Real-Time Water Quality Deployment Report

Paddy's Pond

May 17, 2016 to July 15, 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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General

- Department of Environment and Climate Change staff monitors the real-time web pages consistently.
- The increase in pH, coupled with pronounced diurnal cycling, a drop in dissolved oxygen concentration, and increasing turbidity correlates with reports of a blue-green algae bloom.
    - A sample was taken on July 8 and analysed for the presence of phytoplankton and algae. A value of 6290 ASU/1ml was determined, of which 5460 ASU/1ml was determined to be *Anabaena sp.*, a common genus of cyanobacteria. While this genus is capable of producing neurotoxic microcyctins, analysis indicated a value of <0.05 ug/l (less than detect). Health Canada guidelines propose a maximum acceptable concentration (MAC) of 1.5 ug/l in drinking water. Since the measured value is substantially lower than the MAC and Paddy's Pond is not a public drinking water supply, no concern is warranted.
    - Environment and Climate Change officials will continue to monitor for future cyanobacterial blooms.

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

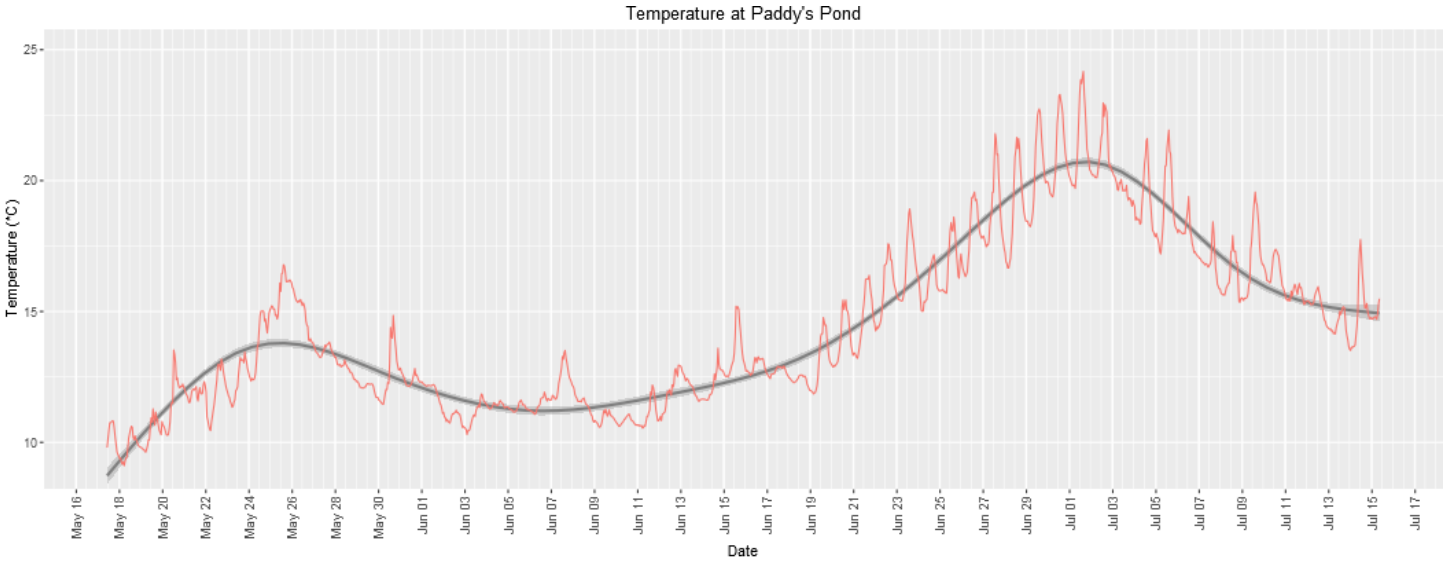
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	May 17, 2016	Deployment	Excellent	Poor	Good	Excellent	Good
	July 15, 2016	Removal	NA	NA	NA	NA	NA

- Failure to connect to the QAQC sonde at removal precluded the calculation of rankings on July 15th.

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.

