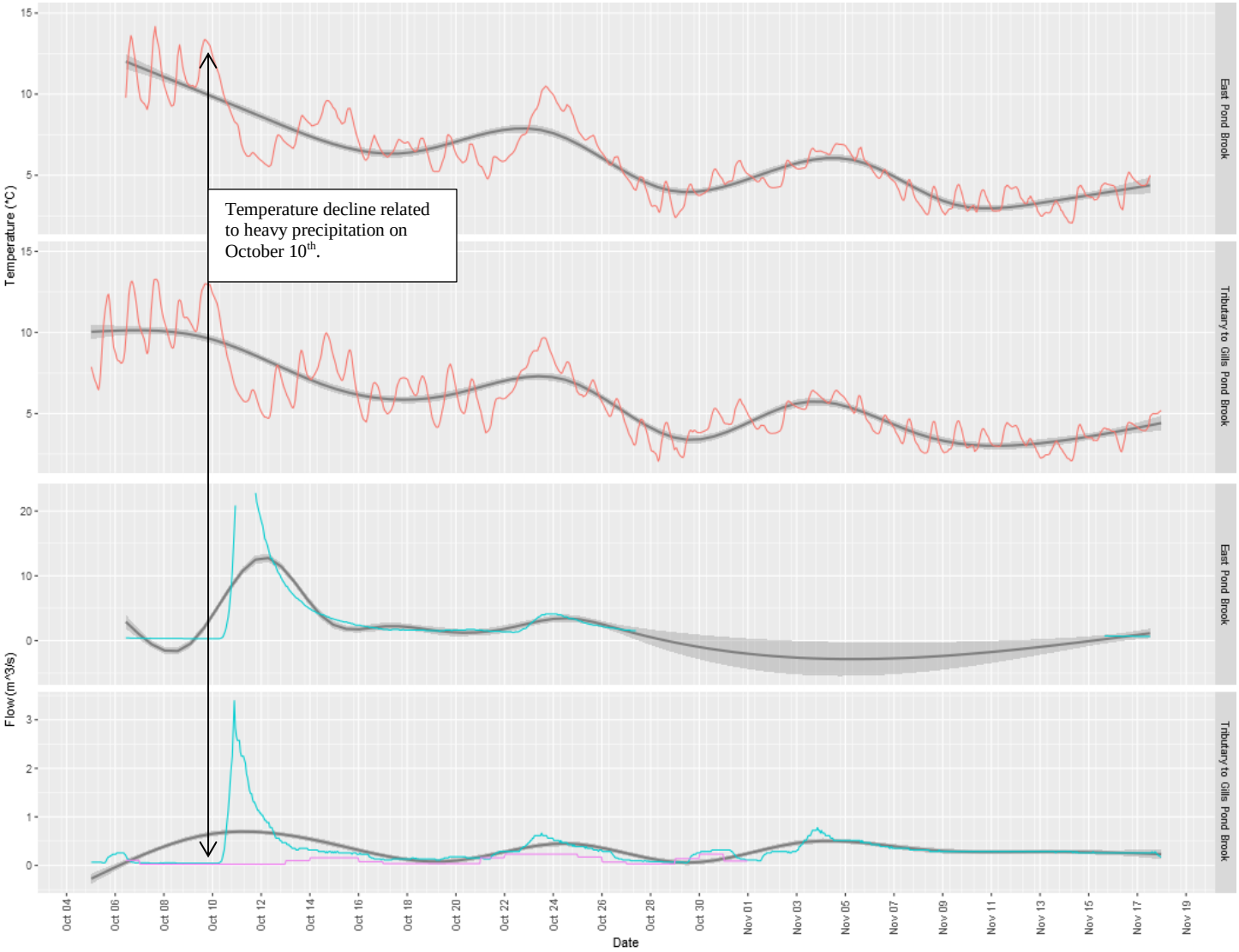
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
East Pond Brook	2016-10-05	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	2016-11-17	Removal	Good	Poor	Excellent	Good	Excellent
Tributary to Gills Pond Brook	2016-10-05	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	2016-11-17	Removal	Excellent	Good	Excellent	Excellent	Excellent

- The QAQC pH sensor used during removal appears to have drifted resulting in a “Poor” ranking at East Pond Brook and Gills Pond Brook.

Data Interpretation

Temperature

Water Temperature is a major factor used to describe water quality. Temperature has major implications on both the ecology and chemistry of a water body, governing processes such as the metabolic rate of aquatic plants and animals and the degree of dissolved oxygen saturation.



