

Real-Time Water Quality Deployment Report

Rattling Brook Network

March 9, 2021 to April 21, 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.
 - Note: Big Pond sonde was left deployed in March as ice conditions did not allow for a switch out at that time.

Table 1: Qualitative QAQC Ranking

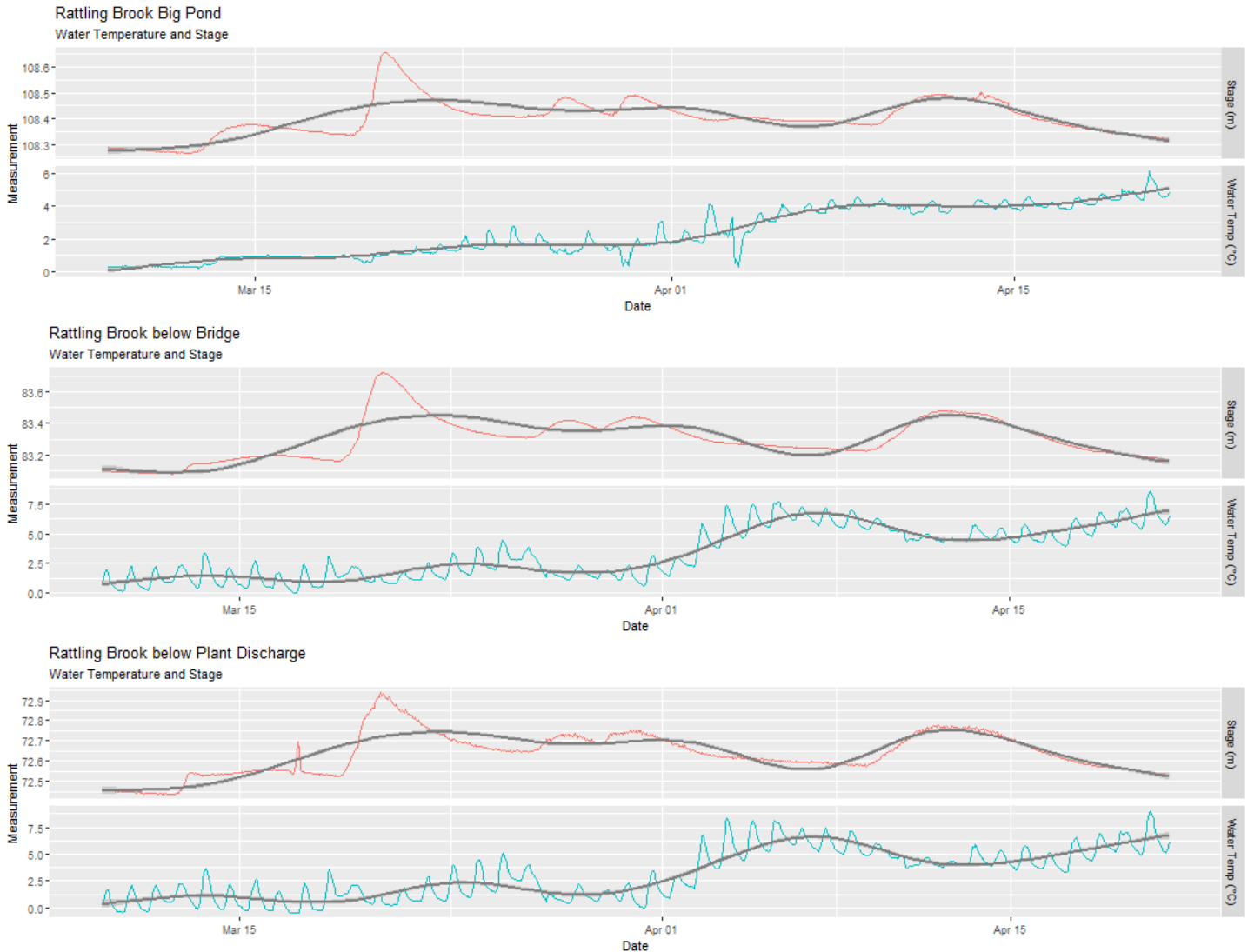
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	March 9	Continuous	N/A	N/A	N/A	N/A	N/A
	April 21	Removal	Fair	Good	Good	Excellent	Excellent
Rattling Brook below Bridge	March 9	Deployment	Excellent	Marginal	Good	Good	Excellent
	April 21	Removal	Excellent	Good	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	March 9	Deployment	Good	Excellent	Good	Excellent	Excellent
	April 21	Removal	Good	Good	Good	Excellent	Excellent

