Real-Time Water Quality Deployment Report

Paddy's Pond

June 26, 2017 to July 28, 2017

Newfoundland Labrador

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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2017-06-23 to 2017-07-28

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- Water quality at Paddy's Pond was within seasonal expectations during this time period.

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.

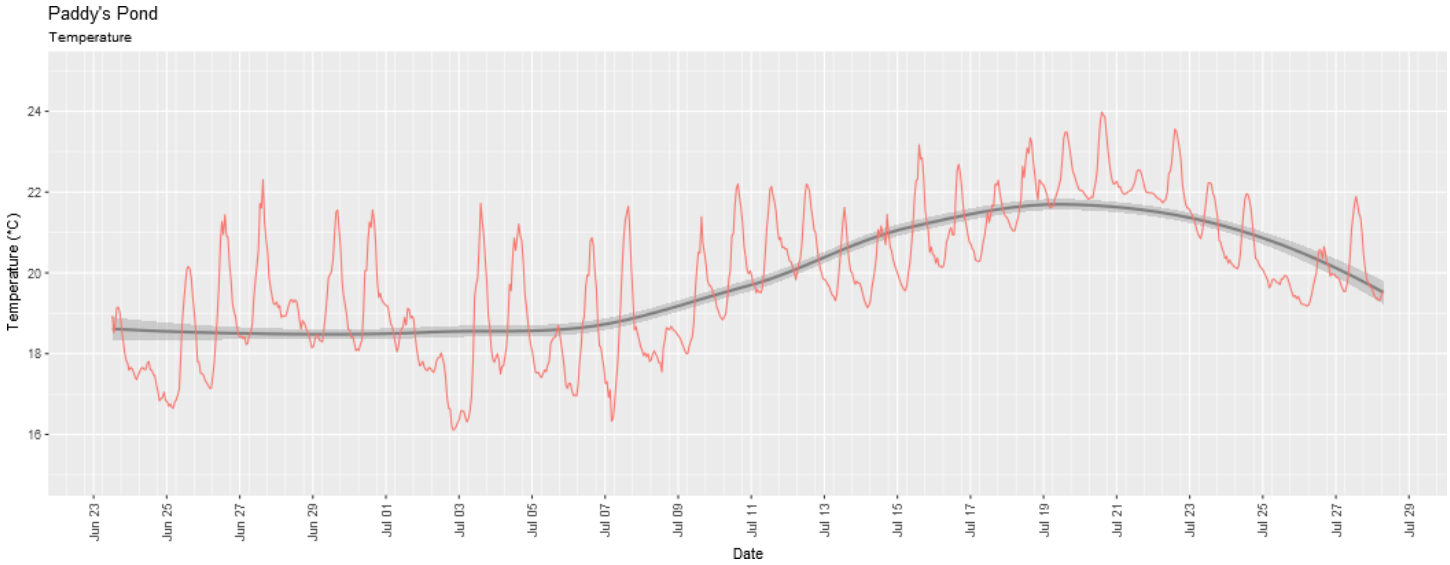
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	June 23, 2017	Deployment	Good	Fair	Good	Excellent	Excellent
	July 28, 2017	Removal	Good	Excellent	Excellent	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.

