Real-Time Water Quality Deployment Report

Rattling Brook Network

March 21, 2014 to April 16, 2014

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.
- Rattling Brook Big Pond remained offline for this deployment period due to prolonged ice cover.

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

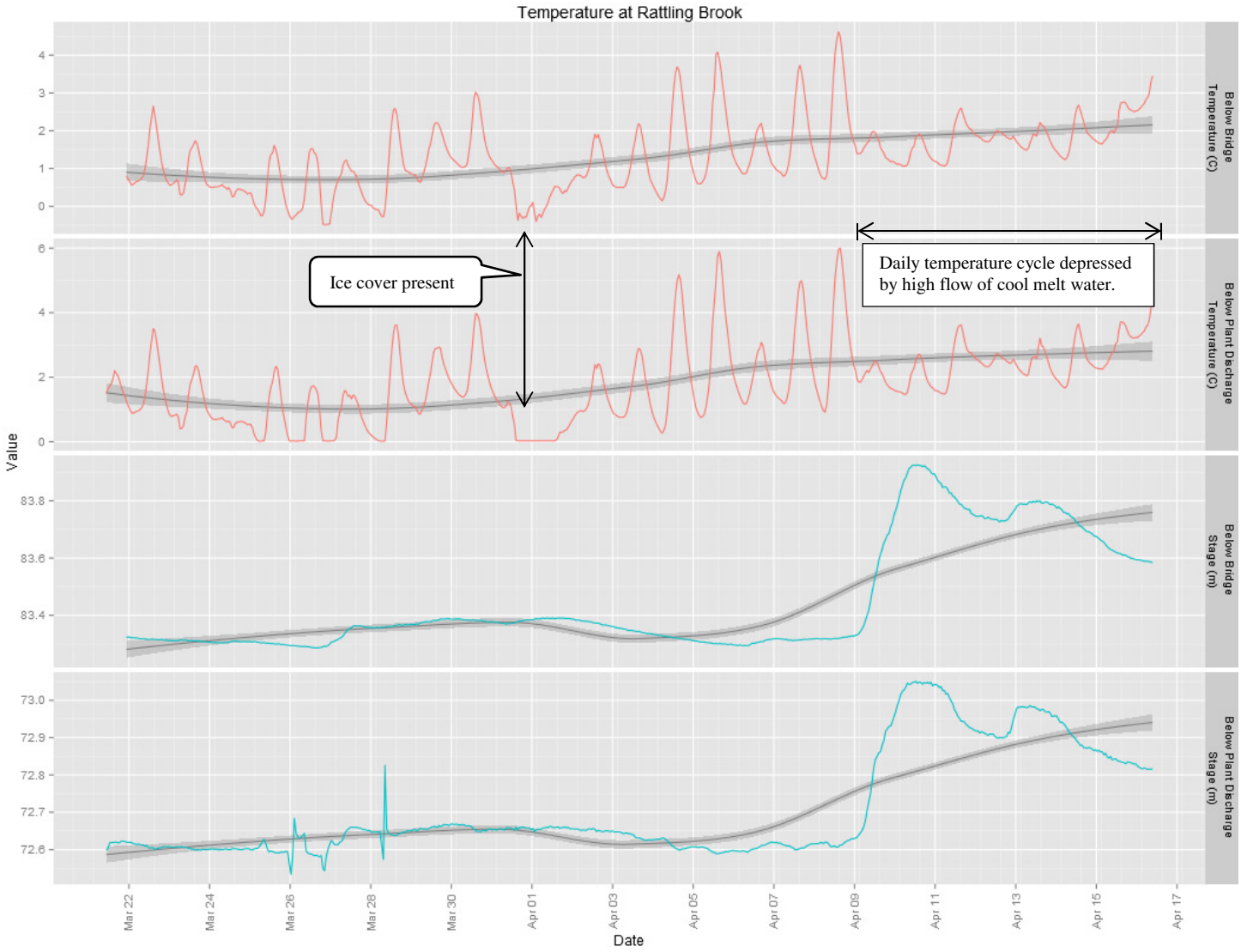
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook below Bridge	March 21, 2014	Deployment	Good	Fair	Excellent	Marginal	Excellent
	April 16, 2014	Removal	Good	Good	Excellent	Fair	Excellent
Rattling Brook below Plant Discharge	March 21, 2014	Deployment	Excellent	Good	Excellent	Fair	Excellent
	April 16, 2014	Removal	Excellent	Good	Excellent	Good	Excellent

- Dissolved Oxygen rankings were found to be lower than desired for bother deployment and removal at Bridge and Discharge stations. An investigation will be made into the probable cause for lower than expected rankings.

