Real-Time Water Quality Deployment Report

Rattling Brook Network

May 21, 2015 to June 25, 2015

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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2015-05-21 to 2015-06-25

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- After a protracted period of ice cover, Big Pond station was redeployed on May 21st.
- 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

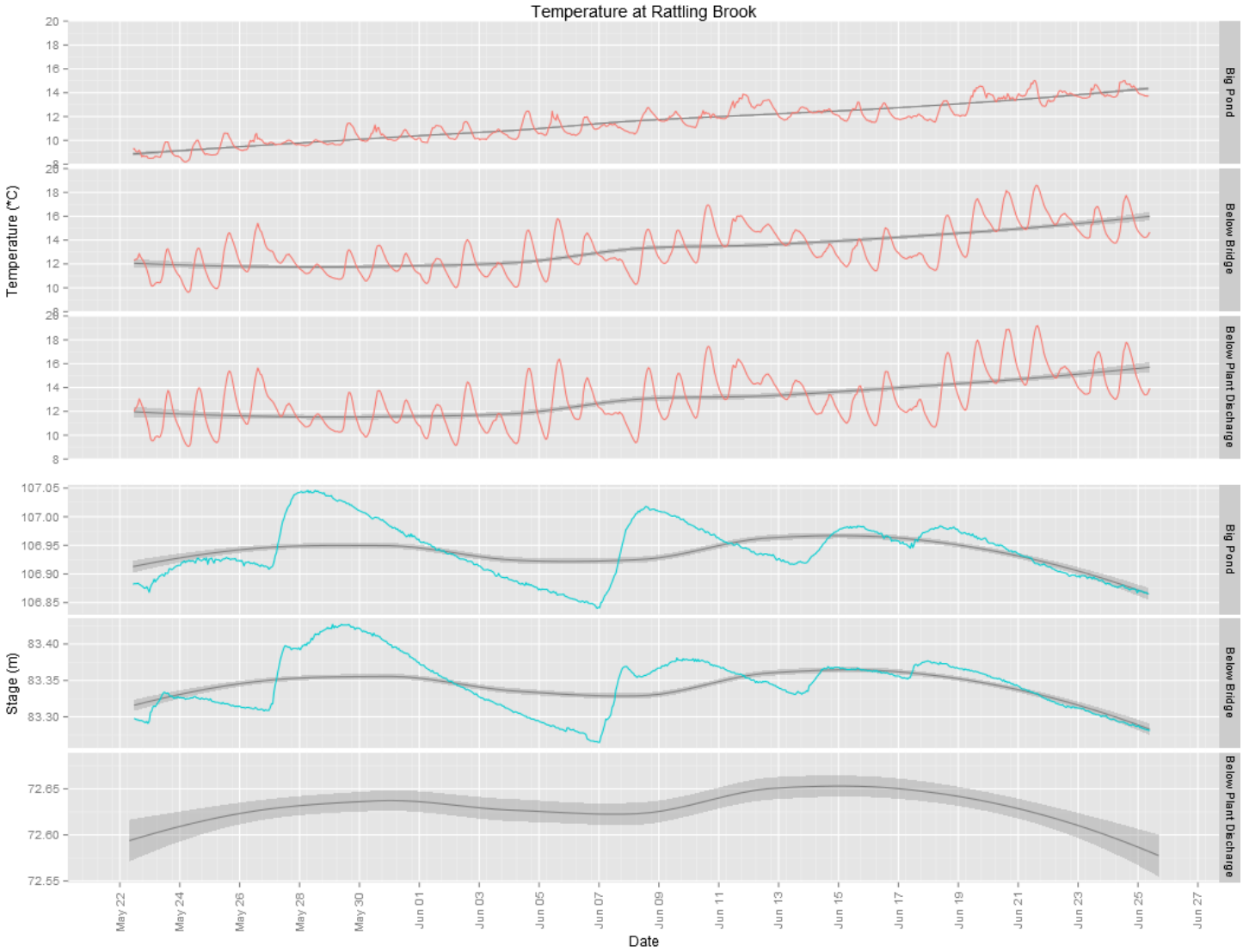
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	May 21, 2015	Deployment	Excellent	Good	Good	Excellent	Excellent
	June 25, 2015	Removal	NA	NA	NA	NA	NA
Rattling Brook below Bridge	May 22, 2015	Deployment	Excellent	Excellent	Excellent	Good	Good
	June 25, 2015	Removal	Good	NA	Fair	Poor	Excellent
Rattling Brook below Plant Discharge	May 22, 2015	Deployment	Excellent	Excellent	Good	Good	Excellent
	June 25, 2015	Removal	Good	NA	Poor	Poor	Excellent

- Another model of multi-parameter sonde was used during the removal QAQC process which may have led to unreasonably low rankings. Anecdotally, data from the Field sonde was as expected given the conditions on June 25th.

