

Real-Time Water Quality Deployment Report

Rattling Brook Network

May 17, 2021 to June 29, 2021



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

General

- Department of Environment and Climate Change staff monitor the real-time web pages consistently.
- 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 (https://wateroffice.ec.gc.ca/index_e.html)*.

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

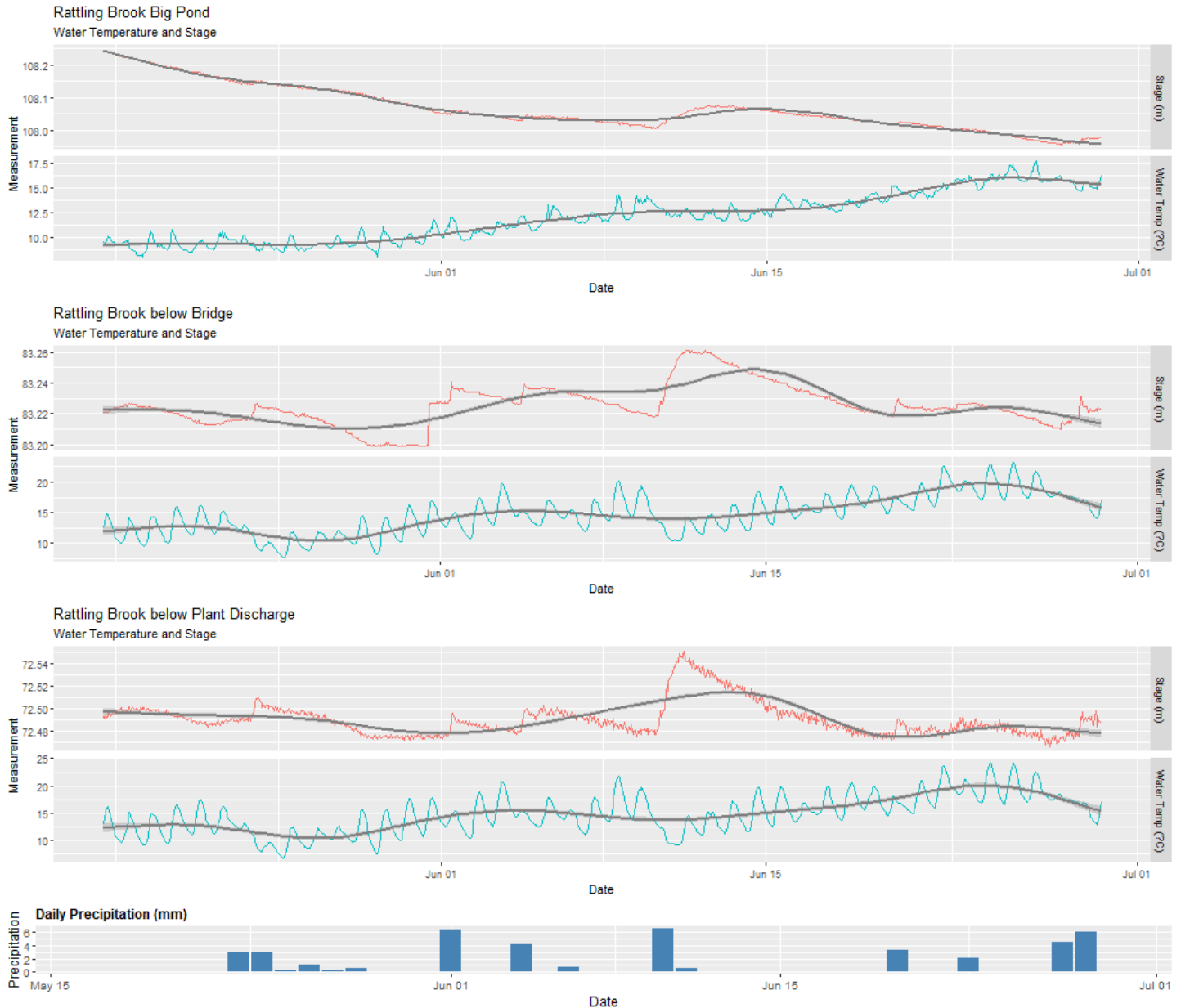
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	May 17	Deployment	Poor	Good	Excellent	Good	Excellent
	June 29	Removal	Fair	Fair	Good	Excellent	Excellent
Rattling Brook below Bridge	May 17	Deployment	Fair	Good	Good	Good	Excellent
	June 29	Removal	Excellent	Good	Good	Good	Excellent
Rattling Brook below Plant Discharge	May 17	Deployment	Good	Good	Good	Fair	Excellent
	June 29	Removal	Excellent	Good	Good	Good	Excellent

