

Real-Time Water Quality Deployment Report

Rattling Brook Network

September 7, 2022 to October 14, 2022



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

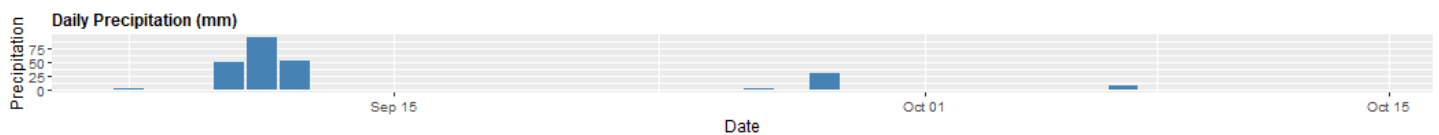
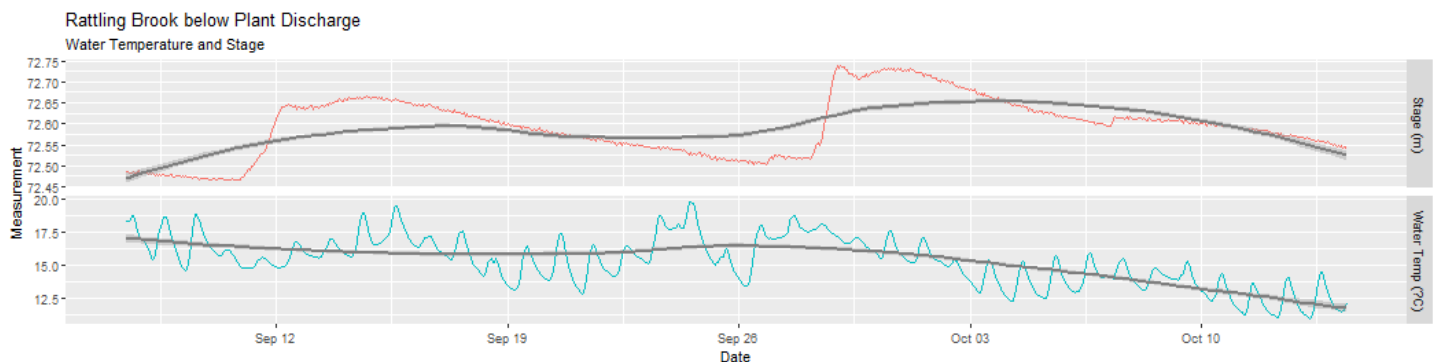
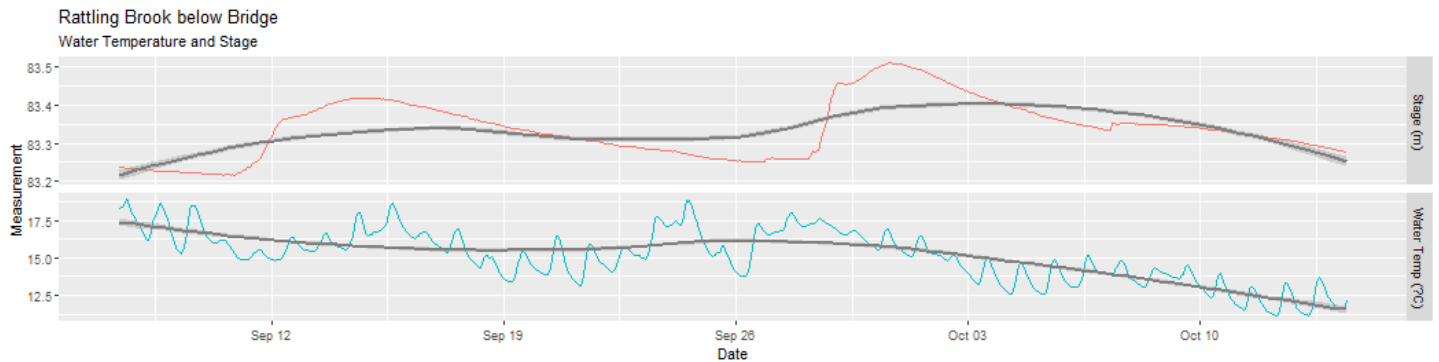
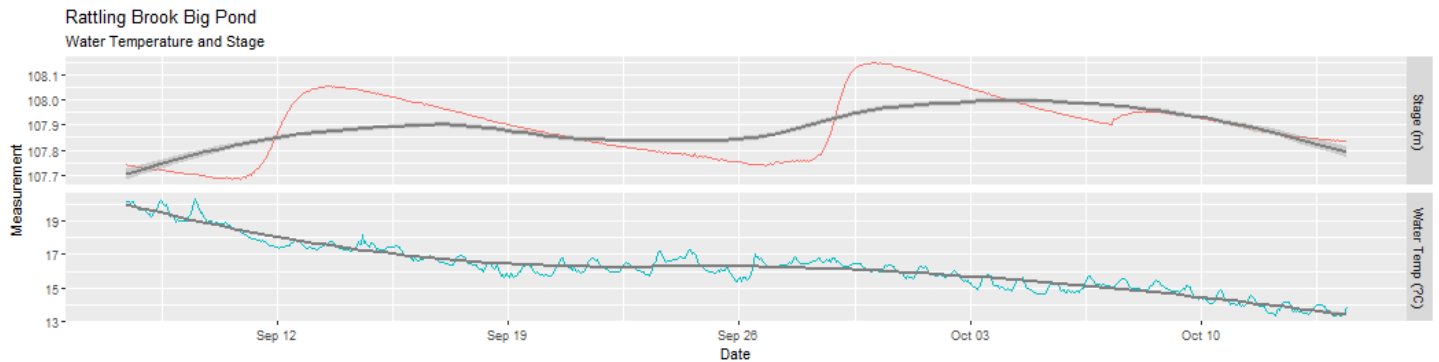
| Station | Date | Action | Comparison Ranking | | | | |
|--------------------------------------|-------------|------------|--------------------|-----------|--------------|------------------|-----------|
| | | | Temperature | pH | Conductivity | Dissolved Oxygen | Turbidity |
| Rattling Brook Big Pond | September 7 | Deployment | Good | Excellent | Good | Excellent | Marginal |
| | October 14 | Removal | Excellent | Good | Good | Excellent | Excellent |
| Rattling Brook below Bridge | September 7 | Deployment | Good | Excellent | Fair | Excellent | Excellent |
| | October 14 | Removal | Good | Excellent | Good | Excellent | Excellent |
| Rattling Brook below Plant Discharge | September 7 | Deployment | Excellent | Excellent | Fair | Excellent | Excellent |
| | October 14 | Removal | Excellent | Excellent | Fair | Excellent | Excellent |