Station	Mean	Median	Min	Max
East Pond Brook	5.77	5.35	2.05	14.18
Tributary to Gills Pond Brook	5.84	5.34	2.06	13.28

- A general downward trend is observed at both stations during this deployment, as expected for the time of year. Ice formation is expected within the next few weeks as daily temperatures continue to decline.

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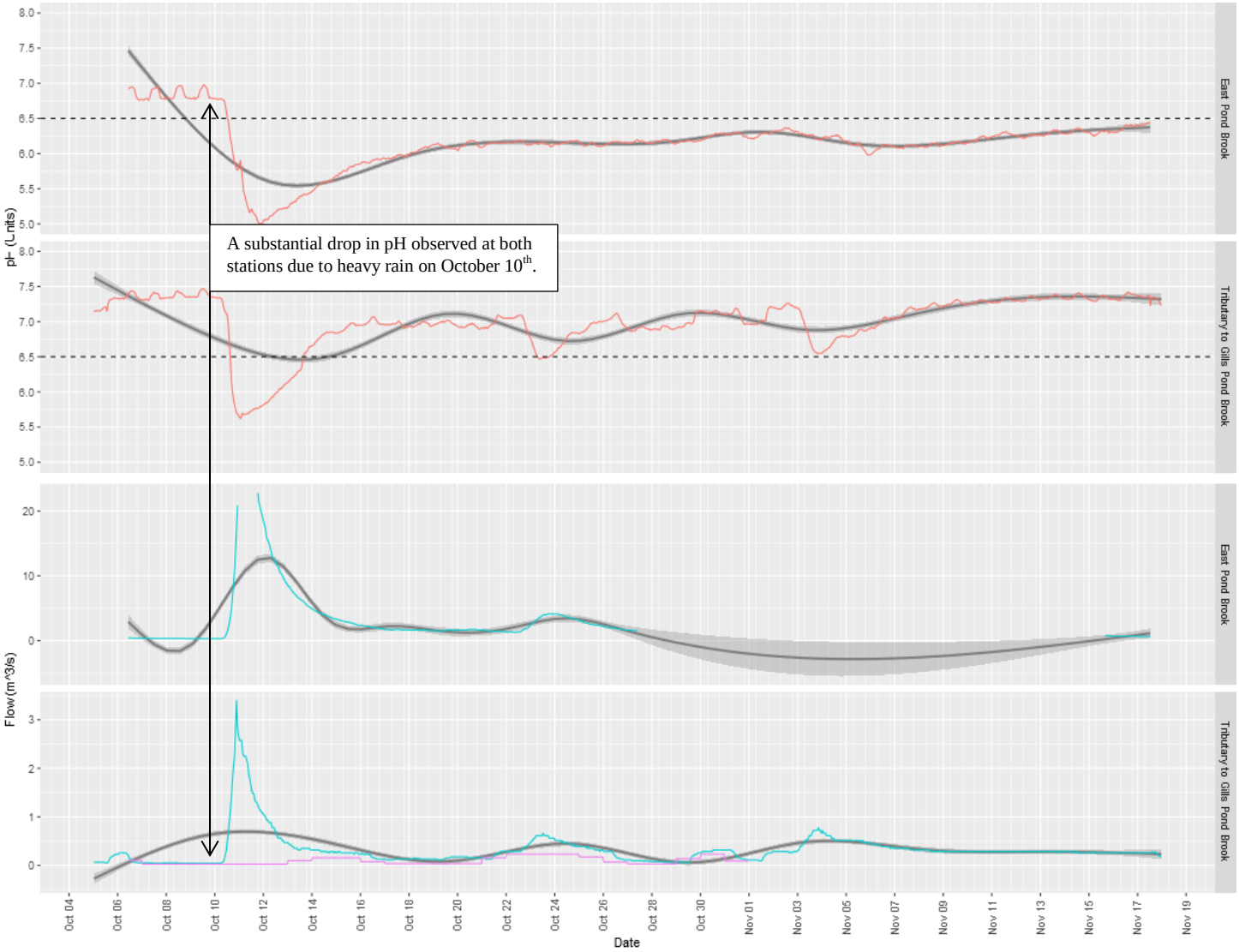
pH

pH is used to give an indication of the acidity or basicity of a solution. A pH of 7 denotes a neutral solution while lower values are acidic and higher values are basic. Technically, the pH of a solution indicates the availability of protons to react with molecules dissolved in water. Such reactions can affect how molecules function chemically and metabolically.