- Below Bridge station experienced a fouled turbidity sensor that caused erroneous values from April 6-7th.

- 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.



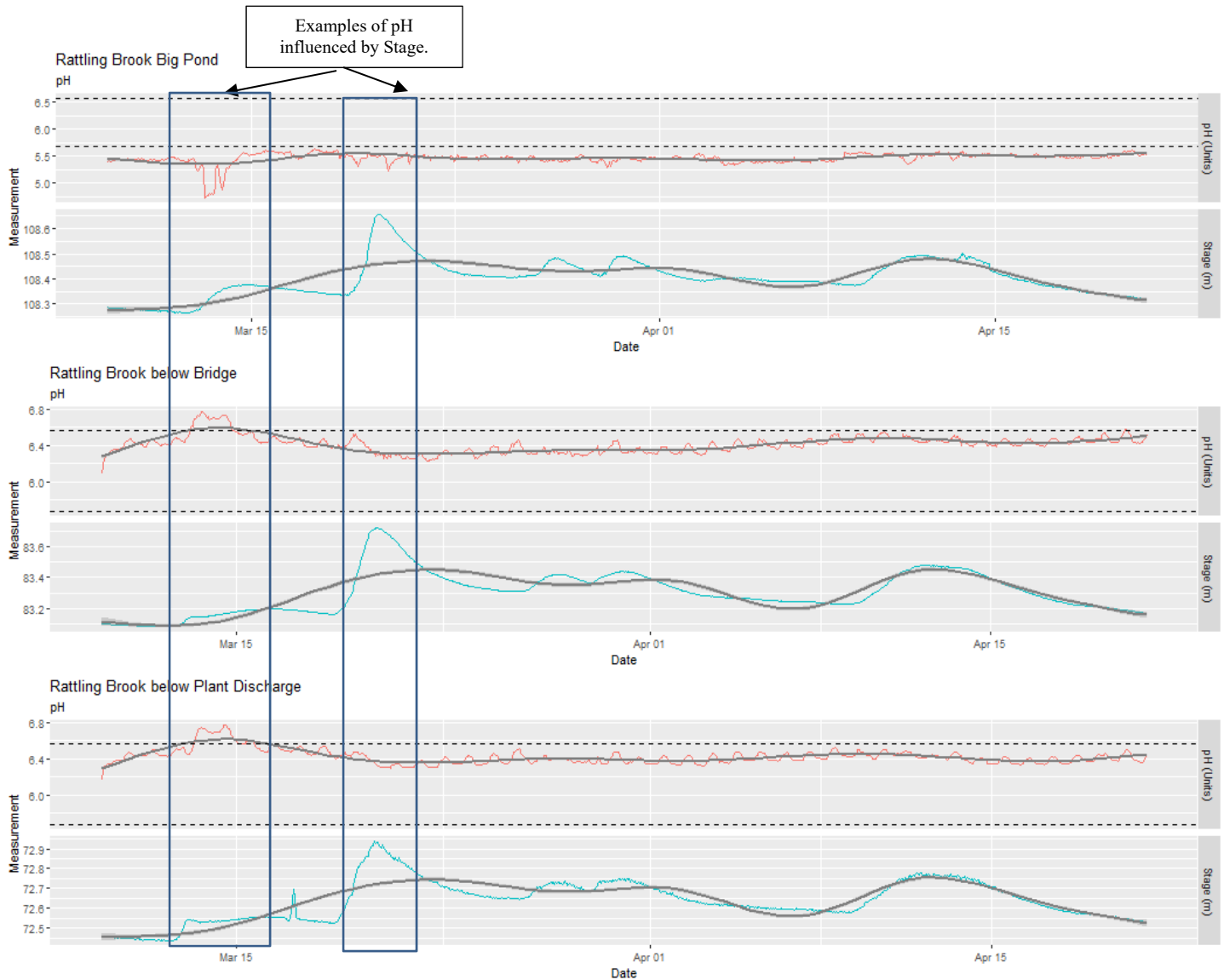
Station	Max	Min	Median	Mean
Big Pond	6.13	0.23	1.96	2.46
Below Bridge	8.57	0.00	3.10	3.48
Below Plant Discharge	9.01	-0.49	3.24	3.20

