Real-Time Water Quality Deployment Report

Teck: Duck Pond Operations

May 18, 2017 to July 6, 2017

Newfoundland Labrador

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

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2017-05-18 to 2017-07-06

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- Throughout this report, East Pond Brook and Tributary to Gills Pond Brook will be abbreviated as EPB and TGPB, respectively.
- pH returns from the East Pond Brook station were found to be highly variable and far out of expected ranges during this deployment period. As such, a flaw with the pH sensor was assumed and the data was not used in the report.
- 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

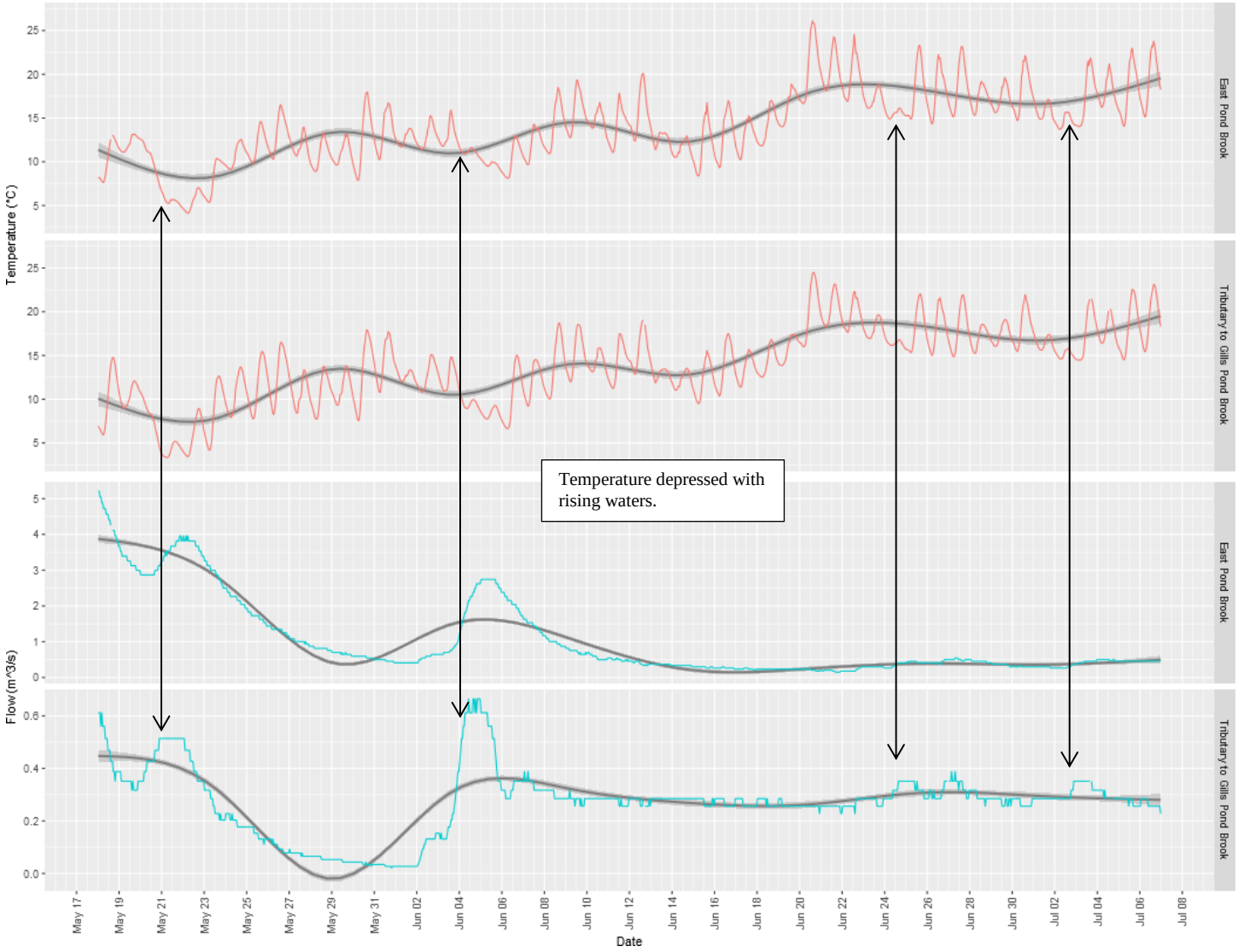
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
East Pond Brook	May 18, 2017	Deployment	Excellent	Fair	Excellent	Good	Excellent
	July 6, 2017	Removal	Excellent	Poor	Excellent	Excellent	Excellent
Tributary to Gills Pond Brook	May 18, 2017	Deployment	Excellent	Good	Good	Marginal	Excellent
	July 6, 2017	Removal	Excellent	Good	Excellent	Marginal	Good

- A large difference between QAQC and Field sondes on removal led to a ‘Poor’ ranking for pH at EPB station. This was due to a pH failure on the Field sonde. Data was removed from the report.