- Upon deployment at Big Pond, water temperature rated ‘poor’ due to the QA/QC instrument’s placement near the shoreline in shallower water.

- 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.



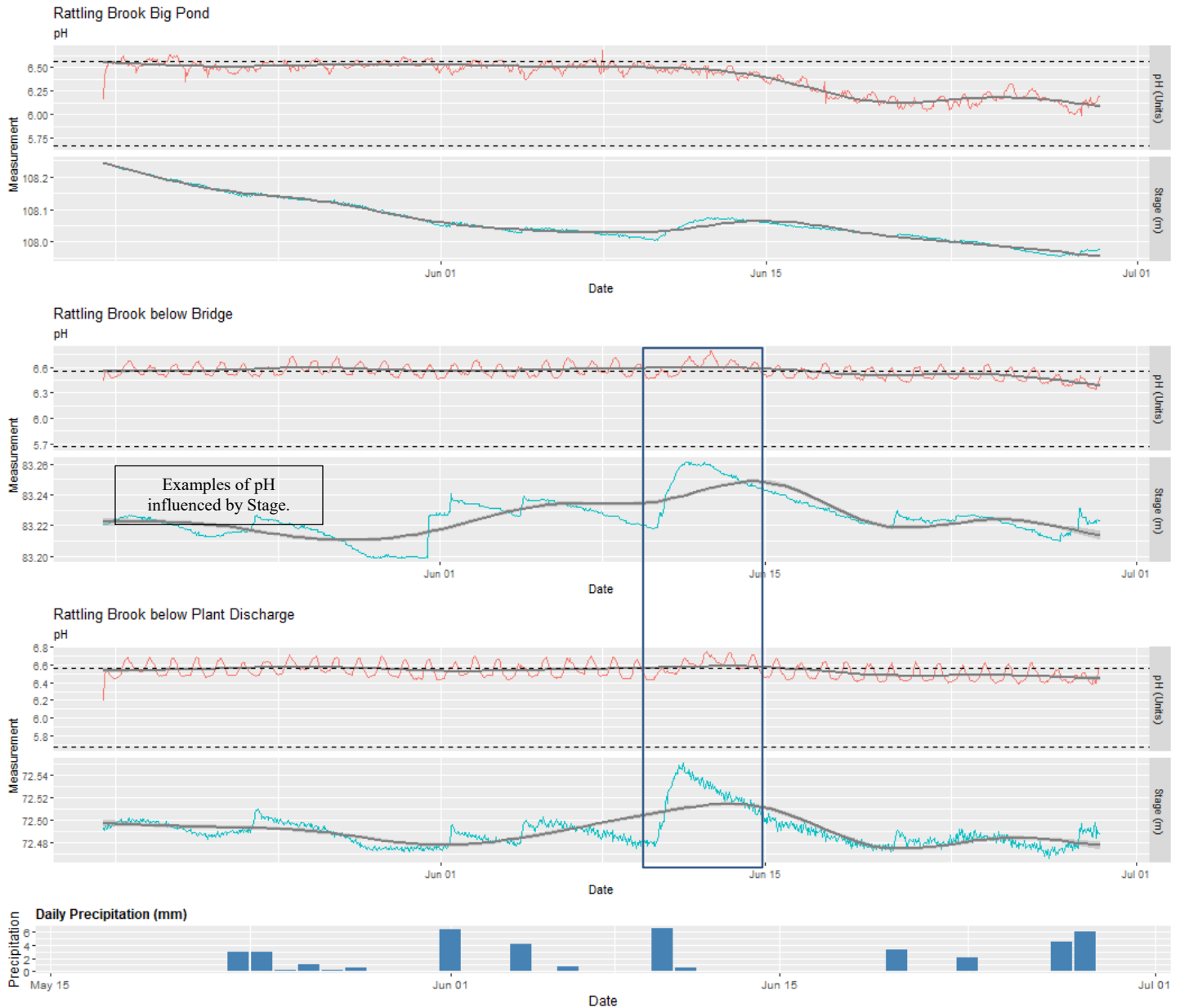
Station	Max	Min	Median	Mean
Big Pond	17.68	8.00	11.81	11.91
Below Bridge	23.30	7.67	14.43	14.59
Below Plant Discharge	24.45	6.73	14.64	14.71