- Gradual water temperature increases are observed at each station during this deployment period with a mid-deployment cooling trend April 9th - 13th related to a combination of heavy precipitation and cooling air temperatures.

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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.



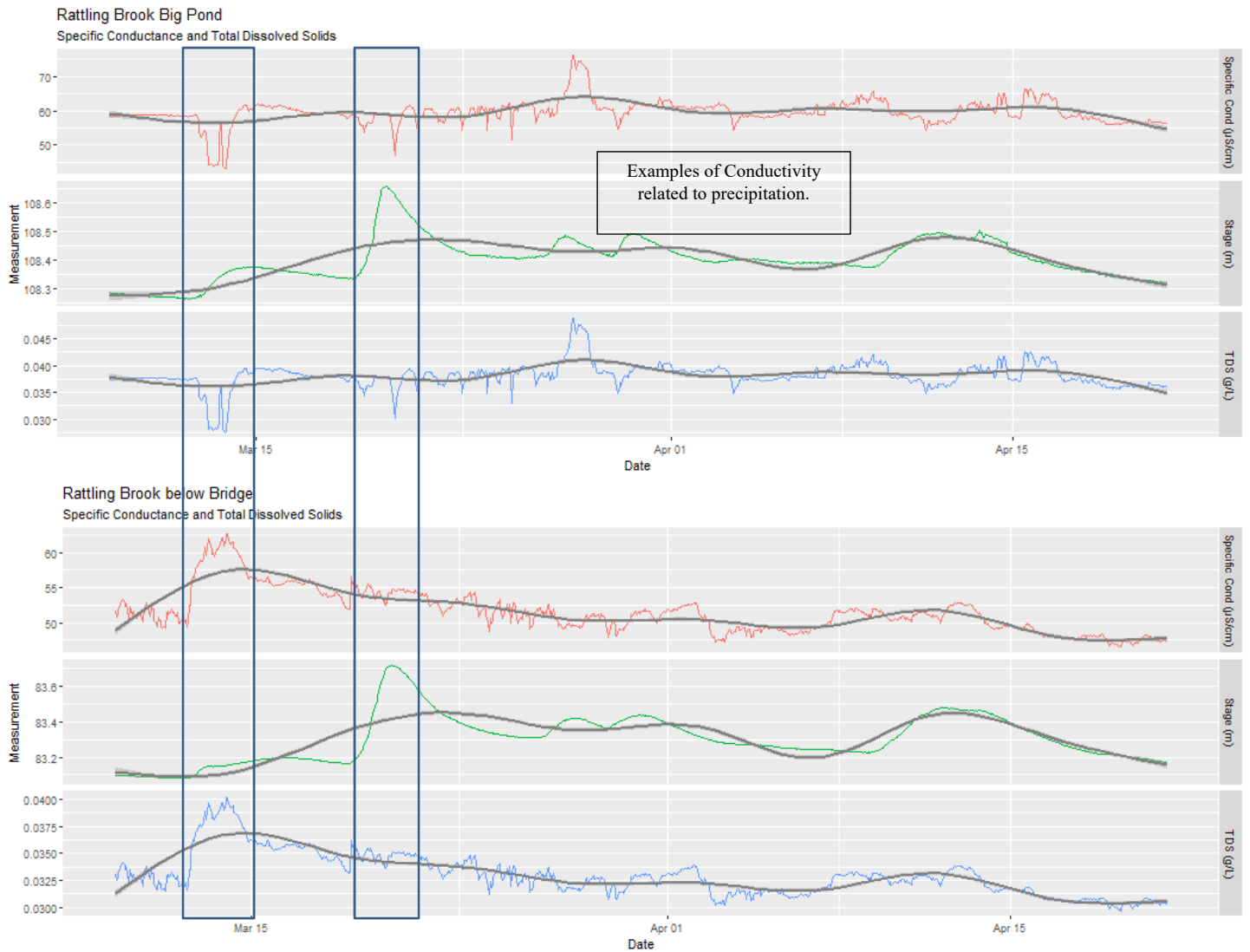
Station	Max	Min	Median	Mean
Big Pond	5.63	4.72	5.48	5.46
Below Bridge	6.77	6.09	6.42	6.42
Below Plant Discharge	6.77	6.16	6.41	6.42