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.

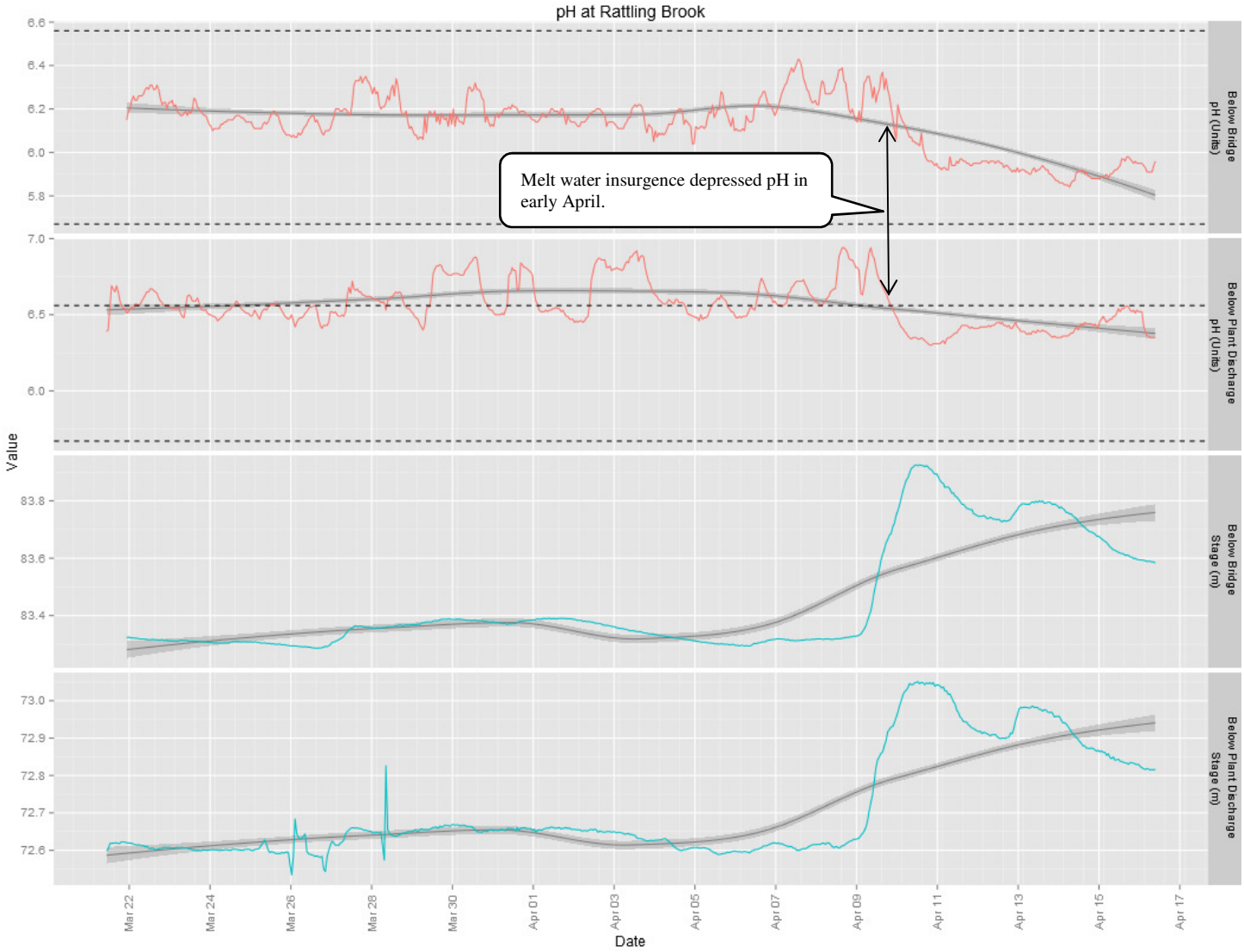


- Water temperatures during this deployment period went from freezing to a max of 6°C at Plant Discharge station. A clear upward trend is apparent in the graph above as water warms during the spring thaw.

Station	Parameter	Mean	Median	Min	Max
Below Bridge	Temperature (C)	1.32	1.26	-0.48	4.62
Below Plant Discharge	Temperature (C)	1.83	1.71	0.02	6.00

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.