Station	Mean	Median	Min	Max
East Pond Brook	6.17	6.18	4.98	6.98
Tributary to Gills Pond Brook	7.00	7.05	5.62	7.47

- Prior to October 10th, pH values were mostly stable and depicted some diurnal cycling. Following the rainfall, a rapid drop in pH led to unstable conditions and a slow return back to near-precipitation levels.

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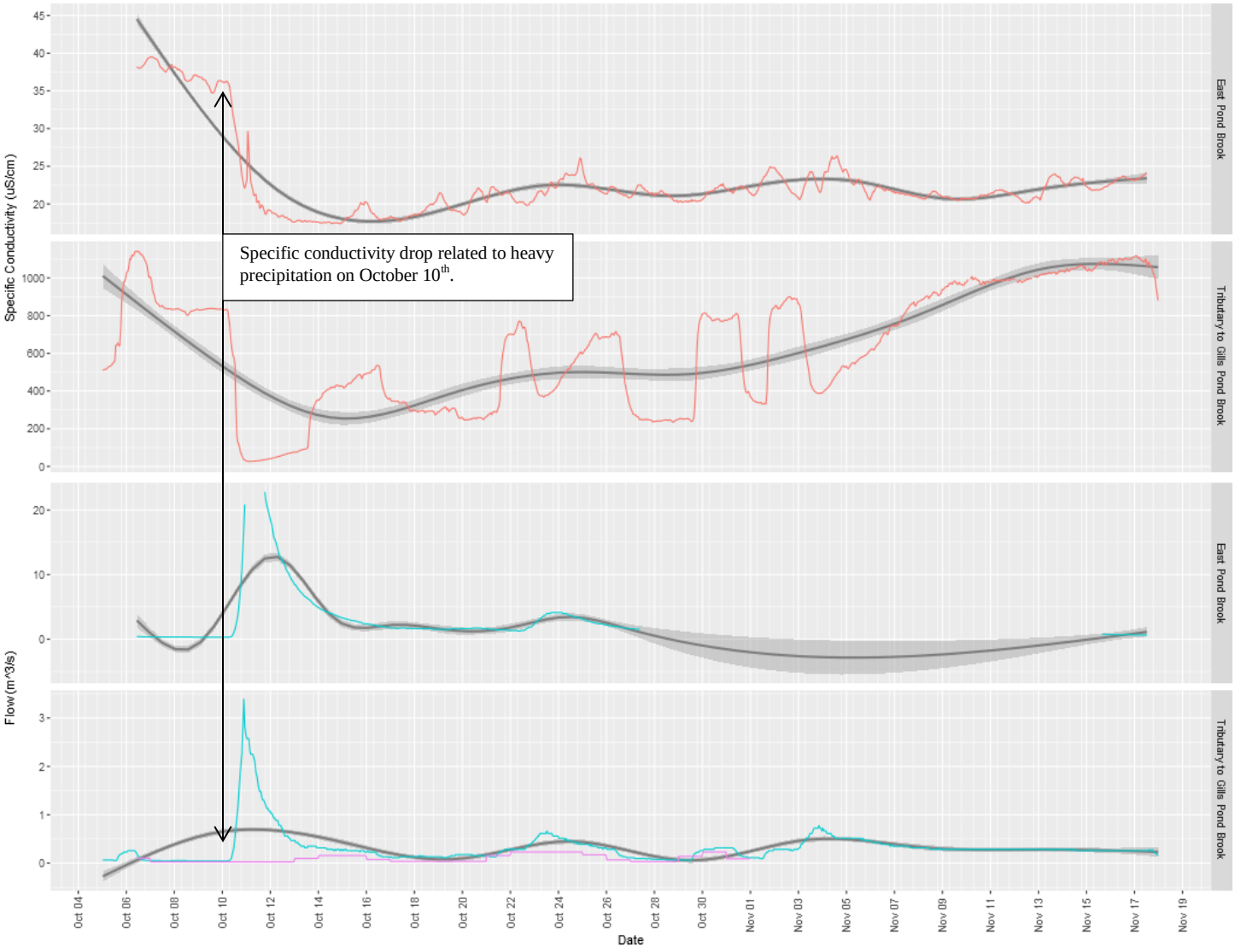
Specific Conductivity

Conductivity relates to the ease of passing an electric charge – or resistance – through a solution. Conductivity is highly influenced by the concentration of dissolved ions in solution: distilled water has zero conductivity (infinite resistance) while salty solutions have high conductivity (low resistance). Specific Conductivity is corrected to 25°C to allow comparison across variable temperatures.



