Real-Time Water Quality Deployment Report

Rattling Brook Network

2014-07-04 to 2014-08-07

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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General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.

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

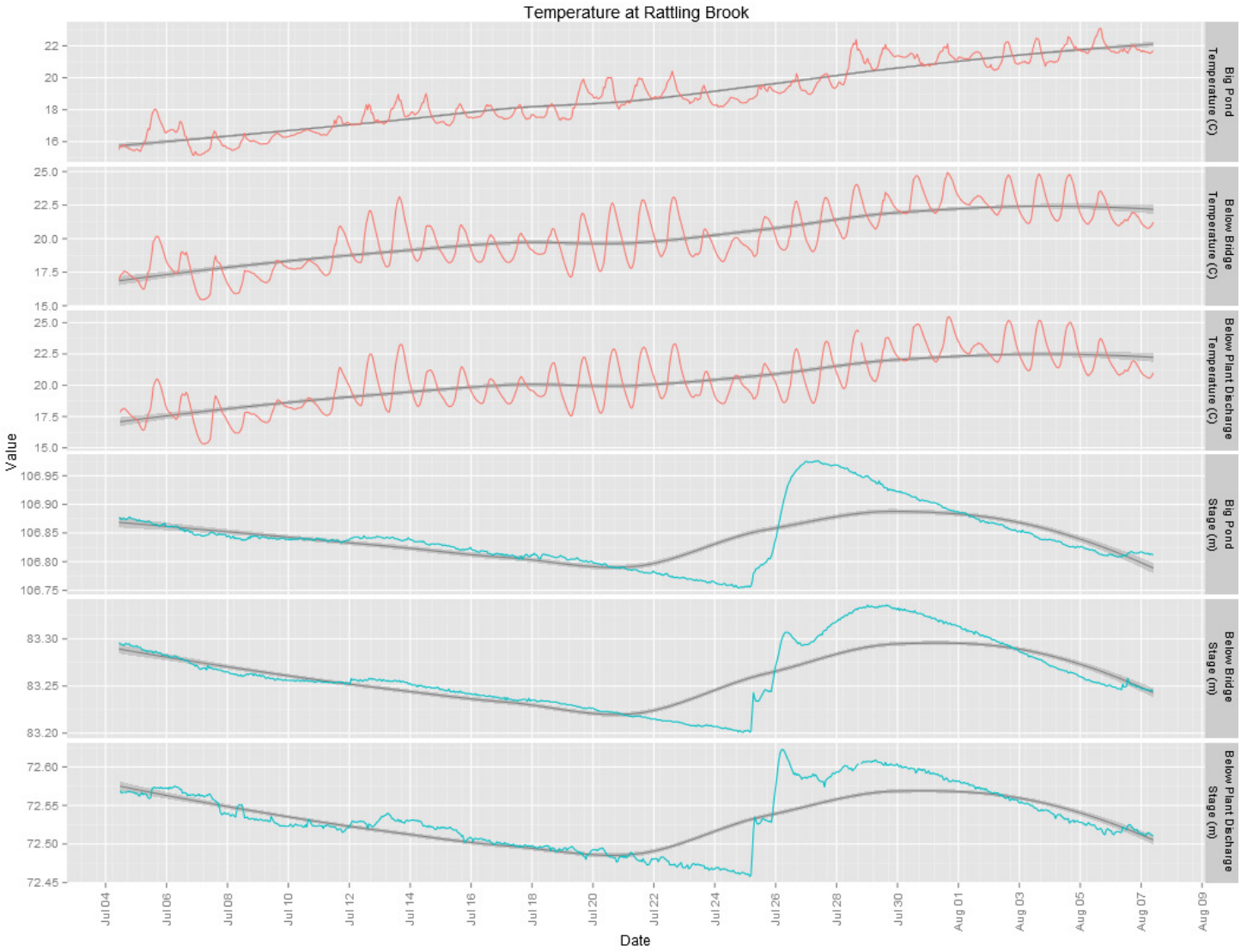
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	July 4, 2014	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	August 7, 2014	Removal	Excellent	Excellent	Excellent	Excellent	Excellent
Rattling Brook below Bridge	July 4, 2014	Deployment	Good	Good	Good	Excellent	Excellent
	August 7, 2014	Removal	Good	Excellent	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	July 4, 2014	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	August 7, 2014	Removal	Excellent	Excellent	Excellent	Excellent	Excellent

- All QAQC Rankings fell between “Excellent” and “Good” for deployment and removal.