- Gradual water temperature increases are observed at each station during this deployment period.

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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.



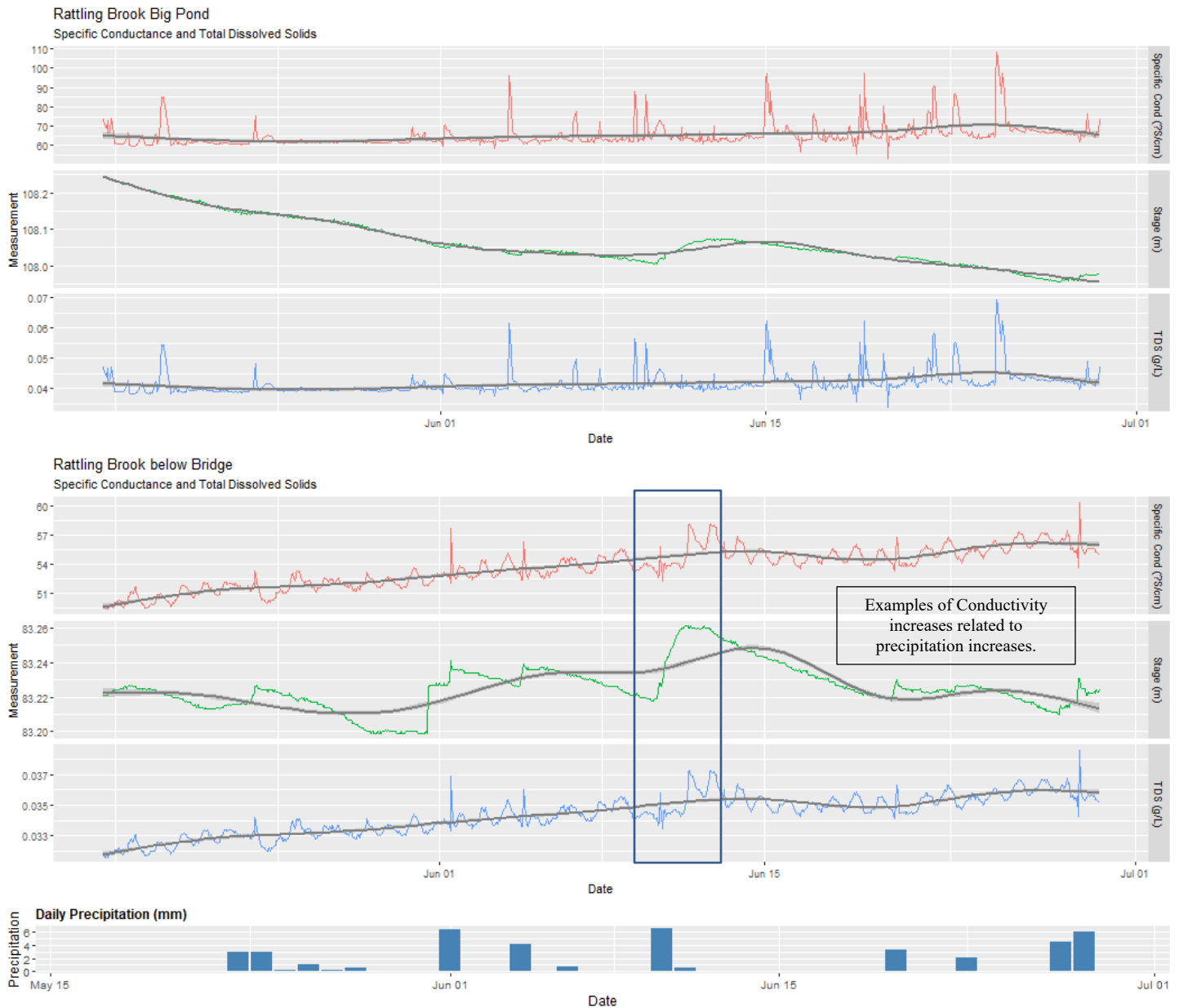
Station	Max	Min	Median	Mean
Big Pond	6.68	5.99	6.48	6.41
Below Bridge	6.79	6.35	6.55	6.55
Below Plant Discharge	6.75	6.19	6.52	6.54