Station	Mean	Median	Min	Max
East Pond Brook	22.7	21.6	17.4	39.5
Tributary to Gills Pond Brook	627.3	642.0	26.8	1141.0

- Much like pH, specific conductivity was also driven down by heavy rainfall on October 10th. Recovery of pre-rainfall levels was relatively swift for TGPB due to the high level of dissolved solids in the effluent released into the stream. EPB station, however, was found to have a substantially lower specific conductivity at the end of the deployment than was observed at the start.

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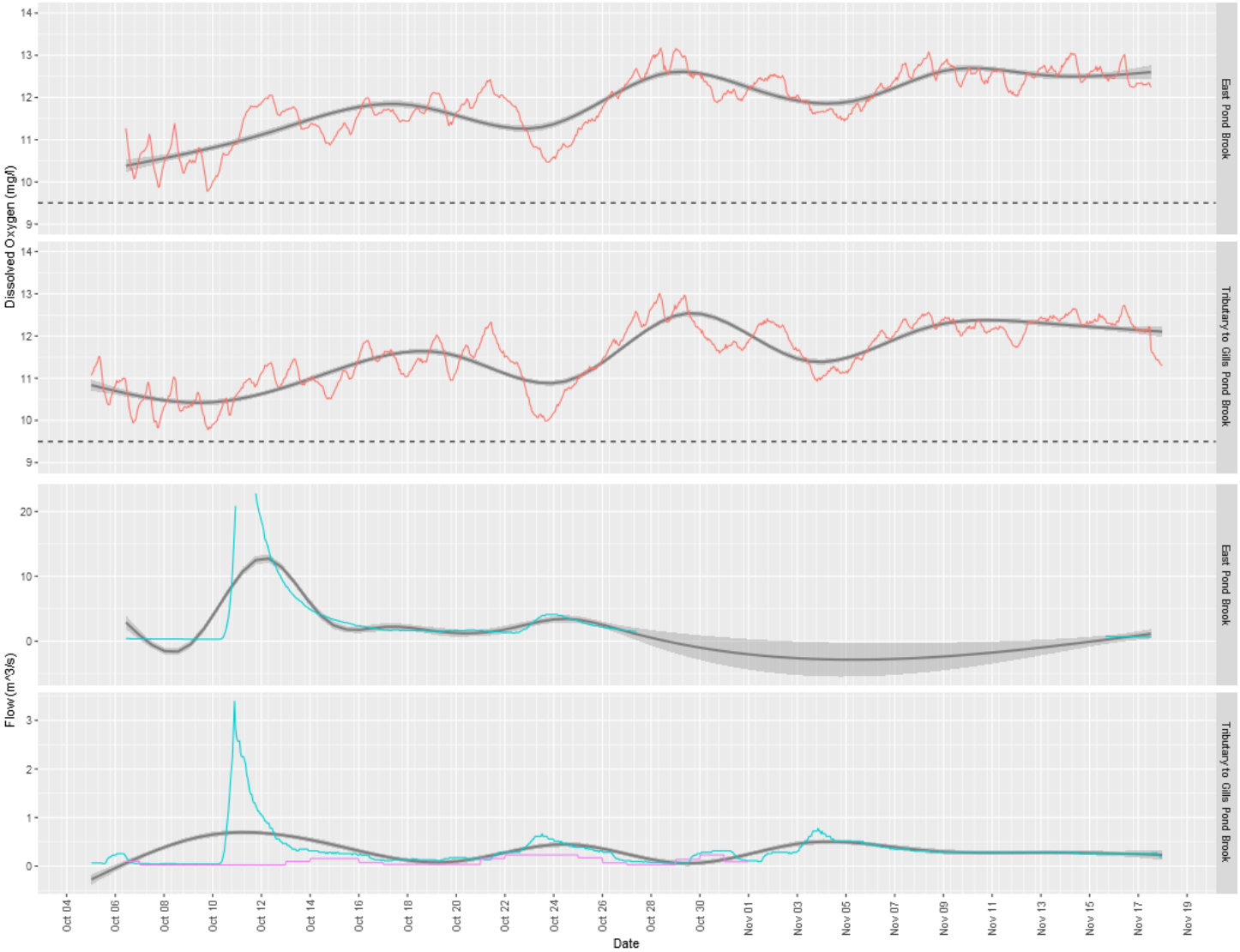
Dissolved Oxygen

Dissolved oxygen is a metabolic requirement of aquatic plants and animals. The concentration of oxygen in water depends on many factors, especially temperature – the saturation of oxygen in water is inversely proportional to water temperature. Oxygen concentrations also tend to be higher in flowing water compared to still, lake environments. Low oxygen concentrations can give an indication of excessive decomposition of organic matter or the presence of oxidizing materials.