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.

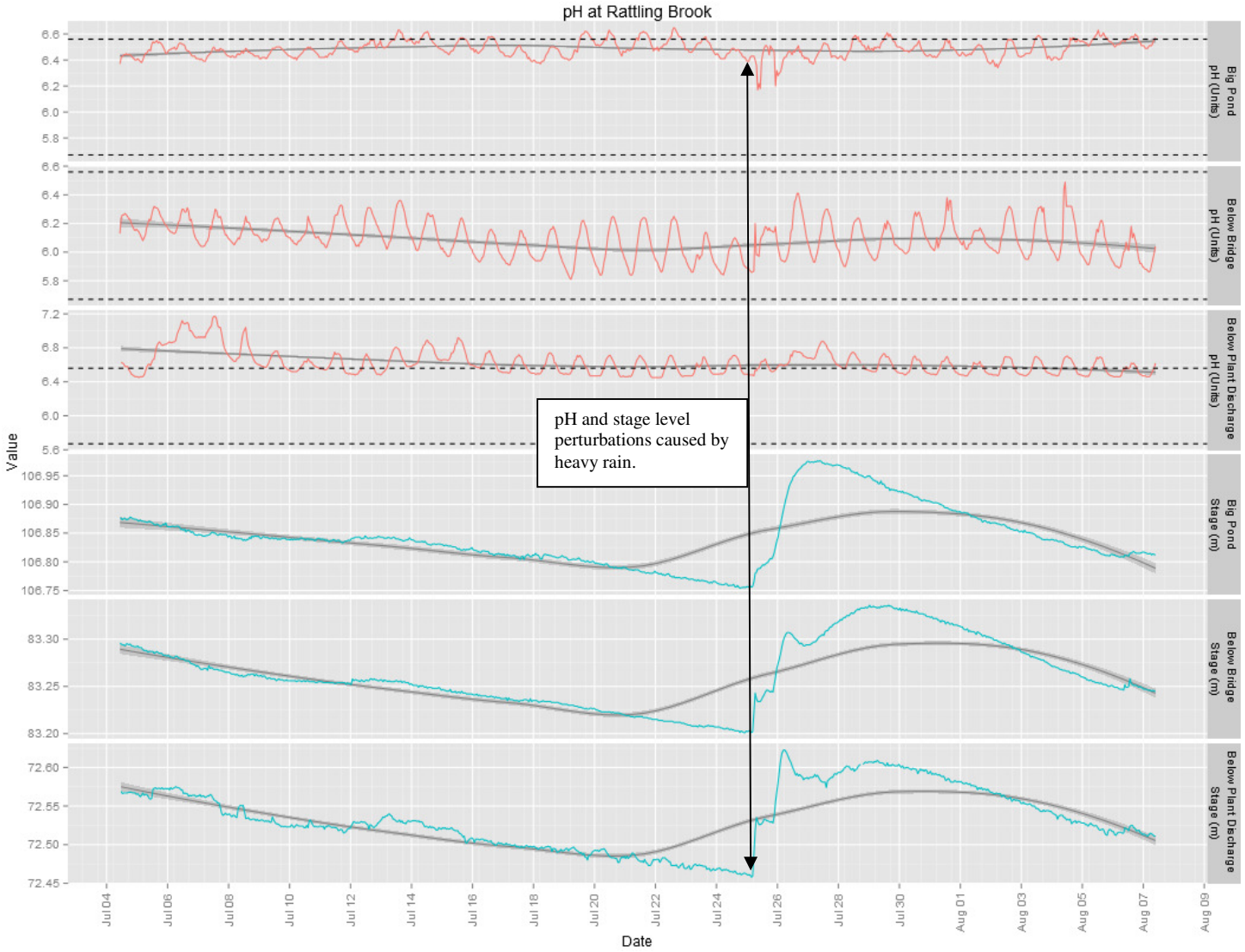


Station	Variable	Mean	Median	Min	Max
Big Pond	Temperature (C)	18.87	18.67	15.13	23.10
Below Bridge	Temperature (C)	20.18	20.07	15.45	24.93
Below Plant Discharge	Temperature (C)	20.39	20.33	15.32	25.48

- Water temperature showed a steady increase from the time of deployment to removal at each station. Water temperatures ranged from a low of 15.13°C at Big Pond to a high of 25.48°C at Plant Discharge station.

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.