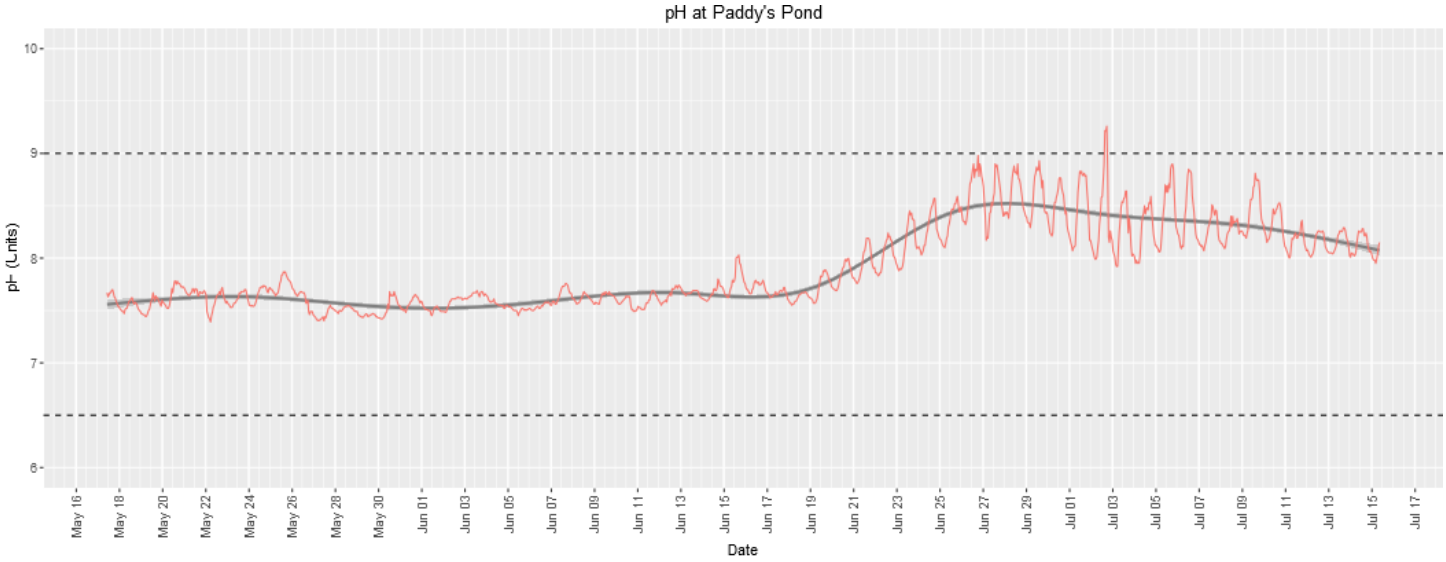


Mean	Median	Min	Max
14.43	13.39	9.11	24.17

- Two distinct warming peaks are apparent: on May 25th and July 1st air temperature was especially high. A cooling period following the deployment high of 24.17^{o}C may indicate 2016's annual maximum, however, highest temperatures are usually observed in late July and early August.

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.