Station	Mean	Median	Min	Max
East Pond Brook	11.97	12.06	9.78	13.17
Tributary to Gills Pond Brook	11.55	11.64	9.78	13.01

- Dissolved oxygen levels increased throughout the deployment period as a result of cooling water temperatures. All values were found to be greater than the stated CCME guideline of 9.5 mg/l for the protection of cold water aquatic life.

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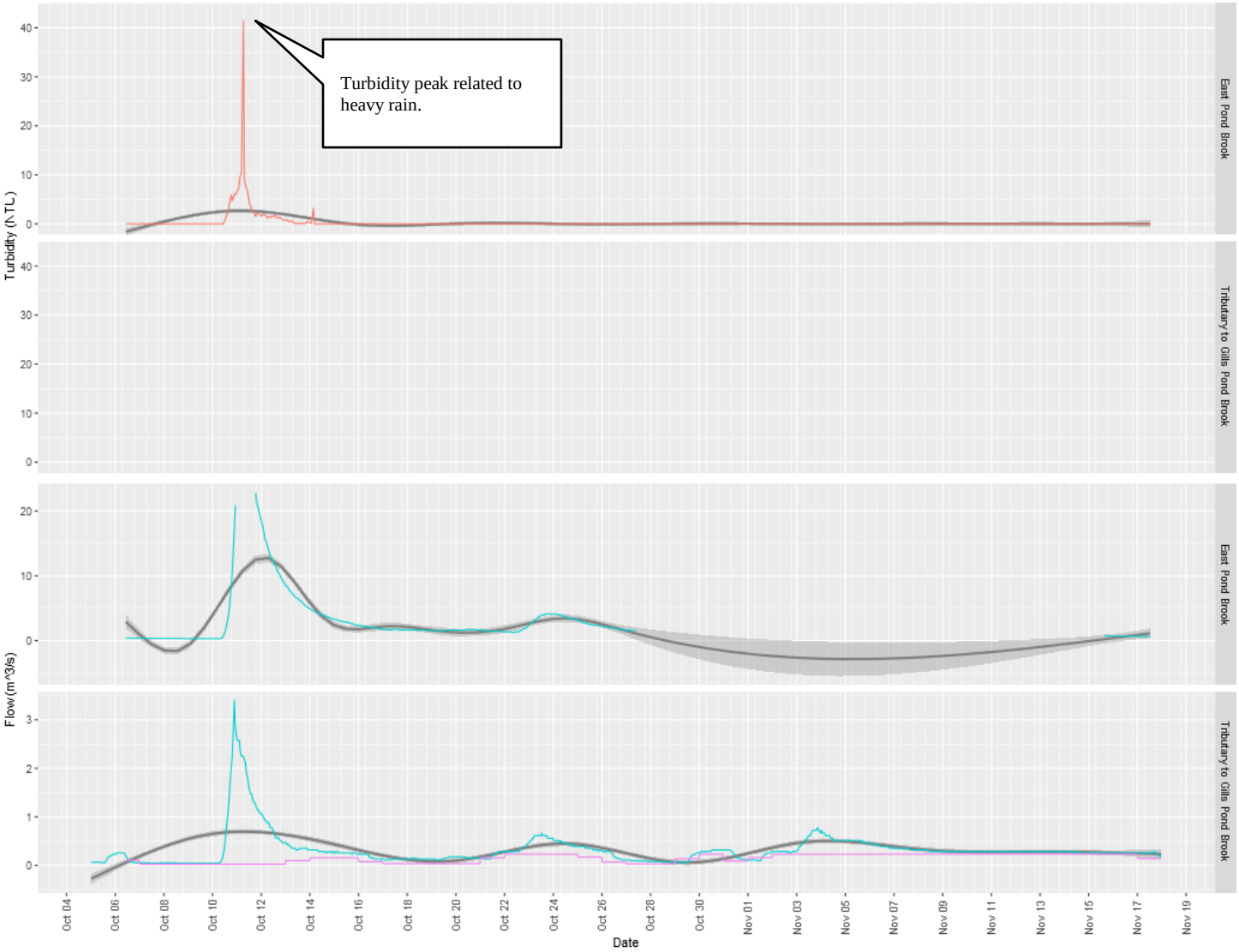
Turbidity

Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



Station	Mean	Median	Min	Max
East Pond Brook	0.2	0.0	0.0	41.4
Tributary to Gills Pond Brook				

- Turbidity at EPB station was low for much of the deployment, except for a large increase following rain on October 10th. Turbidity quickly recovered in this case and exhibited a median value of 0.0 NTU for the duration.