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	11.53	11.61	8.21	15.02
Below Bridge	13.22	12.88	9.63	18.61
Below Plant Discharge	12.97	12.71	9.07	19.19

- Water temperatures increased consistently through the deployment period at all stations due to rising air temperatures and sunshine. Since ponds tend to resist temperature changes, they tend to moderate temperature downstream as well. Hence, Bridge station tends to be warmer in the summer compared to Big Pond station and Plant Discharge station, where a pond is located immediately upstream.

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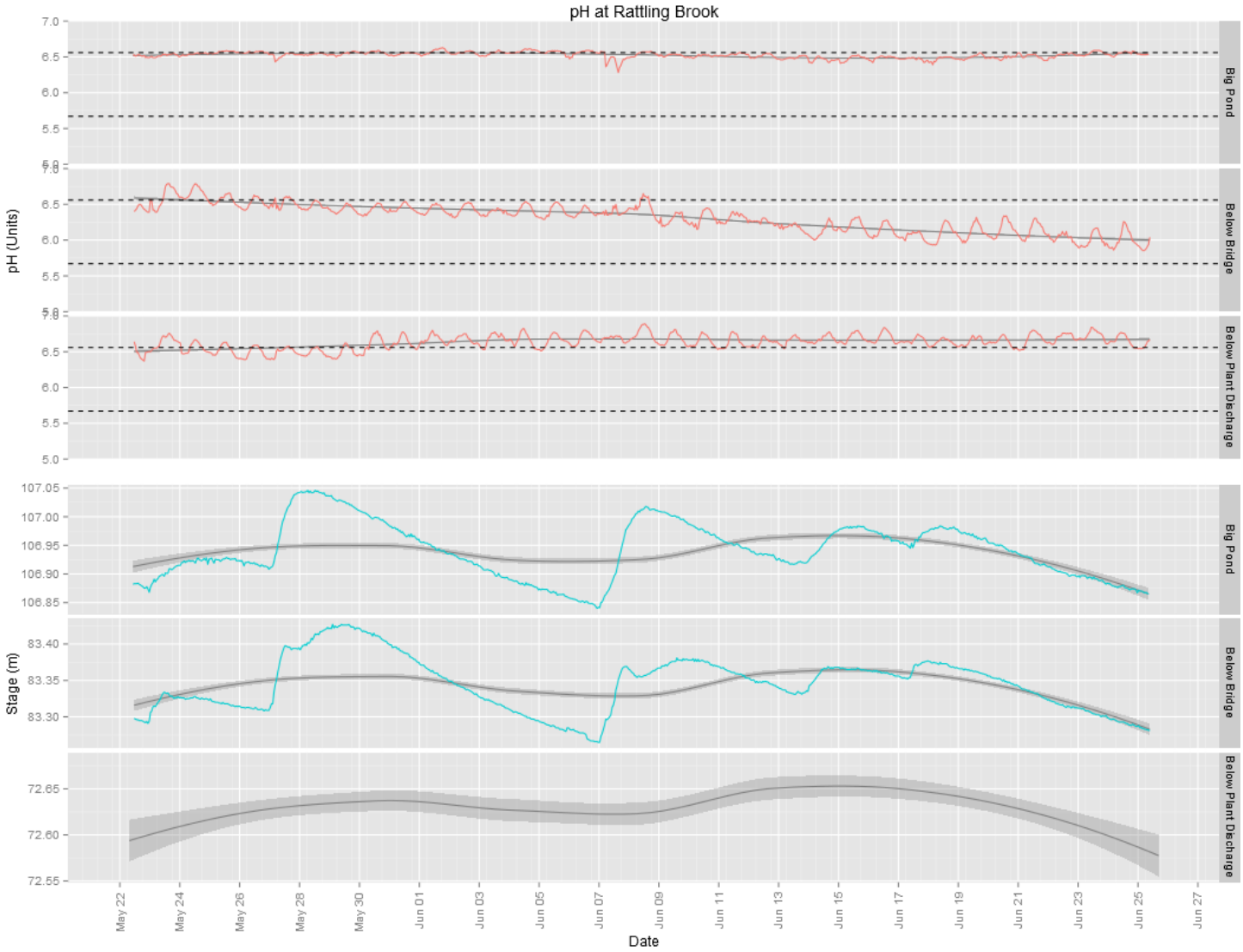
pH

