Real-Time Water Quality Deployment Report

Paddy's Pond

November 20, 2015 to December 18, 2015

Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

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2015-11-20 to 2015-12-18

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Due to the risks inherent in through-ice deployments, it was decided to remove instrumentation from Paddy's Pond for the winter season. The station will be reactivated in Spring 2016.

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

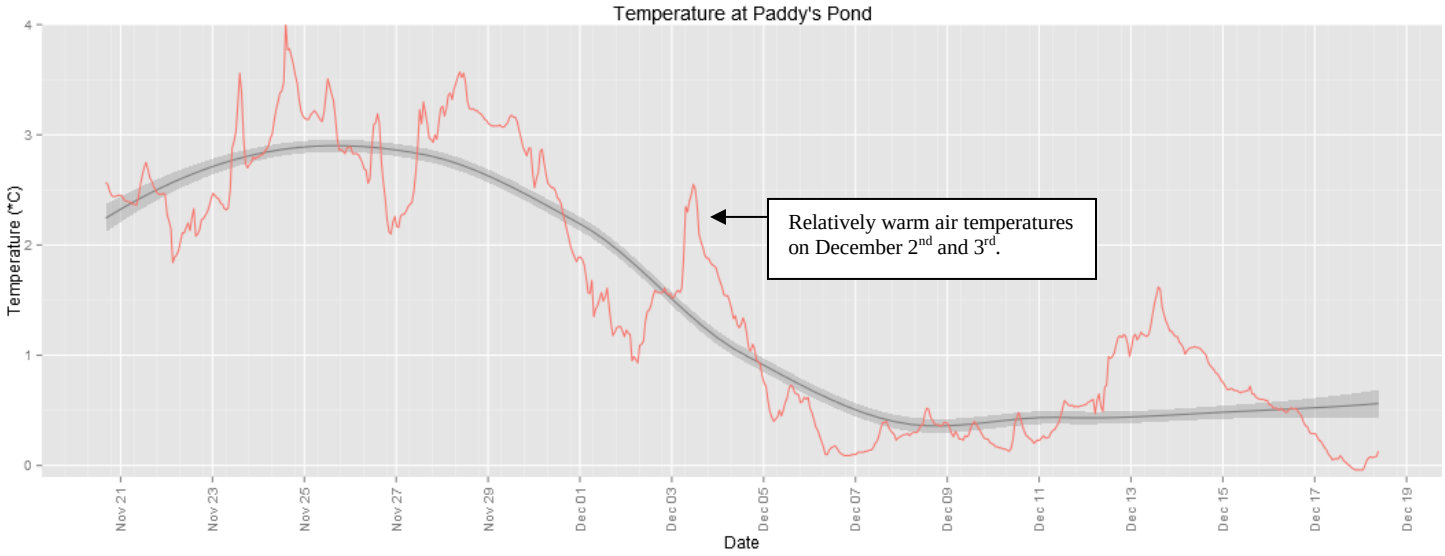
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	November 20, 2015	Deployment	Good	Excellent	Excellent	Good	Excellent
	December 18, 2015	Removal	Good	Poor	Poor	Excellent	Excellent

- The QAQC instrument was deployed in the upper water layers, approximately 2 feet above the Field sonde, resulting in some significant differences in parameters, especially since the upper layer of water was disturbed when ice was physically removed from the area.

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.

