Real-Time Water Quality Deployment Report

Paddy's Pond

July 10, 2015 to August 28, 2015

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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2015-07-10 to 2015-08-28

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Paddy's Pond is a Research and Development test site used to trial atypical instrumentation and deployment techniques. During this period, the field sonde deployed was an Exo2 multi-parameter sonde.

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

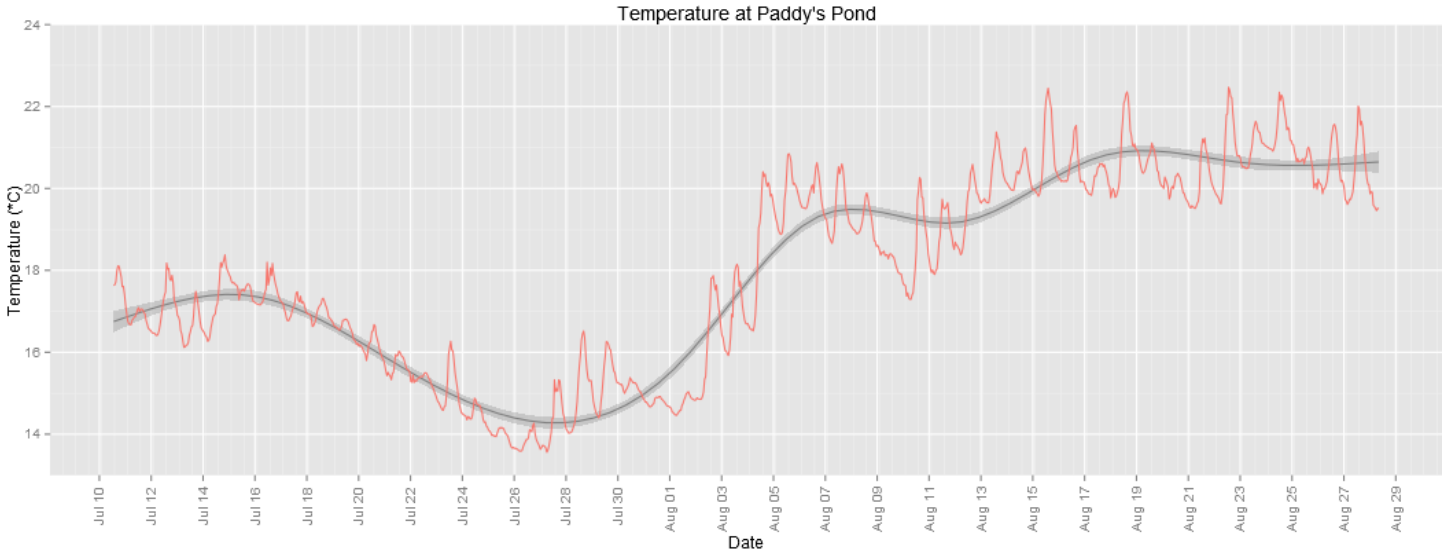
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	July 10, 2015	Deployment	Poor	Excellent	Excellent	Excellent	Excellent
	August 28, 2015	Removal	Excellent	Excellent	Good	Excellent	Excellent

- Because of a cable fault, during removal the QAQC sonde could only be connected to the handheld device via Bluetooth. Unfortunately, Bluetooth disconnects when the instrument is submerged limiting the depth at which QAQC readings could be taken. As a result, the QAQC sonde was immersed in the warmer surface layer of Paddy's Pond resulting in a poor ranking (QAQC Sonde temperature: 19.07^{o}C, Field Sonde temperature: 17.76^{o}C).

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.

