Real-Time Water Quality Deployment Report

Paddy's Pond

July 15, 2016 to August 12, 2016

Newfoundland Labrador

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

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2016-07-15 to 2016-08-12

General

- Department of Environment and Climate Change staff monitors the real-time web pages consistently.
- A telemetry or battery issue has resulted in partial data loss throughout this deployment period. Statistical smoothing and partial data has allowed for a reasonable analysis, however.

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

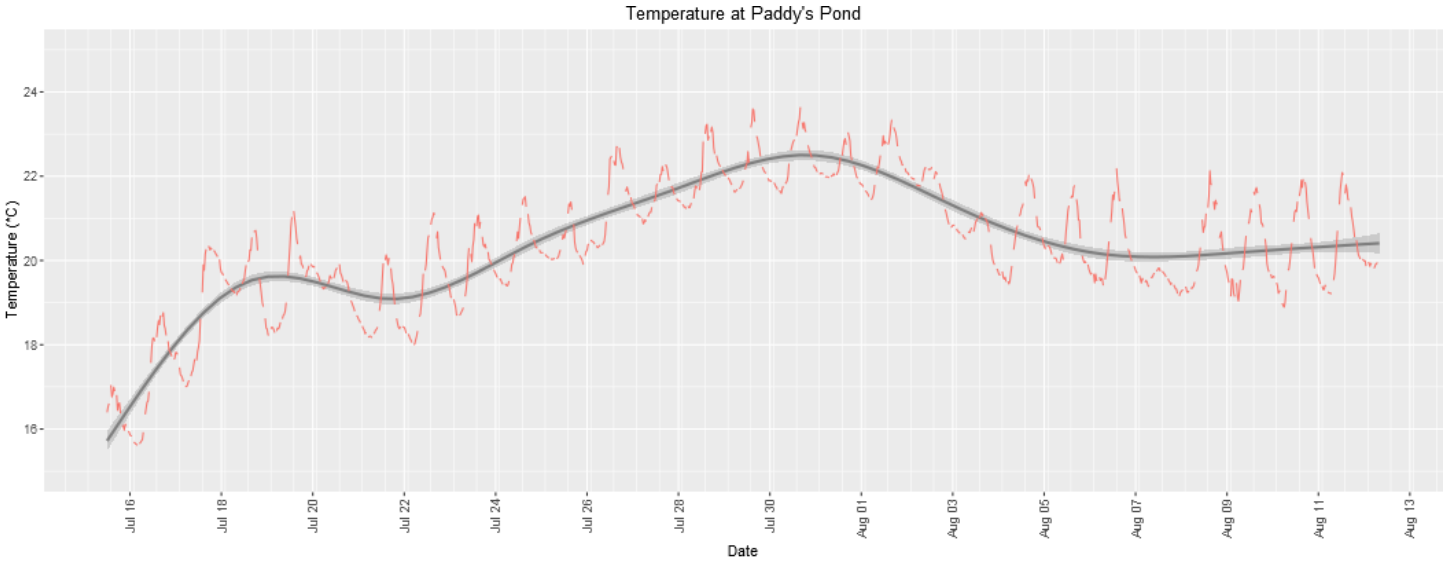
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	2016-07-15	Deployment	Fair	Good	Good	Excellent	Excellent
	2016-08-12	Removal	NA	NA	NA	NA	NA

- Could not connect to QAQC sonde during removal – 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.