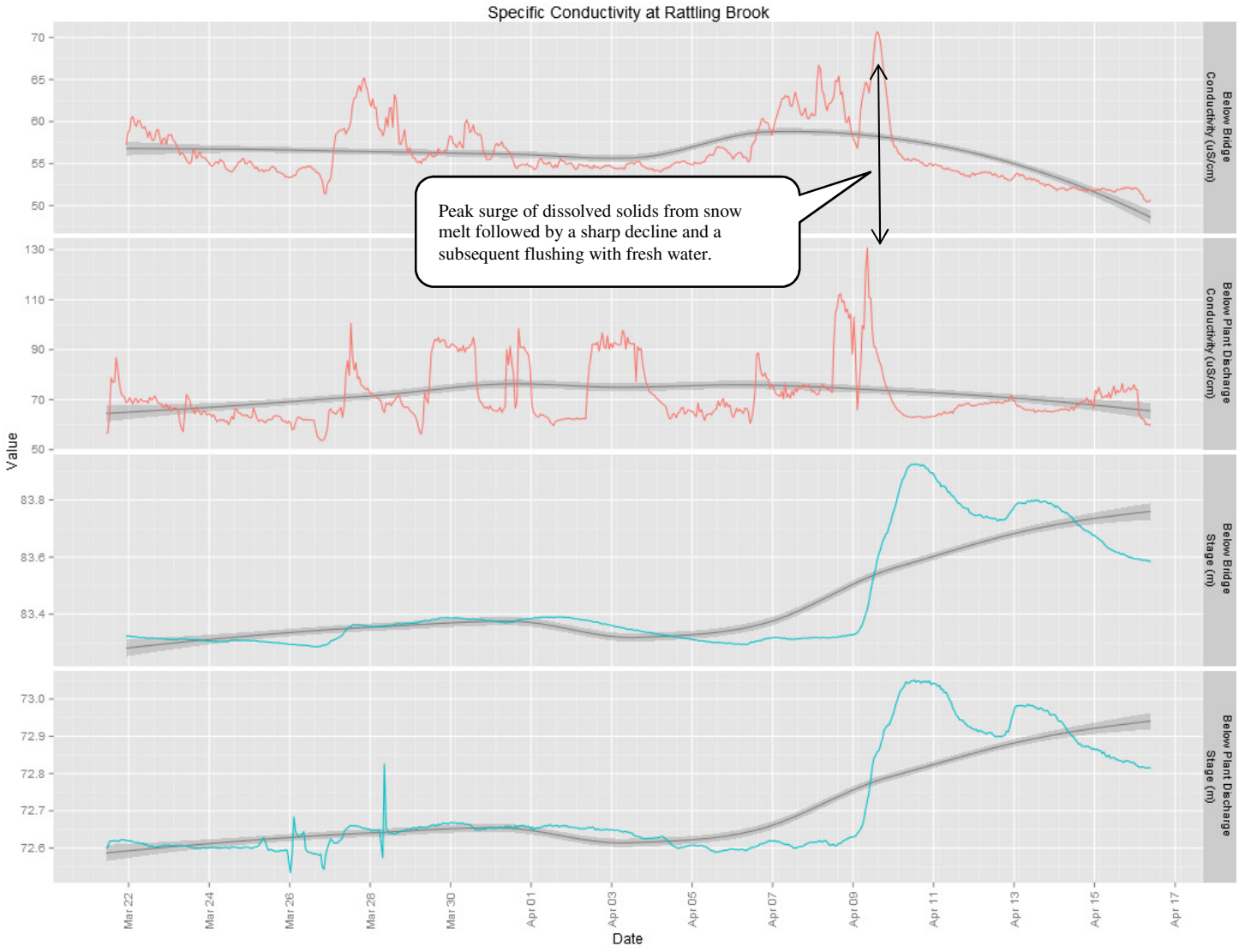


- In the graph above, Site Specific Guidelines for pH are outlined by dashed lines. pH levels at Bridge station fell within the Site Specific Guidelines for the entire duration of the deployment period while pH levels at Plant Discharge station straddled the upper guideline.
- In early April, mean daily temperatures consistently remained above freezing resulting in a rapid thaw and stream level rise in Rattling Brook. The insurgence of melt water depressed pH at both stations.

Station	Parameter	Mean	Median	Min	Max
Below Bridge	pH (Units)	6.12	6.15	5.84	6.43
Below Plant Discharge	pH (Units)	6.56	6.54	6.3	6.94

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.