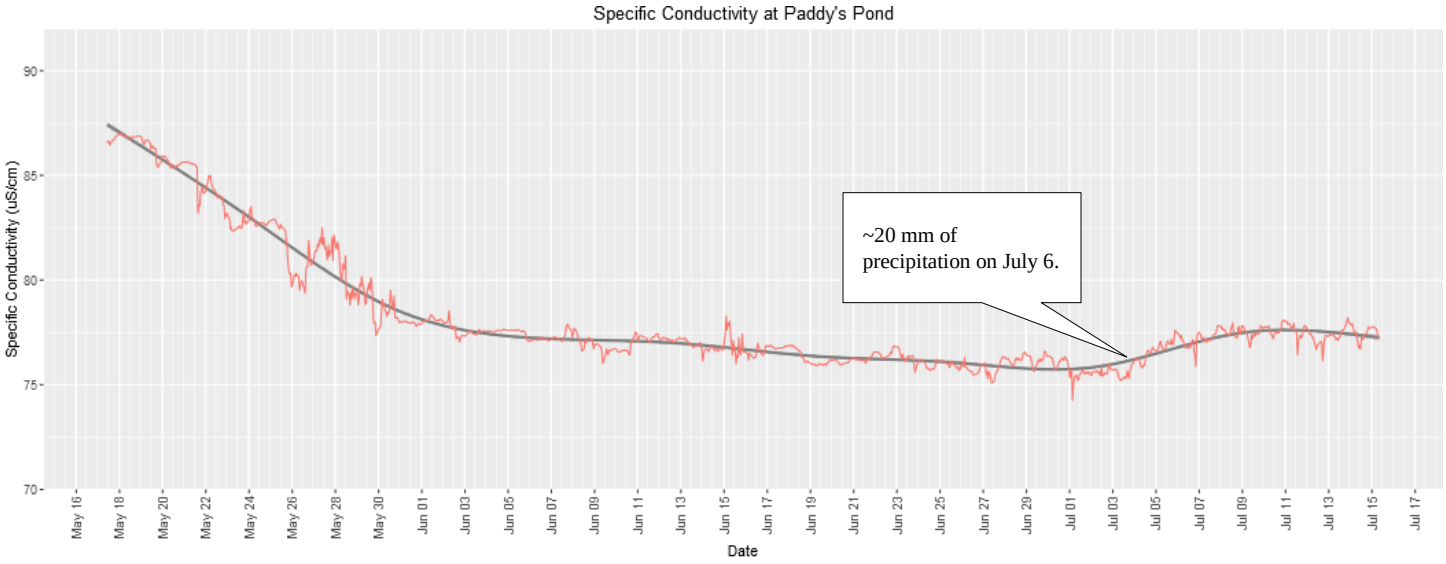


Mean	Median	Min	Max
7.91	7.71	7.39	9.26

- Almost all pH values observed during this deployment period fell within the CCME Guidelines for the protection of cold water biota (see dashed lines).
- A sudden rise in pH was observed following a sudden warming trend on June 18th where the daily mean temperature increased from <5^{o}C to 13^{o}C the next day. After this rise, diurnal cycling became more pronounced, indicating that there may have been a sudden increase in vegetative 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.

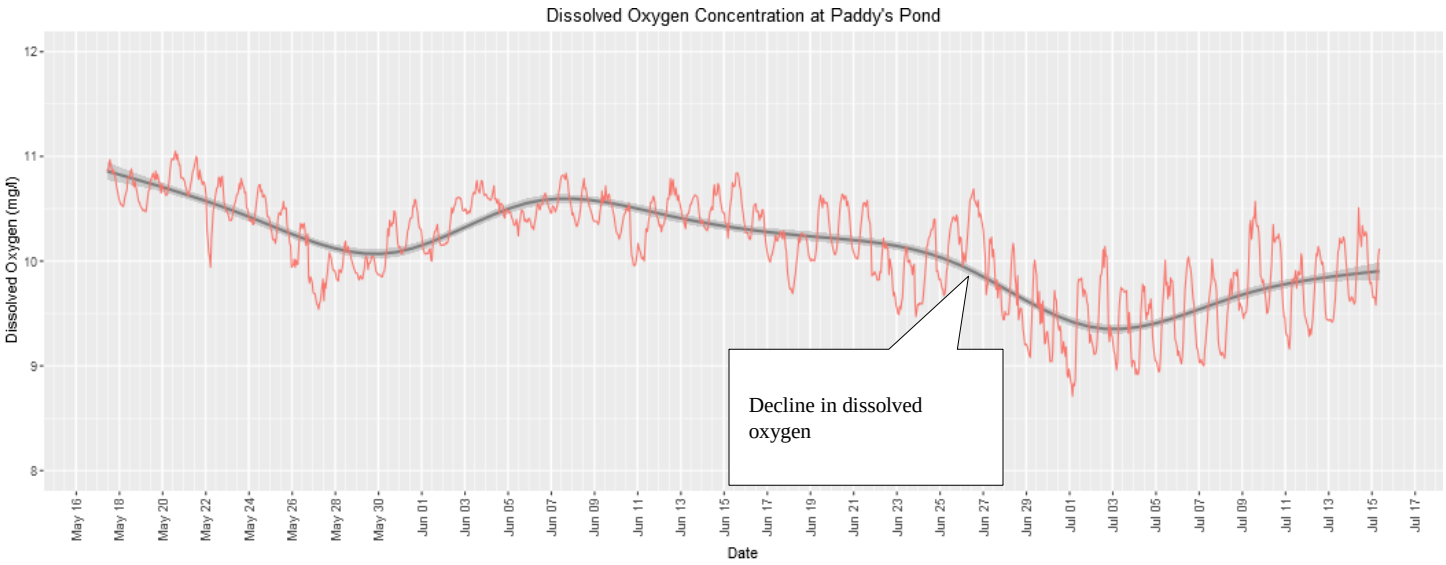


Mean	Median	Min	Max
78.20	77.21	74.26	87.00

- Specific conductivity declined consistently through the deployment period indicating a decrease in dissolved solids at Paddy's Pond. A slight increase in the latter part of the deployment period appears to be a response to approximately 20 mm of rain on July 6.

