Real-Time Water Quality Deployment Report

Paddy's Pond

June 2, 2017 to June 23, 2017

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

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2017-06-02 to 2017-06-23

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.

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.

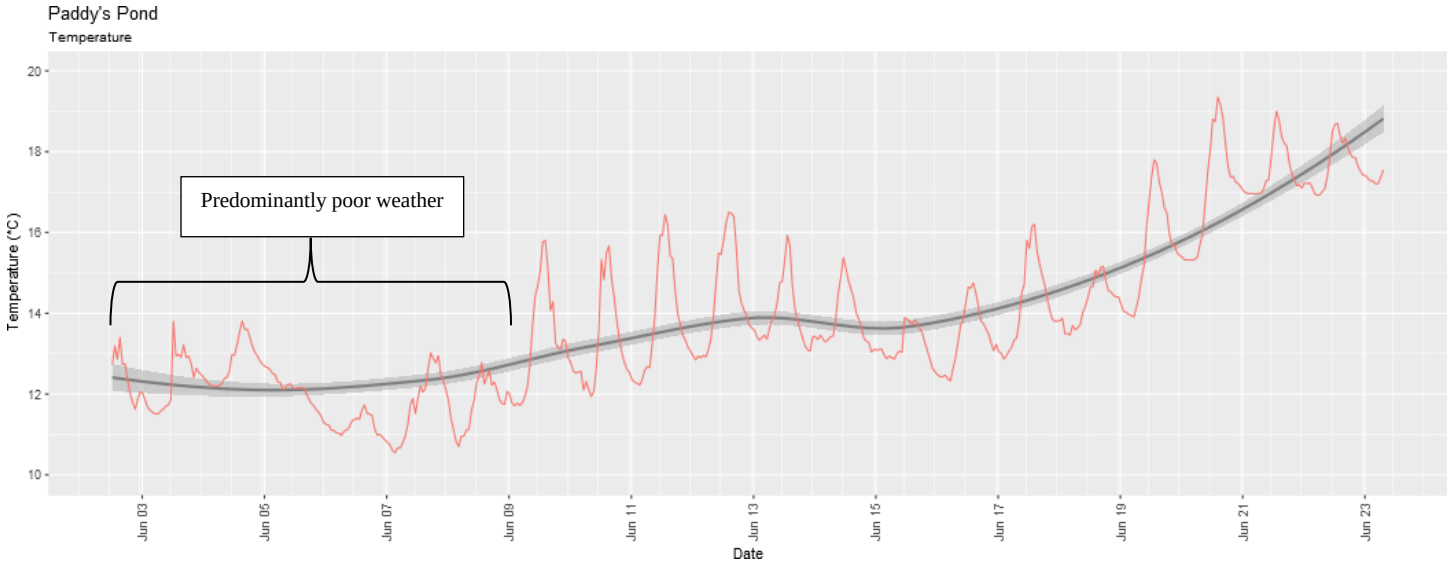
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	June 2, 2017	Deployment	Fair	Fair	Excellent	Excellent	Excellent
	June 23, 2017	Removal	Good	Good	Good	Excellent	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.