- Bridge and Plant Discharge station pH values were consistent over the deployment period. The majority of values were within the site-specific guidelines (5.67-6.56 pH Units). Big Pond pH values were consistently below site specific guidelines caused by sensor drift due to the prolonged over winter deployment.

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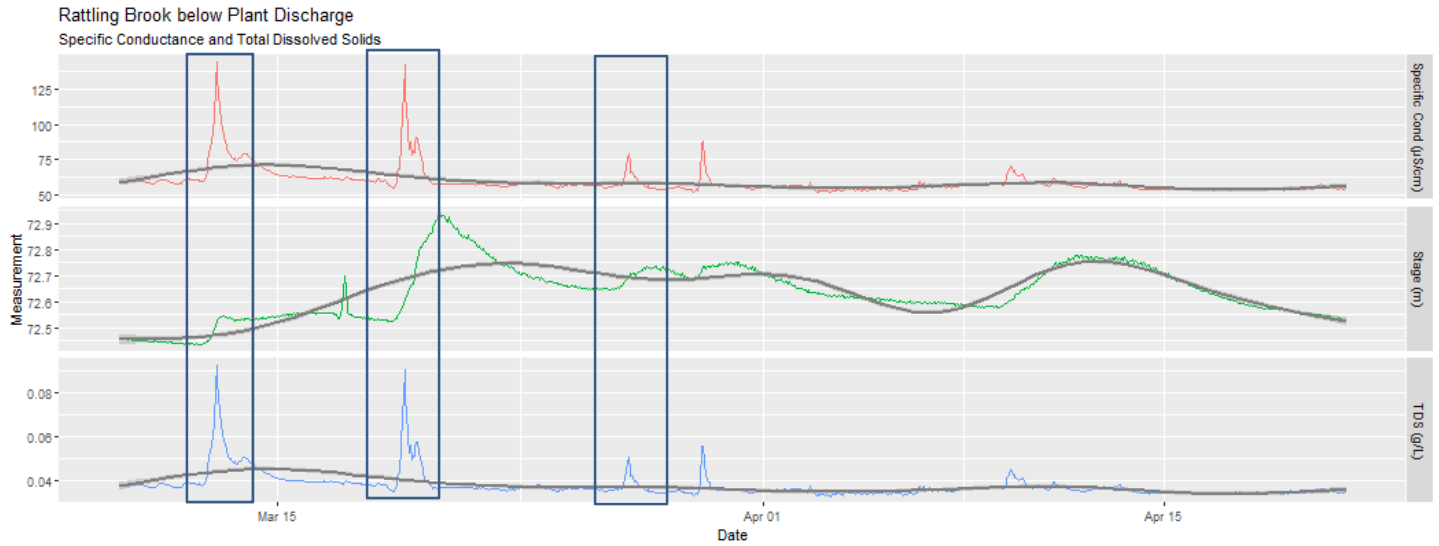
Specific Conductivity