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	6.53	6.53	6.28	6.63
Below Bridge	6.31	6.34	5.85	6.79
Below Plant Discharge	6.63	6.64	6.37	6.89

- pH remained near the upper end of the Site Specific guidelines (dashed lines) at Big Pond and Plant Discharge stations. A steady decline was observed at Bridge station, but this may be due to a calibration drift since it is not seen downstream at Plant Discharge station.

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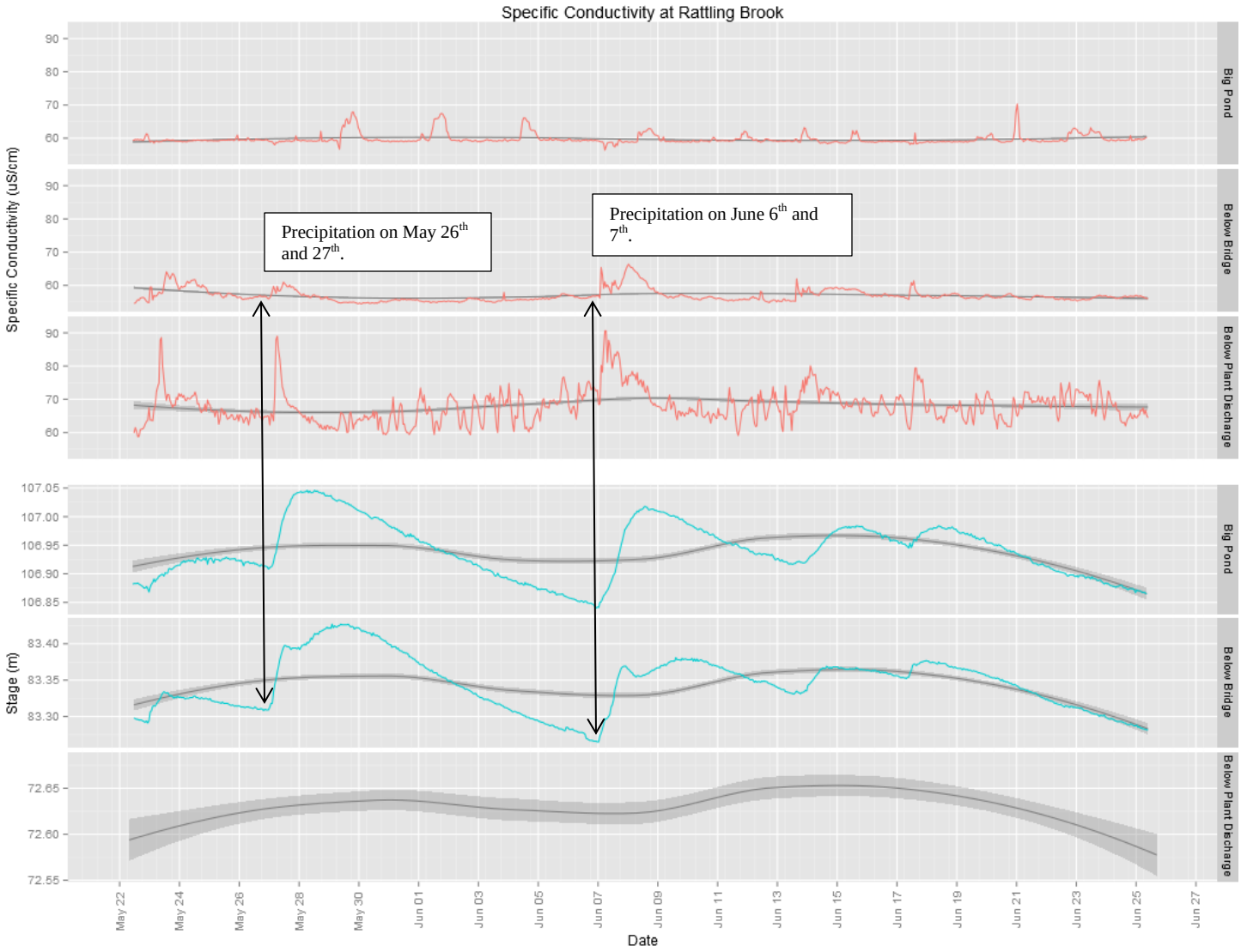
Specific Conductivity