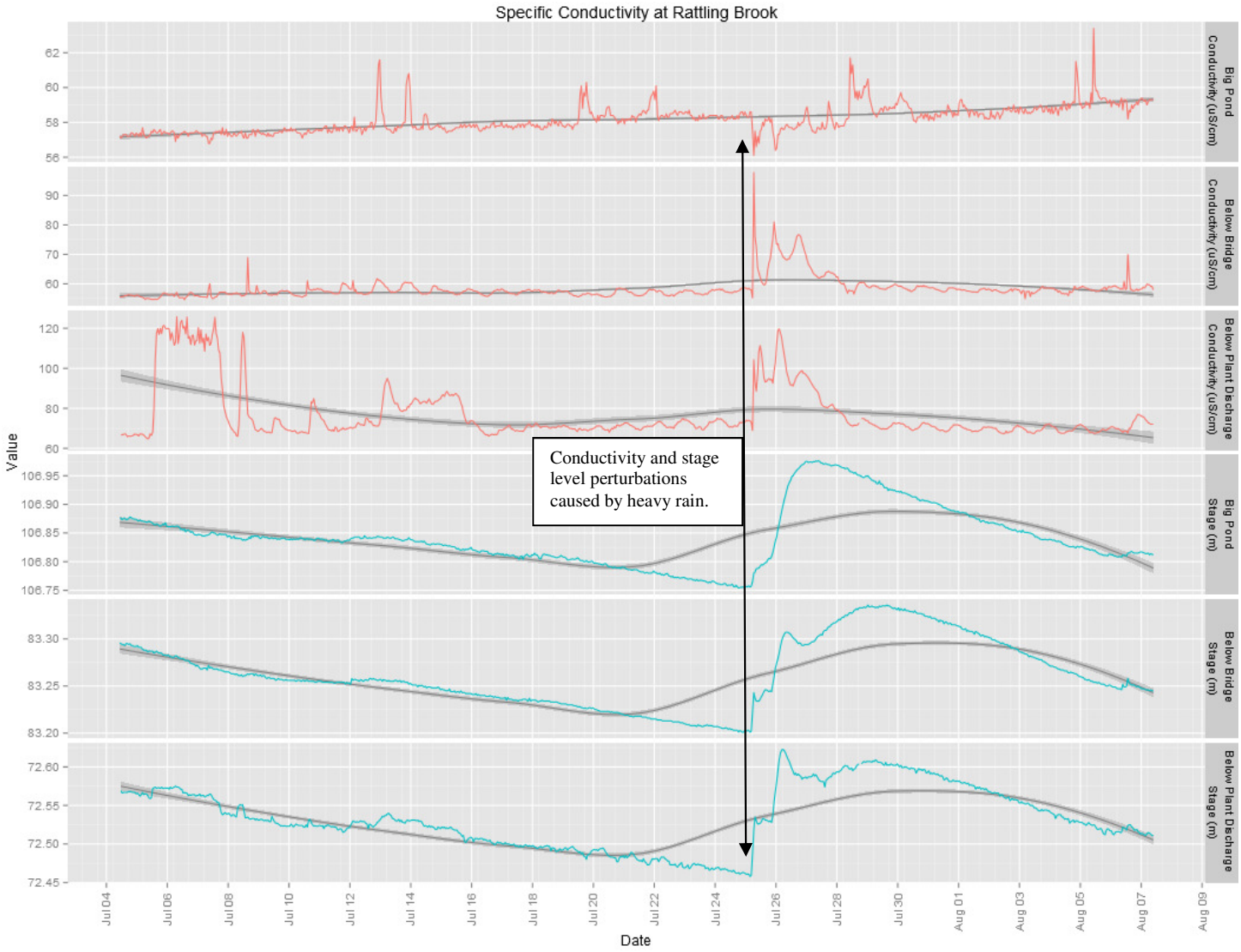


Station	Variable	Mean	Median	Min	Max
Big Pond	pH (Units)	6.49	6.48	6.17	6.65
Below Bridge	pH (Units)	6.09	6.09	5.81	6.49
Below Plant Discharge	pH (Units)	6.62	6.60	6.45	7.17

- pH values fell mostly within the Site Specific Guidelines (dashed lines) at each station for this deployment period. A heavy rainfall on July 25 of more than 50 mm resulted in some small pH disruptions at each station. The disruptions subsequently recovered within 24 hours.

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.