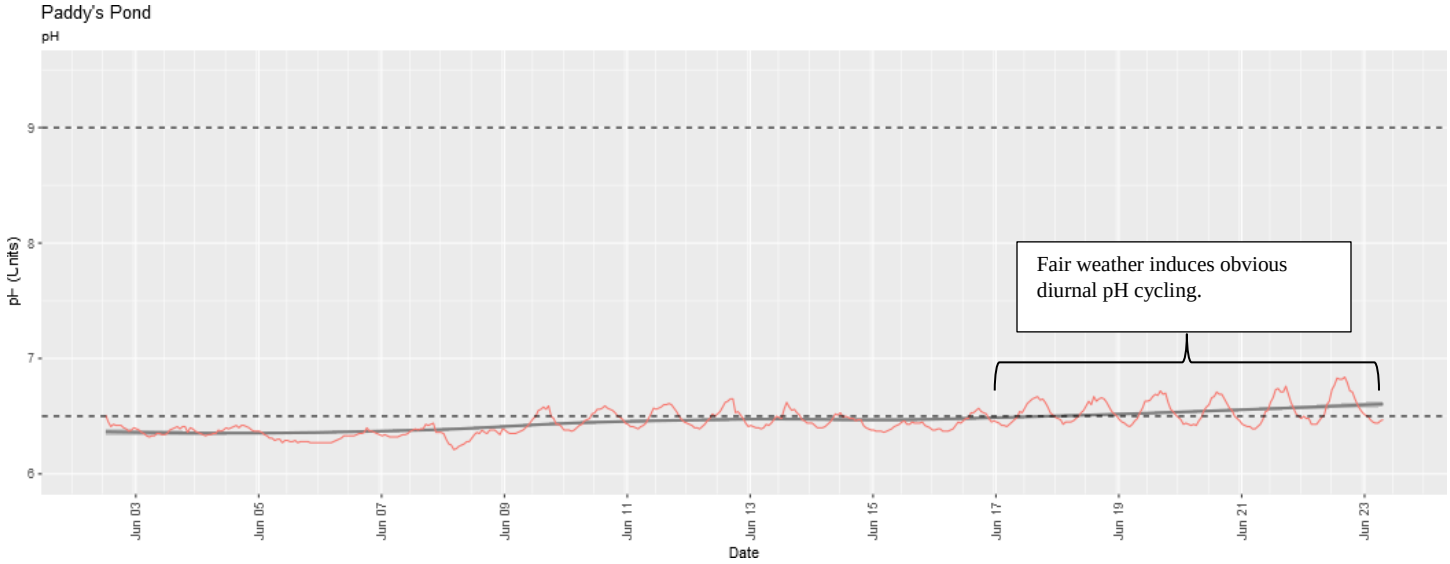


Mean	Median	Min	Max
13.89	13.39	10.55	19.35

- In the figure above, the spring warming trend is in full effect with water temperatures increasing from a low of 10.55^{o}C to a high of 19.35^{o}C. Water temperatures can be expected to continue climbing into early August before declining once again.
- Temperature swings of almost 4^{o}C are not unusual from highs found just after noon until the coolest hours in the morning. These diurnal swings in temperature tend to be depressed and limited during periods of rainfall and overcast days – such as around June 2nd to June 9th, when poor weather predominated.

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.