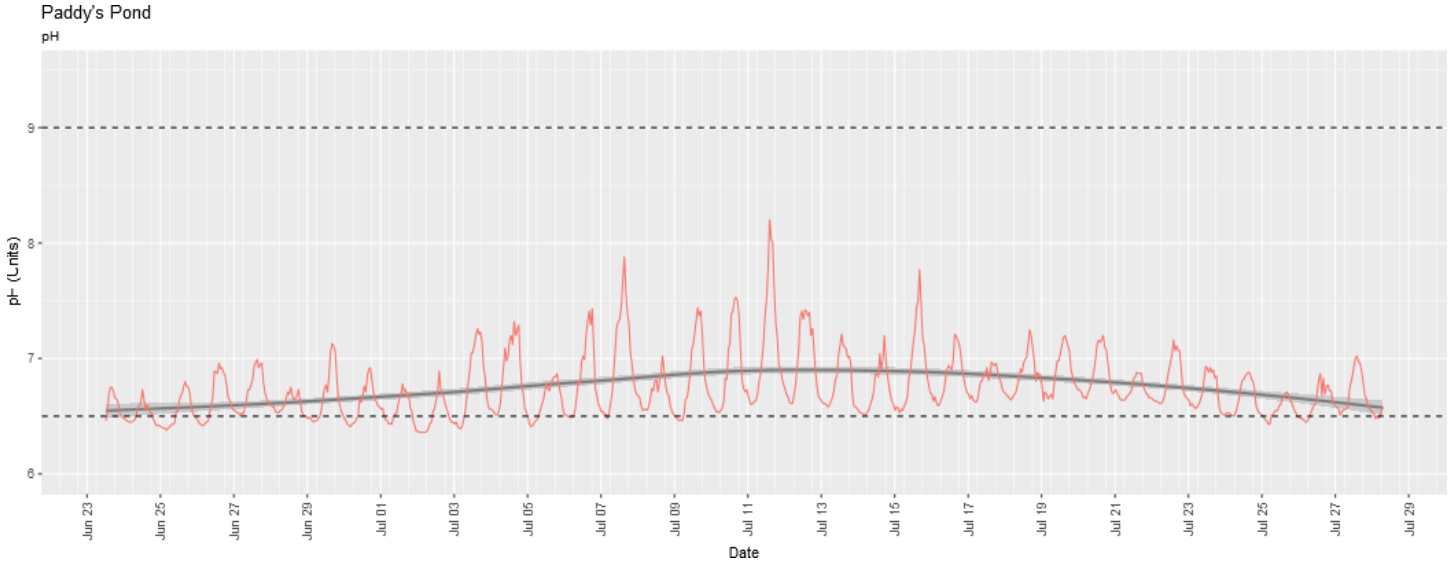


Mean	Median	Min	Max
19.87	19.85	16.11	23.98

- Water temperature at Paddy's Pond peaked at approximately 24^{o}C on July 20th. This is likely the annual peak in temperature for 2017 as air and water temperatures generally plateau at this point in the summer. The final few days of the deployment period show a downward trend.

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.