- During the weekend of January 7th, the Vale weather station was compromised during a wind event. As data is currently suspect, this report utilizes weather data at St. John’s West, 78kms NE of Long Harbour.

- 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.



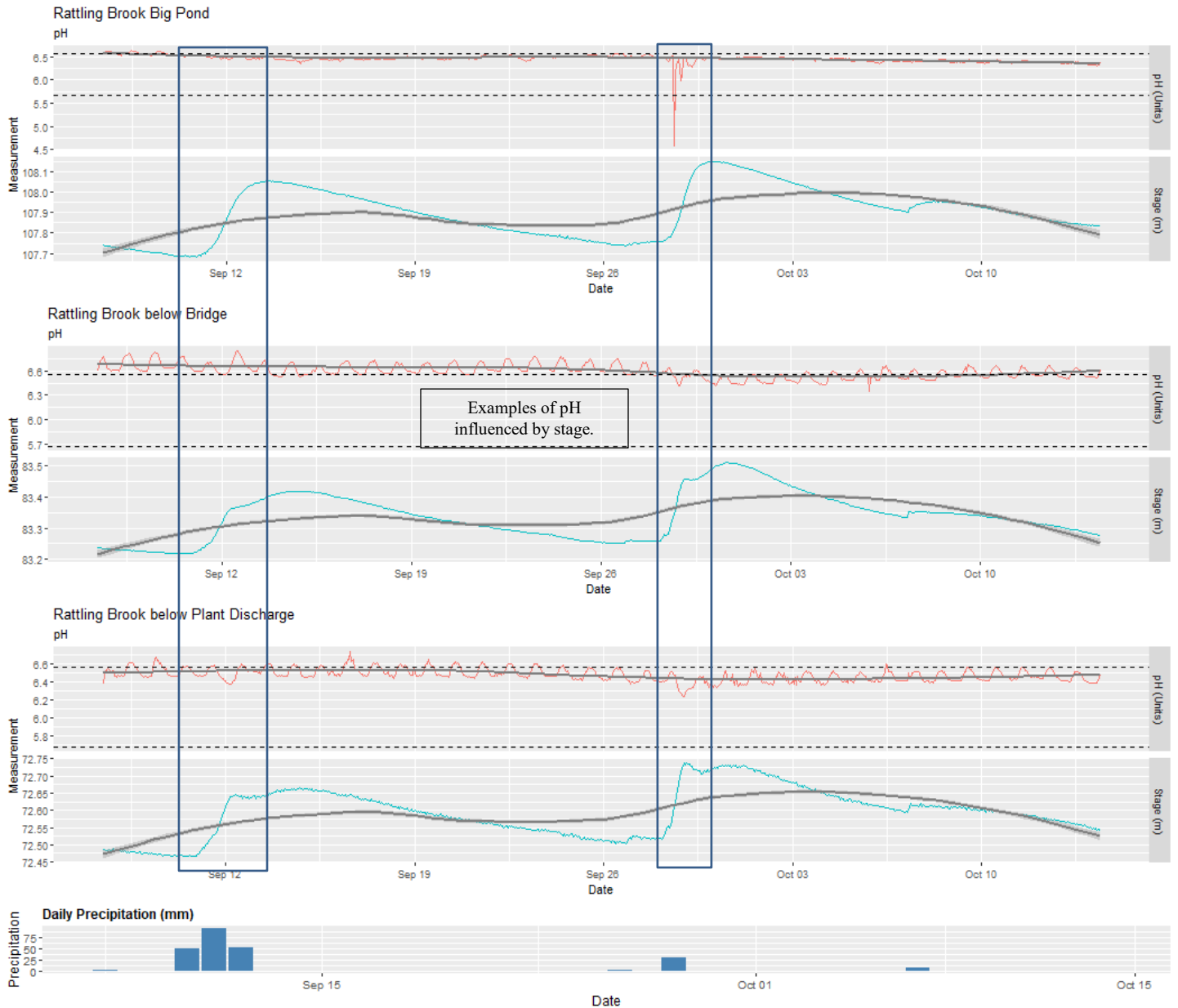
| Station | Max | Min | Median | Mean |
|-----------------------|-------|-------|--------|-------|
| Big Pond | 20.33 | 13.31 | 16.16 | 16.22 |
| Below Bridge | 18.92 | 11.12 | 15.18 | 15.12 |
| Below Plant Discharge | 19.75 | 10.93 | 15.39 | 15.30 |

- As expected, trend lines show seasonal water temperatures declining at all three stations.

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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.



