Real-Time Water Quality Deployment Report

Rattling Brook Network

April 28, 2016 to June 23, 2016

Newfoundland Labrador

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

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2016-04-28 to 2016-06-23

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- A server outage occurred from April 30 to May 1 resulting in data loss from each of the surface water stations.
- 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

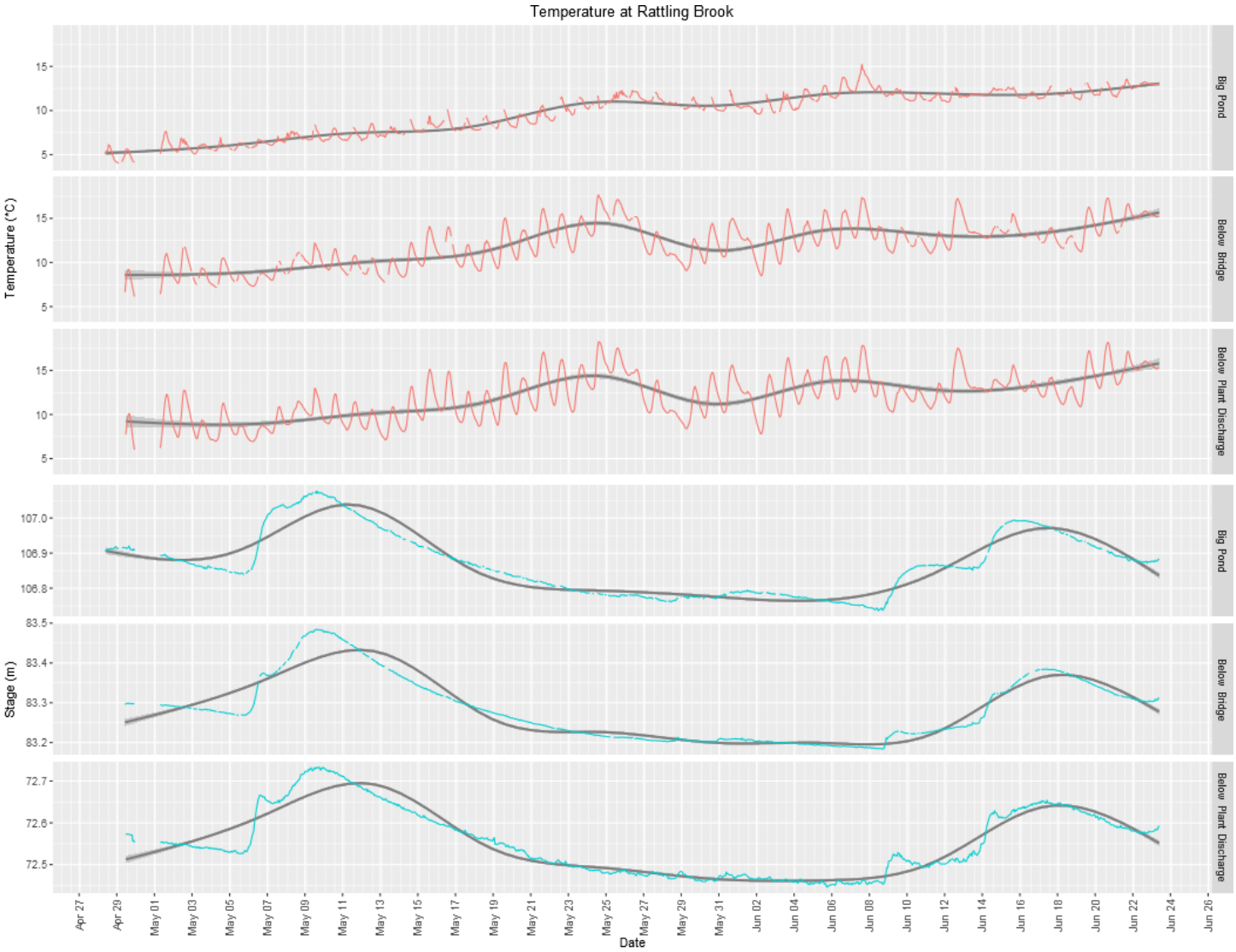
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	April 28, 2016	Deployment	Good	Excellent	Fair	Excellent	Excellent
	June 23, 2016	Removal	Good	Good	Good	Excellent	Excellent
Rattling Brook below Bridge	April 29, 2016	Deployment	Good	Excellent	Excellent	Excellent	Excellent
	June 23, 2016	Removal	Excellent	Excellent	Good	Excellent	Poor
Rattling Brook below Plant Discharge	April 29, 2016	Deployment	Good	Good	Excellent	Excellent	Excellent
	June 23, 2016	Removal	Excellent	Good	Good	Excellent	Good

- A “Poor” ranking was encountered during removal at Bridge station. At the time, the Field sonde read 57.8 NTU while the QAQC sonde read 42.2 NTU. Since both instruments were reading elevated turbidity levels, the difference between the two could be accounted for by spatial differences and slight variations in silt levels. The “Poor” ranking does not appear to be fully justified.