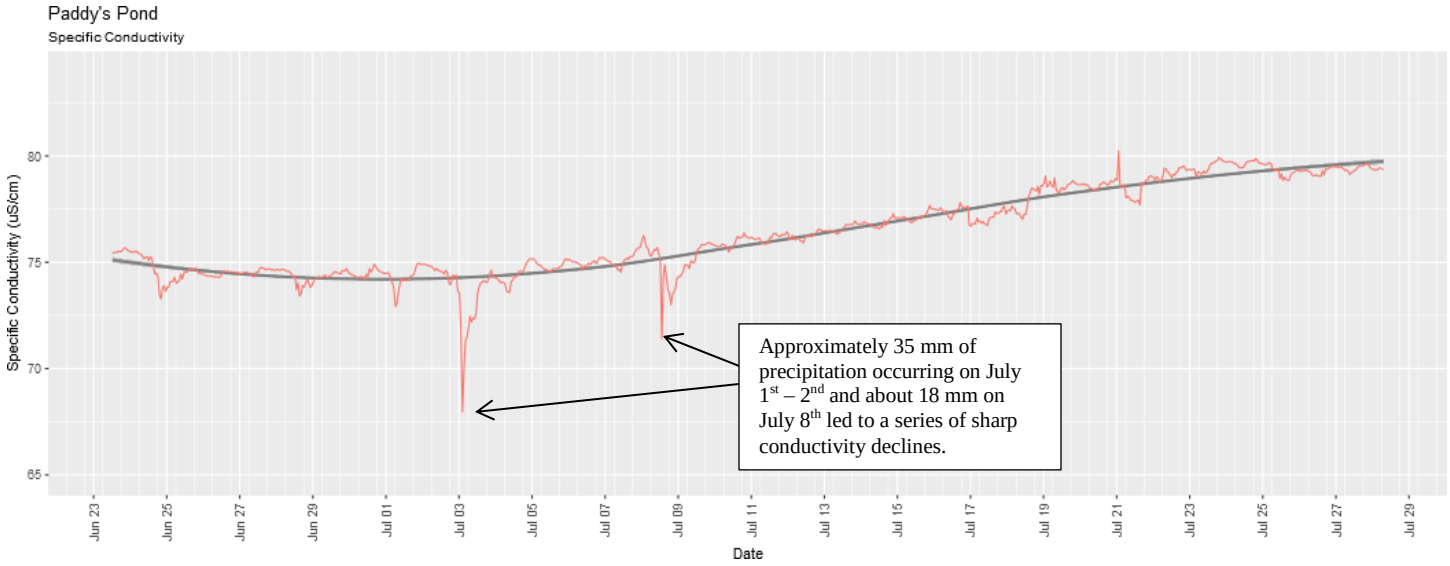


Mean	Median	Min	Max
6.75	6.68	6.36	8.20

- Daily pH cycling was seen at its maximum on July 11th. pH increased from 6.60 at 03:15 to 8.2 at 15:15 in the same day. This large swing in pH coincides with the daily low and high periods of respiration by aquatic organisms. With a lack of sunlight at 03:15, respiration has a net production of carbon dioxide which generates a weak acid within the Paddy's Pond, lowering pH. During the daily max in sunlight and temperature, there is a net consumption of carbon dioxide, allowing pH level to rise.

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.

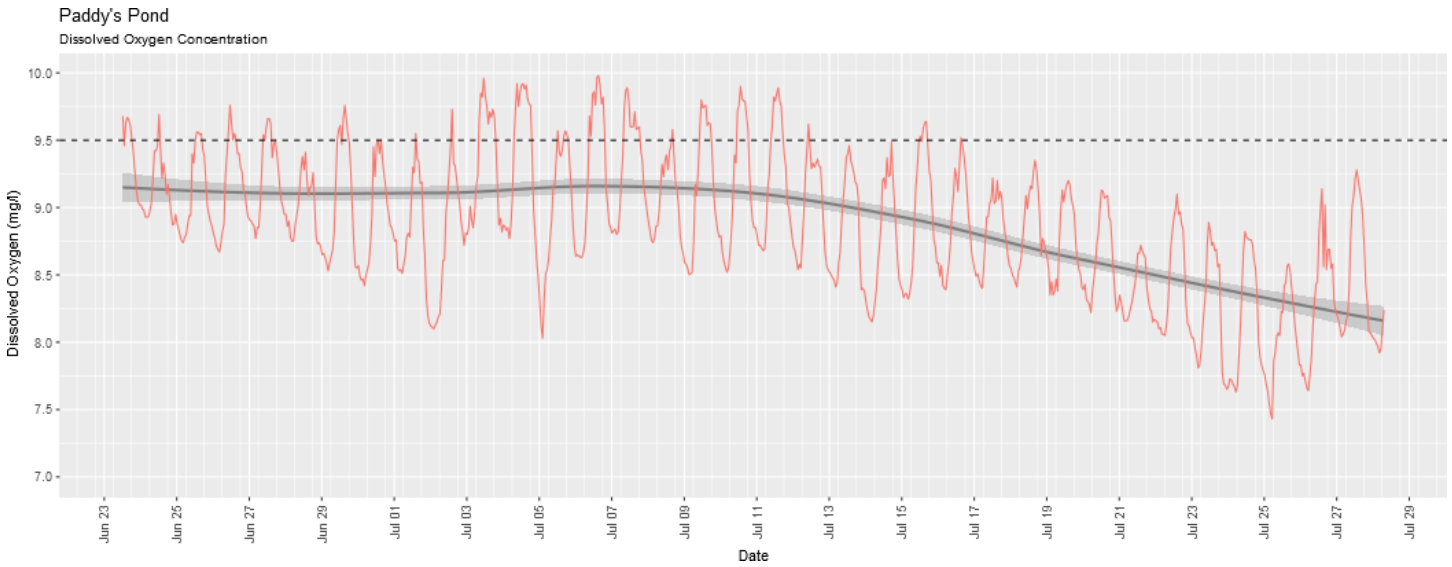


Mean	Median	Min	Max
76.36	76.06	67.96	80.25

- Specific Conductivity was seen to rise during from late June into late July. This is commonly seen when dissolved-solid laden groundwater inflow outpaces relatively pure precipitation inputs. This effect tends to lead to a concentrating effect of dissolved solids, raising conductivity. It is expected that frequent rainfalls in the autumn season will push conductivity levels back down.