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	14.09	13.94	4.12	26.12
Tributary to Gills Pond Brook	13.93	14.20	3.34	24.50

- The annual temperature increase is clear at both stations during this deployment period. Also notable is a depression in the warming trend during water level perturbations.

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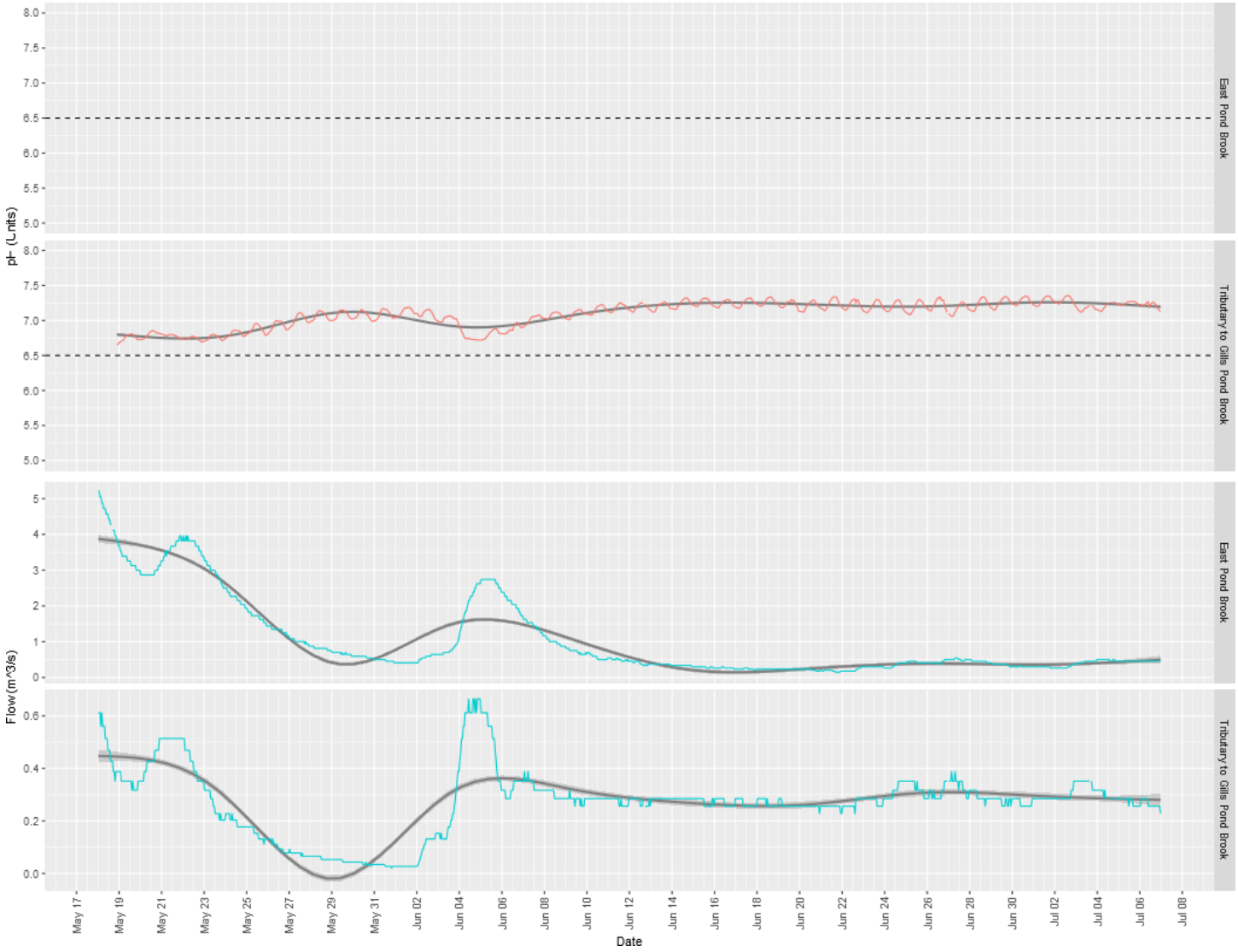
pH

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
Tributary to Gills Pond Brook	7.09	7.15	6.65	7.36

- Dashed lines above are CCME guidelines established for the protection of early life stage aquatic biota. CCME guidelines fall between 6.5 and 9.0.
- pH at TGPB station showed a 0.5 unit increase over the deployment interval. pH levels tend to be highest during low-flow periods – pH low points observed during this deployment period were also during high-flow at the station.
- pH values were not reported for East Pond Brook station due to a sensor failure.