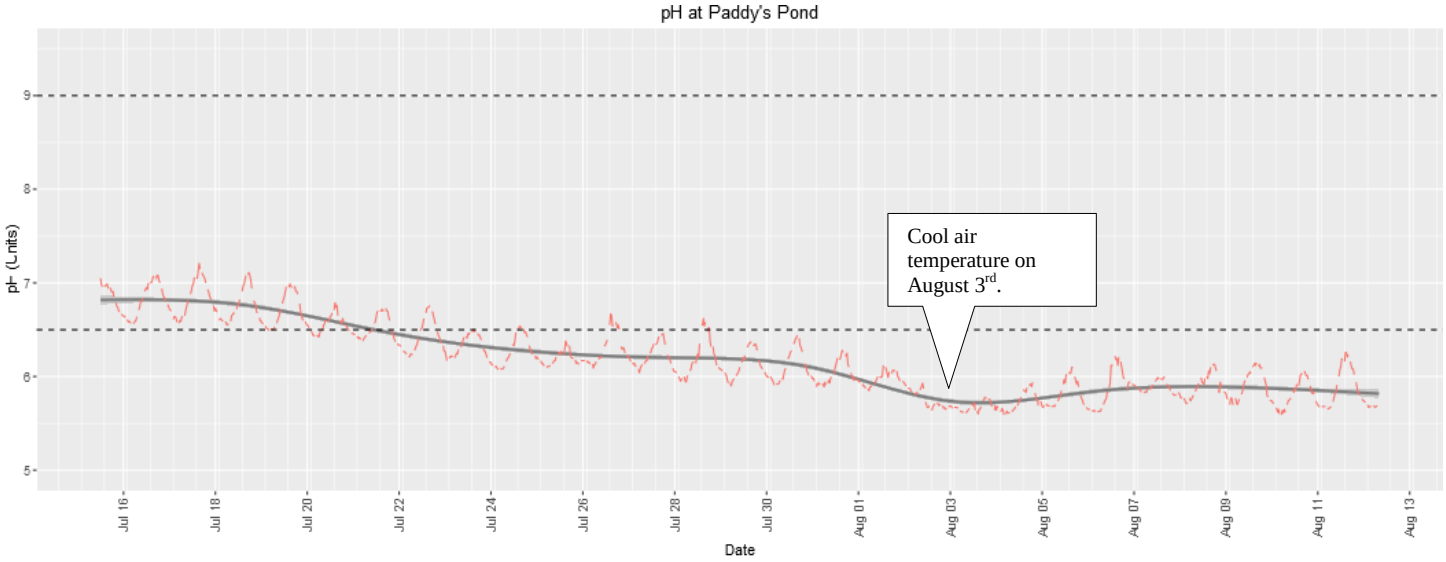


Mean	Median	Min	Max
20.36	20.30	15.62	23.64

- Water temperature increased from mid-July to mid-August with a peak temperature occurring on July 30 at 4:00 PM. Since water temperature typically peaks by the first or second week of August, this is likely the annual high temperature for 2016.

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.

