Real-Time Water Quality Deployment Report

Paddy's Pond

September 7, 2017 to November 9, 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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2017-09-07 to 2017-11-09

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- Nearly 200 mm of rain fell in early September over the period of six days. Despite a large amount of rain in a short period of time, water quality parameters generally fell within expected ranges.
- Water level increased significantly during this deployment period – estimated at 0.3 m.
- Hydrometric data included in this report is provisional and used only for illustrative purposes. Corrected and finalized data may be retrieved from the Water Survey of Canada website (http://www.ec.gc.ca/rhc-wsc/)*.

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.

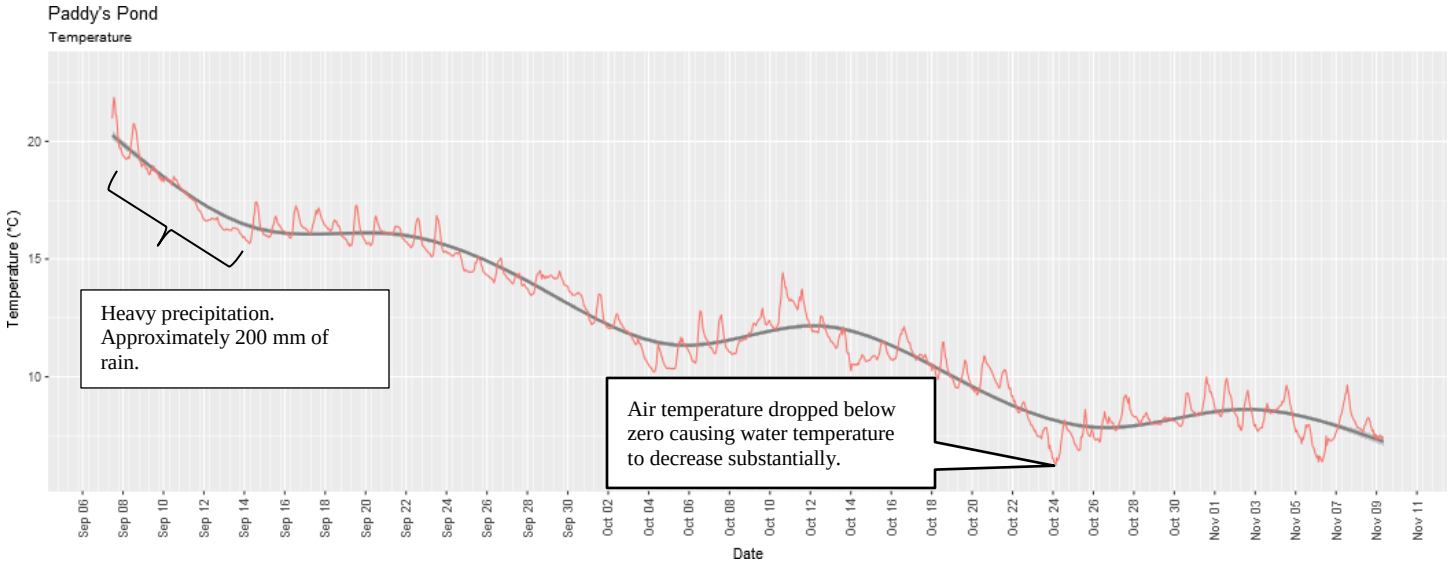
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	September 7, 2017	Deployment	Good	Excellent	Fair	Excellent	Excellent
	November 9, 2017	Removal	Good	Excellent	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.