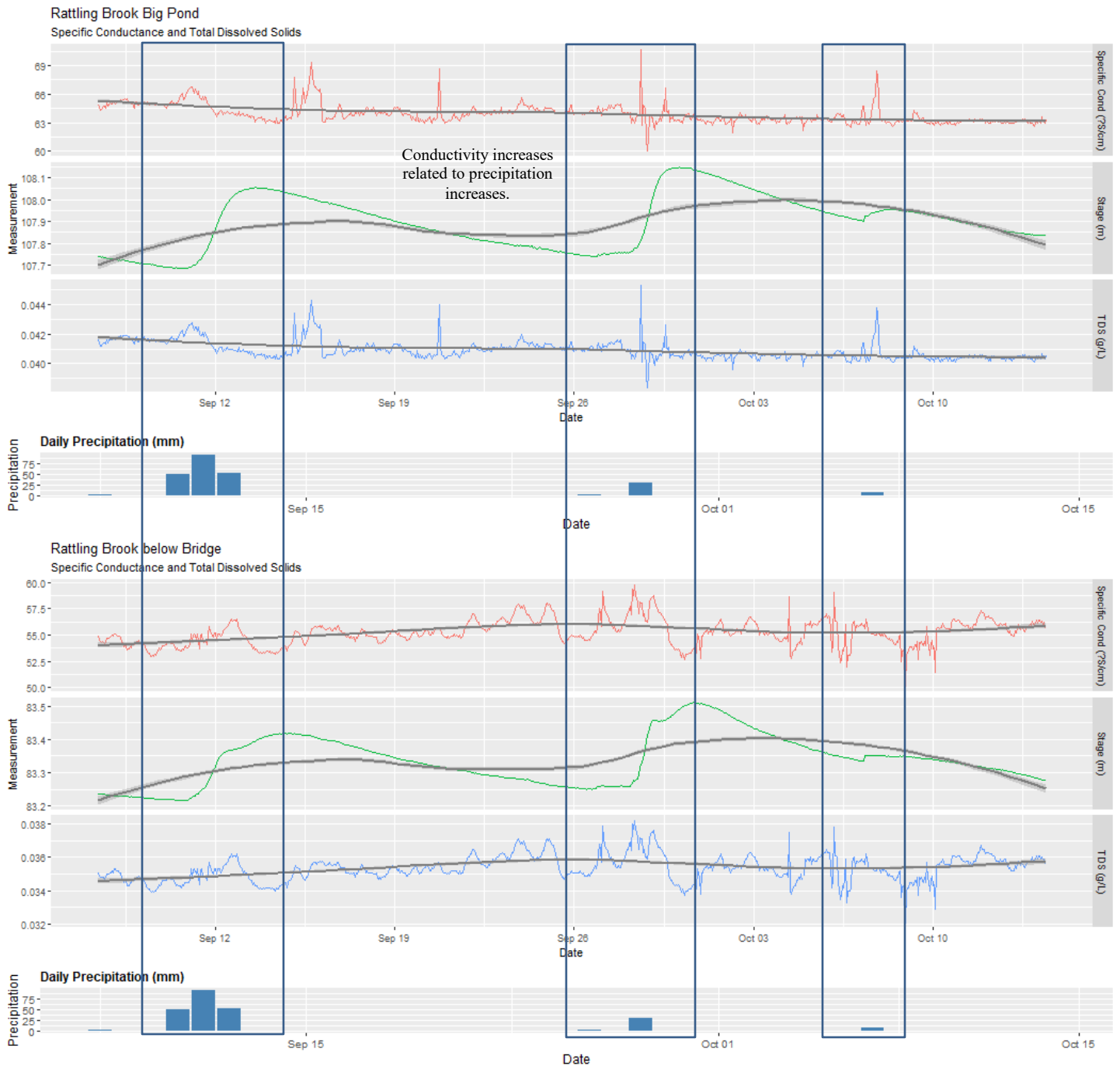
| Station | Max | Min | Median | Mean |
|-----------------------|------|------|--------|------|
| Big Pond | 6.64 | 4.57 | 6.47 | 6.46 |
| Below Bridge | 6.84 | 6.34 | 6.59 | 6.59 |
| Below Plant Discharge | 6.74 | 6.24 | 6.47 | 6.48 |

- pH values were consistent with the majority of values within the site-specific guidelines (5.67-6.56 pH Units). Fluctuations were evident during significant stage increases at all stations.

