

Real-Time Water Quality Deployment Report

Paddy's Pond

August 28, 2015 to October 2, 2015



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



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.

Station	Date	Action	Comparison Ranking				
			Temperature	pН	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	August 28, 2015	Deployment	Fair	Poor	Fair	Excellent	Poor
	October 2, 2015	Removal	NA	NA	NA	NA	NA

Table 1: Qualitative QAQC Ranking

- Because of a cable fault, during deployment 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 and impacting the validity of the QAQC values and rankings.
- A connection could not be made between the QAQC sonde and handheld device during removal on October 2nd. Rankings could not be calculated.

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 fell throughout the deployment period with a couple of especially notable declines associated with low air temperatures and precipitation.

pН

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.



- All pH values were found to fall within the CCME guidelines for the protection of aquatic life. While many waterbodies throughout Newfoundland and Labrador tend to be acidic in nature (with the exception of parts of the west coast), Paddy's Pond was near neutral for almost the entire deployment.
- Large diurnal cycling in pH was observed, especially mid-deployment where the difference was more than 1.5 units in less than 12 hours. This is an indication of substantial aquatic productivity.

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.



Conductivity decreased through the first two thirds of the deployment but increased in the last third. No clear trend can be deciphered; however conductivity is clearly impacted – to a large degree – by precipitation.

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.



As water temperature declined, dissolved oxygen levels increased. Substantial diurnal trends in oxygen concentration were also present, and mirrored pH levels – DO and pH are highest in the day when photosynthesis is at its highest rate producing O₂ and consuming CO₂.

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.



 Background turbidity increased throughout the first half of the deployment period with several instances of spikes that may be associated with some precipitation occurrences. In the latter half of the deployment, background turbidity was relatively stable, possibly due to rain in mid-September.

Appendix



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