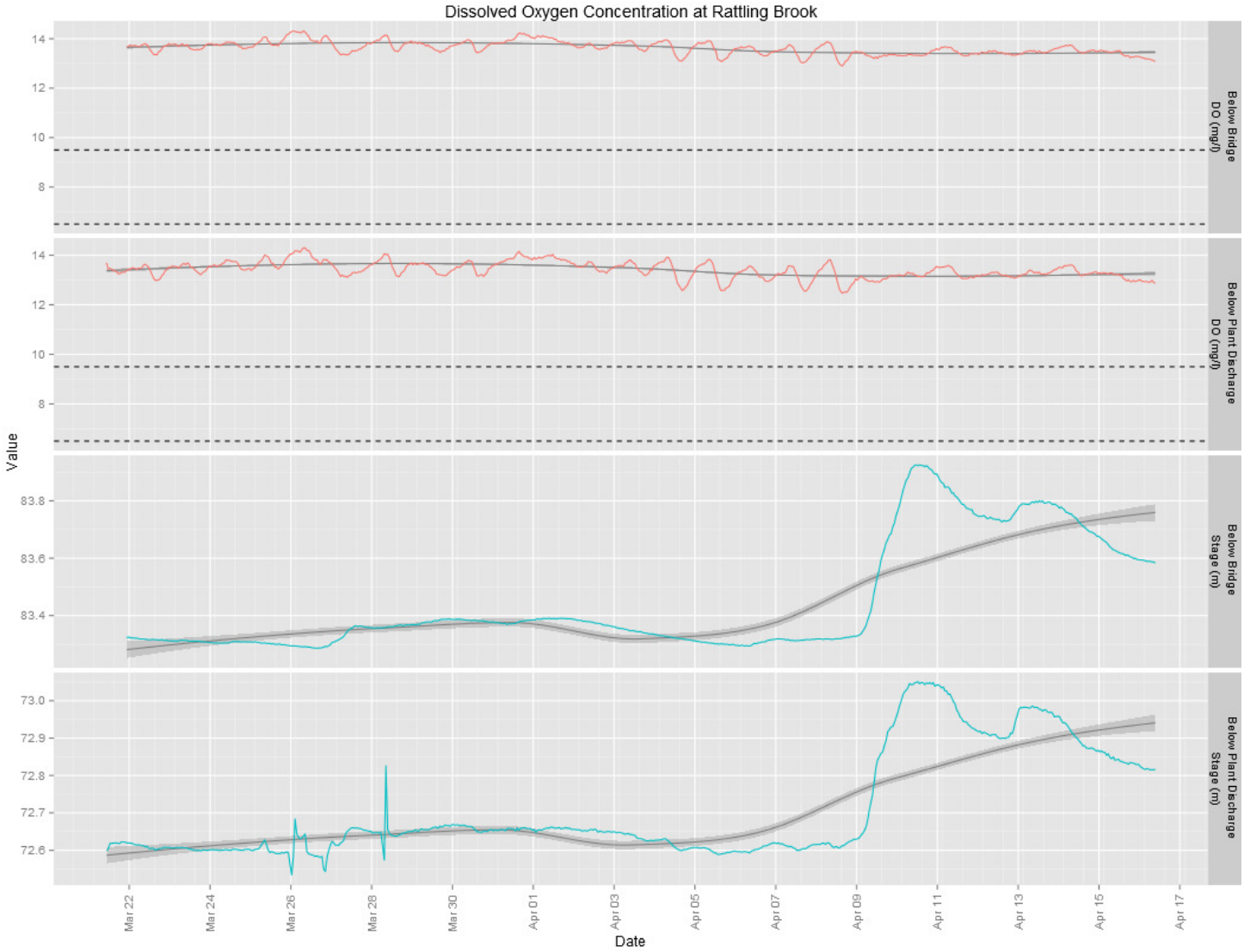


- Specific conductivity tends to be highly variable during this time of year due to frequent precipitation and melting periods. Increased flow into the Rattling Brook channel brings additional sediment, silt, and dissolved solids. In early April, however, the trend was reversed as warm temperatures resulted in a prolonged fresh water entry into Rattling Brook flushing much of the dissolved solids out of the river channel.

Station	Parameter	Mean	Median	Min	Max
Below Bridge	Conductivity (uS/cm)	56.3	55.2	50.4	70.7
Below Plant Discharge	Conductivity (uS/cm)	71.7	67.9	53.7	130.8

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.

