Real-Time Water Quality Deployment Report

Rattling Brook Network

January 10, 2014 to February 18, 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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2014-01-10 to 2014-02-18

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Rattling Brook Big Pond station was removed from service on January 9th due to ice conditions – drifting ice poses a risk of severe damage to instrumentation and cabling.

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

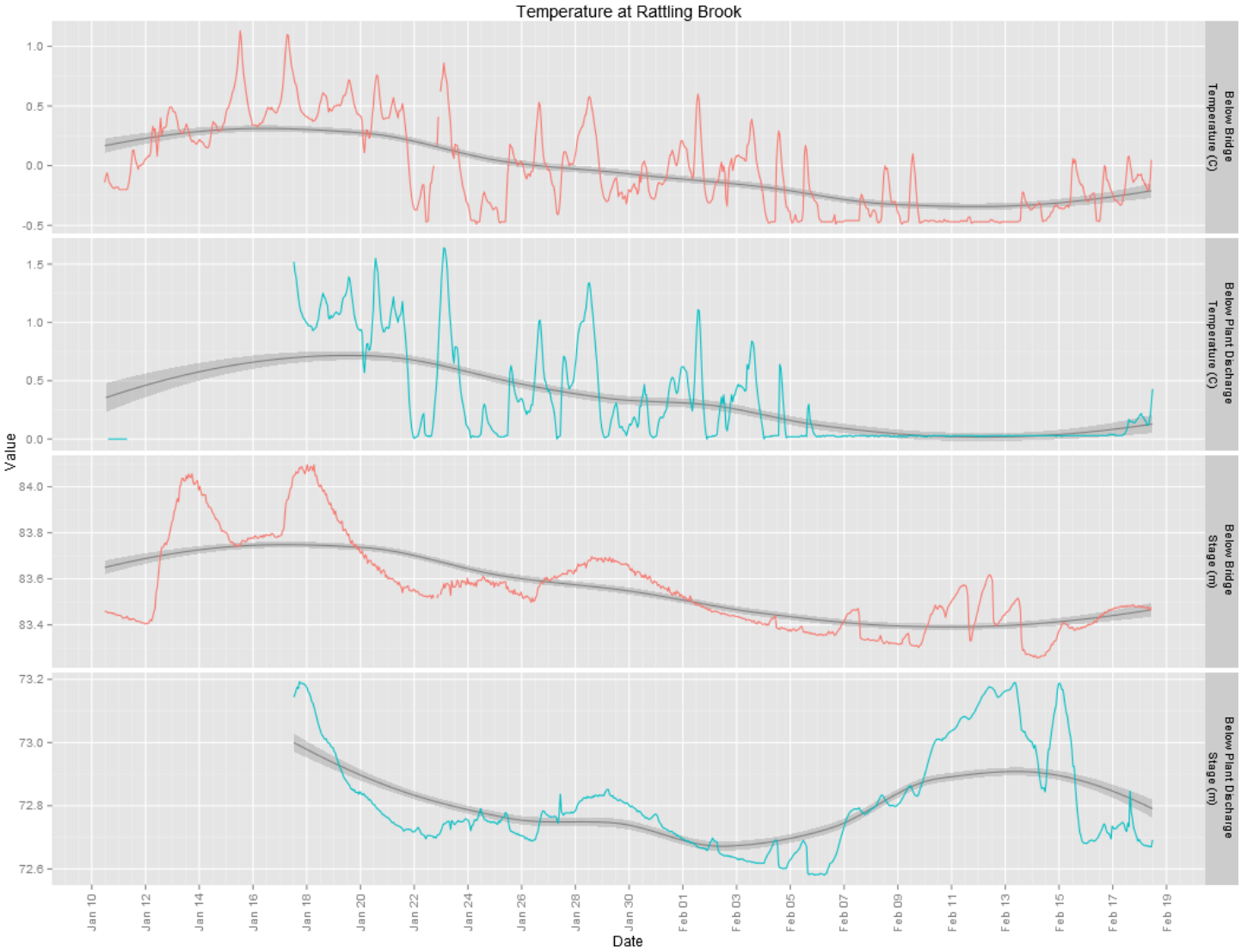
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook below Bridge	January 10, 2014	Deployment	Good	Marginal	Excellent	NA	Excellent
	February 18, 2014	Removal	Good	Good	Excellent	Good	Excellent
Rattling Brook below Plant Discharge	January 10, 2014	Deployment	Excellent	Excellent	Good	NA	Excellent
	February 18, 2014	Removal	Excellent	Excellent	Excellent	Good	Good

- The QAQC sonde battery was insufficient to power the LDO sensor during deployment time, likely due to the deep cold at the time. The result was insufficient data for ranking, resulting in NAs.
- At deployment time, the Bridge station Field sonde reported a lower than expected pH reading resulting in a "Marginal" ranking, At removal, however, a "Good" reading achieved, indicating that the pH sensor may require replacement in the future.