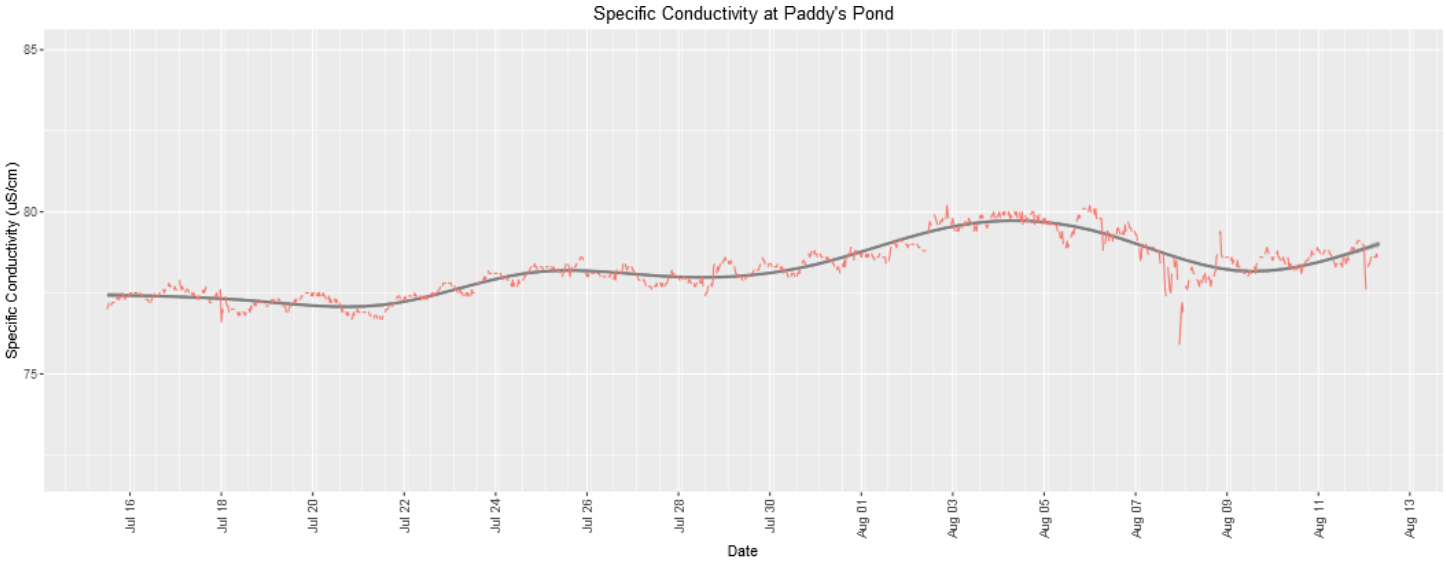


Mean	Median	Min	Max
6.18	6.12	5.59	7.21

- pH values dropped below CCME guidelines (dashed lines) near the end of July. Following a cooling period on July 3rd, the declining pH values stabilized for the remainder of the deployment.

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^{o}C to allow comparison across variable temperatures.

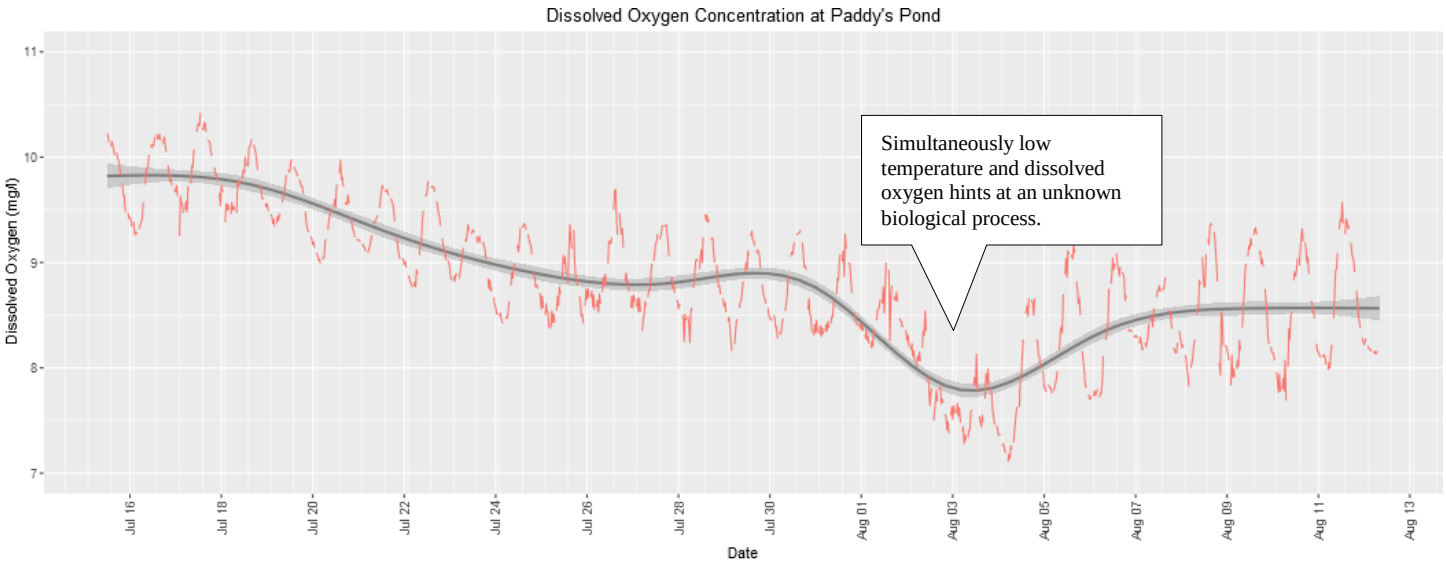


Mean	Median	Min	Max
78.2	78.2	75.9	80.5

- Over this deployment, specific conductivity increased gradually, reaching a maximum in early August. Diurnal cycling in conductivity is apparent with values peaking overnight and falling by mid-day. The mechanism for this process is not currently understood.