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
Big Pond	9.78	10.50	4.04	15.22
Below Bridge	12.07	12.12	6.14	17.68
Below Plant Discharge	12.03	12.09	6.03	18.25

- Seasonal increases in water temperature were observed at all three Rattling Brook stations during this time frame.

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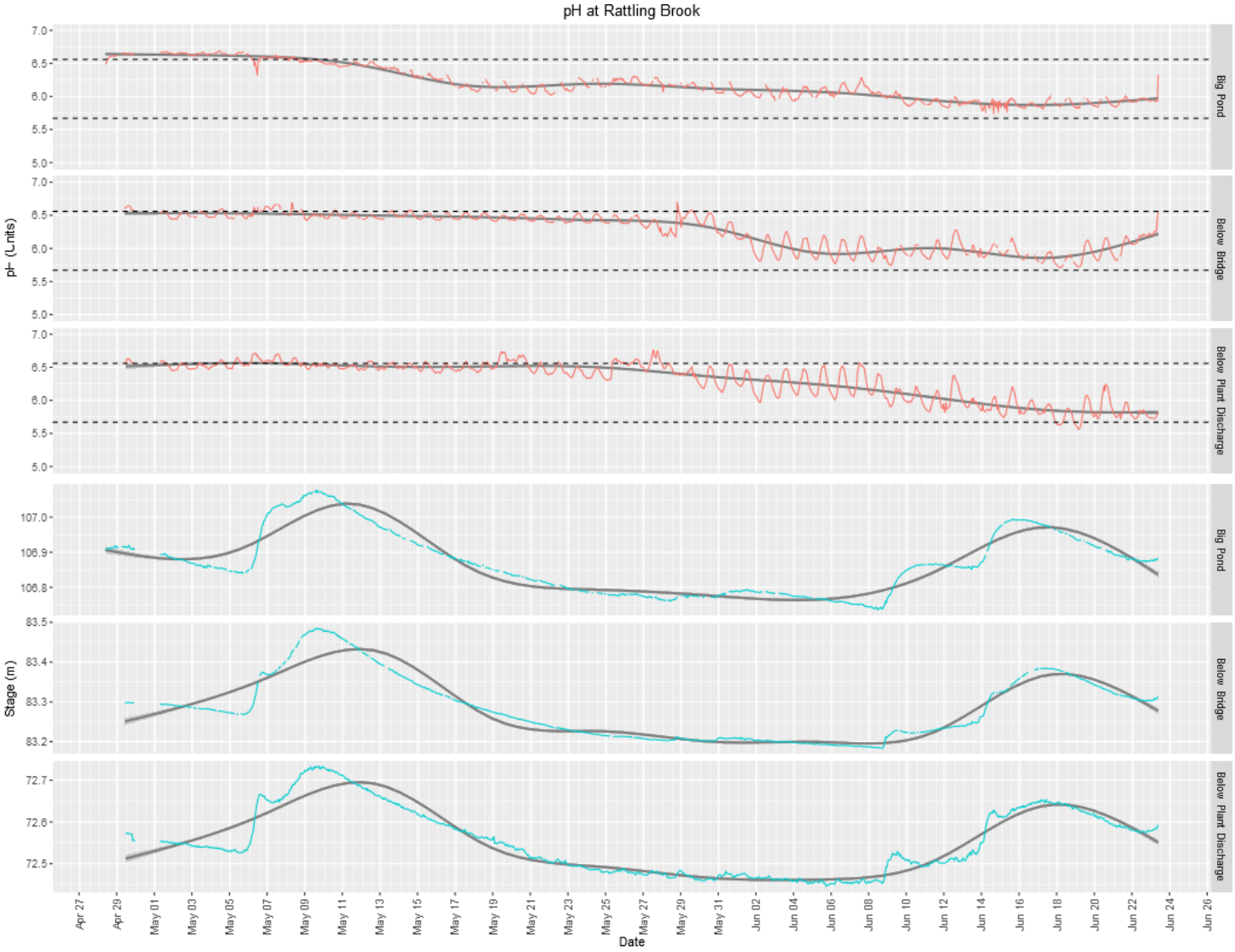
pH