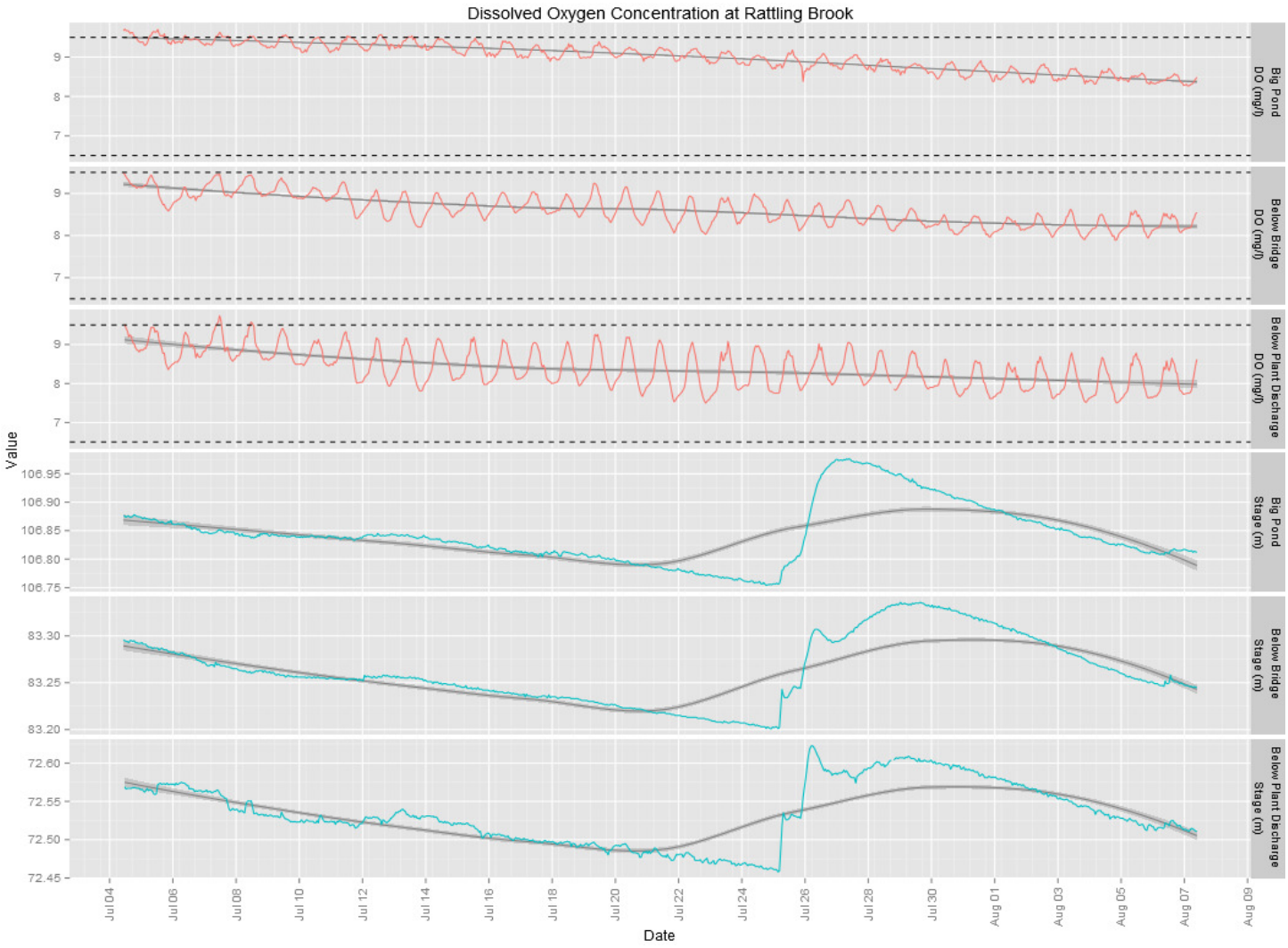


Station	Variable	Mean	Median	Min	Max
Big Pond	Conductivity (uS/cm)	58.2	58.1	56.1	63.4
Below Bridge	Conductivity (uS/cm)	58.4	57.6	54.6	97.8
Below Plant Discharge	Conductivity (uS/cm)	77.0	71.3	64.8	125.8

- Big Pond station showed a dilution effect because of the heavy precipitation on July 25, whereas Bridge station and Plant Discharge stations showed concentration effects for more than 24 hours following the rain. Overland flow into the river channel from disturbed ground and roadways contribute to sediment and silt loading in the Rattling Brook channel.