- At all stations, pH values were generally consistent over the deployment period. The majority of values were within the site-specific guidelines (5.67-6.56 pH Units).

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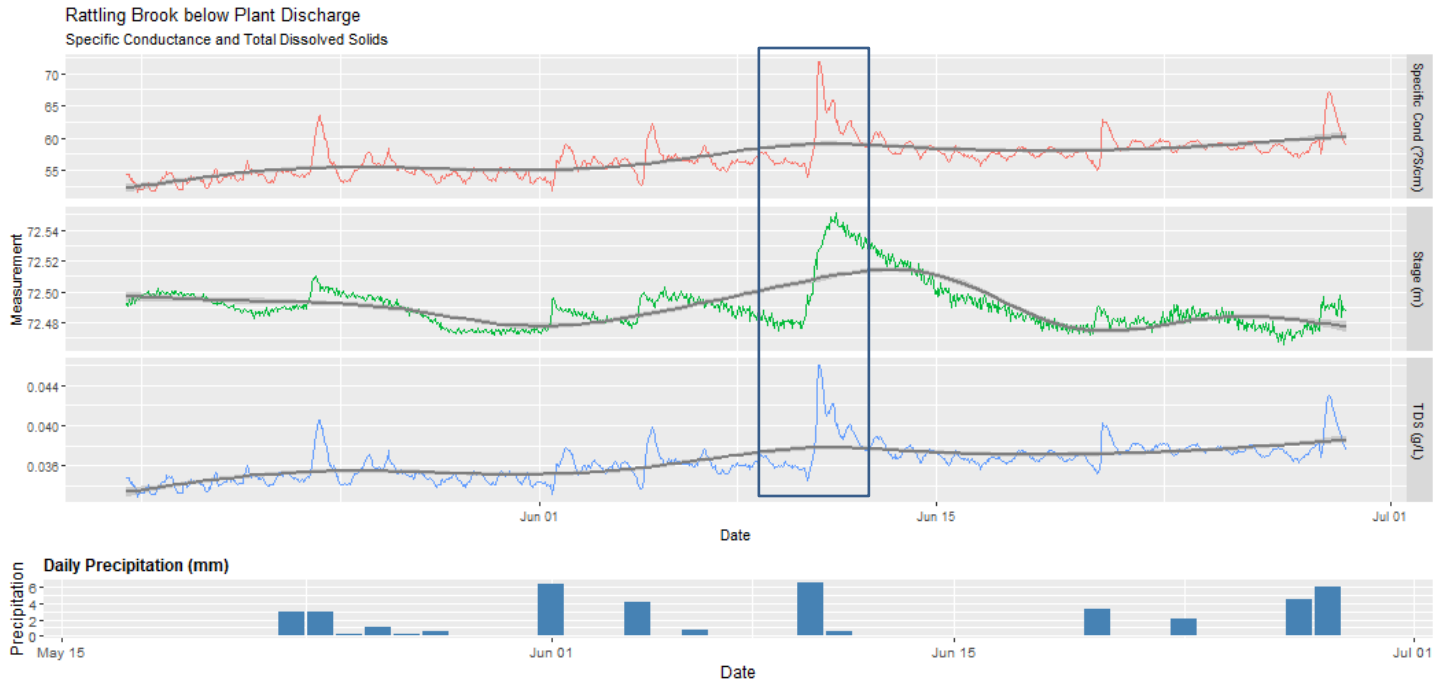
Specific Conductivity

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.