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	59.8	59.3	56.4	70.3
Below Bridge	56.9	56.5	54.5	66.4
Below Plant Discharge	67.9	67.3	58.8	90.6

- Variability in conductivity increases as water flows downstream – Big Pond station is relatively static compared to the highly variable conditions at Plant Discharge station. This is the result of compounding additions of suspended solids to the river along its course.
- Rainfall on May 26th-27th and June 6th-7th resulted in peak conductivity at Bridge and Discharge stations.

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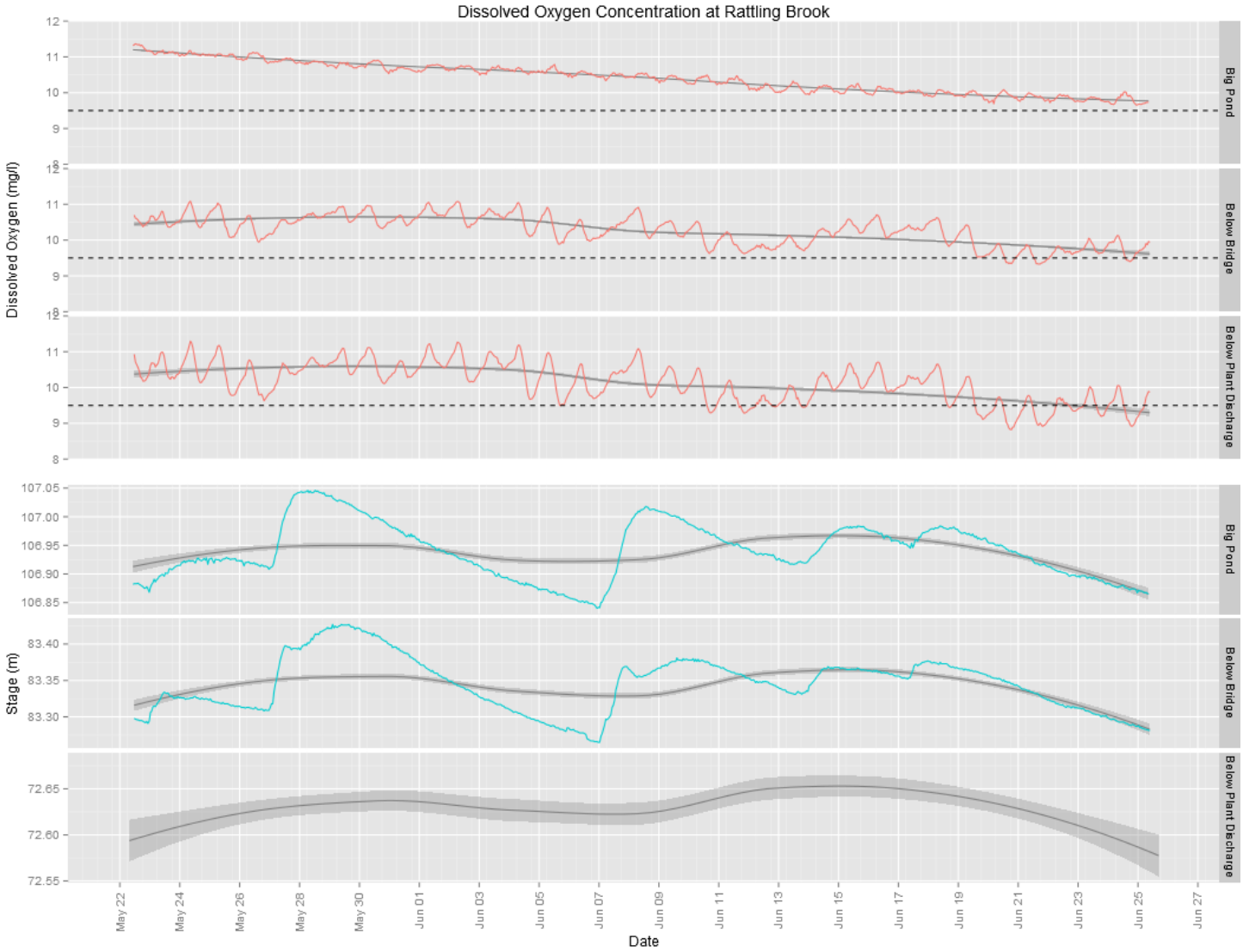
Dissolved Oxygen