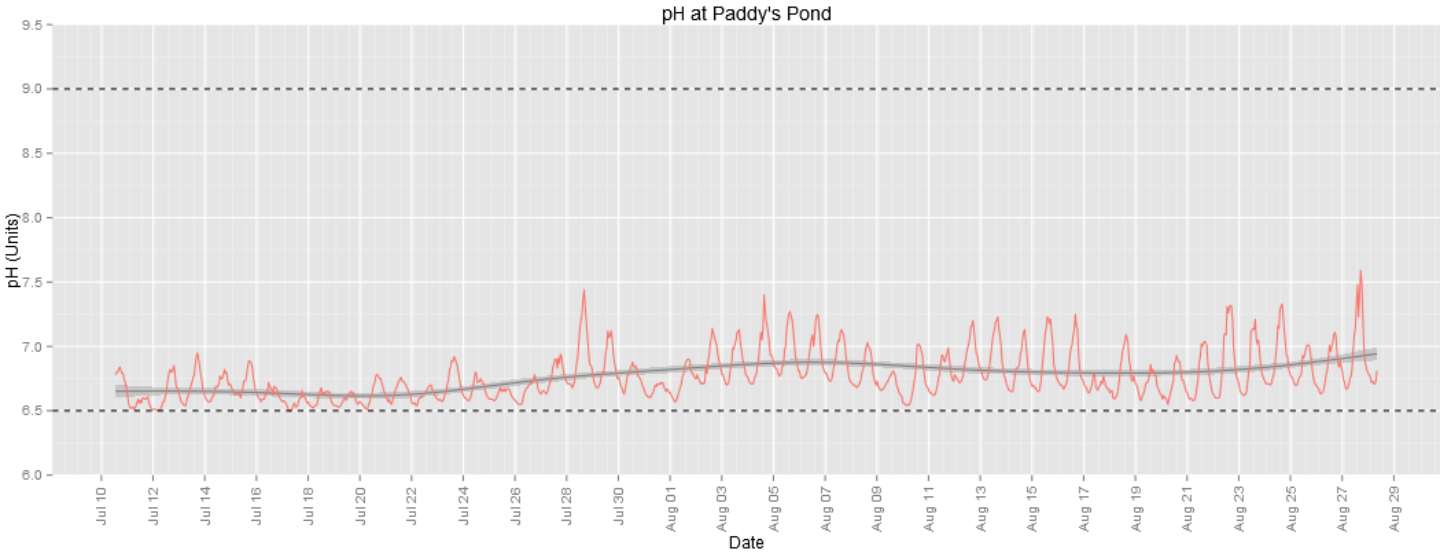


Mean	Median	Min	Max
17.97	17.91	13.56	22.47

- Water temperature at Paddy's Pond increased from early July into late August, mostly matching trends in air temperature (see Appendix). A mid-deployment drop in water temperature beginning around July 16th and ending around July 27th was associated with both cool air temperatures below 15^{o}C and consistent – and occasionally heavy – precipitation.

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.