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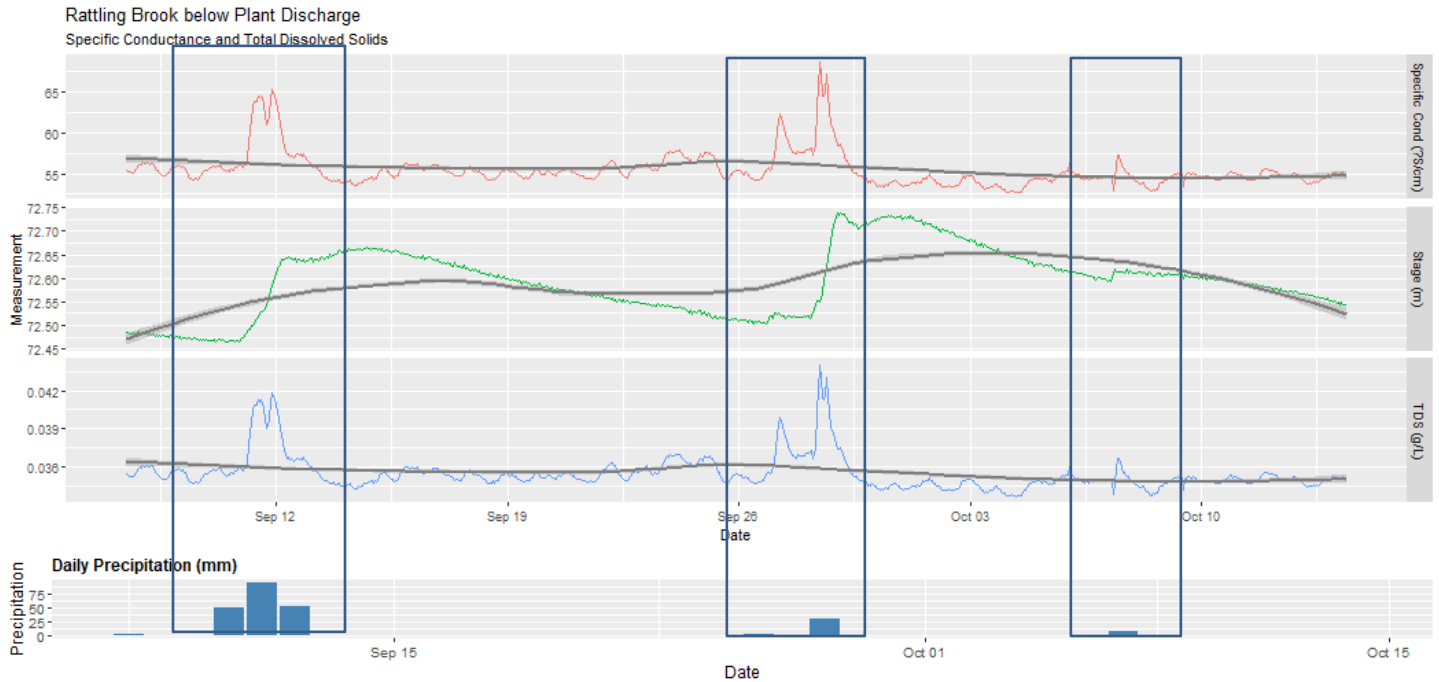
Specific Conductivity

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.