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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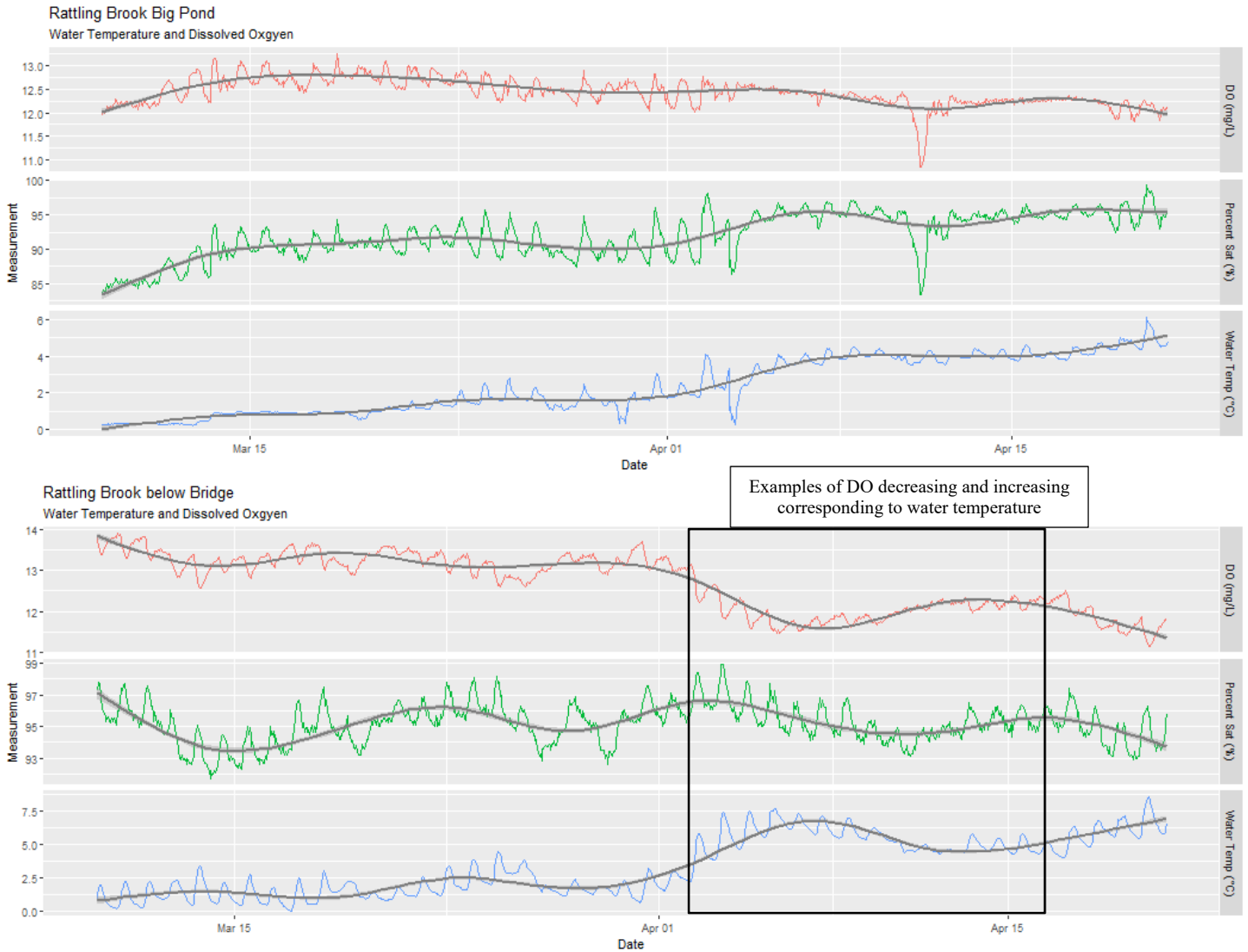
Station	Max	Min	Median	Mean
Big Pond	76.3	43.1	59.2	59.5
Below Bridge	62.7	46.5	51.0	51.4
Below Plant Discharge	144.6	51.6	56.7	59.0

- Specific conductivity was relatively stable at all stations during this deployment period with few fluctuations due to variations in Stage caused by precipitation or snow melt. Fluctuations at Bridge station are lesser in magnitude than fluctuations observed at Plant Discharge station, likely due to additional inputs into the river system between Bridge and Plant Discharge stations.