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.

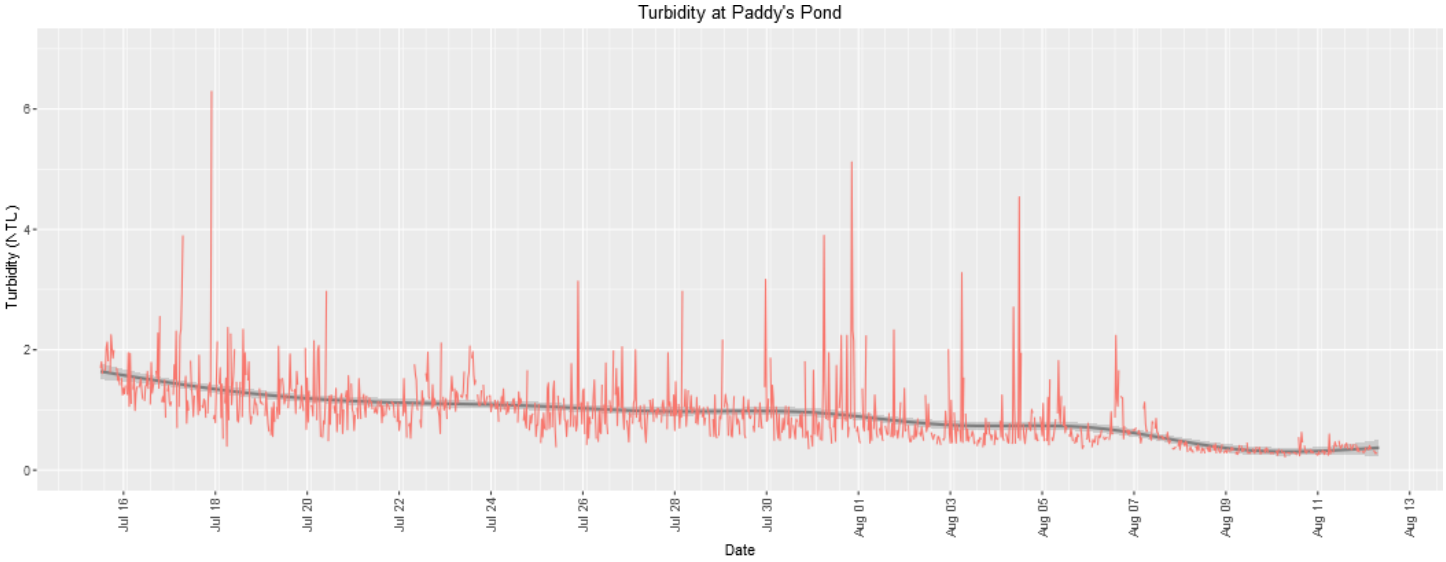


Mean	Median	Min	Max
8.82	8.82	7.11	10.42

- As water temperature increased during this deployment period, dissolved oxygen concentration declined. Substantial diurnal cycles of nearly 2 mg/l at times are observed throughout the deployment period. This indicates substantial vegetative productivity in Paddy's Pond.