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
Big Pond	6.19	6.14	5.74	6.69
Below Bridge	6.26	6.40	5.71	6.70
Below Plant Discharge	6.31	6.44	5.56	6.76

- Most pH values fell within the site-specific guidelines indicated by the dashed lines for this deployment interval. Diurnal cycling at all stations increased substantially as pH levels declined (mid-May for Big Pond and late May for Bridge and Plant Discharge stations).

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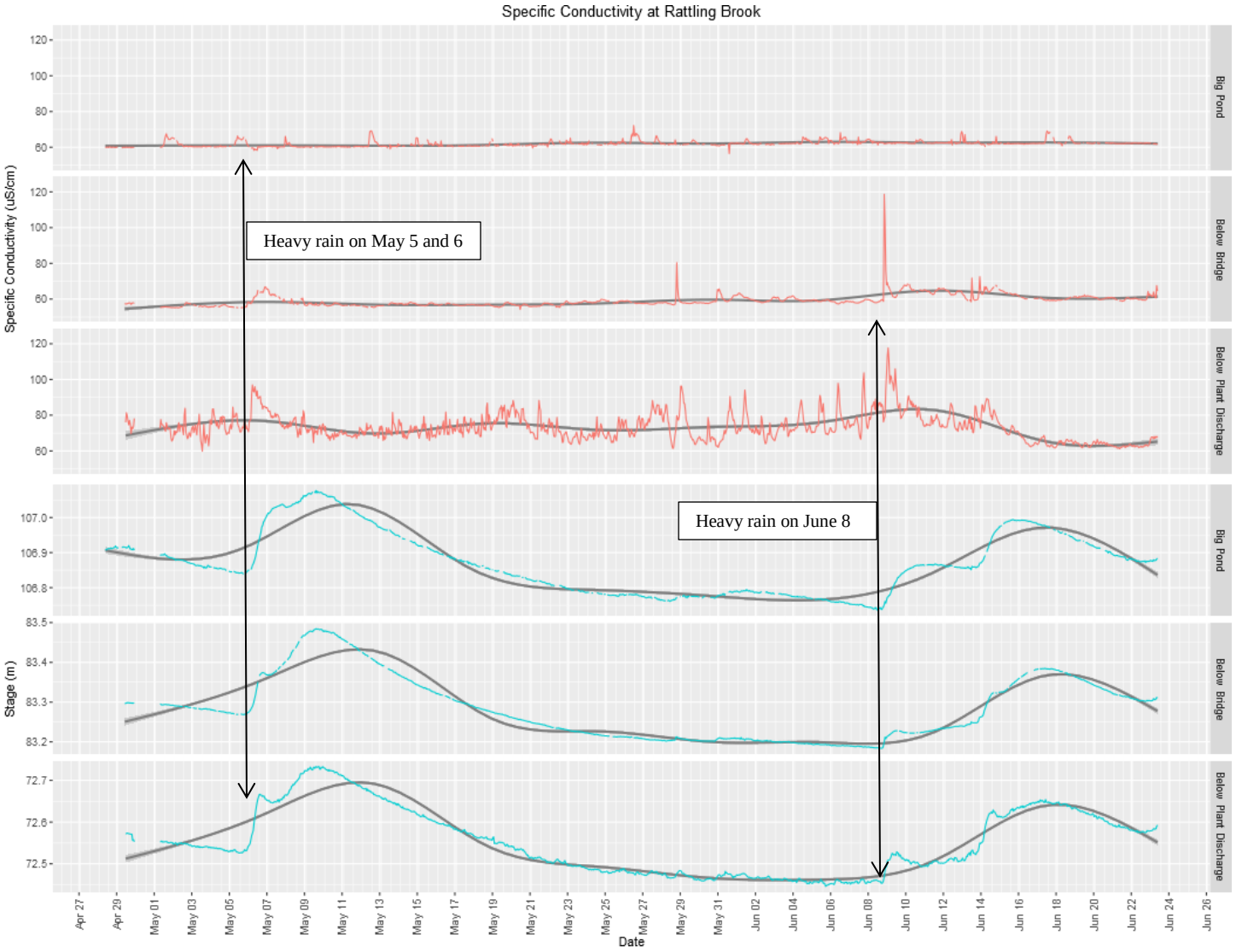
Specific Conductivity