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.

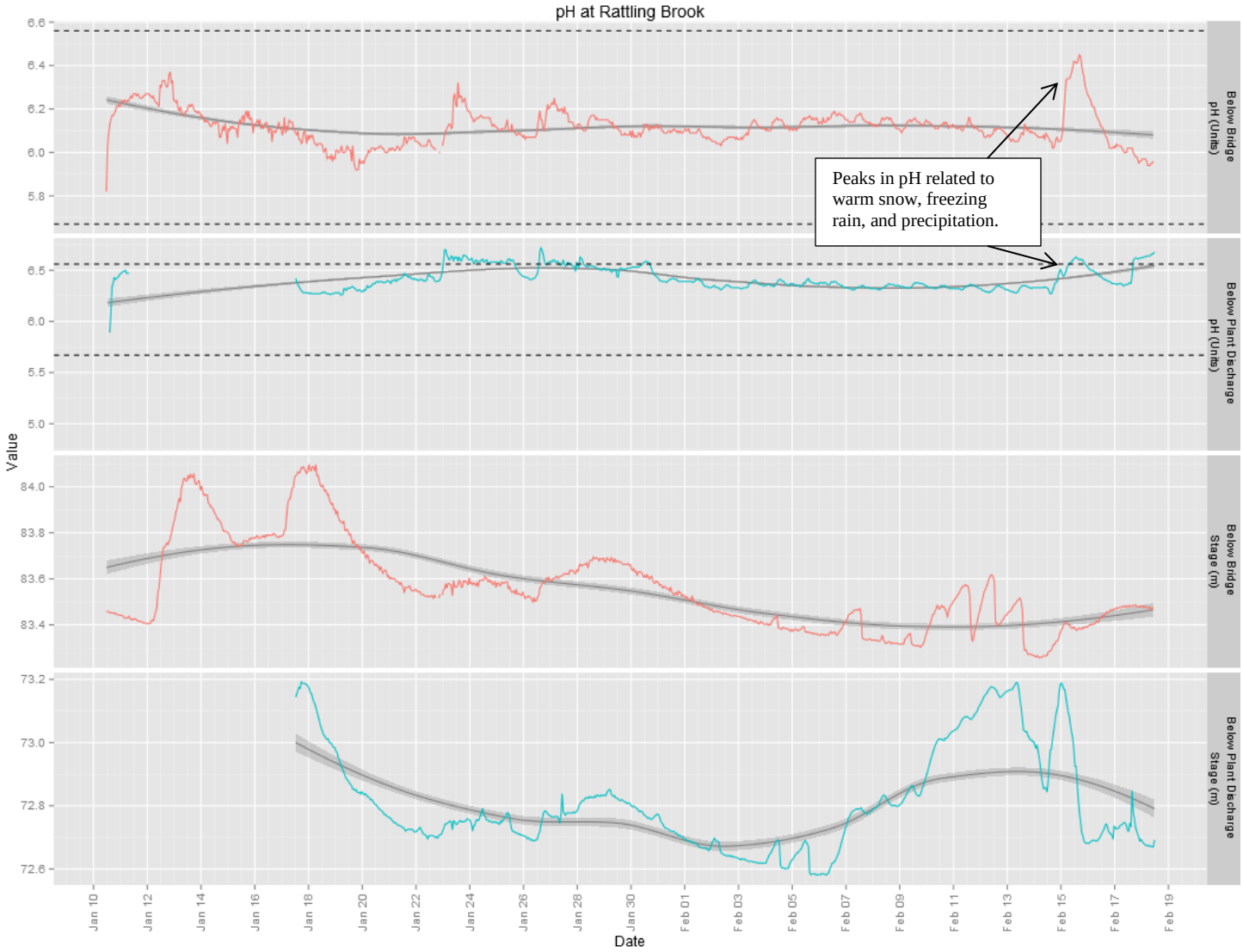


Station	*Parameter*	*Mean*	*Median*	*Min*	*Max*
Below Bridge	Temperature (C)	-0.03	-0.11	-0.49	1.13
Below Plant Discharge	Temperature (C)	0.31	0.05	0.00	1.64

- At both stations, water temperature fell gradually until ice cover maintained water temperatures near zero or slightly below on February 6th at both Bridge and Plant Discharge stations. Generally, water temperatures below 0^{o}C are achieved when there is vigorous and turbulent flow that prevents freezing.