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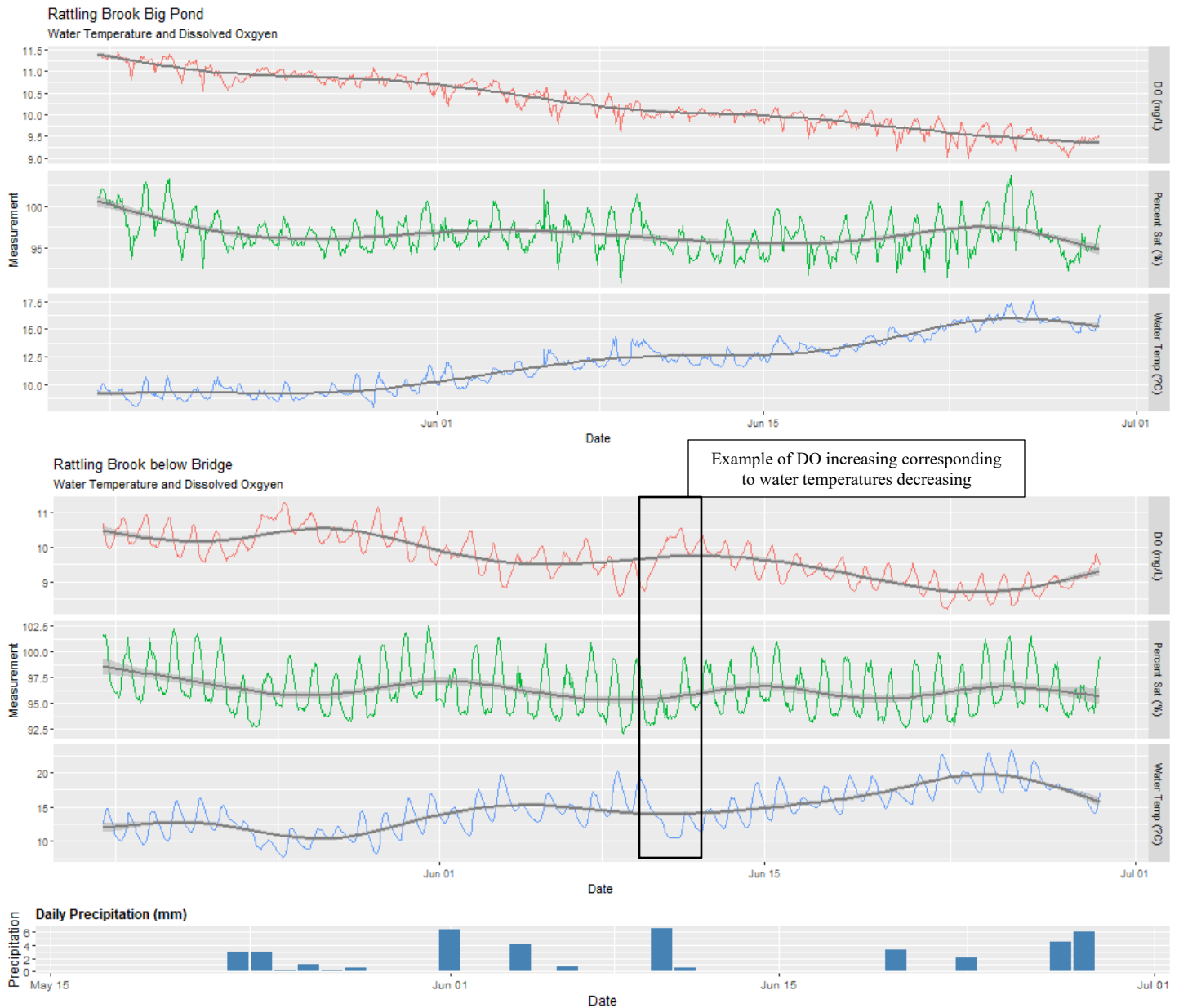
Station	Max	Min	Median	Mean
Big Pond	108.5	53.1	63.4	65.1
Below Bridge	60.4	49.4	53.9	53.7
Below Plant Discharge	71.9	51.6	56.8	56.9

- Specific conductivity was relatively stable at all stations during this deployment period with few fluctuations due to variations in Stage caused by precipitation. There are increases at Big Pond not related to precipitation. This may be due to wave action from the pond occasionally stirring up sediment around the sonde, increasing the conductivity.