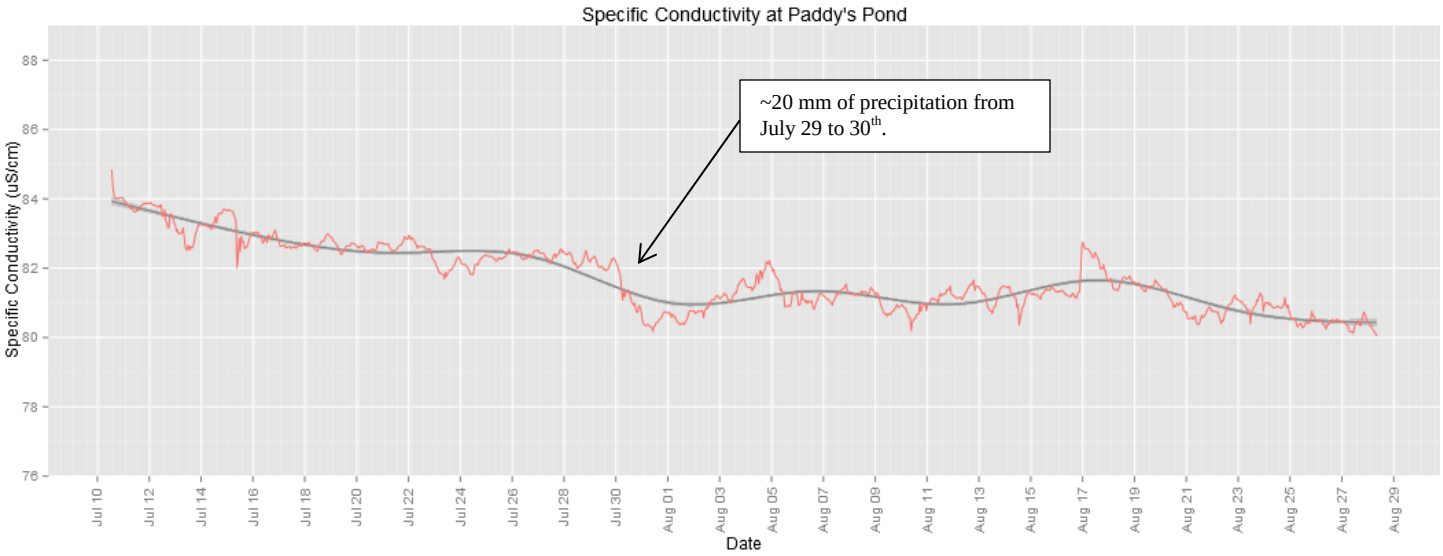


Mean	Median	Min	Max
6.77	6.72	6.50	7.59

- pH level increased through the deployment period and showed increased magnitude of diurnal varation. This is likely related to the increase in water temperature encouraging a greater degree of respiration and photosynthesis by aquatic biota. At night, respiration predominates resulting in a net CO_2 production and subsequent acidification via carbonic acid formation. During daylight hours, CO_2 consumption predominates, reducing carbonic acid concentration and increasing pH.

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.