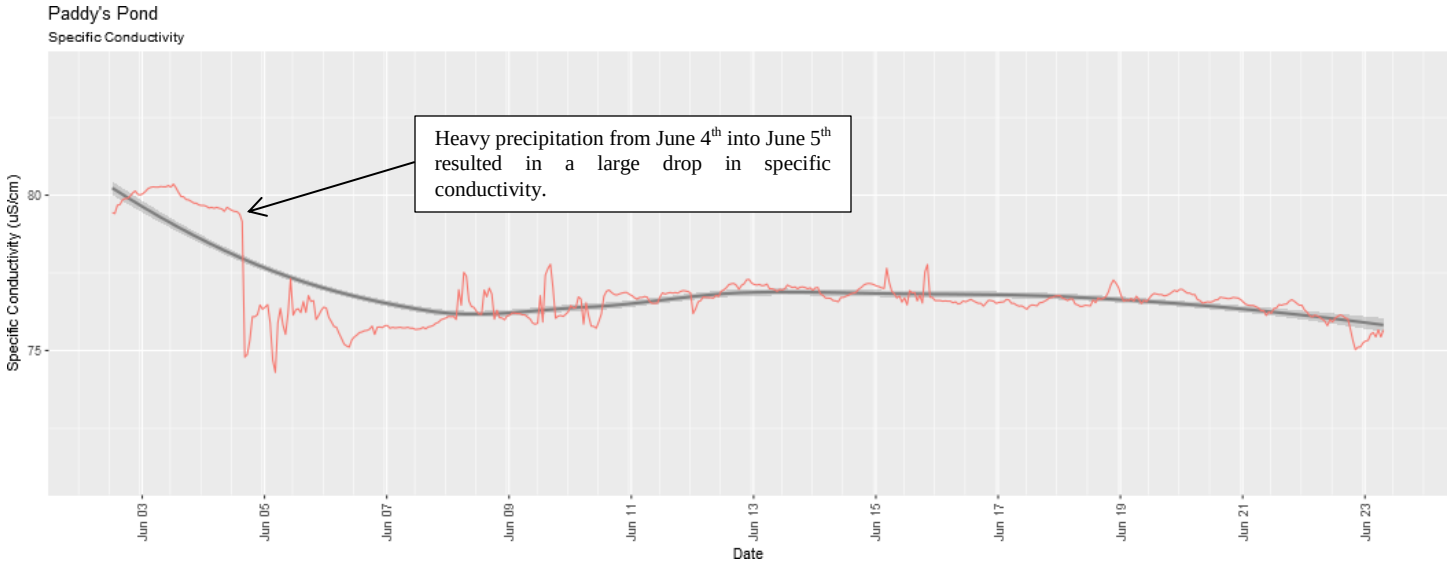


Mean	Median	Min	Max
6.45	6.43	6.21	6.84

A slight increase in pH was observed from just below the CCME guideline of 6.5 to just above that guideline. This trend is common during spring as increased biological activity in the water body consumes carbon dioxide and allows water to become more alkaline. Diurnal cycling can also be observed in this figure, especially near the end of June during fair weather.

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.

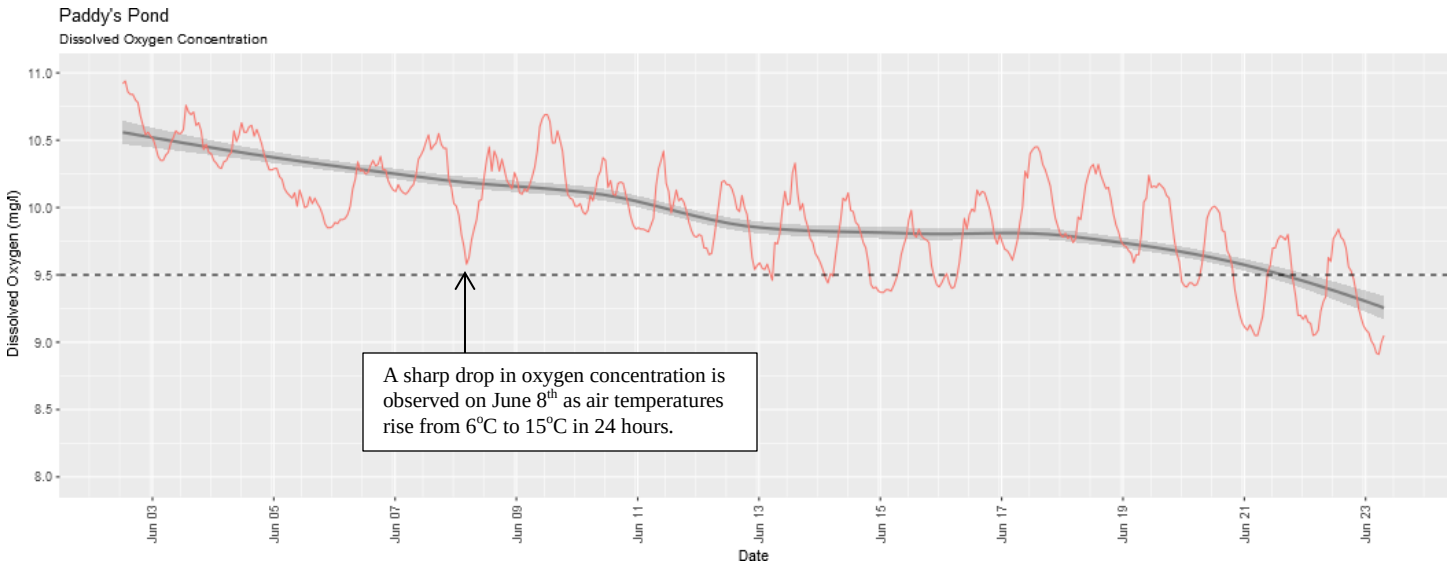


Mean	Median	Min	Max
76.81	76.61	74.30	80.36

- From the beginning of the deployment to the end, conductivity declined by approximately 5 uS/cm, largely as a result of close to 30 mm of rain on June 4th and 5th. Later, a very shallow, but persistent, decline is present at the latter third of the deployment due to dilution of the water body.