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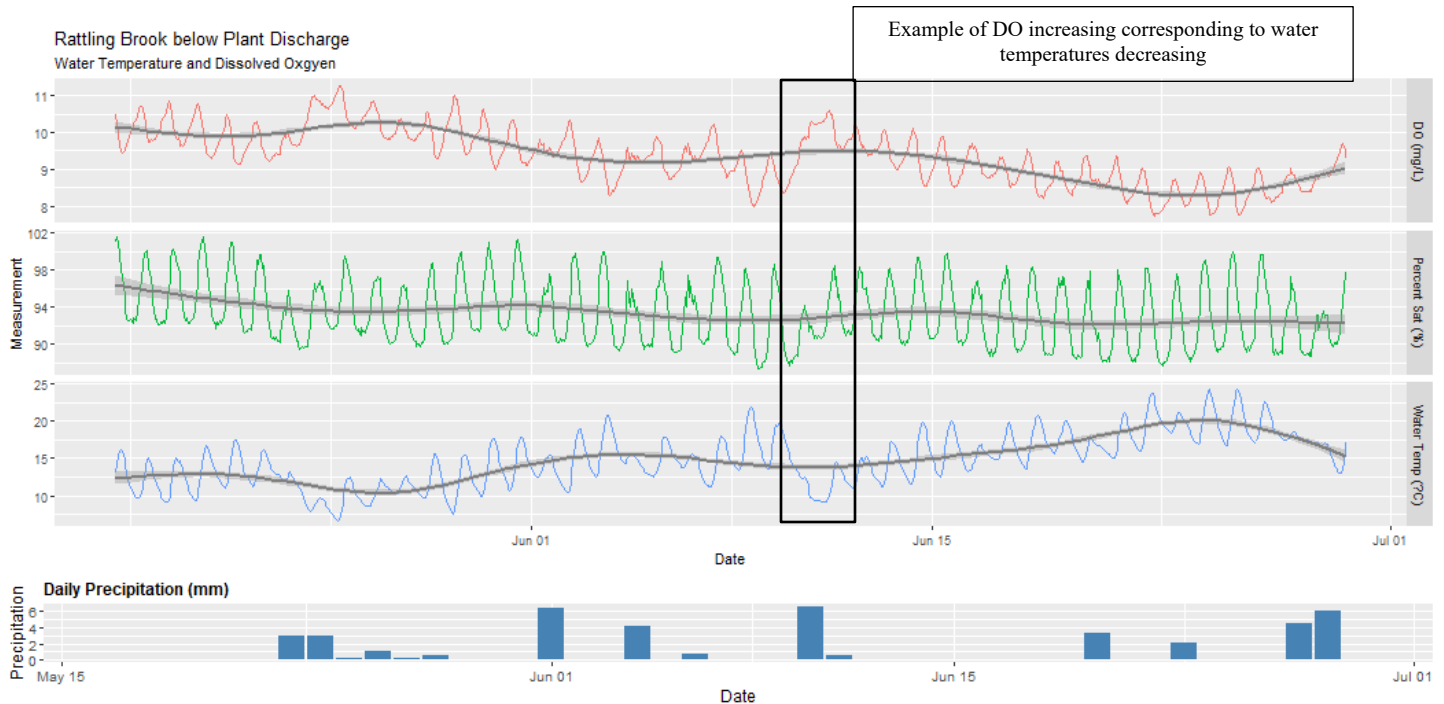
Dissolved Oxygen

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 oxidation reactions.