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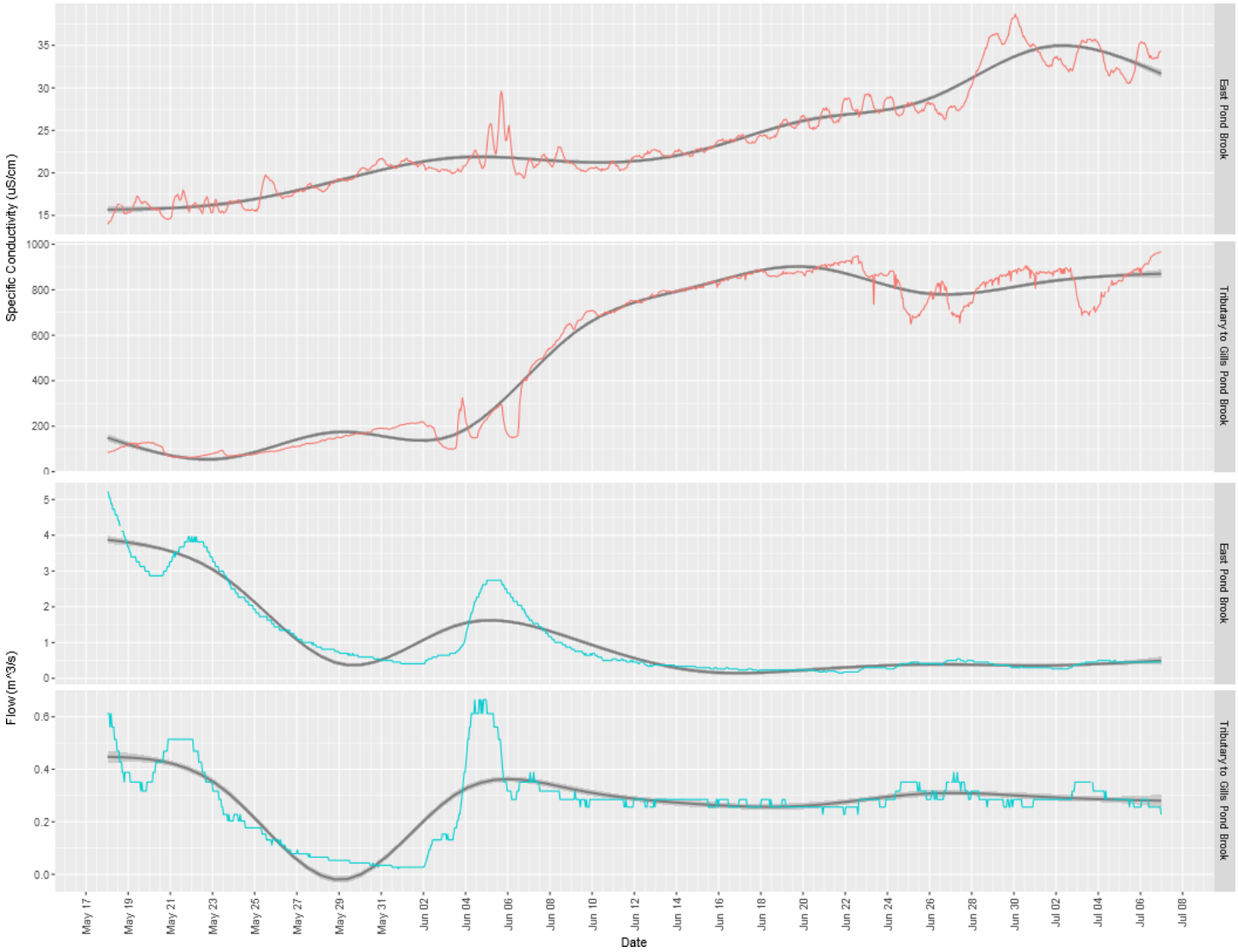
Specific Conductivity

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	23.9	22.3	14.0	38.7
Tributary to Gills Pond Brook	536.9	702.0	62.6	969.0

- Substantial increases in conductivity were observed at both EPB and TGPB stations as water levels were at low-flow conditions. During dry periods, groundwater inflow dictates water quality characteristics – in this case, dissolved solid-laden groundwater predominates over a lack of precipitation.