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.

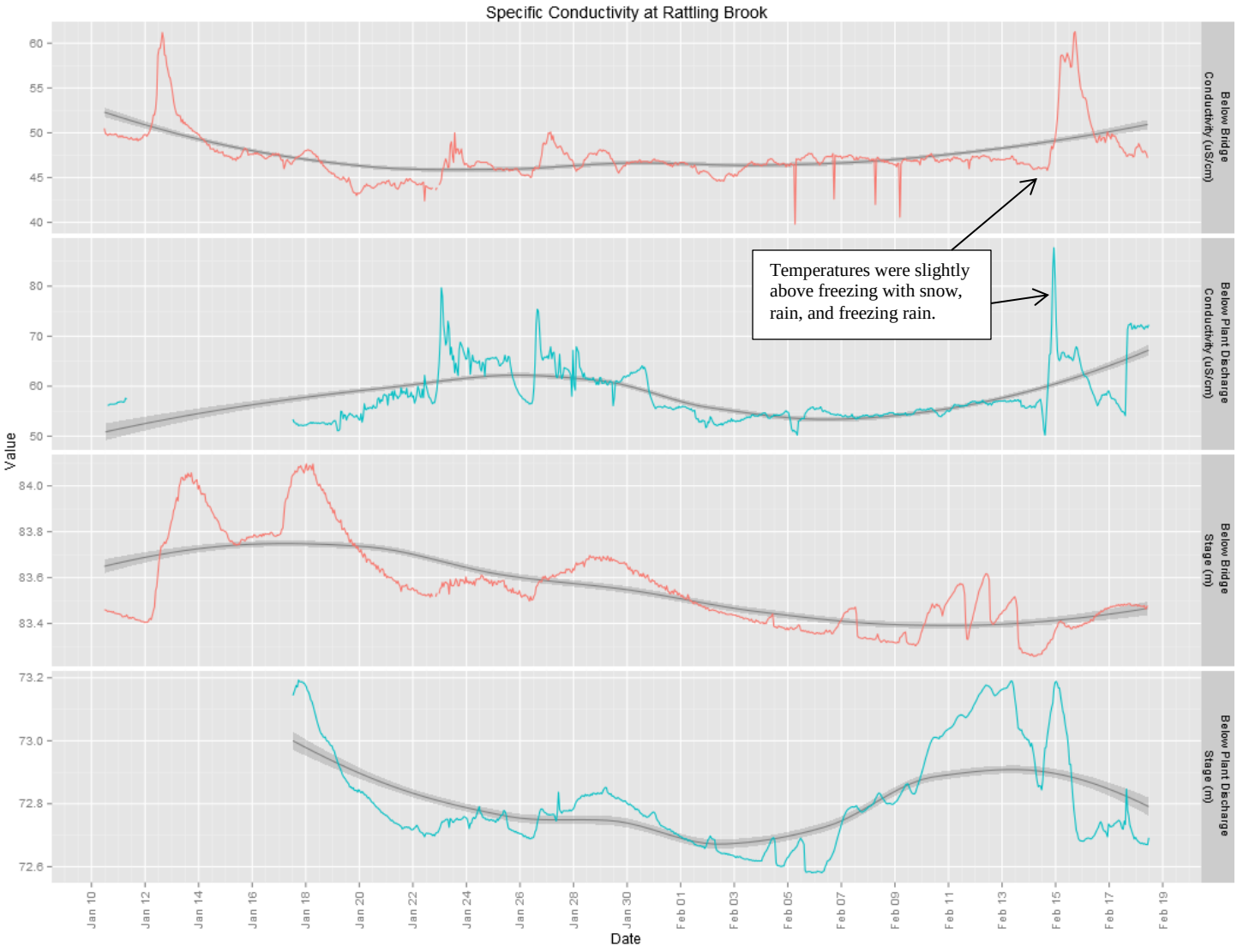


Station	*Parameter*	*Mean*	*Median*	*Min*	*Max*
Below Bridge	pH (Units)	6.12	6.11	5.82	6.45
Below Plant Discharge	pH (Units)	6.41	6.38	4.83	6.72

- pH values at Bridge station fell within the Site Specific Guidelines (dashed lines at 5.67 and 6.56) for the entire deployment period while straddling the upper SSG at Plant Discharge station in late-January and mid-February. No major trend is evident at either station.