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.

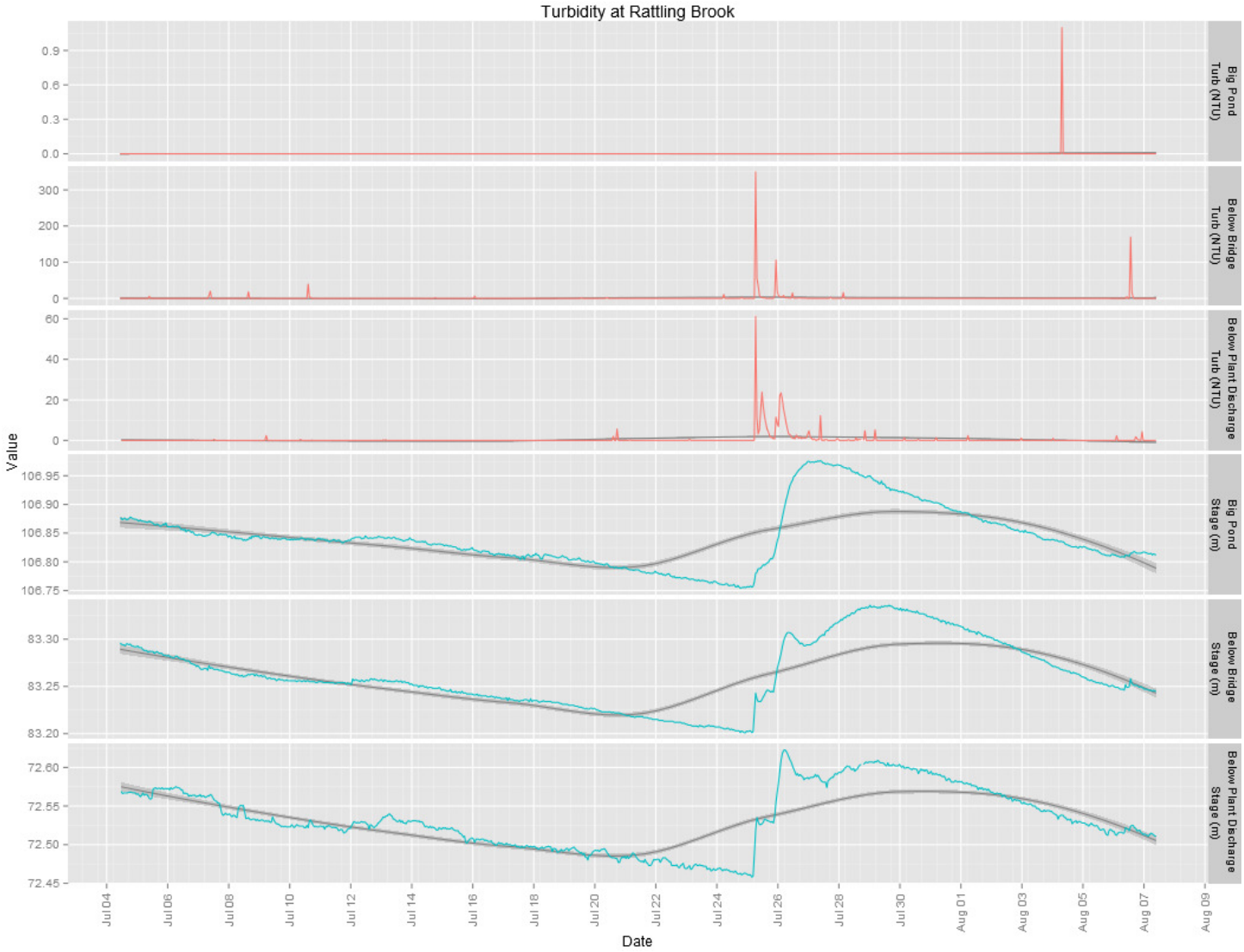


Station	Variable	Mean	Median	Min	Max
Big Pond	DO (mg/l)	9.00	9.03	8.27	9.71
Below Bridge	DO (mg/l)	8.61	8.56	7.89	9.49
Below Plant Discharge	DO (mg/l)	8.40	8.39	7.50	9.74

- Most dissolved oxygen values were below the CCME guidelines of 6.5 to 9.5 mg/l for the protection of early life stage cold water biota (indicated by dotted lines). This is typical for warm, mid-summer water temperatures. Dissolved oxygen values usually reach their annual low in mid-August just before air temperatures start to decline.