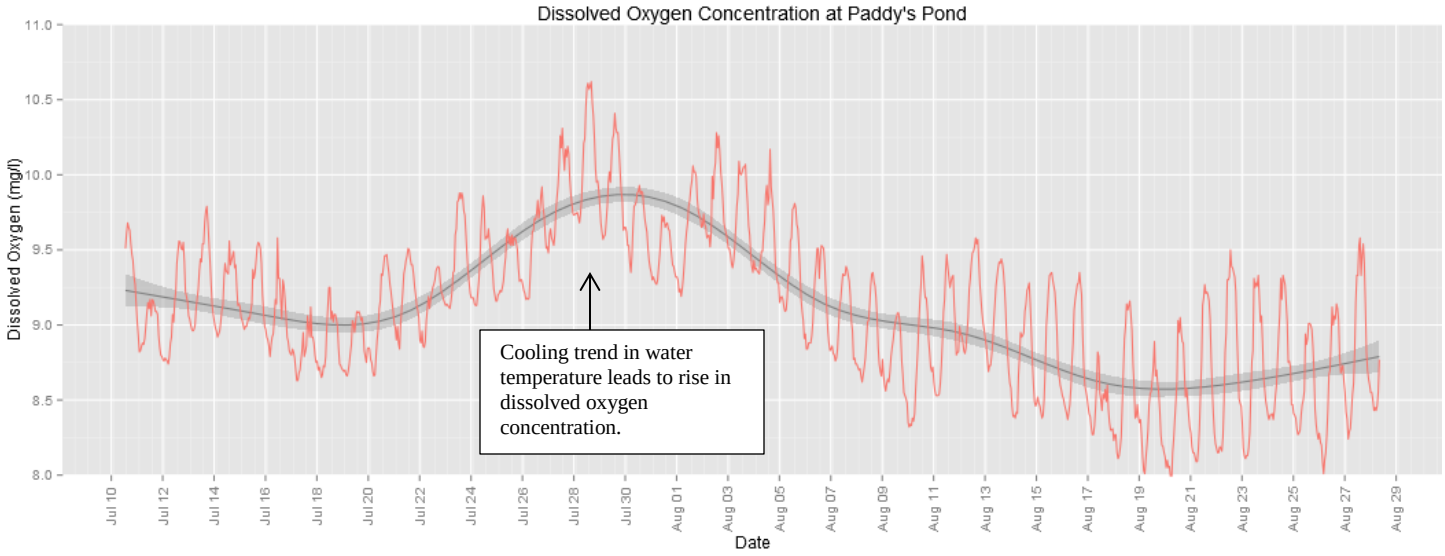


Mean	Median	Min	Max
81.73	81.45	80.04	84.85

- Specific conductivity decreased throughout the deployment period especially at times when precipitation was heavy.

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.

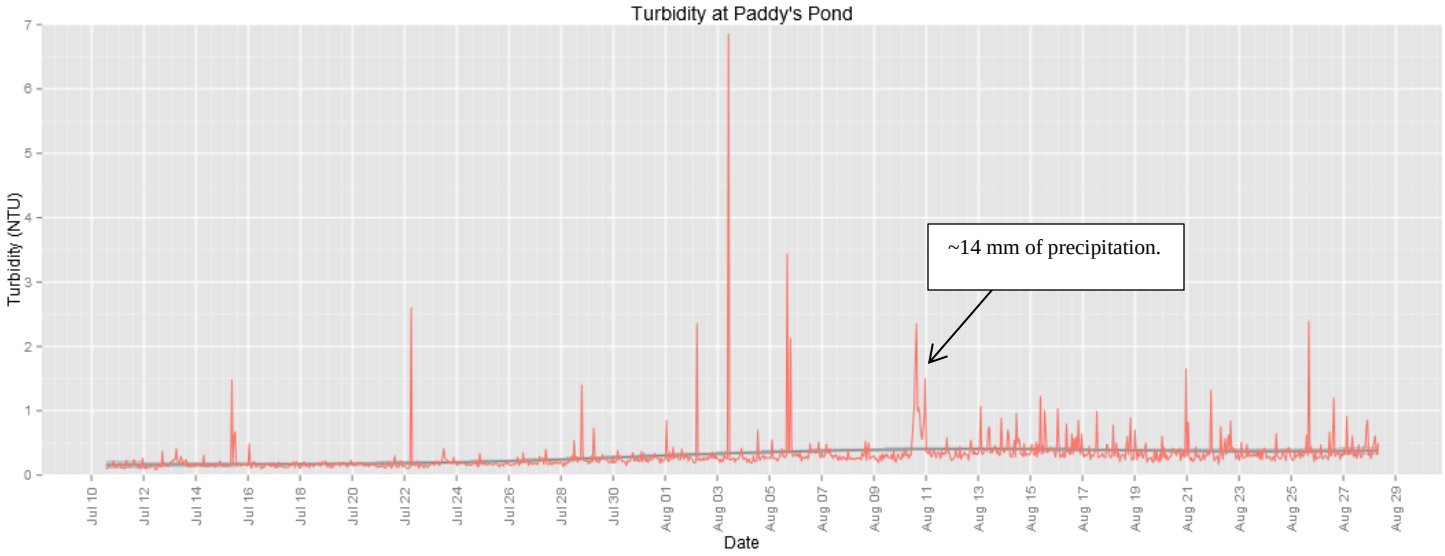


Mean	Median	Min	Max
9.10	9.12	7.96	10.62

- Dissolved oxygen concentrations showed a generally downward trend, although a substantial rise was observed during the middle of deployment (mirroring the simultaneous drop in water temperature). Large daily swings in dissolved oxygen concentration also agree with diurnal pH values and suggest notable aquatic biota.