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
Big Pond	62.0	61.9	56.4	72.2
Below Bridge	59.2	58.4	54.2	118.7
Below Plant Discharge	73.3	72.3	59.8	117.7

- During this deployment period, no substantial trend was observed. Some sporadic events were observed at Bridge and Plant Discharge stations and appear to be related to heavy precipitation.
- Specific conductivity values still tend to be highly variable at Plant Discharge station.

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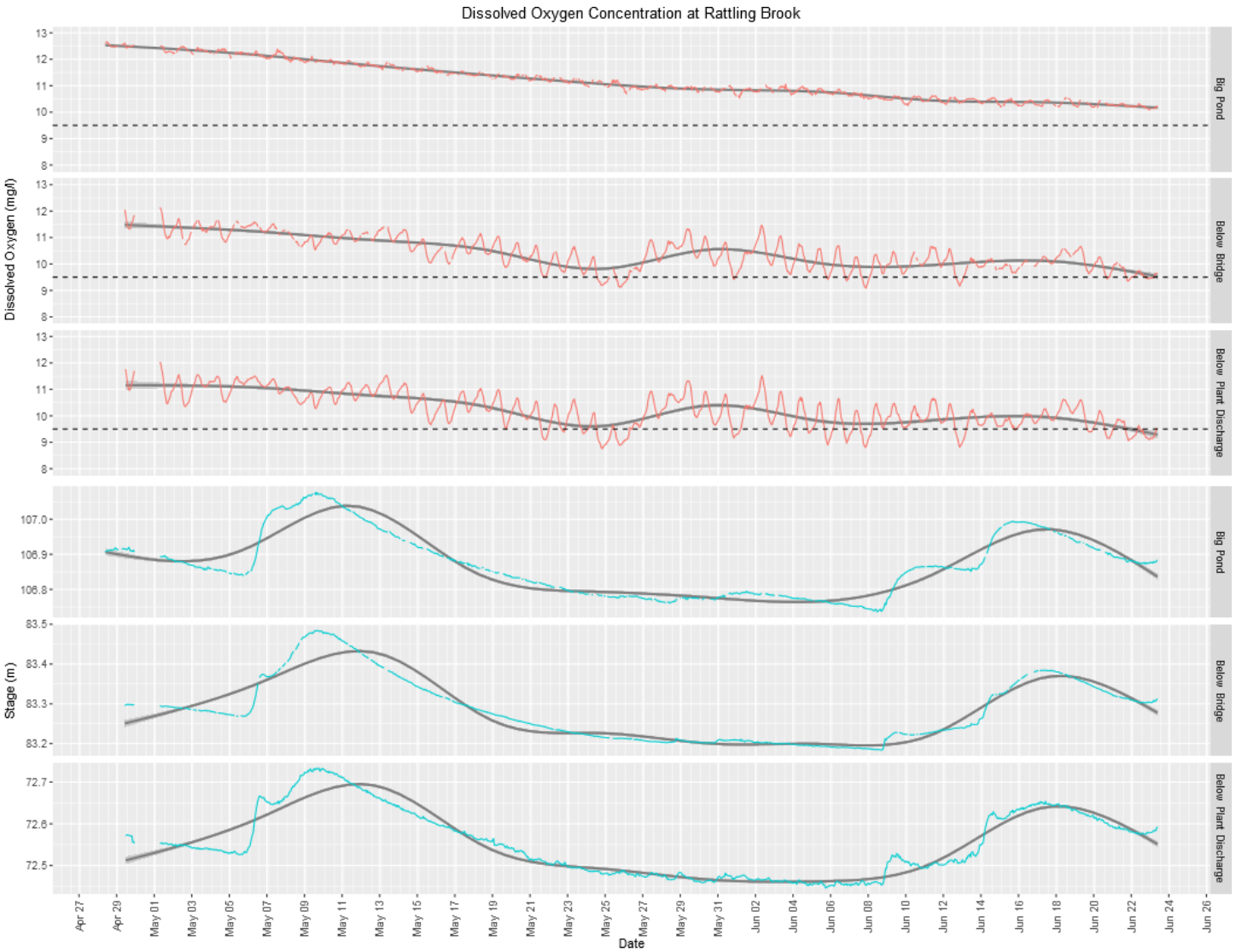
Dissolved Oxygen

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
Big Pond	11.15	10.95	10.09	12.67
Below Bridge	10.40	10.35	9.09	12.14
Below Plant Discharge	10.23	10.20	8.76	12.04

- Dissolved oxygen levels declined throughout the deployment period as water temperatures increased. A few instances of oxygen concentrations below the 9.5 mg/l CCME guideline for the protection of early life stages (see dashed line) were encountered which is not unusual for this time of year.