Turbidity

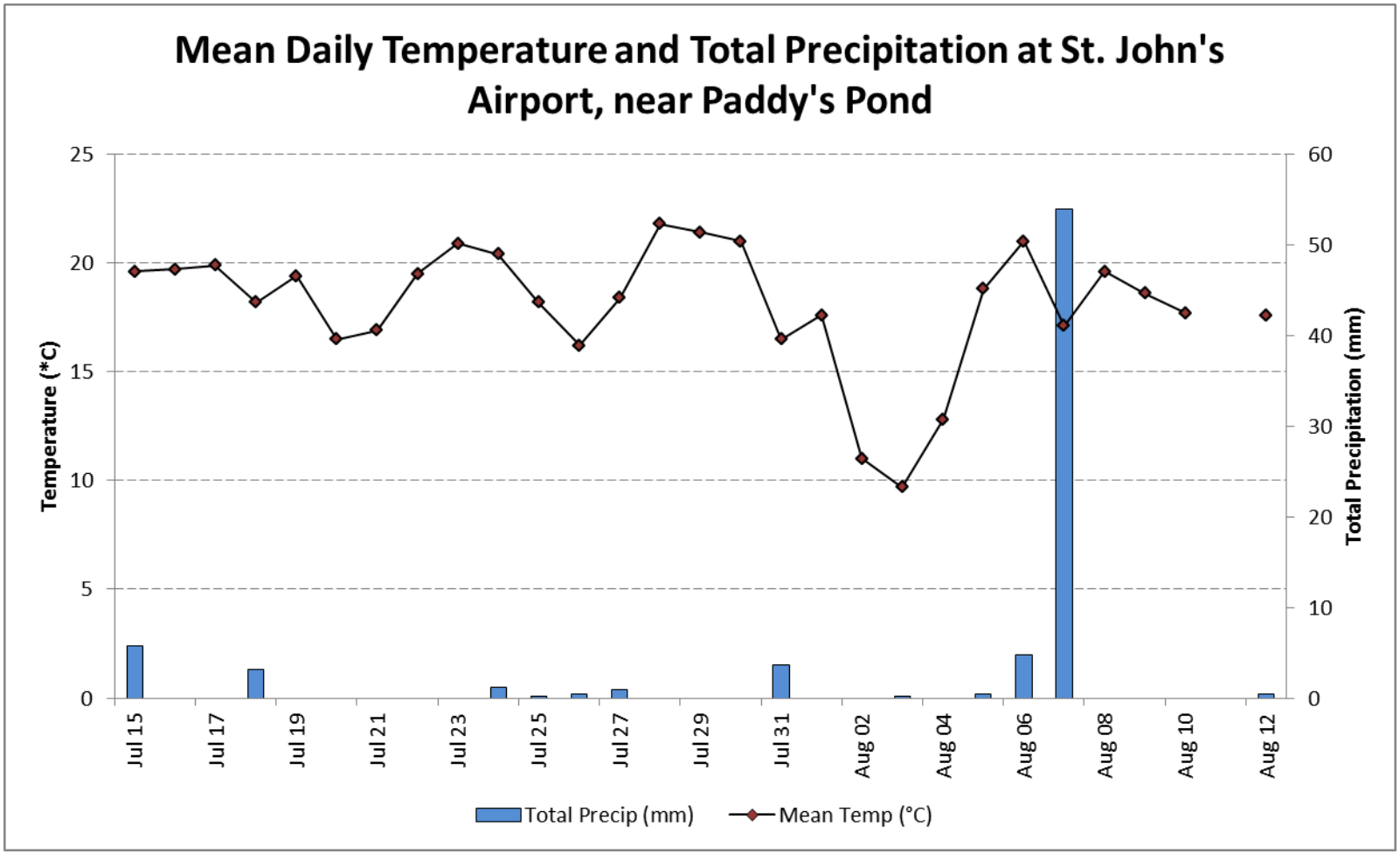
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.91	0.82	0.21	6.30

- From mid-July to mid-August turbidity levels slowly retreated and became much less variable, especially at the end of the deployment period.

Appendix


Mean Daily Temperature and Total Precipitation at St. John's Airport, near Paddy's Pond
Temperature (*C)
Total Precipitation (mm)
25
20
15
10
5
0
60
50
40
30
20
10
0
Jul 15
Jul 17
Jul 19
Jul 21
Jul 23
Jul 25
Jul 27
Jul 29
Jul 31
Aug 02
Aug 04
Aug 06
Aug 08
Aug 10
Aug 12
Total Precip (mm)
Mean Temp (°C)