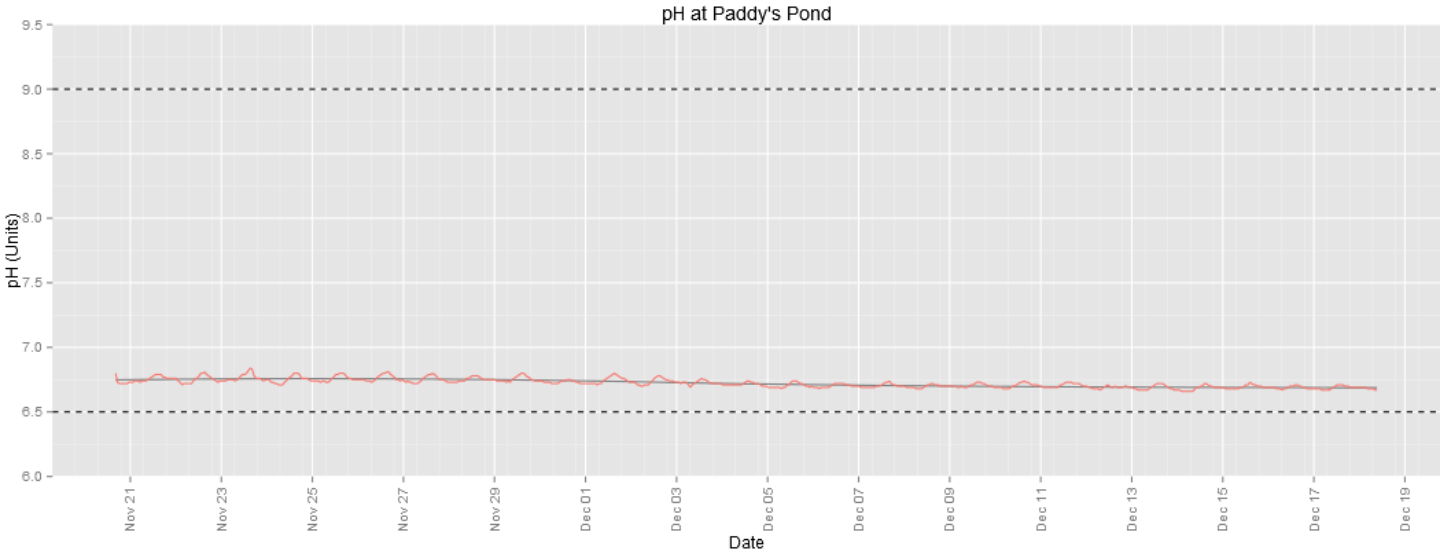


Mean	Median	Min	Max
1.49	1.22	-0.04	4.01

- In general, water temperature fell during this deployment period, however an intervening series of warming trends were observed in response to warm air temperatures and precipitation. Ice conditions were present at the deployment period when approximately 27 cm of ice was broken to remove the instrument.

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.

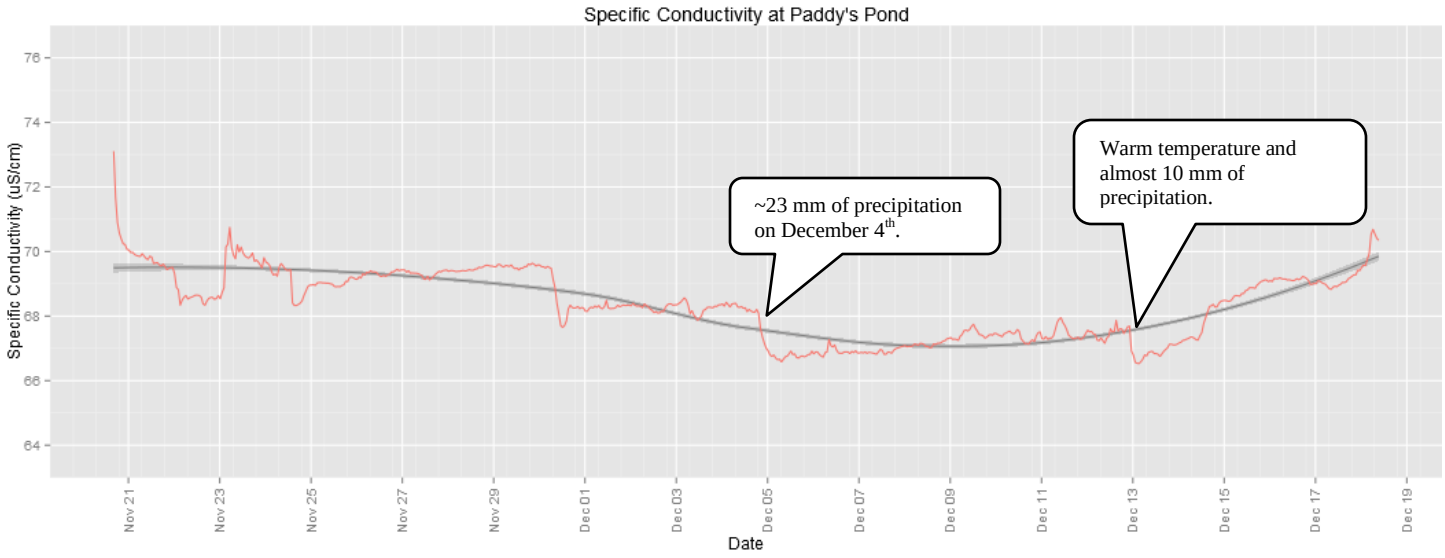


Mean	Median	Min	Max
6.72	6.72	6.66	6.84

- pH levels were very stable during the deployment period and ranged from 6.84 to 6.66 – all between the CCME guidelines for the protection of cold-water life. A slight downward trend was observed and as was the presence of diurnal cycling in pH values.

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.