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.

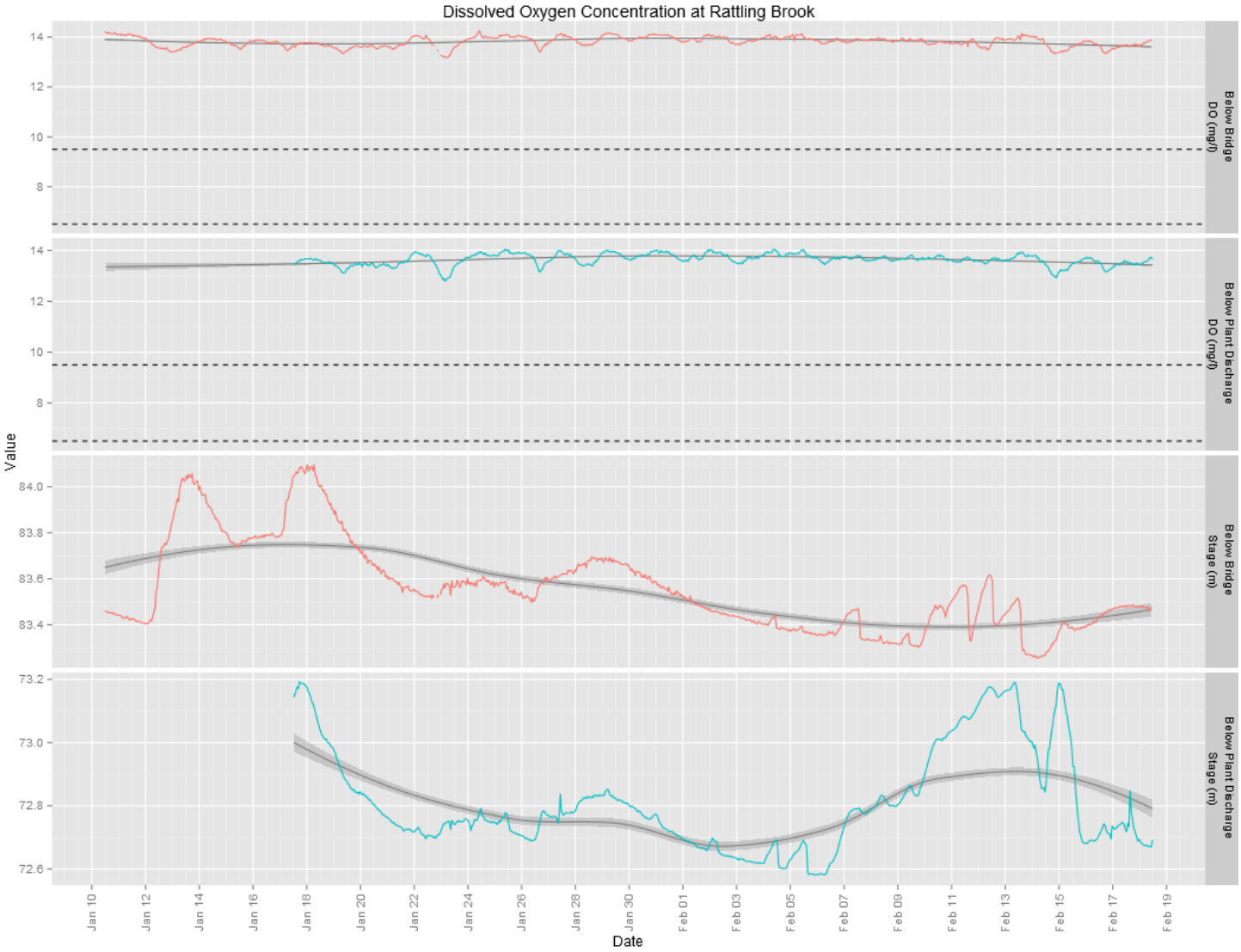


Station	*Parameter*	*Mean*	*Median*	*Min*	*Max*
Below Bridge	Conductivity (uS/cm)	47.4	47.0	39.8	61.3
Below Plant Discharge	Conductivity (uS/cm)	58.2	56.4	50.2	87.7

- Conductivity peaked at both stations on February 14 – 15 during stormy conditions with snow and freezing rain. Precipitation inflow into the Rattling Brook river channel increases the concentration of dissolved solids.

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.