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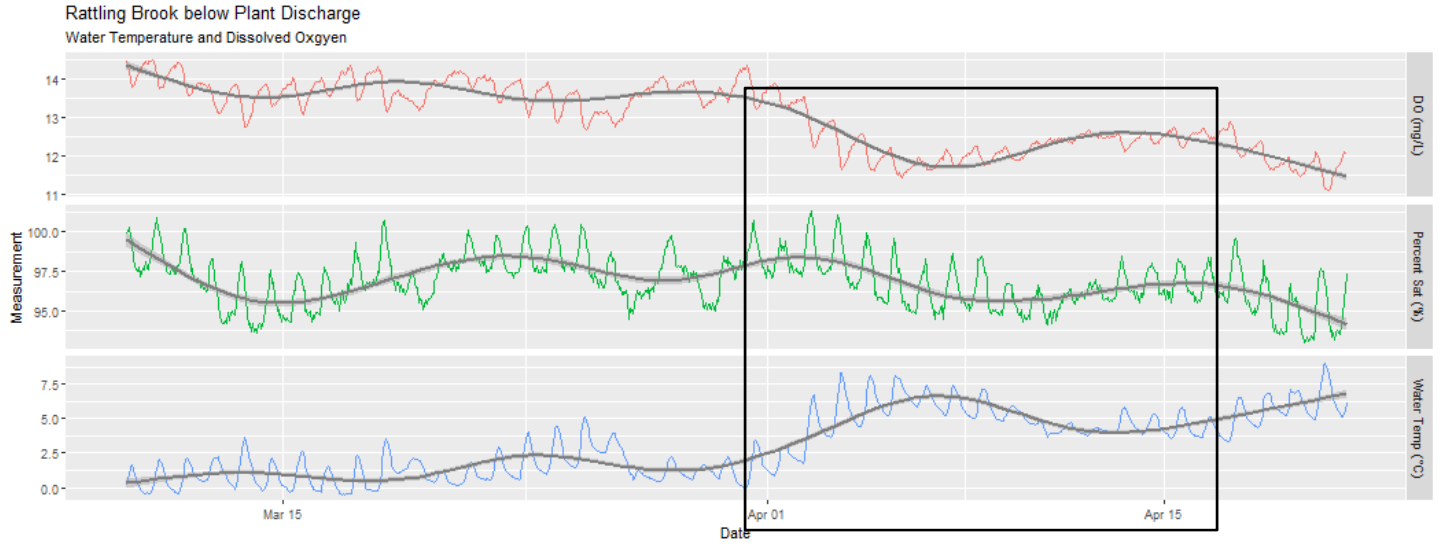
Dissolved Oxygen

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 oxidation reactions.