Turbidity

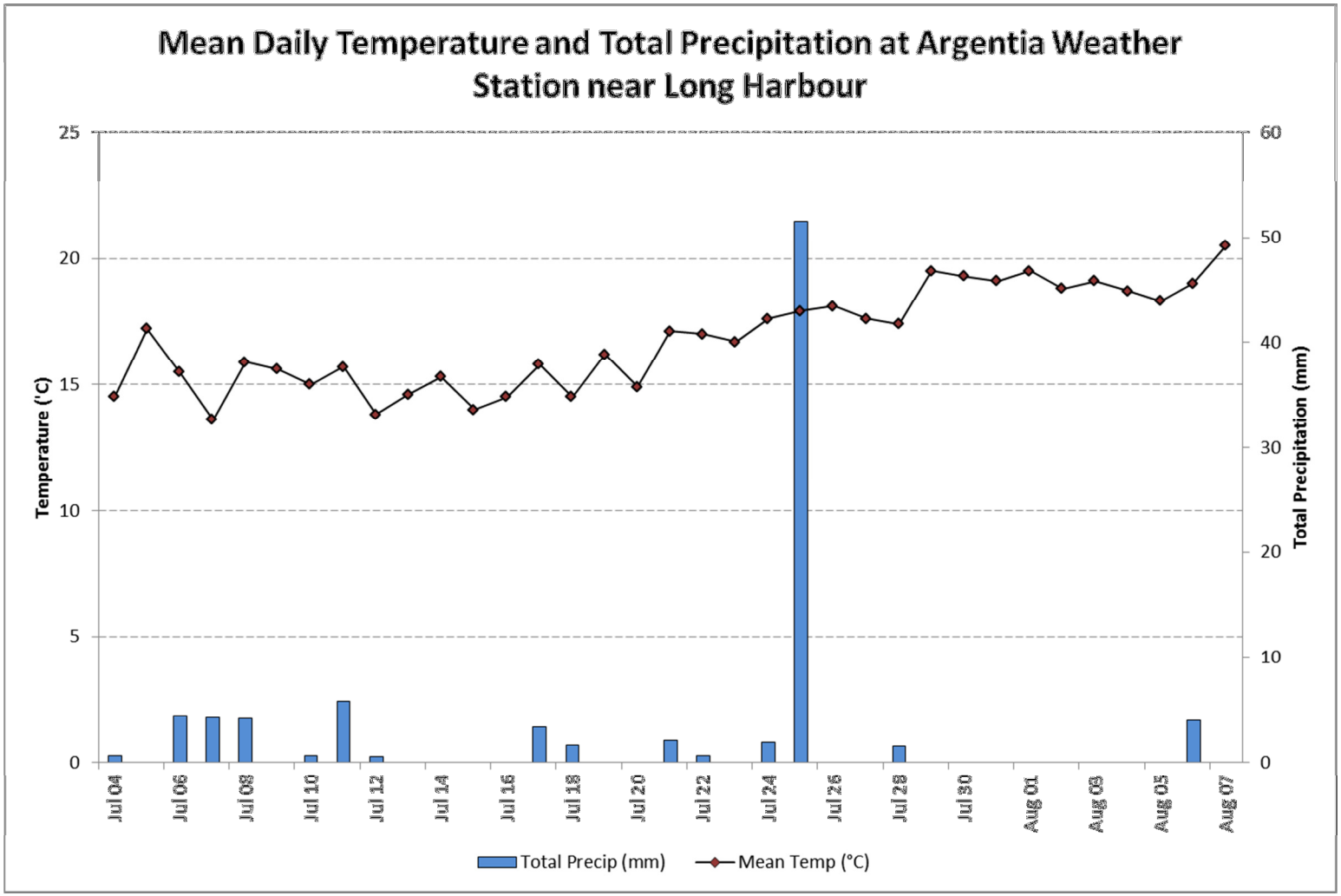
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



Station	Variable	Mean	Median	Min	Max
Big Pond	Turb (NTU)	0.0	0.0	0.0	1.1
Below Bridge	Turb (NTU)	1.2	0.0	0.0	349.6
Below Plant Discharge	Turb (NTU)	0.5	0.0	0.0	61.2

- Turbidity levels were low throughout the deployment period – median turbidity values at all three stations were 0.0 NTU. A few instances of turbidity were observed in response to precipitation on July 25th, though were of no concern since their duration was quite short.

Appendix



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