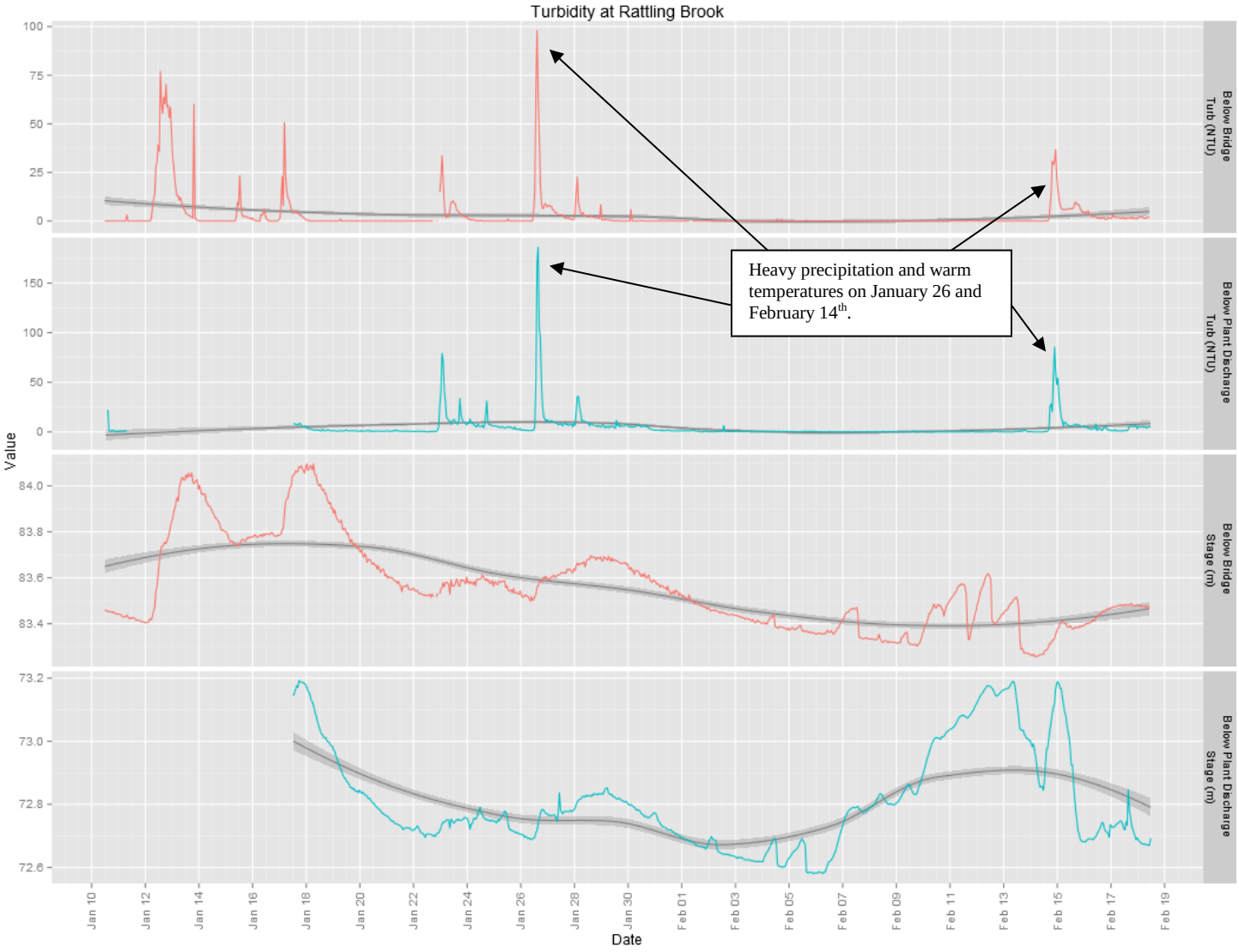
Station	*Parameter*	*Mean*	*Median*	*Min*	*Max*
Below Bridge	DO (mg/l)	13.81	13.84	13.18	14.25
Below Plant Discharge	DO (mg/l)	13.65	13.67	12.79	14.11

- Dashed lines in the figures above indicate CCME Guidelines for the protection of early (9.5 mg/l O_2) and other life stage (6.5 mg/l O_2) cold-water biota. All dissolved oxygen levels were found to be above the CCME guidelines for the protection of early life stage aquatic biota (9.5 mg/l). Oxygen concentrations were

relatively stable at both Bridge and Plant Discharge stations, though were marginally higher at Bridge station.