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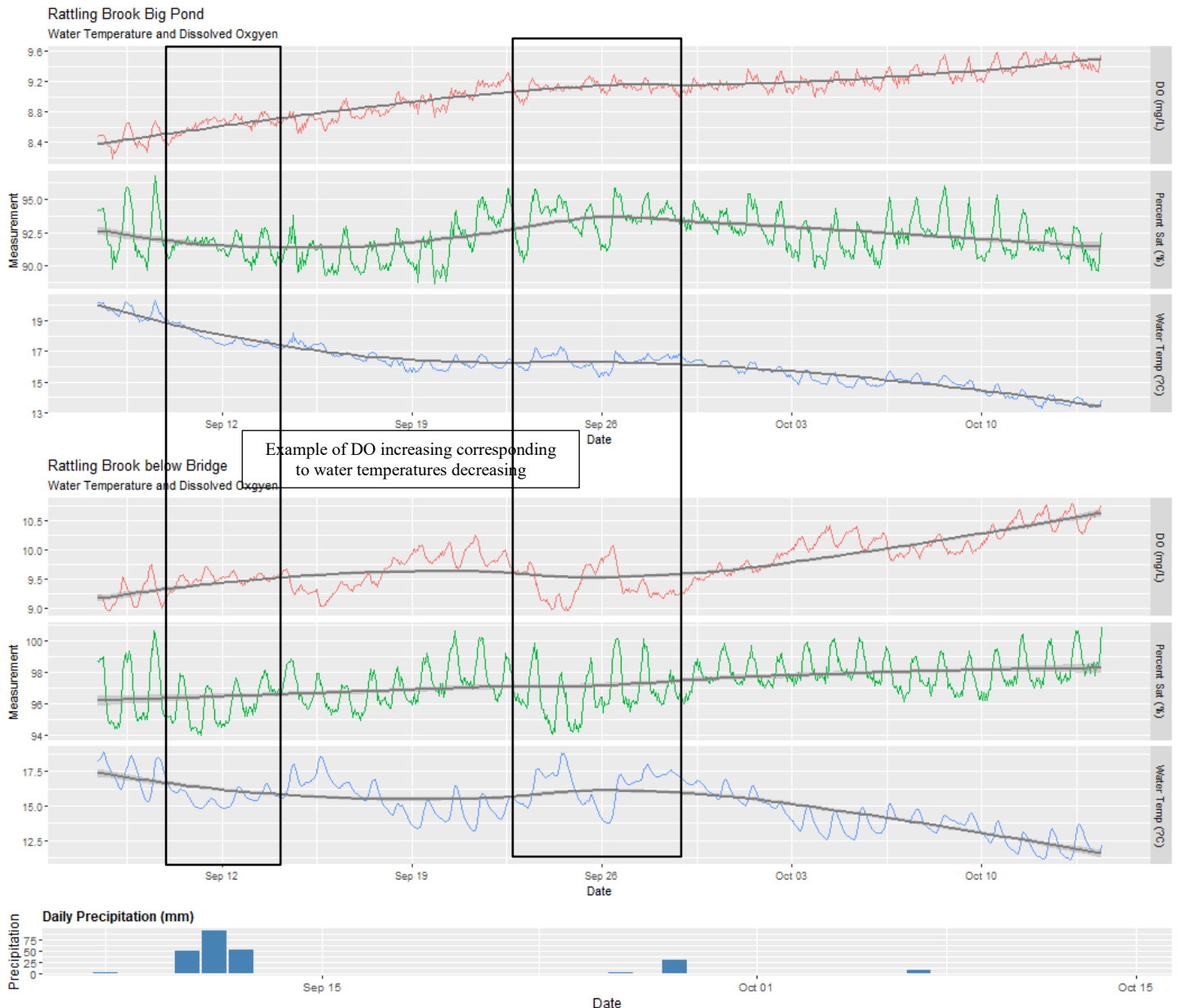
| Station | Max | Min | Median | Mean |
|-----------------------|------|------|--------|------|
| Big Pond | 70.7 | 60.0 | 63.7 | 63.9 |
| Below Bridge | 59.8 | 50.1 | 55.2 | 55.2 |
| Below Plant Discharge | 68.8 | 52.7 | 55.0 | 55.5 |