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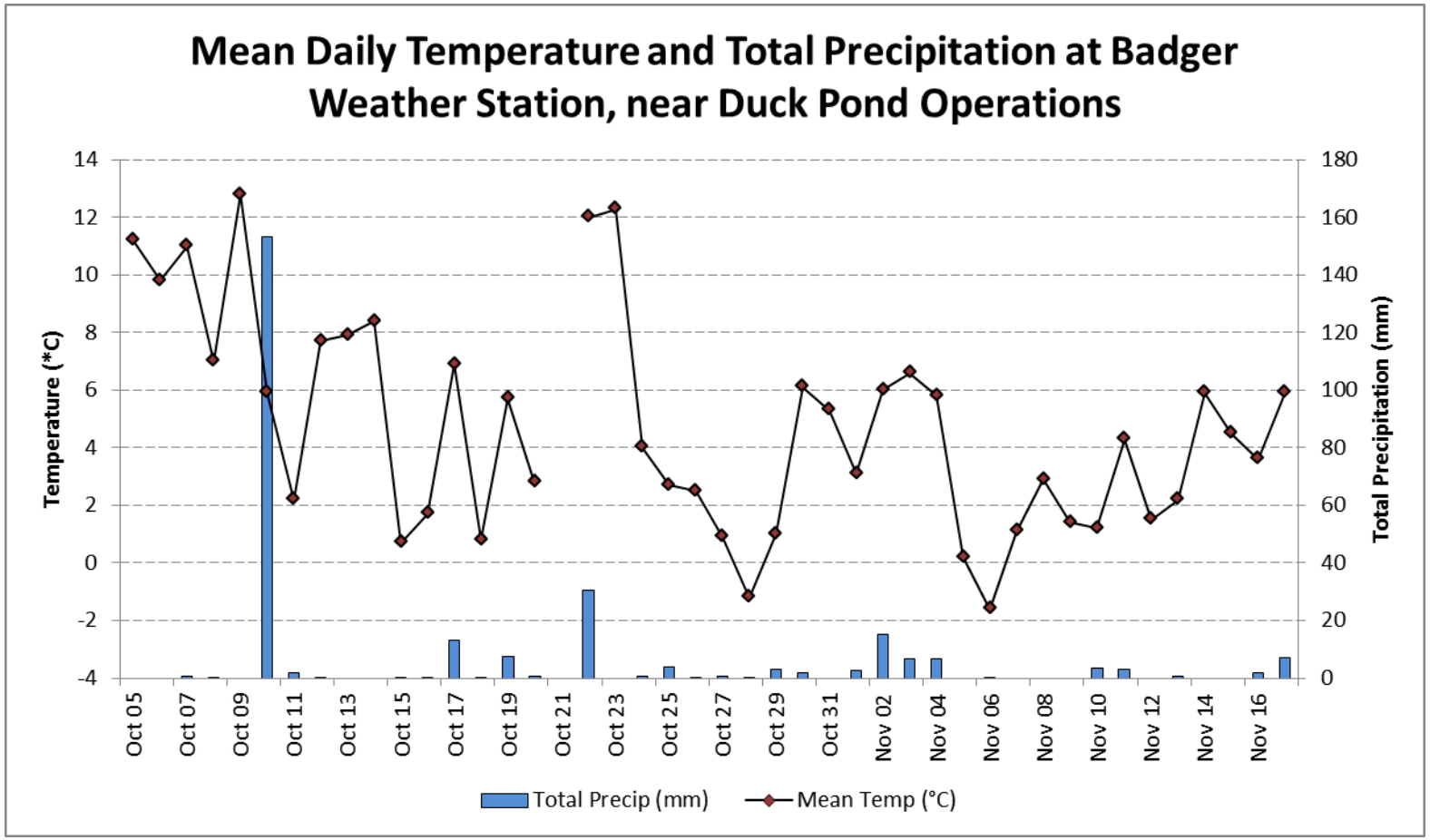
Appendix



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