Real-Time Water Quality Deployment Report

Paddy's Pond

June 9, 2015 to July 10, 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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2015-06-09 to 2015-07-10

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- This is the first deployment since December 10, 2014 when instrumentation was removed due to ice cover.
- 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.

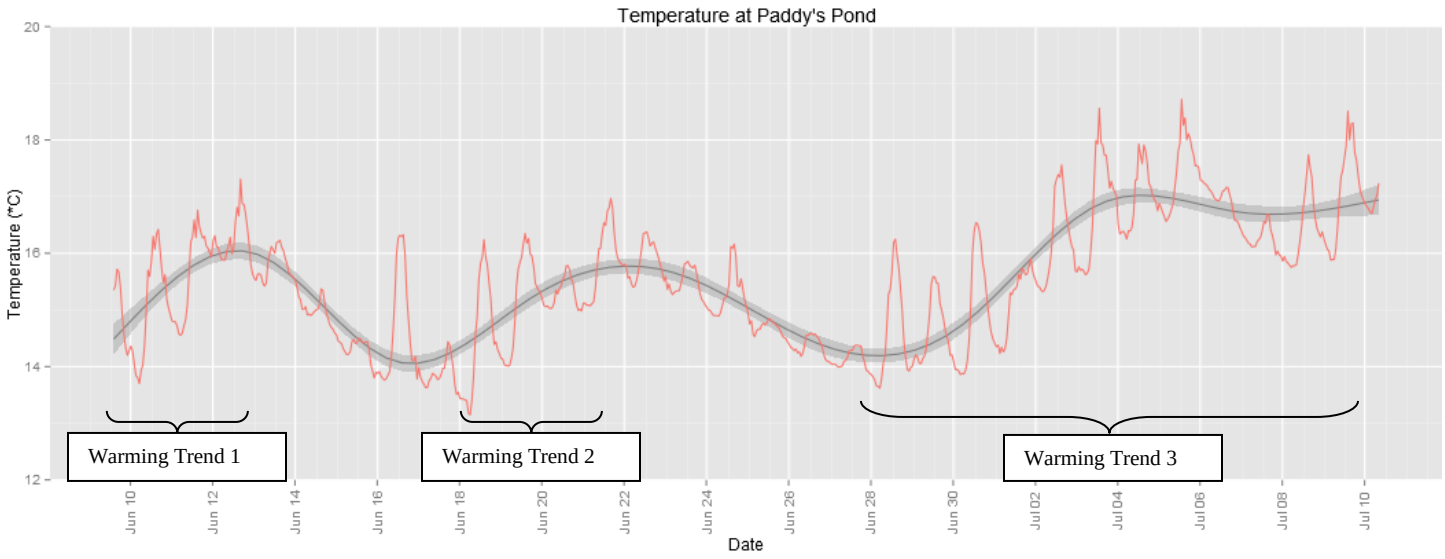
Table 1: Qualitative QAQC Ranking

Date	Action	Comparison Ranking				
		Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
June 9, 2015	Deployment	Marginal	Good	Good	Excellent	Excellent
July 10, 2015	Removal	Fair	Fair	Excellent	Fair	Excellent

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.