- Specific conductivity was relatively stable at all stations with most peaks occurring during precipitation events. 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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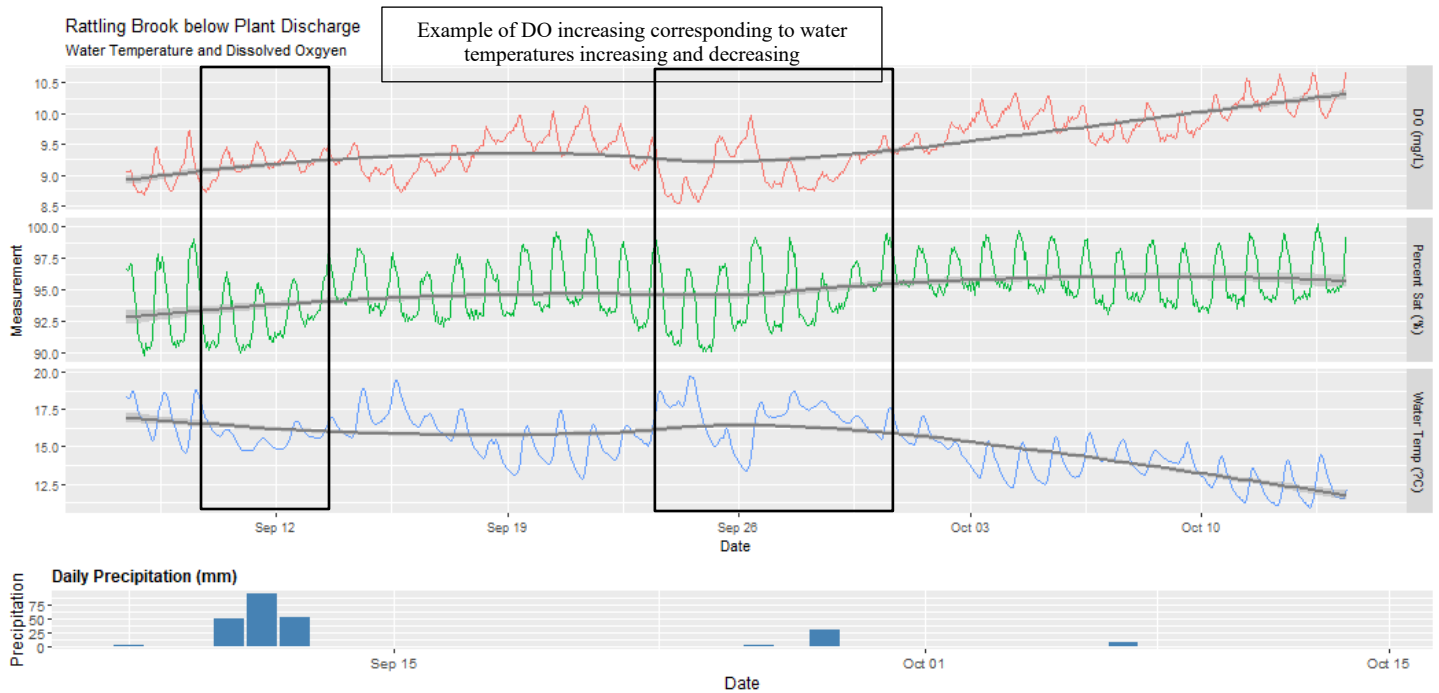
Dissolved Oxygen