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.

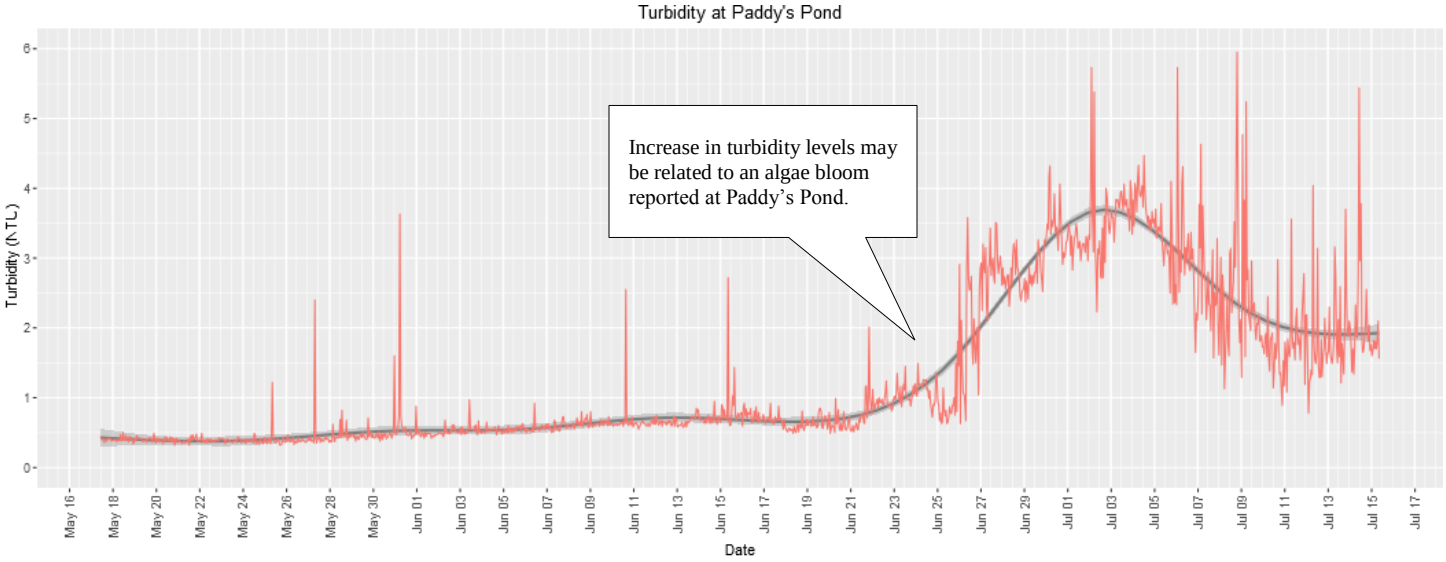


Variable	Mean	Median	Min	Max
DO (mg/l)	10.12	10.21	8.71	11.05
DO ('%-Sat')	99	98	89	118

- Dissolved oxygen concentration declined throughout the deployment period as water temperature increased. A notable perturbation occurred around June 27th when dissolved oxygen decreased. This decrease may be the result of a combination of warm waters (unusually warm daily temperature) and consumption by vegetative growth from an algae bloom.