Turbidity

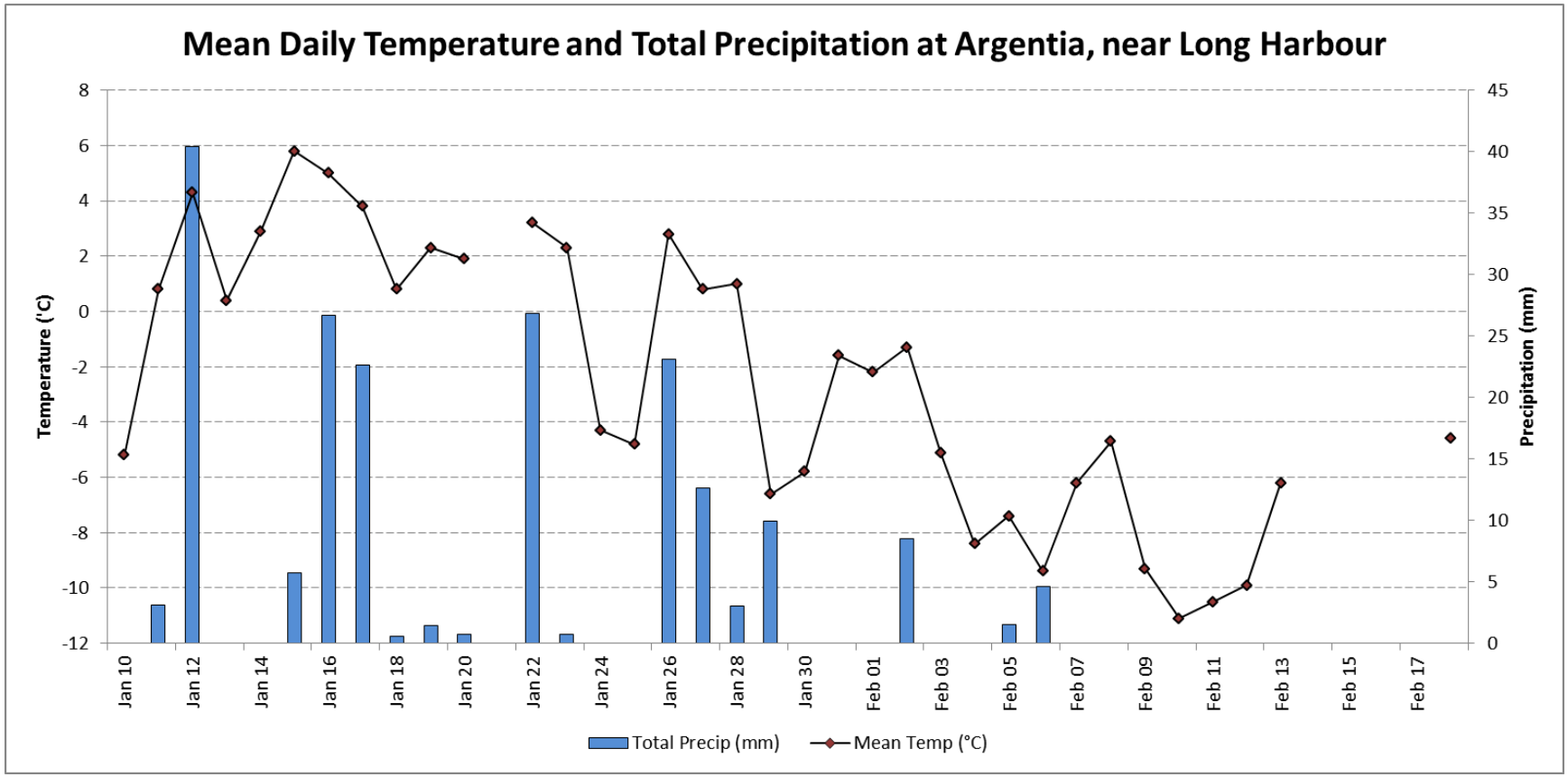
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Station	*Parameter*	*Mean*	*Median*	*Min*	*Max*
Below Bridge	Turb (NTU)	2.8	0.0	0.0	97.9
Below Plant Discharge	Turb (NTU)	4.5	0.9	0.0	186.1

- The trend in turbidity is similar at both Bridge and Plant Discharge station, though the peaks are higher at Plant Discharge. Plant Discharge station intercepts the outflow from settling ponds draining the main plant site, which is a source of silt and sediment input into the Rattling Brook system.

Appendix



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