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	10.42	10.45	9.66	11.37
Below Bridge	10.27	10.34	9.33	11.09
Below Plant Discharge	10.13	10.19	8.82	11.30

- Dissolved oxygen levels trended downward steadily this deployment period in response to rising water temperatures. Both Bridge and Plant Discharge stations have fallen below the 9.5 mg/l CCME guideline for the protection of early life stage biota (typical for this point in the season).

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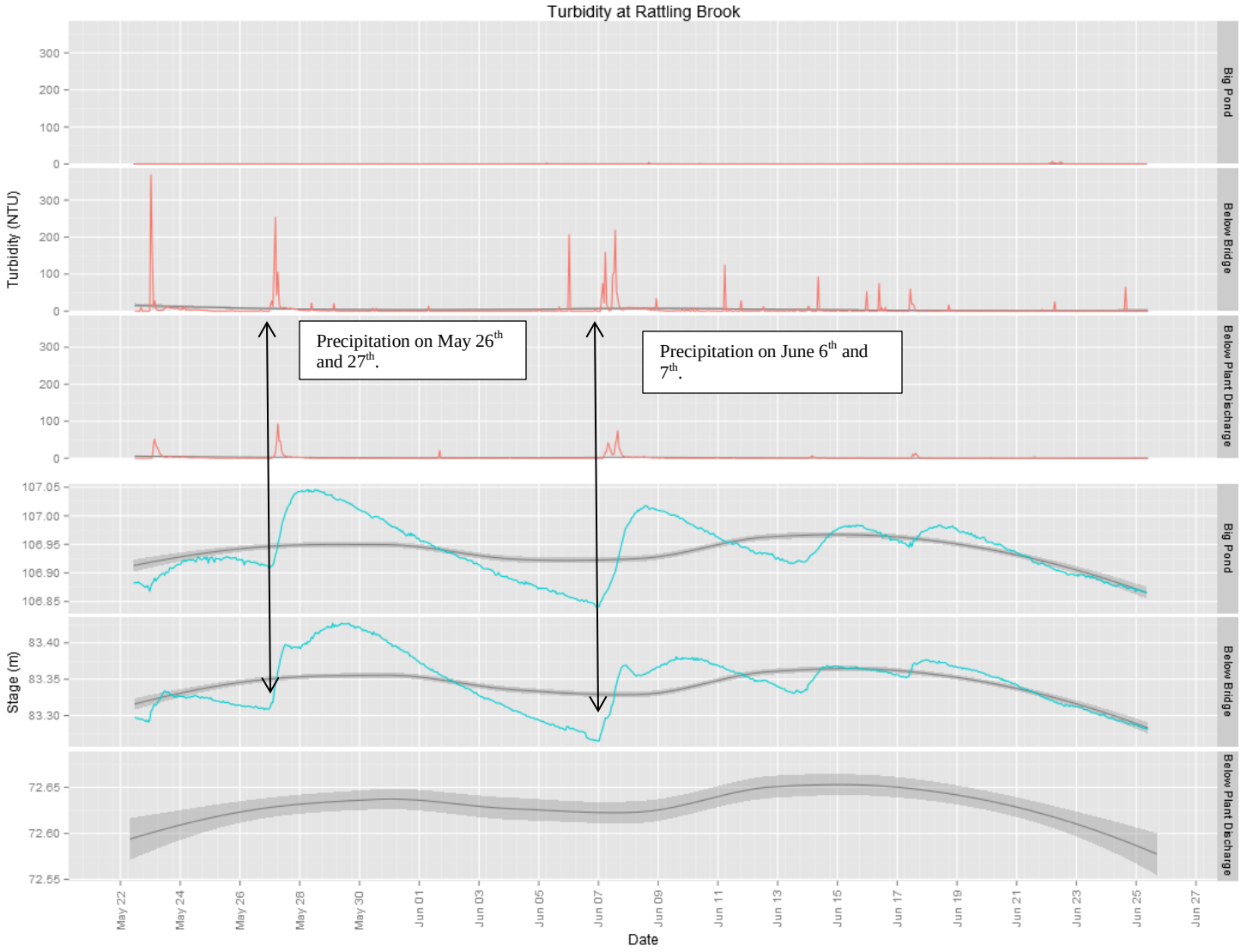
Turbidity

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	0.1	0.0	0.0	6.6
Below Bridge	4.6	0.0	0.0	367.8
Below Plant Discharge	1.5	0.0	0.0	92.8

- Though no turbidity events lasted more than a few hours at a time, peaks were mostly associated with stage level increases over this deployment interval.