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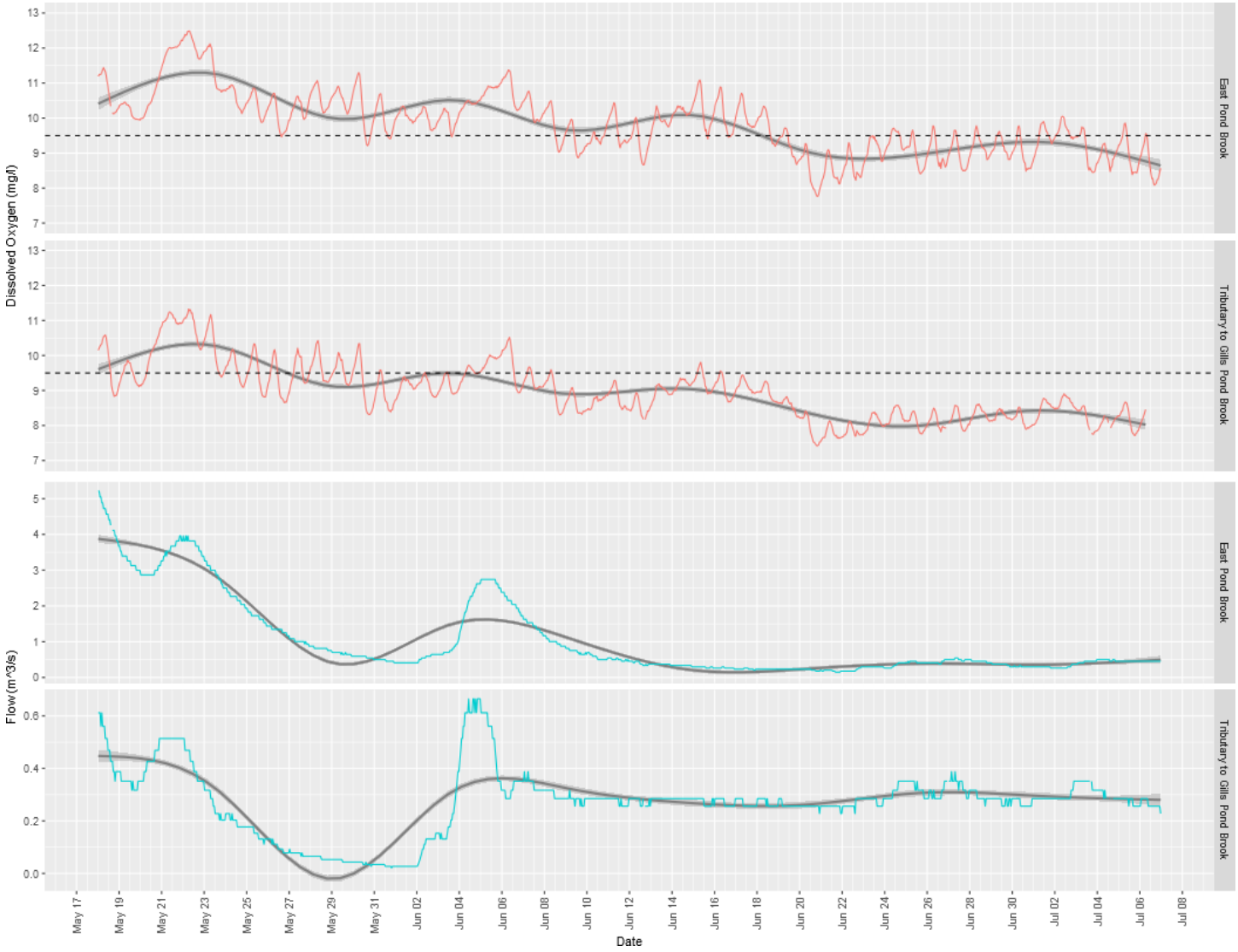
Dissolved Oxygen

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.