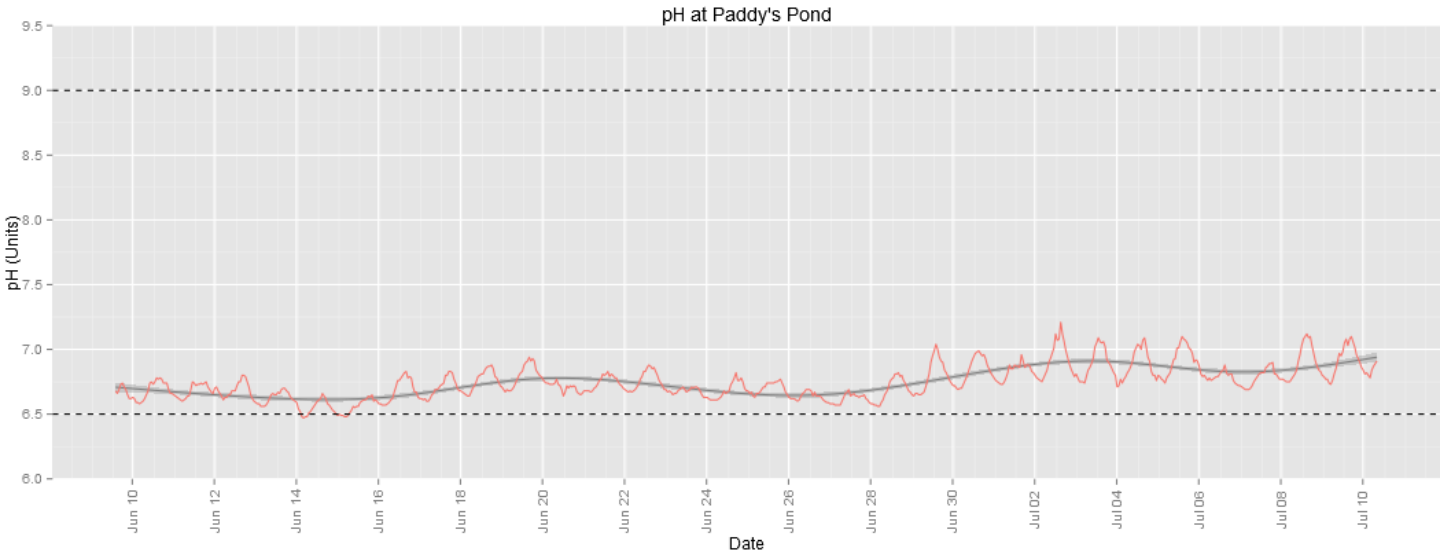


Mean	Median	Min	Max
15.54	15.54	13.15	18.72

- Water temperature exhibited three warming periods during this deployment period as a response to variable air temperatures and rainfall events. As mean daily temperatures increase into July, water temperatures are expected to increase.

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.