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Example of DO increasing corresponding to water temperatures decreasing

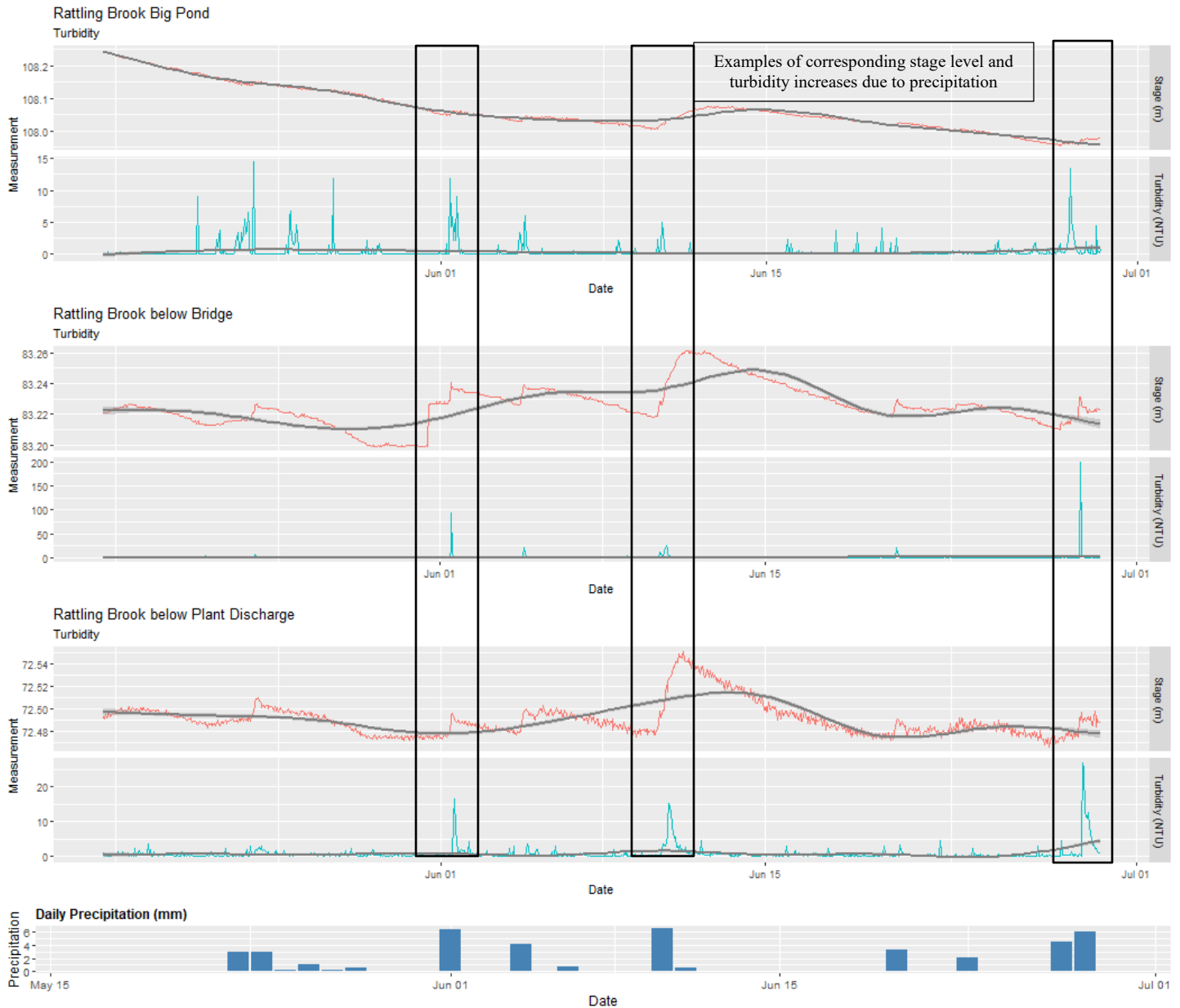
Station	Max	Min	Median	Mean
Big Pond	11.46	8.98	10.26	10.31
Below Bridge	11.30	8.20	9.70	9.68
Below Plant Discharge	11.28	7.71	9.38	9.37

- Trend lines show that as water temperatures warm, a gradual decrease in dissolved oxygen concentrations occurs concurrently as warmer water can hold less oxygen.
- During this deployment period, all values remained above the minimum CCME Aquatic Guideline for other life stages (6.5 mg/l).

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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	Max	Min	Median	Mean
Big Pond	14.5	0.0	0.0	0.4
Below Bridge	198.7	0.0	0.0	0.6
Below Plant Discharge	26.8	0.0	0.3	0.7

- Most turbidity peaks are associated with precipitation events and are of short duration.

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Appendix