Variable	Station	Mean	Median	Min	Max
DO (mg/l)	East Pond Brook	9.84	9.82	7.76	12.49
DO (mg/l)	Tributary to Gills Pond Brook	8.97	8.91	7.42	11.33

- As expected, warming waters depressed the concentration of dissolved oxygen in the water column. This effect is more pronounced at TGPB station where shallow waters are more influenced by warm air temperatures.
- Most DO values were above or just below CCME guidelines for early life stages (dashed lines in figure).

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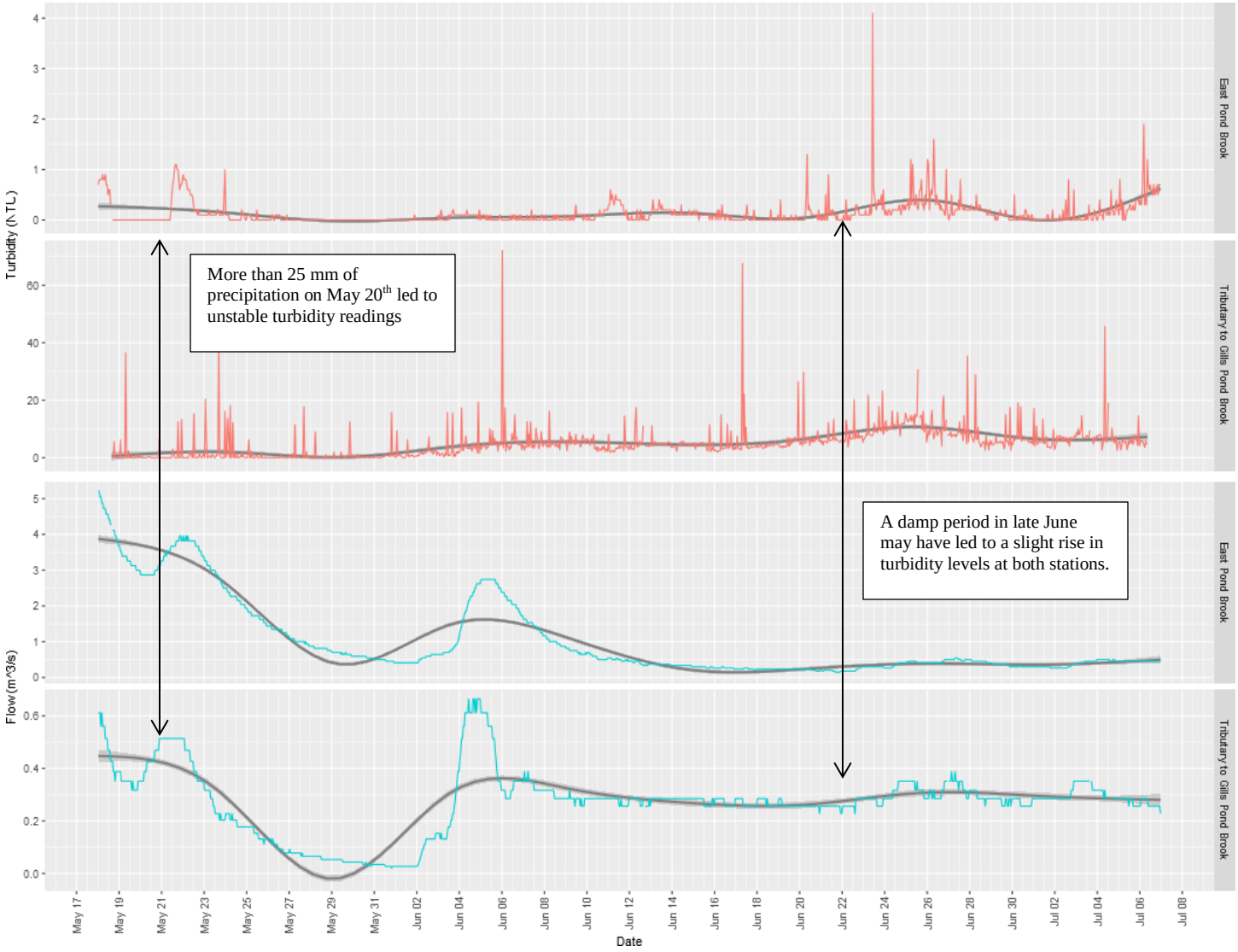
Turbidity

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	0.1	0.1	0.0	4.1
Tributary to Gills Pond Brook	4.9	4.2	0.0	72.1

- Turbidity levels were mostly low during this deployment period with isolated instances of values rising above 60 NTU at TGPB station.