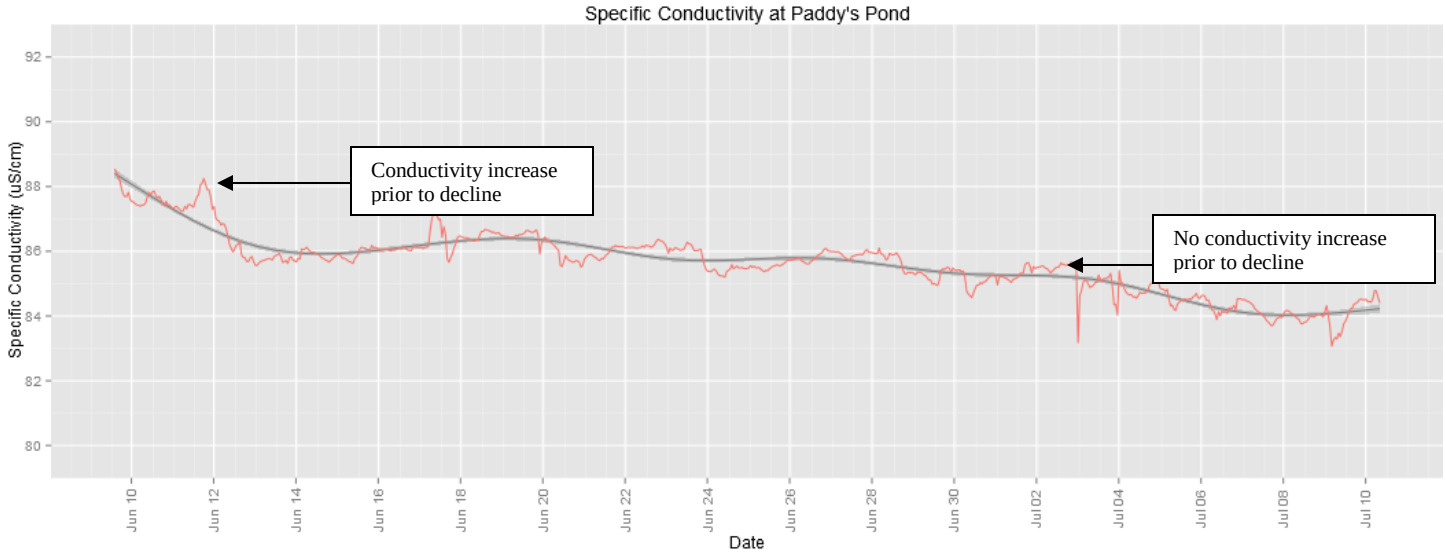


Mean	Median	Min	Max
6.75	6.74	6.47	7.21

- A slight increase in pH was observed from June to July in a response to increasing metabolic activity within Paddy's Pond. A removal of carbon dioxide from the water via photosynthesis reduces the formation of carbonic acid, thereby decreasing the acidity of the water. This effect is also seen on a smaller scale, diurnally – the rate of photosynthesis is greatly overpowered by respiration at night which produces carbon dioxide and increases the rate of carbonic acid formation, thereby increasing acidity.

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.