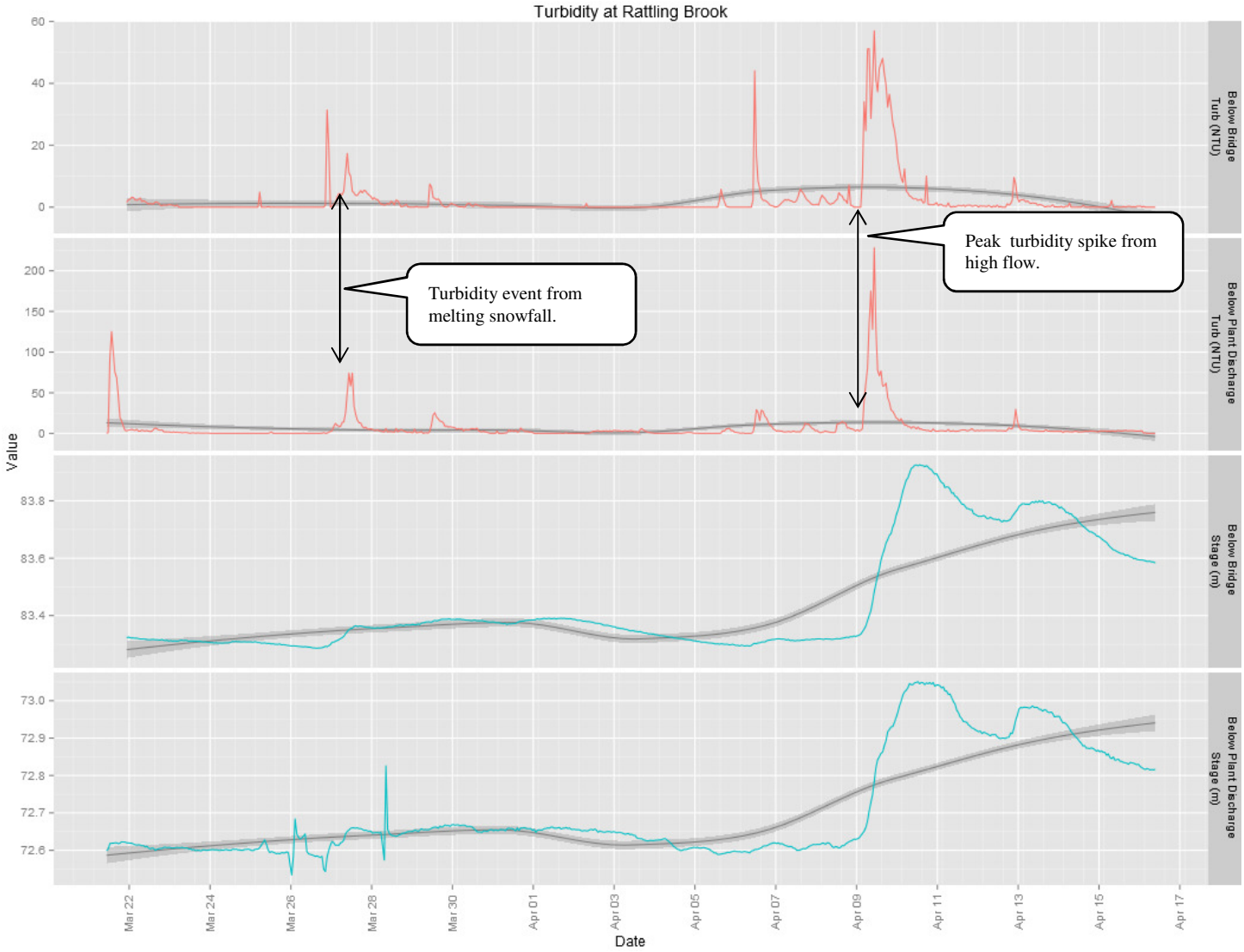


- All dissolved oxygen concentrations remained above the CCME Guidelines of 6.5 mg/l and 9.5 mg/l DO for the protection of early and other life stage cold water biota. No major variation was observed during this deployment period, though a decline is expected in oxygen concentrations as water temperatures rise.