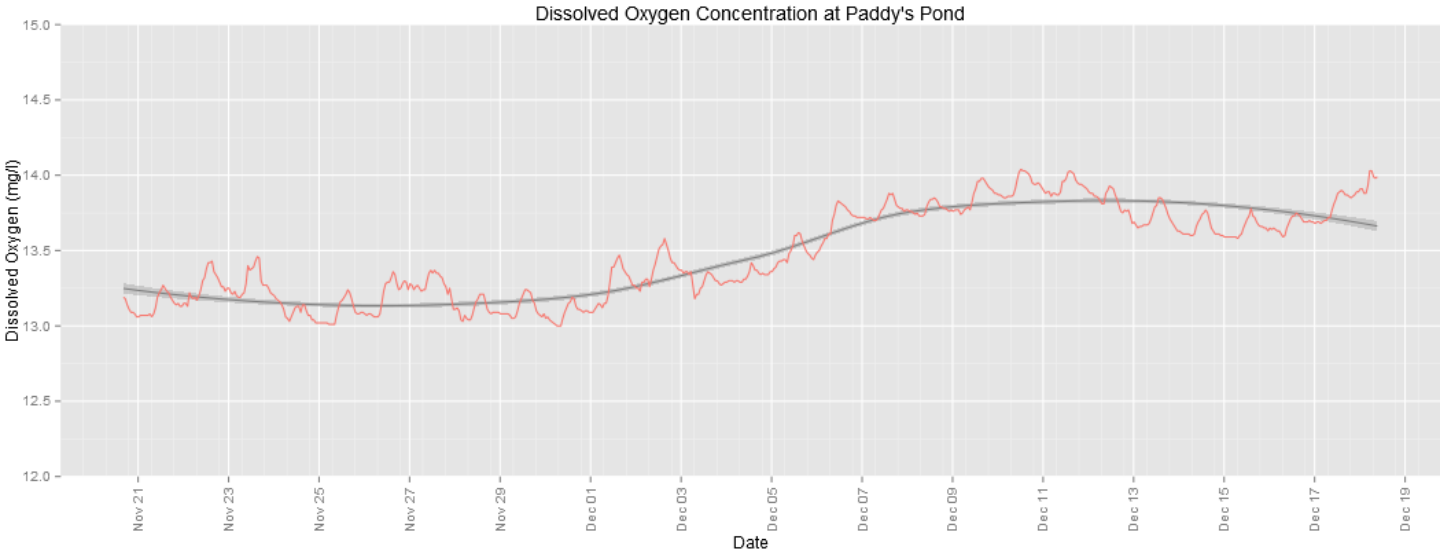


Mean	Median	Min	Max
68.37	68.35	66.53	73.11

- Specific conductivity fell throughout the first half of the deployment period before beginning to rise into the latter half of the deployment. A series of sudden drops in conductivity are observed during this deployment period that can be related to temperature fluctuations and/or precipitation events.

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.

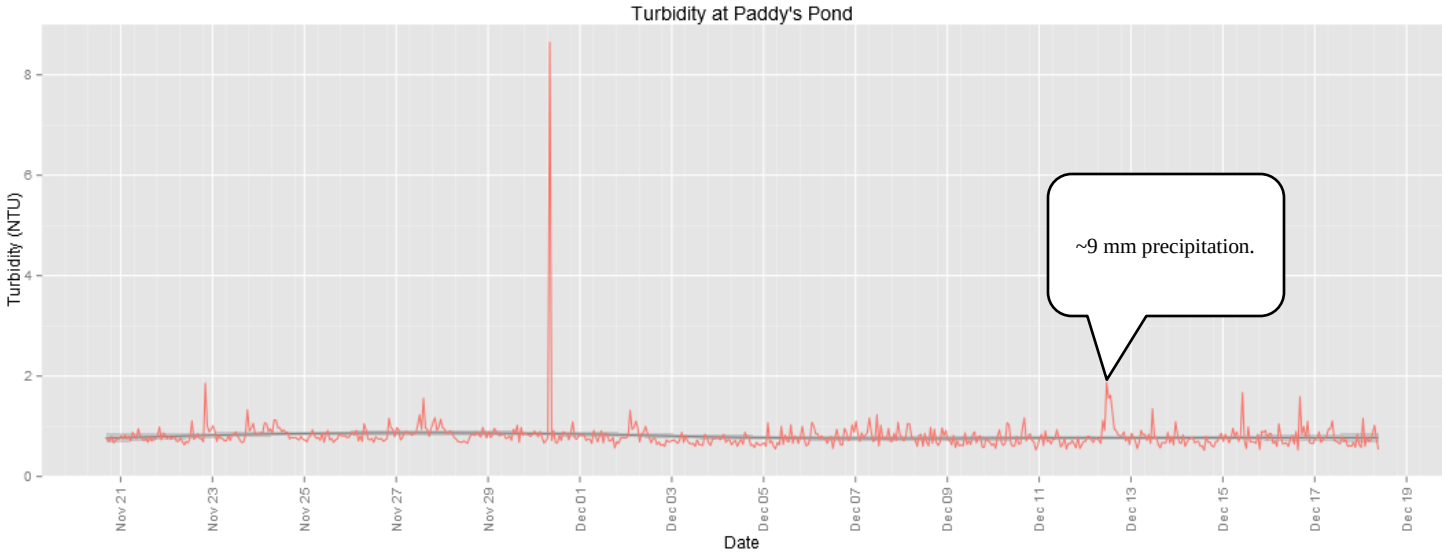


Mean	Median	Min	Max
13.47	13.42	13.00	14.04

- The initial and latter parts of the deployment period were relatively stable with a mid-deployment oxygen concentration increase occurring in response to falling water temperature. Dissolved oxygen concentrations are not expected to increase much more than the deployment high of 14.04 mg/l.