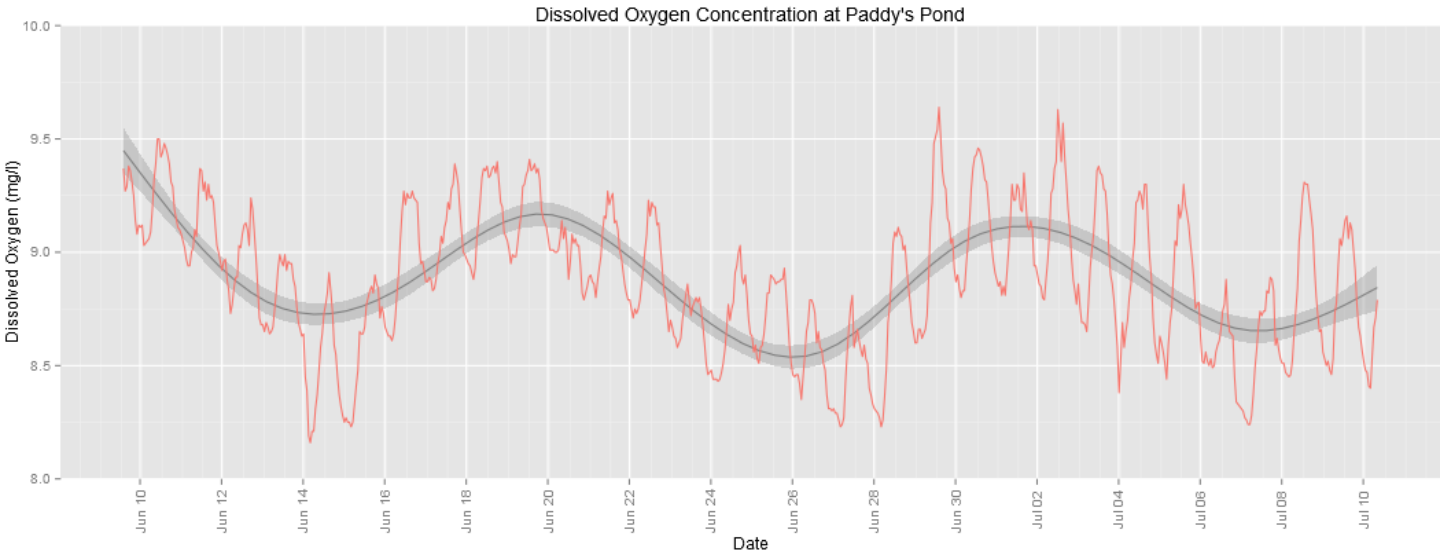


Mean	Median	Min	Max
85.62	85.71	83.07	88.54

- Specific conductivity generally falls throughout the summer season as road salt usage has stopped and precipitation induces a dilution effect in Paddy's Pond.
- Periods of especially high precipitation can have unexpected impacts on conductivity. Early in the deployment, a period of rainfall resulted in a rise prior to a substantial drop in conductivity. Later in the deployment, another rainfall event was observed that caused an increase prior to a sharp drop and rebound. Such differences may be due to differing rainfall intensities. High intensity and short duration rainfalls might result in a different amount of siltation compared to low intensity and long duration rainfalls.

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.

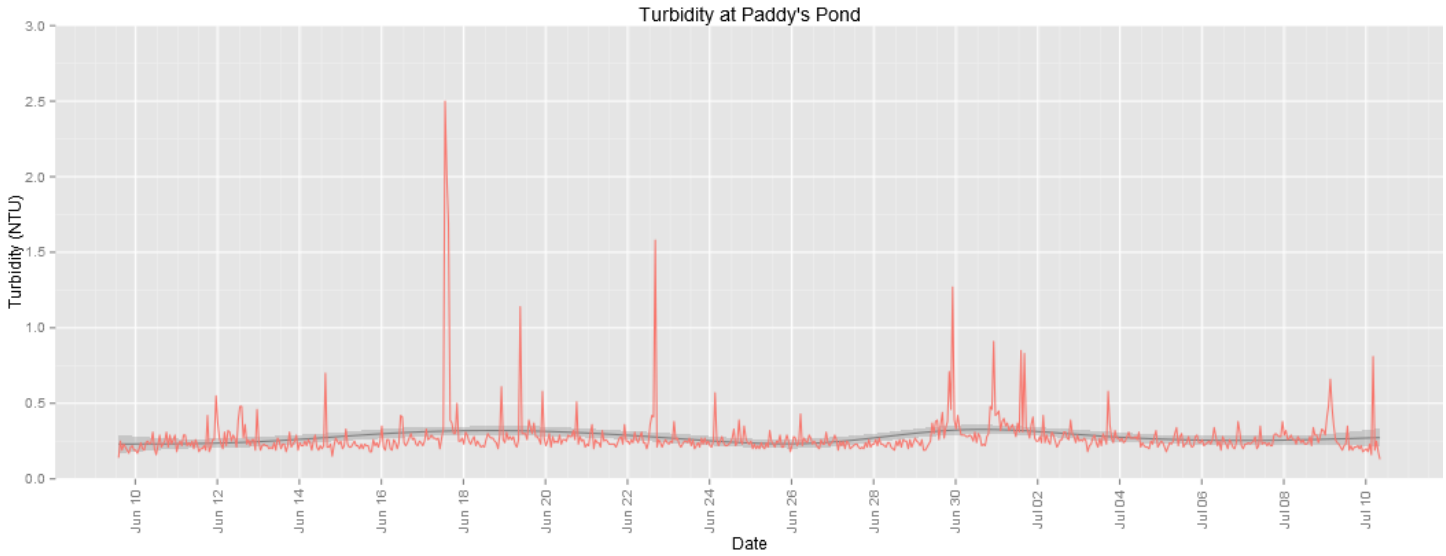


Mean	Median	Min	Max
8.89	8.88	8.16	9.68

- Dissolved oxygen saturation showed similar trends as water temperature – three distinct regions of change. These changes result from a combination of water temperature and precipitation. Lower temperature allows for a greater concentration of dissolved oxygen, however, rainfall tends to reduce the concentration of dissolved oxygen in the ponds.