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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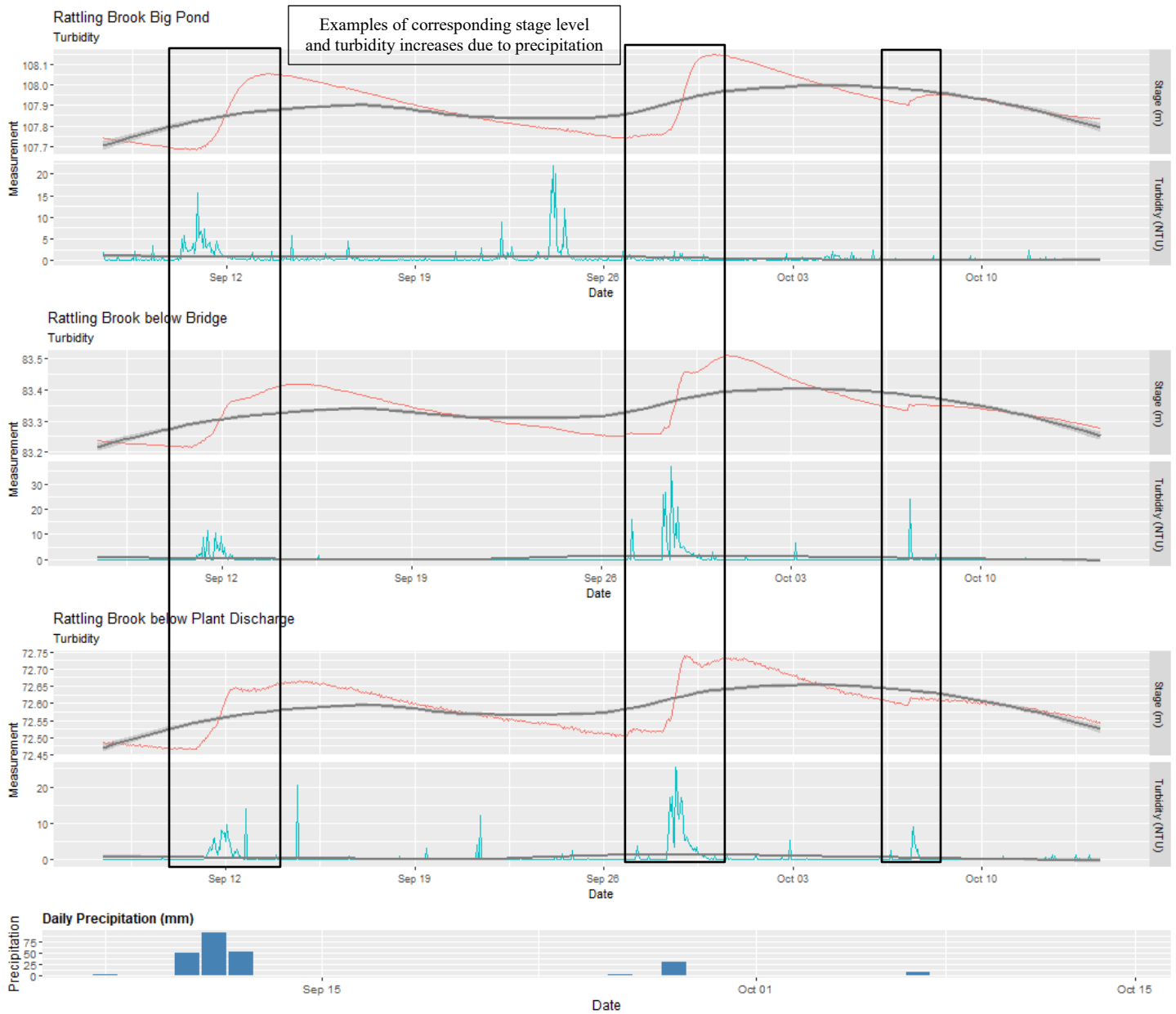
| Station | Max | Min | Median | Mean |
|-----------------------|-------|------|--------|------|
| Big Pond | 9.59 | 8.18 | 9.12 | 9.03 |
| Below Bridge | 10.80 | 8.96 | 9.71 | 9.75 |
| Below Plant Discharge | 10.67 | 8.54 | 9.47 | 9.48 |

- Falling seasonal water temperature trends led to increased dissolved oxygen throughout the deployment period, as expected.
- 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 | 21.9 | 0.0 | 0.1 | 0.5 |
| Below Bridge | 36.9 | 0.0 | 0.0 | 0.5 |
| Below Plant Discharge | 25.4 | 0.0 | 0.0 | 0.6 |

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- Isolated turbidity events were experienced simultaneously with precipitation events and are of short duration. Peaks are observed at Big Pond not related to precipitation, this may be due to wave action from the pond stirring up sediment.

Appendix