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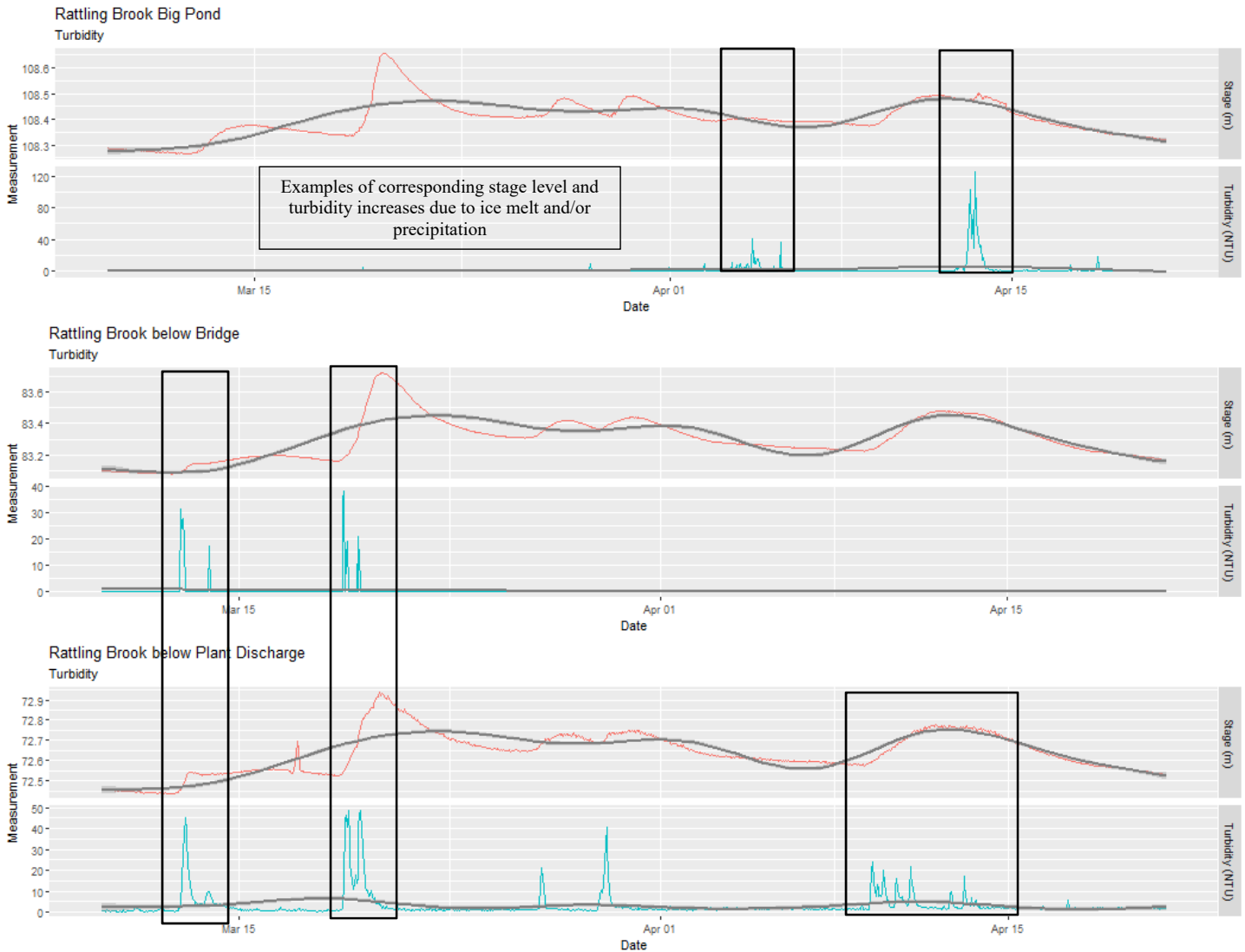
Station	Max	Min	Median	Mean
Big Pond	13.25	10.85	12.39	12.42
Below Bridge	13.91	11.13	12.81	12.64
Below Plant Discharge	14.51	11.10	13.08	12.97

- As expected, trend lines show the start of spring as water temperatures warm, causing gradual decreases of dissolved oxygen concentrations at the end of this deployment.
- During this deployment period, all values remained above the minimum CCME Aquatic Guideline for other life stages (6.5 mg/l) and for cold water biota (9.5 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	125.4	0.0	0.0	1.2
Below Bridge	38.2	0.0	0.0	0.3
Below Plant Discharge	48.5	0.0	1.5	3.1

- Most turbidity peaks are associated with precipitation events and spring runoff. Low median values at all sites indicate low background turbidity during this deployment period.

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Appendix