Turbidity

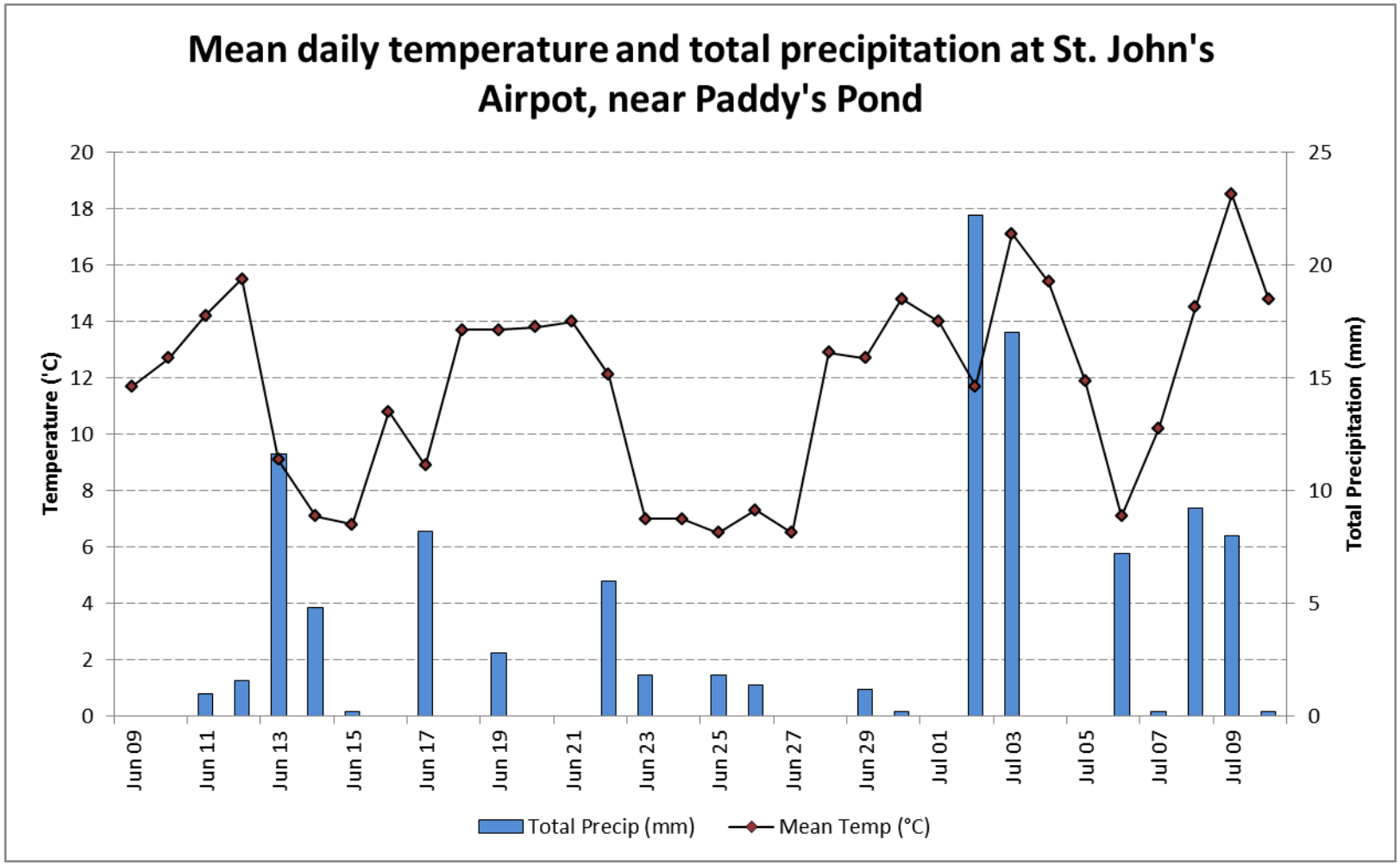
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.3	0.3	0.1	2.5

- Turbidity levels were mostly stable near 0.3 NTU for the deployment period with some small low-level peaks possibly resulting from wave action or nearby activity in the water.

Appendix



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