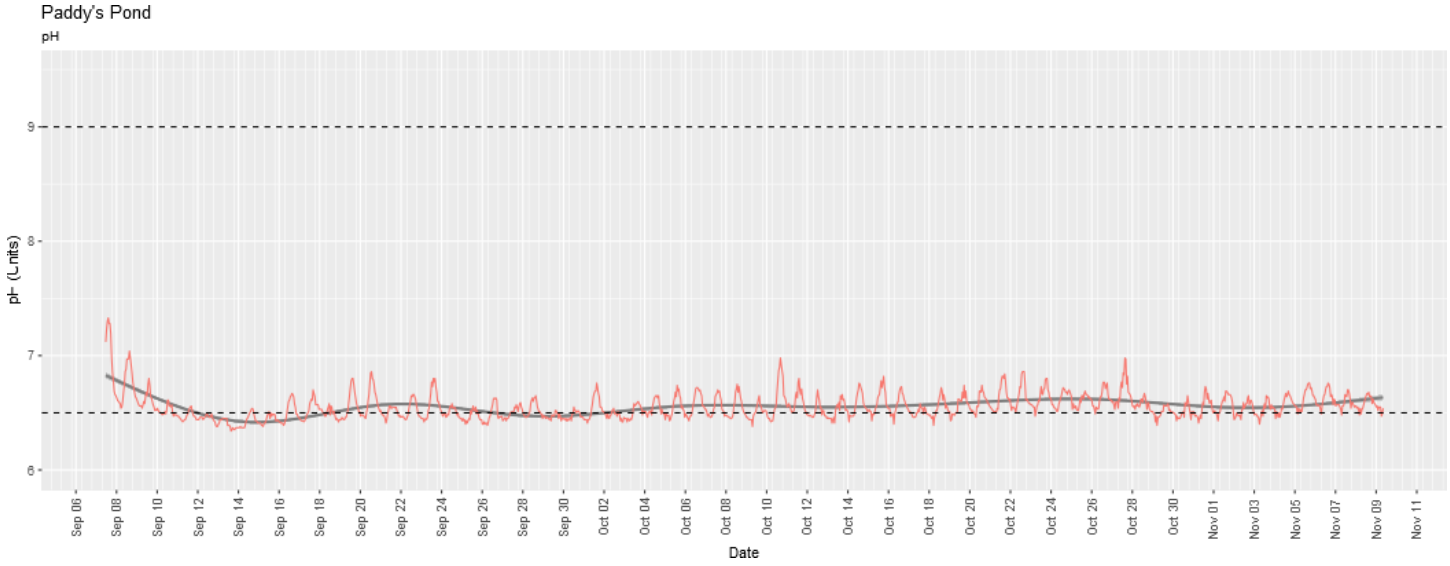


Mean	Median	Min	Max
12.18	11.61	6.25	21.86

- Water temperature dropped consistently over the deployment period as expected. Diurnal cycling of temperature was muted in instances of high precipitation as observed from September 8th to 13th when almost 200 mm of rain fell in less than a week.

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.