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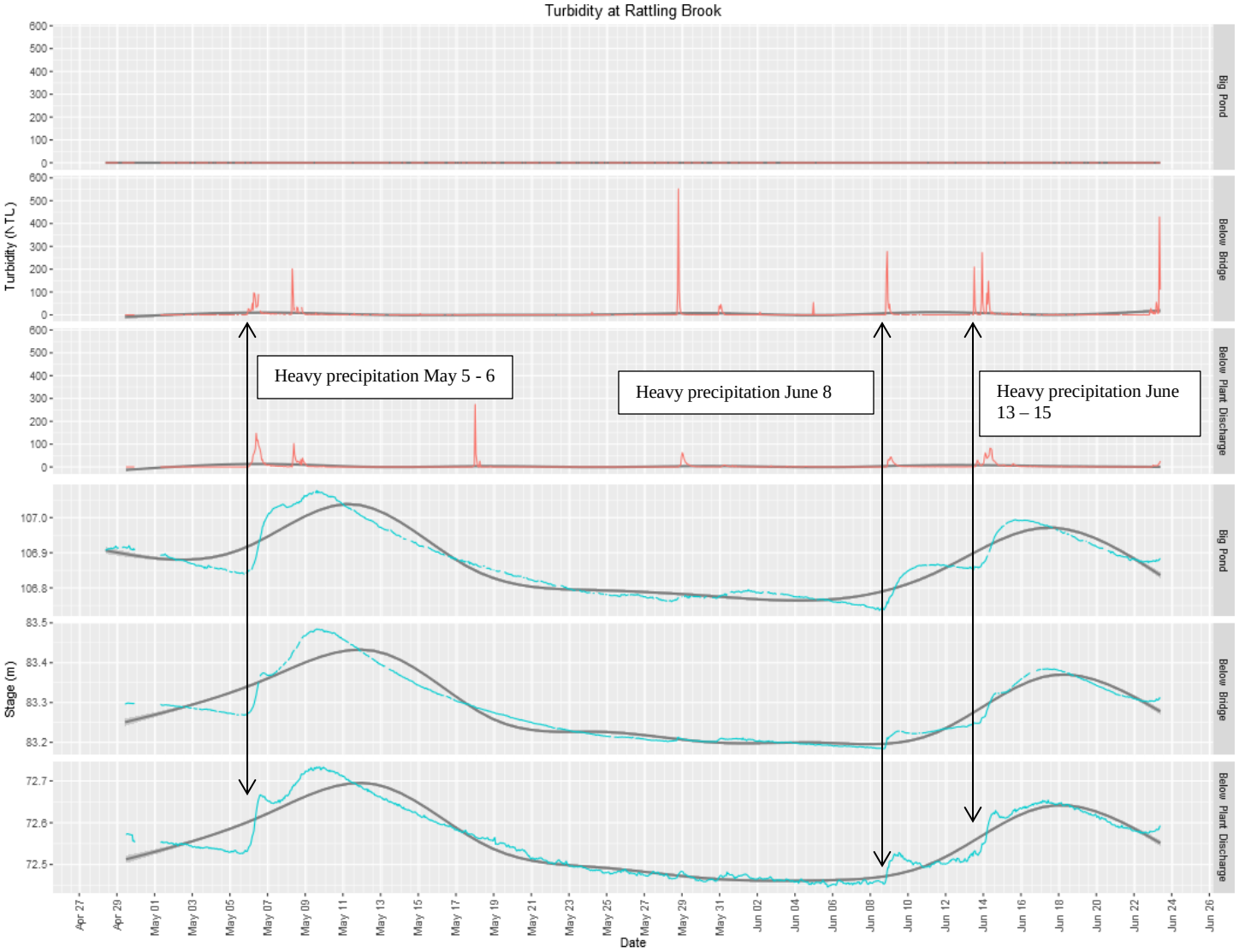
Turbidity

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
Big Pond	0.0	0.0	0.0	0.0
Below Bridge	4.2	0.0	0.0	552.0
Below Plant Discharge	3.6	0.3	0.0	273.8

- Occasional peaks in turbidity were observed from April to June as high-intensity rainfall events rolled through the area.
- Consistent turbidity values have continued their low level trends at Big Pond and Bridge stations; however, low-level turbidity continues to be present at Plant Discharge station with a median value of 0.3 NTU.