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.

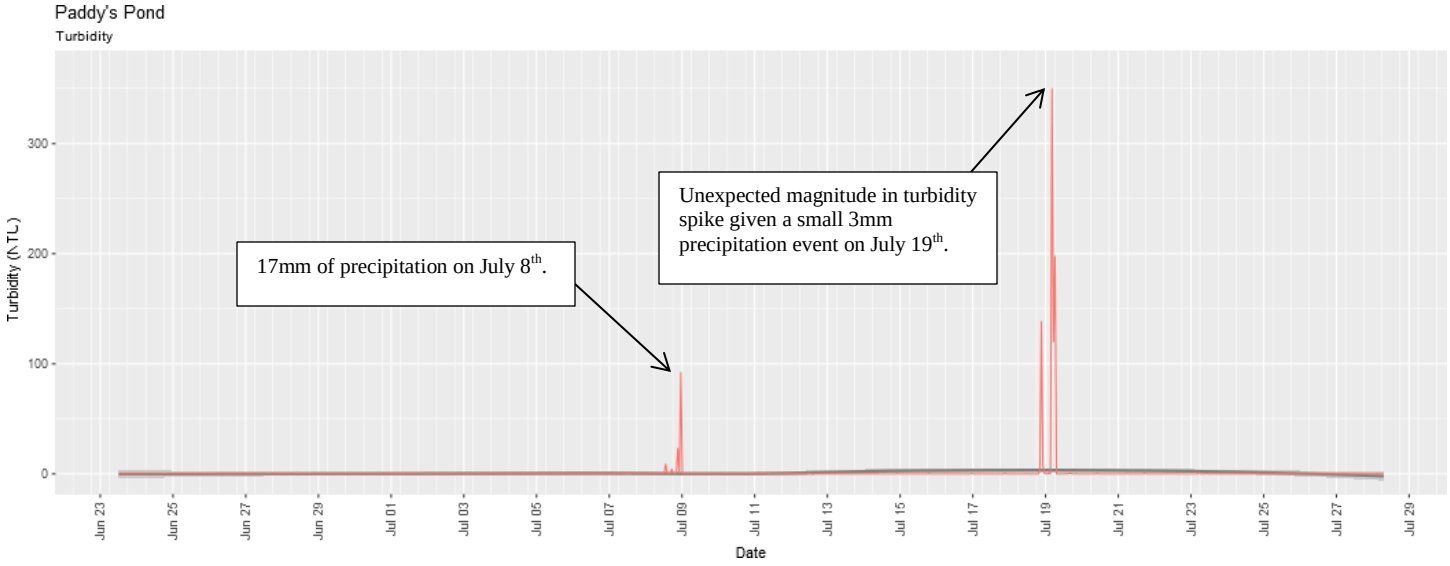


Variable	Mean	Median	Min	Max
DO (mg/l)	8.87	8.86	7.43	9.98
DO ('%-Sat')	97.35944976	96.5	81.3	113

- With the peak in water temperature occurring on July 20th, dissolved oxygen concentration showed a lag of a few days before hitting the deployment low (and likely, annual low) of 7.43 mg/l on July 25th. Following this deployment low, a slight upward trend may be apparent.