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.

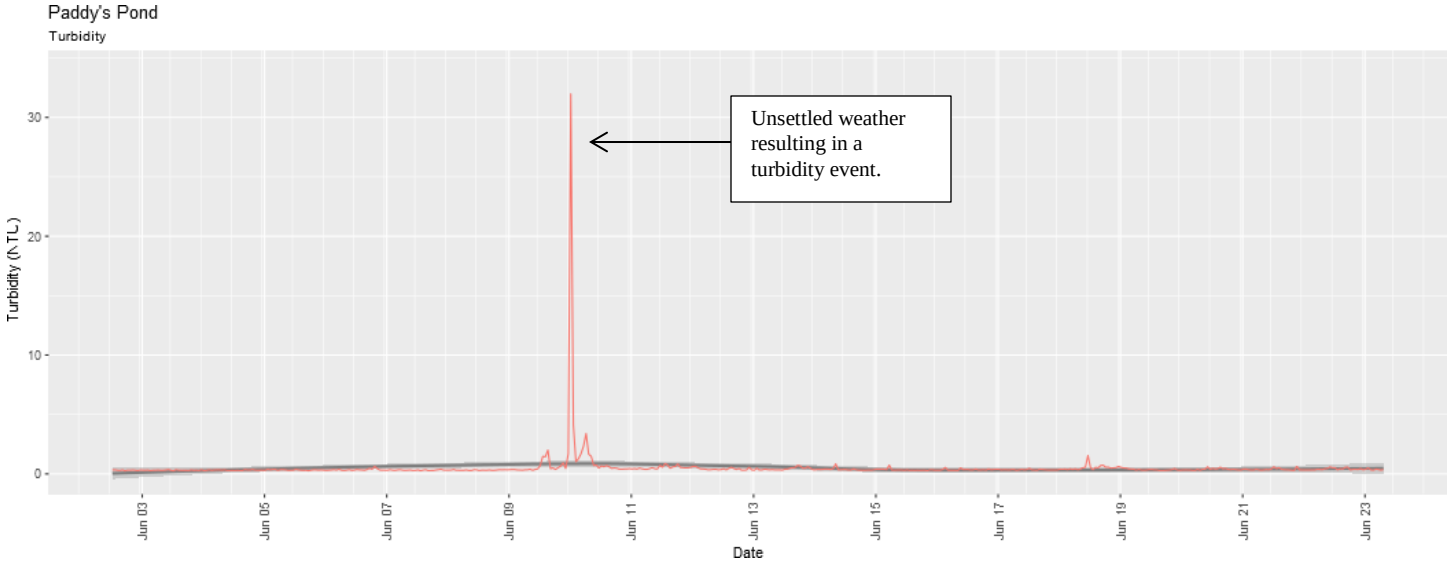


Variable	Mean	Median	Min	Max
DO (mg/l)	9.96	10.00	8.91	10.94
DO ('%-Sat')	96.4	95.6	86.3	108.2

- As water temperature increased over time, dissolved oxygen concentrations began to decline, as well. By the end of the deployment period, oxygen concentrations began to consistently fall below the upper CCME guideline of 9.5 mg/l DO at night, during maximum oxygen consumption. By early summer, however, most sensitive organisms are capable of surviving at and below this level of oxygen concentration.