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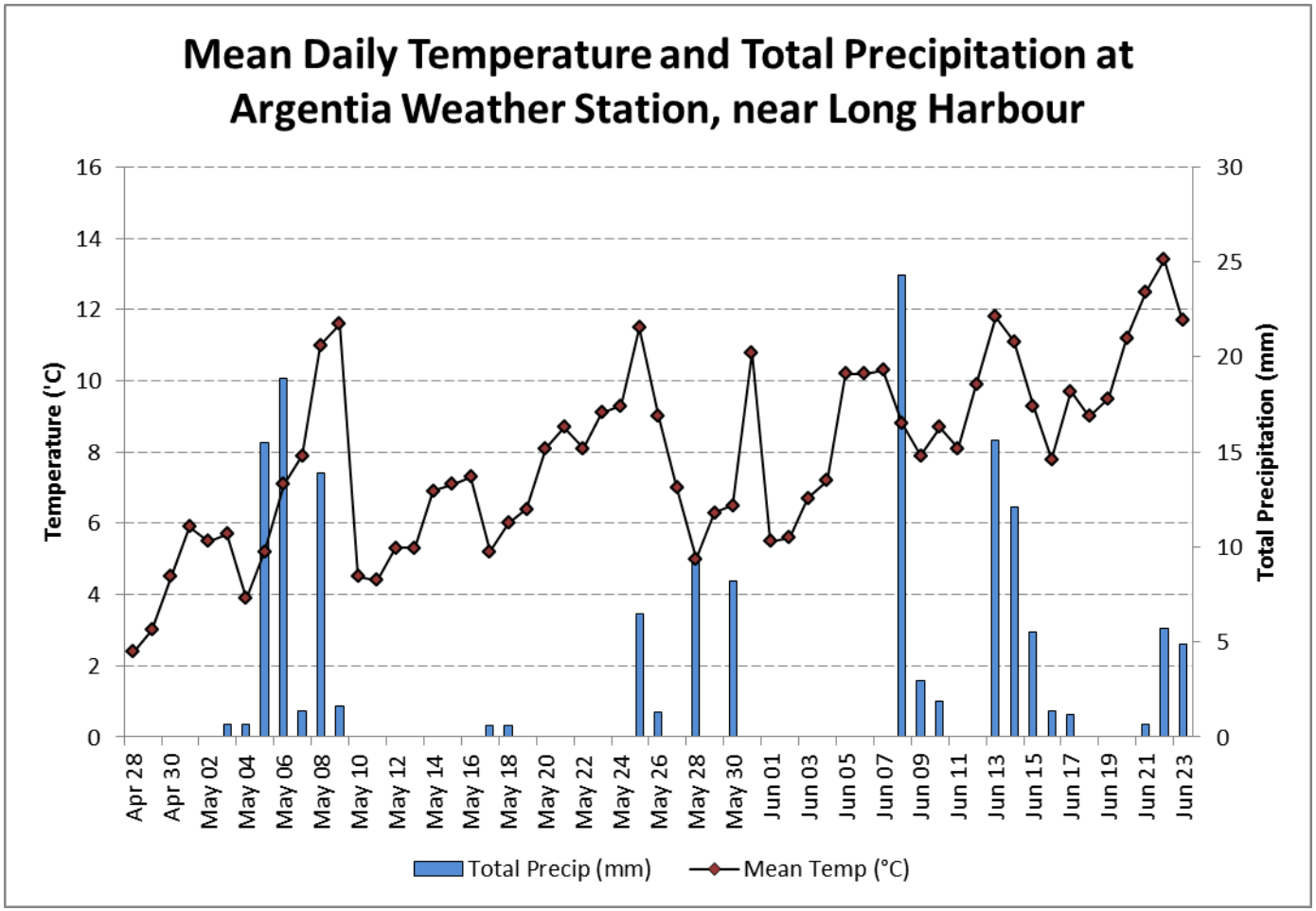
Appendix



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