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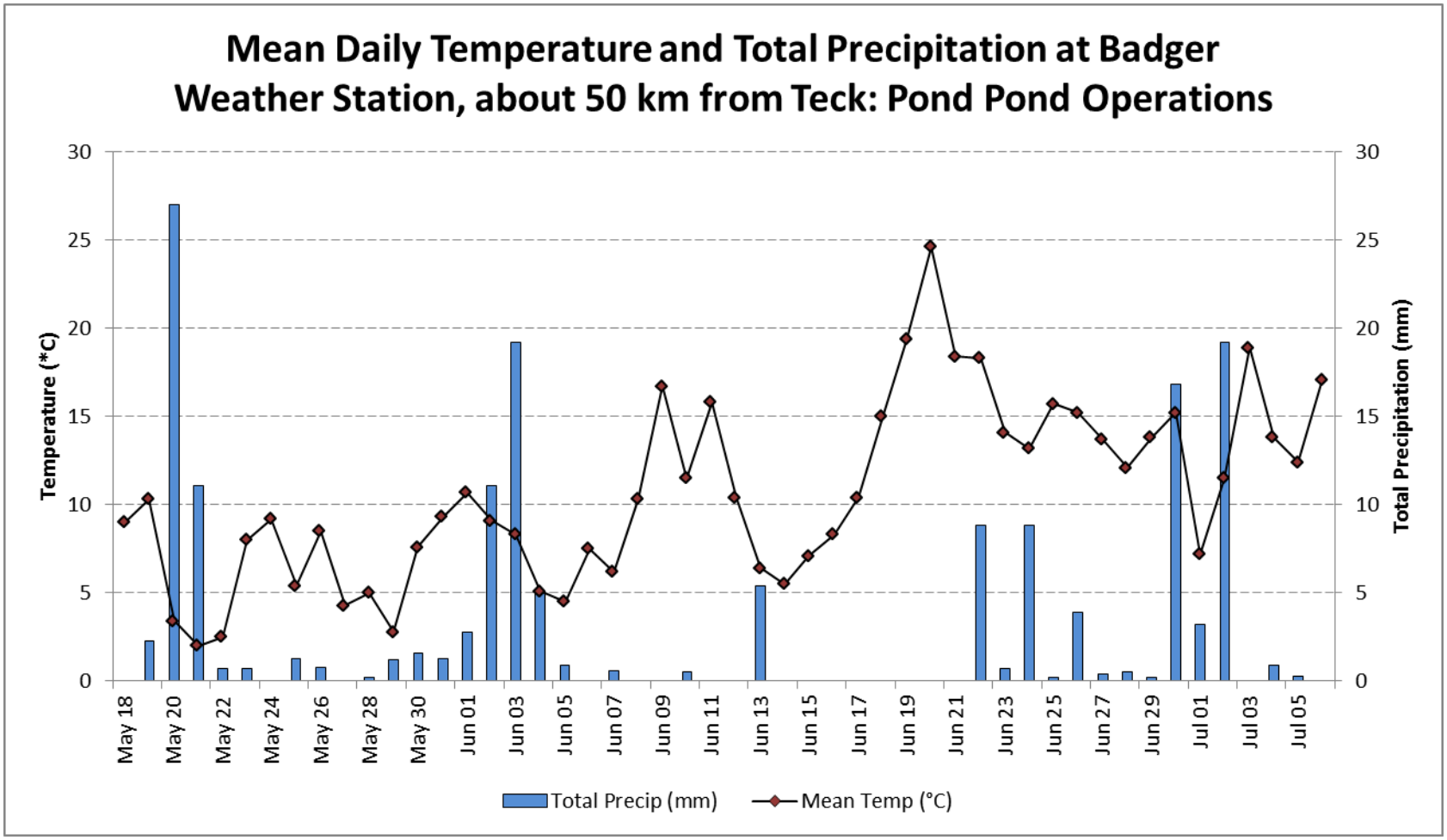
Appendix


Mean Daily Temperature and Total Precipitation at Badger Weather Station, about 50 km from Teck: Pond Pond Operations
Temperature (*C)
Total Precipitation (mm)
30
25
20
15
10
5
0
May 18
May 20
May 22
May 24
May 26
May 28
May 30
Jun 01
Jun 03
Jun 05
Jun 07
Jun 09
Jun 11
Jun 13
Jun 15
Jun 17
Jun 19
Jun 21
Jun 23
Jun 25
Jun 27
Jun 29
Jul 01
Jul 03
Jul 05
Total Precip (mm)
Mean Temp (°C)