Turbidity

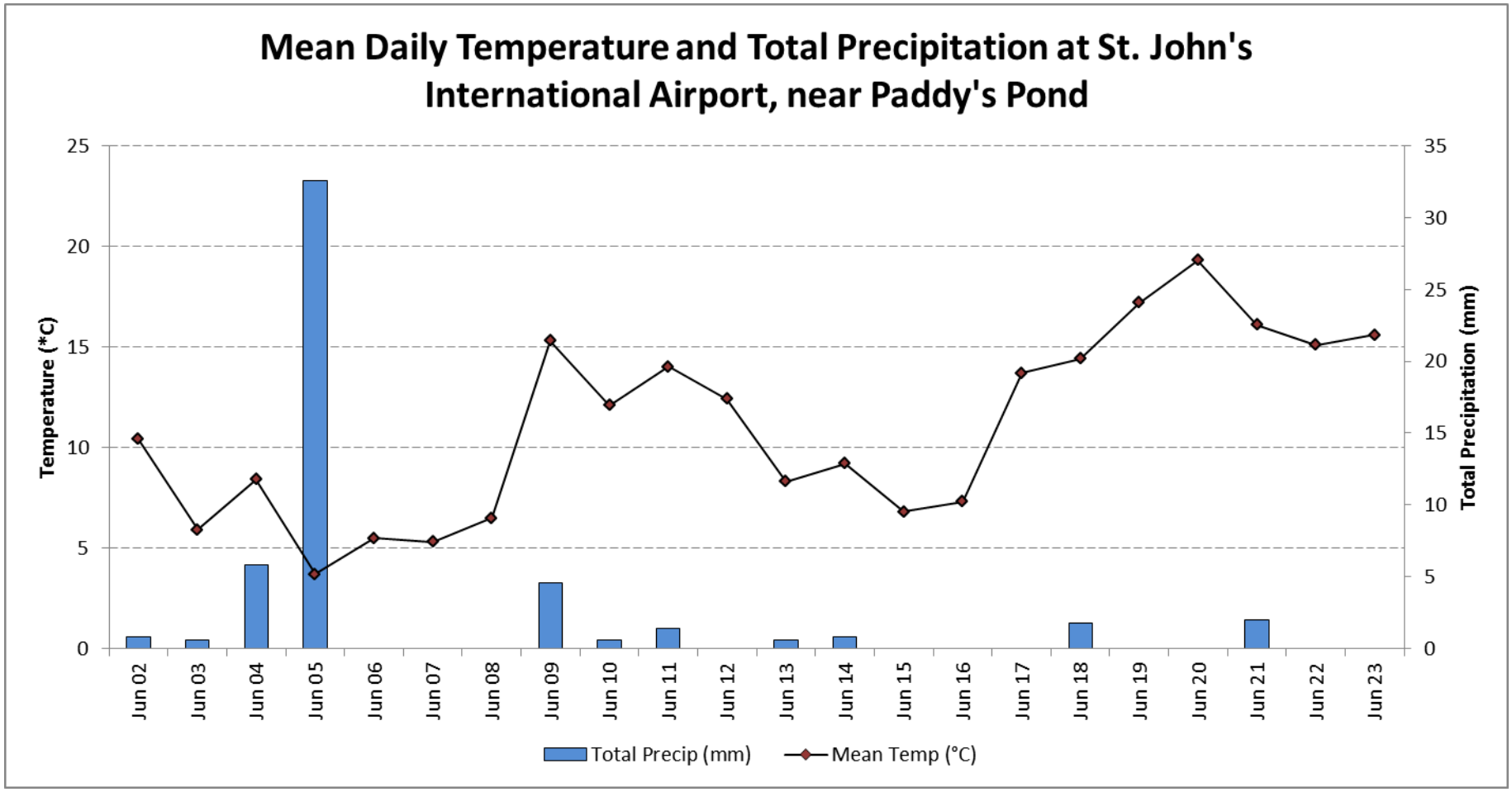
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.49	0.36	0.26	31.98

- Turbidity levels during this deployment period were found to be very low, in general, with one substantial turbidity event occurring from June 9th to June 10th. At this time warm air temperatures and precipitation were prevalent. Unsettled weather likely resulted in rougher than normal conditions on Paddy's Pond, stirring up sediment into the water column.

Appendix


Mean Daily Temperature and Total Precipitation at St. John's International Airport, near Paddy's Pond
Temperature (*C)
Total Precipitation (mm)
25
20
15
10
5
0
35
30
25
20
15
10
5
0
Jun 02
Jun 03
Jun 04
Jun 05
Jun 06
Jun 07
Jun 08
Jun 09
Jun 10
Jun 11
Jun 12
Jun 13
Jun 14
Jun 15
Jun 16
Jun 17
Jun 18
Jun 19
Jun 20
Jun 21
Jun 22
Jun 23
Total Precip (mm)
Mean Temp (°C)