Turbidity

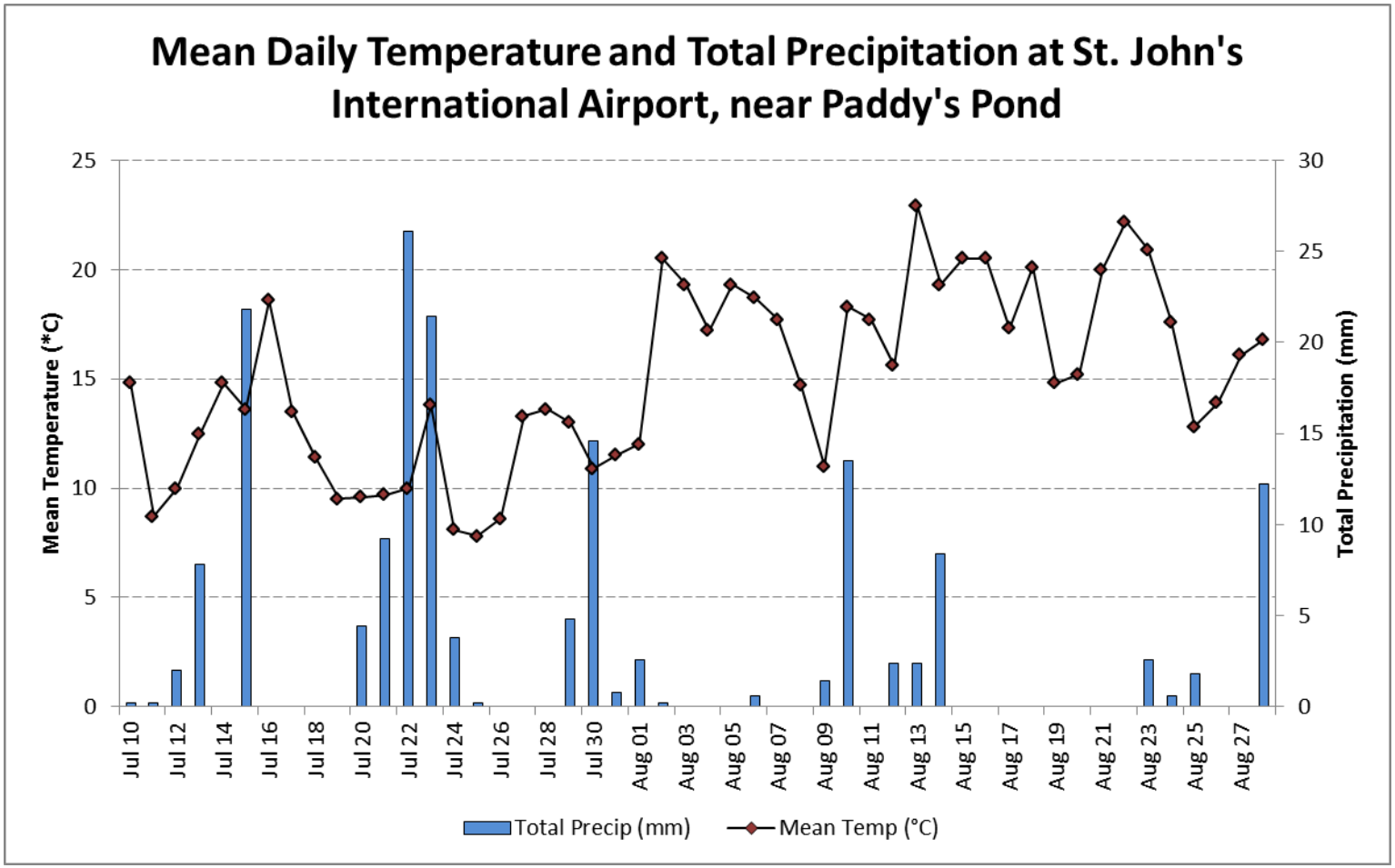
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.30	0.26	0.09	6.85

- A long-term increase in turbidity was seen during this deployment with intermittent spikes up to 6.85 NTU. A few incidences of longer-term turbidity are seen in relation to precipitation.

Appendix



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