Turbidity

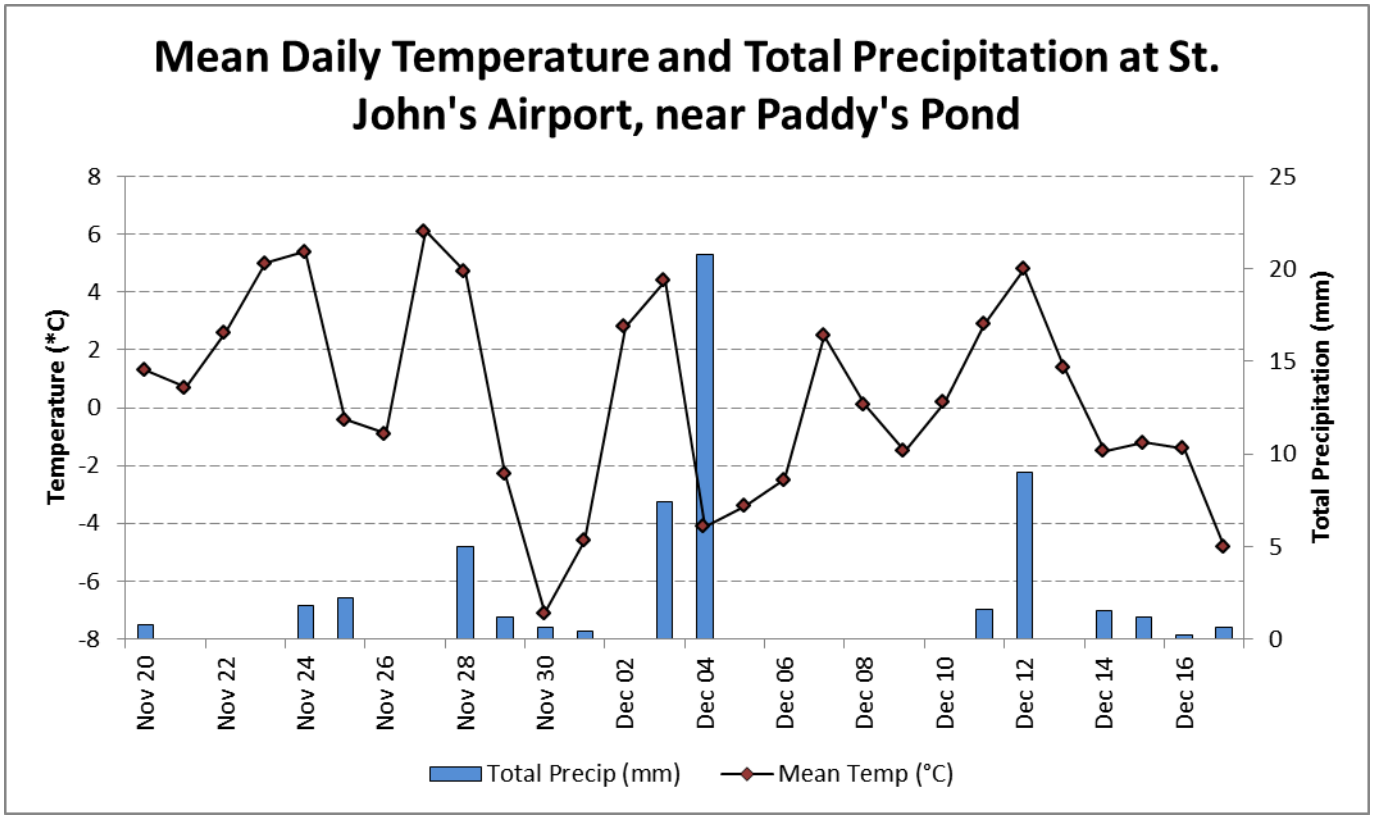
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.81	0.76	0.52	8.65

- Low level turbidity was consistent during this deployment period with a single peak of 8.65 NTU. This peak was likely an errant sensor blockage. Variability in measurements appears to have increased towards the latter half of the deployment period, possibly as a result of freezing conditions and ice formation.

Appendix



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