Station	Parameter	Mean	Median	Min	Max
Below Bridge	DO (mg/l)	13.63	13.63	12.89	14.32
Below Plant Discharge	DO (mg/l)	13.40	13.40	12.46	14.30

Turbidity

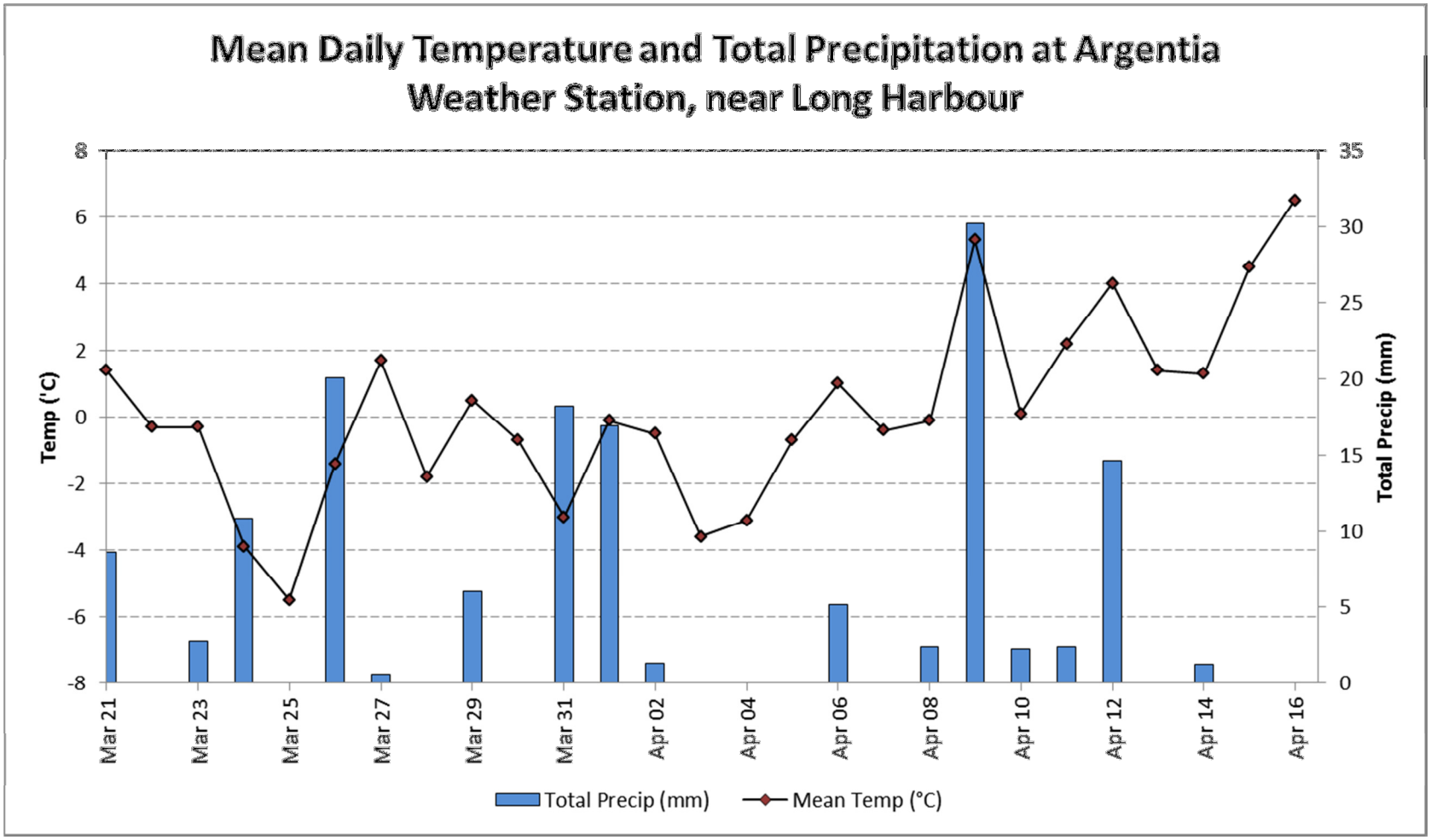
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



- Turbidity was low for Bridge station during this deployment period with a median value of 0.1 NTU. Plant Discharge station, however, shows influence from additional sources such as overland flow and settling pond effluent as peak turbidity levels are substantially higher downstream.

Station	Parameter	Mean	Median	Min	Max
Below Bridge	Turb (NTU)	2.4	0.1	0.0	57.0
Below Plant Discharge	Turb (NTU)	7.1	2.8	0.0	228.3

Appendix



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