Turbidity

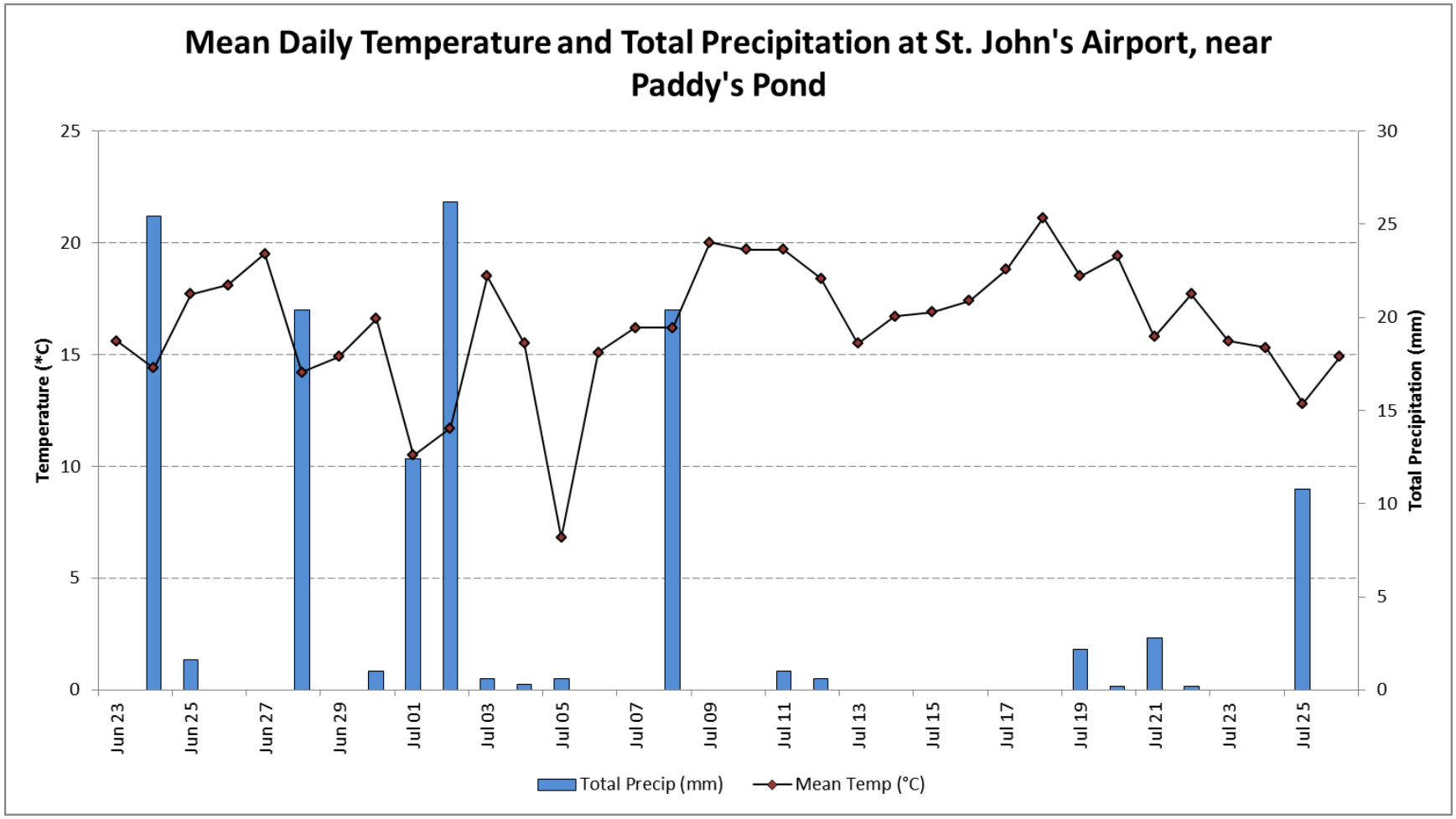
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
1.16	0.00	0.00	349.97

- Turbidity was low during this deployment period with turbidity levels above background occurring in conjunction with precipitation.

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
30
25
20
15
10
5
0
Jun 23
Jun 25
Jun 27
Jun 29
Jul 01
Jul 03
Jul 05
Jul 07
Jul 09
Jul 11
Jul 13
Jul 15
Jul 17
Jul 19
Jul 21
Jul 23
Jul 25
Total Precip (mm)
Mean Temp (°C)