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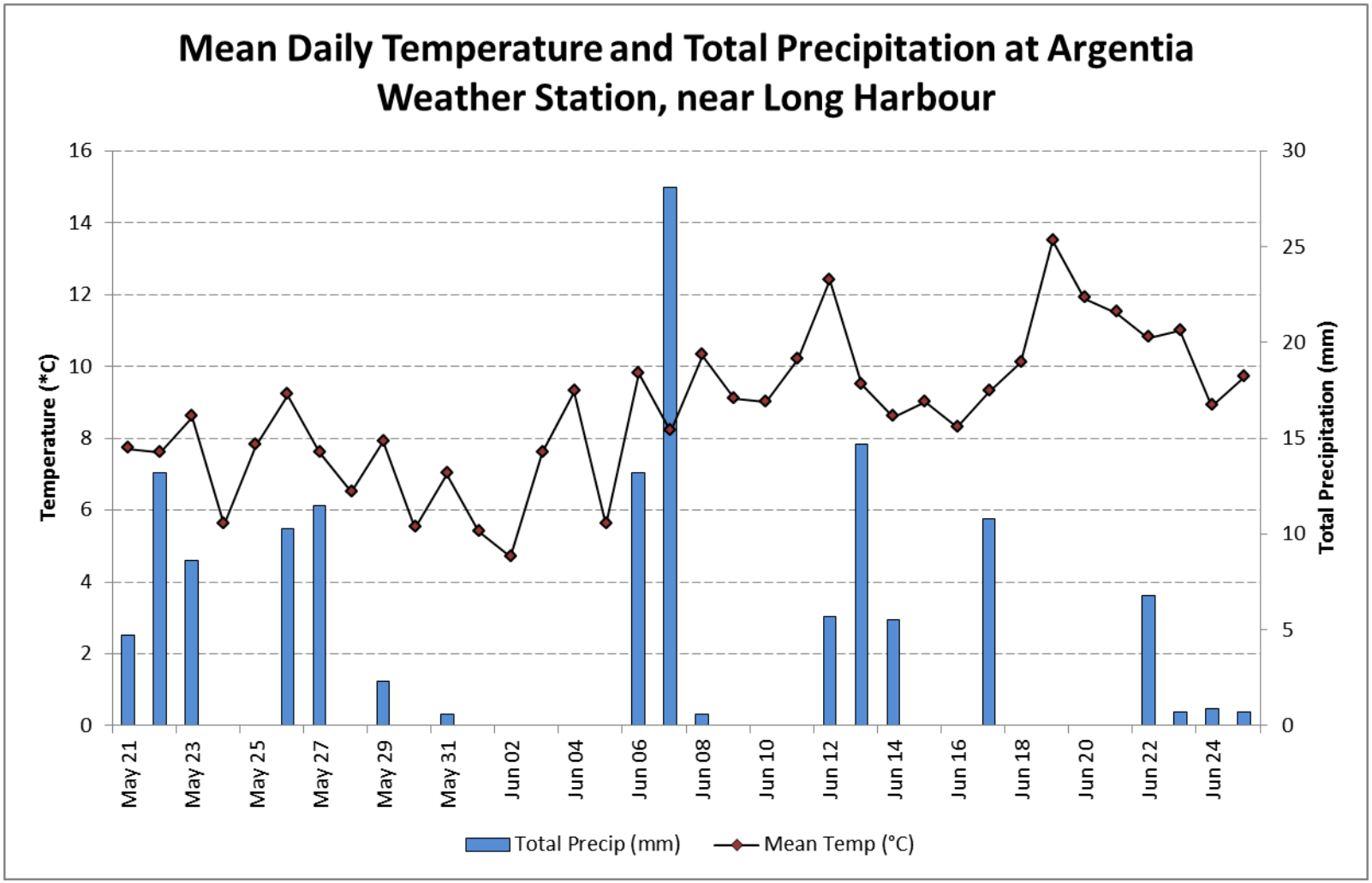
Appendix



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