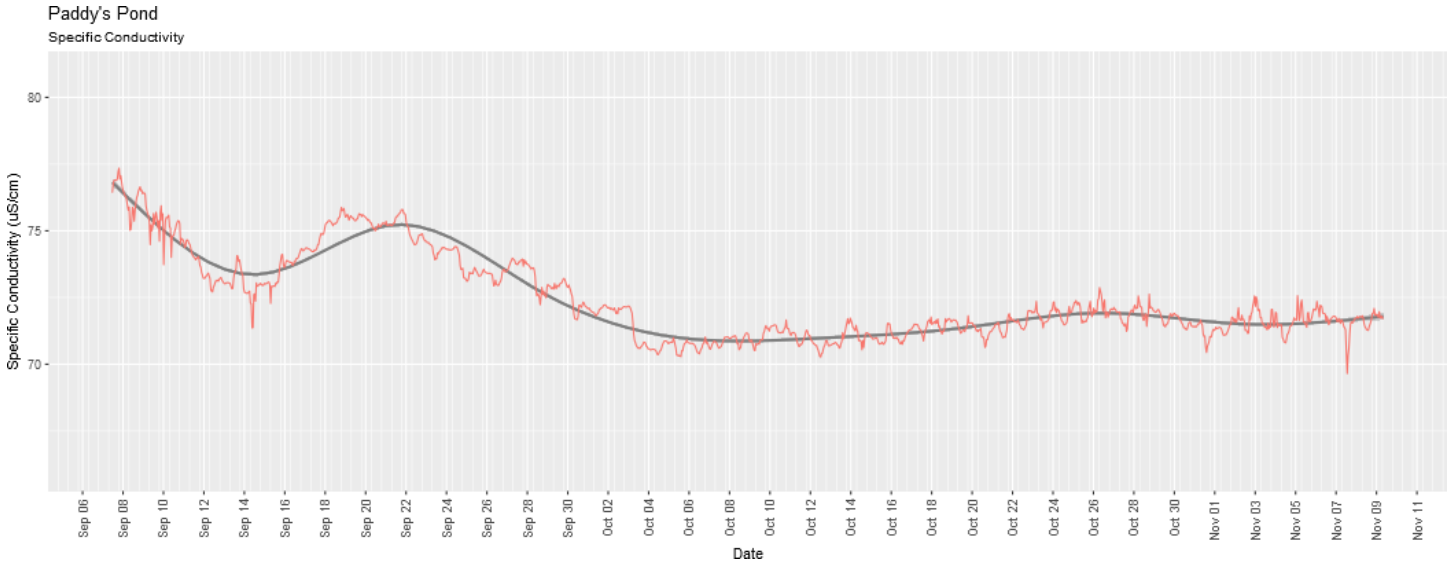


Mean	Median	Min	Max
6.55	6.53	6.34	7.33

- Shortly after heavy precipitation began in September, pH levels decreased. Afterwards, a slight upward trend in pH is seen as the deployment period progressed. Most values were found to be within the CCME Guidelines for the protection of aquatic life (dashed lines in figure).

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.