Turbidity

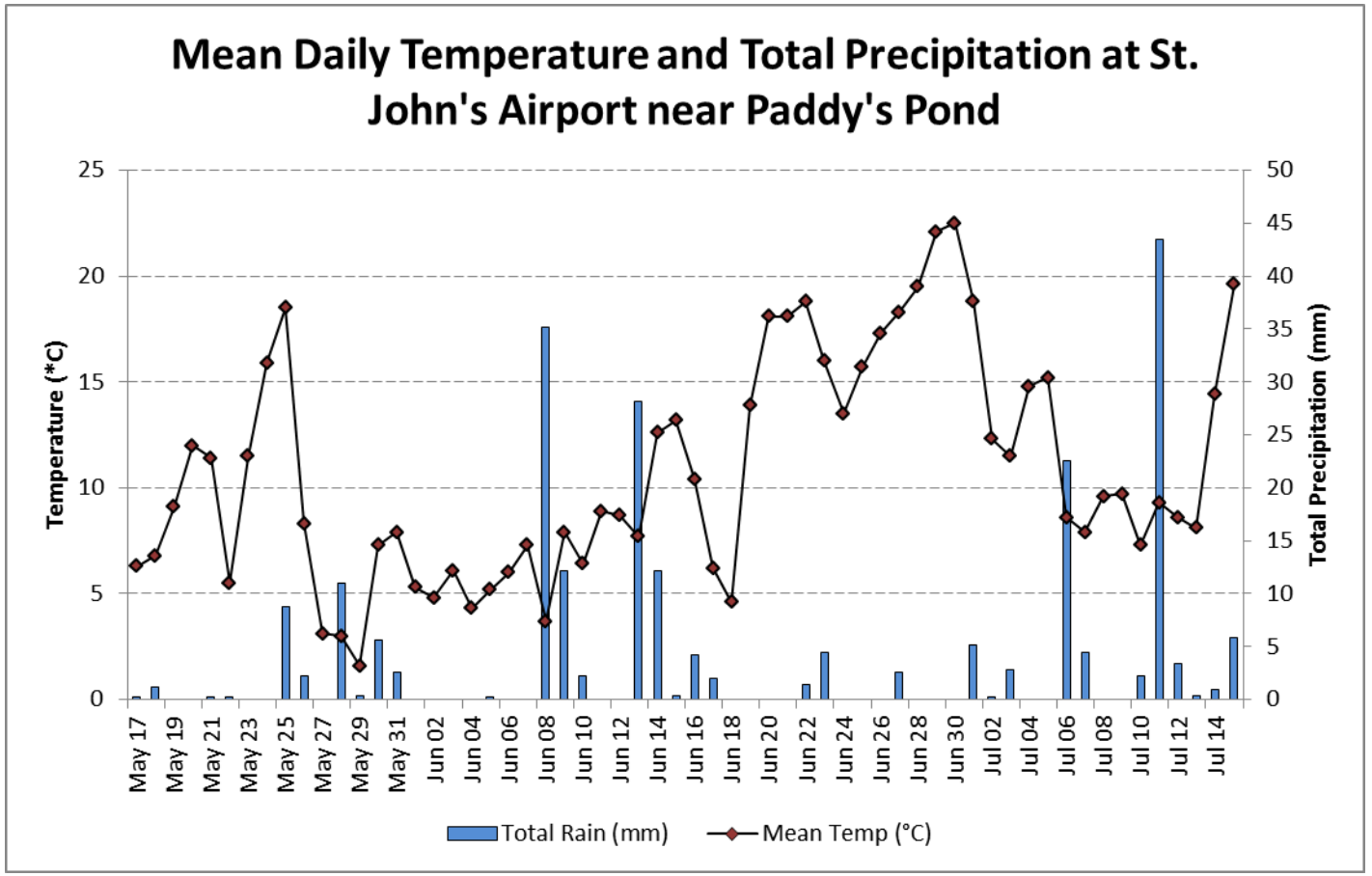
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
1.28	0.67	0.32	5.95

- Turbidity levels showed a small increasing trend with low variability from the beginning of the deployment to the end of June when there was a substantial increase. It was approximately at this time when reports were received about an algae bloom in the water body.

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
50
45
40
35
30
25
20
15
10
5
0
May 17
May 19
May 21
May 23
May 25
May 27
May 29
May 31
Jun 02
Jun 04
Jun 06
Jun 08
Jun 10
Jun 12
Jun 14
Jun 16
Jun 18
Jun 20
Jun 22
Jun 24
Jun 26
Jun 28
Jun 30
Jul 02
Jul 04
Jul 06
Jul 08
Jul 10
Jul 12
Jul 14
Total Rain (mm)
Mean Temp (°C)