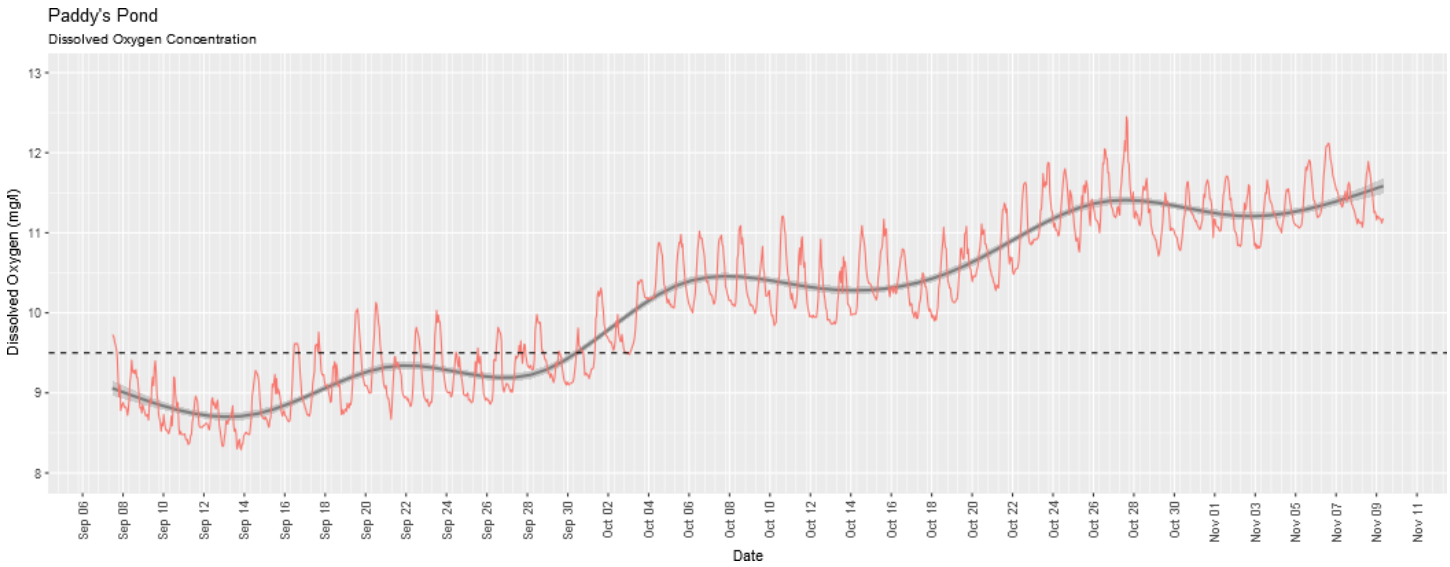


Mean	Median	Min	Max
72.44	71.89	69.65	77.35

- Following heavy rain, conductivity fell substantially due to dilution effects. Following rainfall, conductivity increased but fell gradually until October 4th before slowly rising over the remainder of the deployment period.
- Changes in conductivity during this deployment period are likely the result of precipitation and also water level changes. An increase of 0.3 m in water level was estimated between deployment and removal.

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.

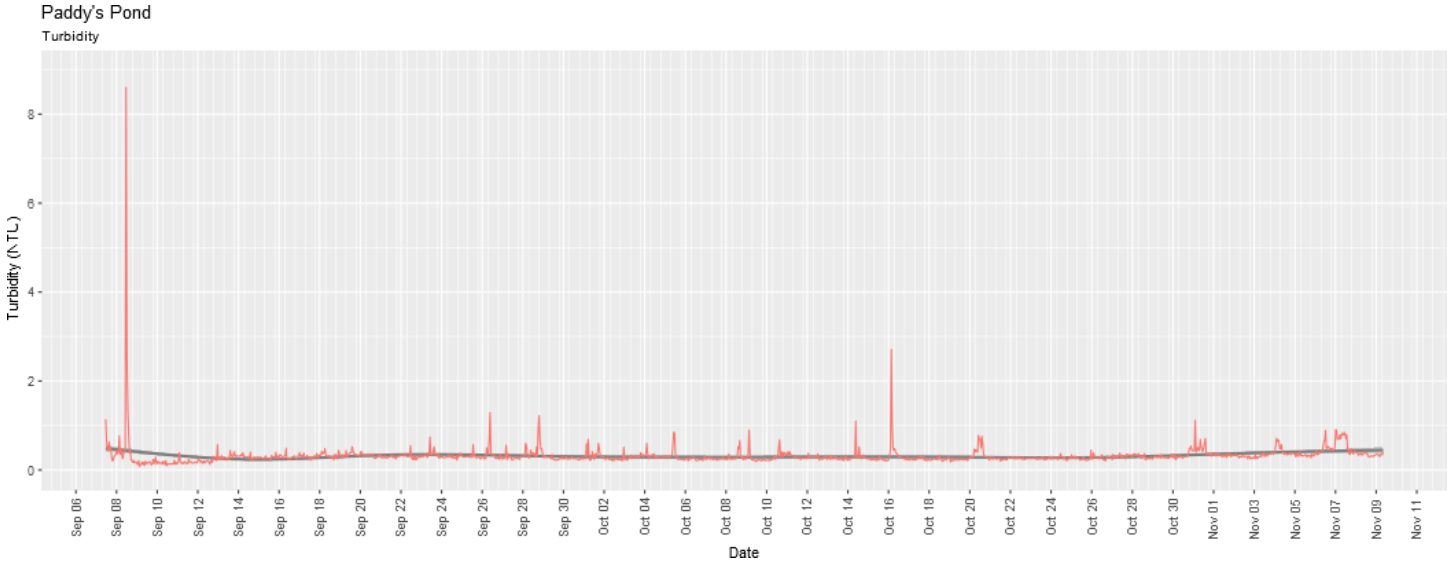


Variable	Mean	Median	Min	Max
DO (mg/l)	10.15	10.18	8.29	12.45
DO ('%-Sat')	94.0	93.4	84.1	110.5

- A substantial upward swing in dissolved oxygen was observed from September to November as water temperatures cooled. By early October, all values were found to be above the CCME guideline of 9.5 mg/l DO for the protection of cold water biota (see dashed line).

Turbidity

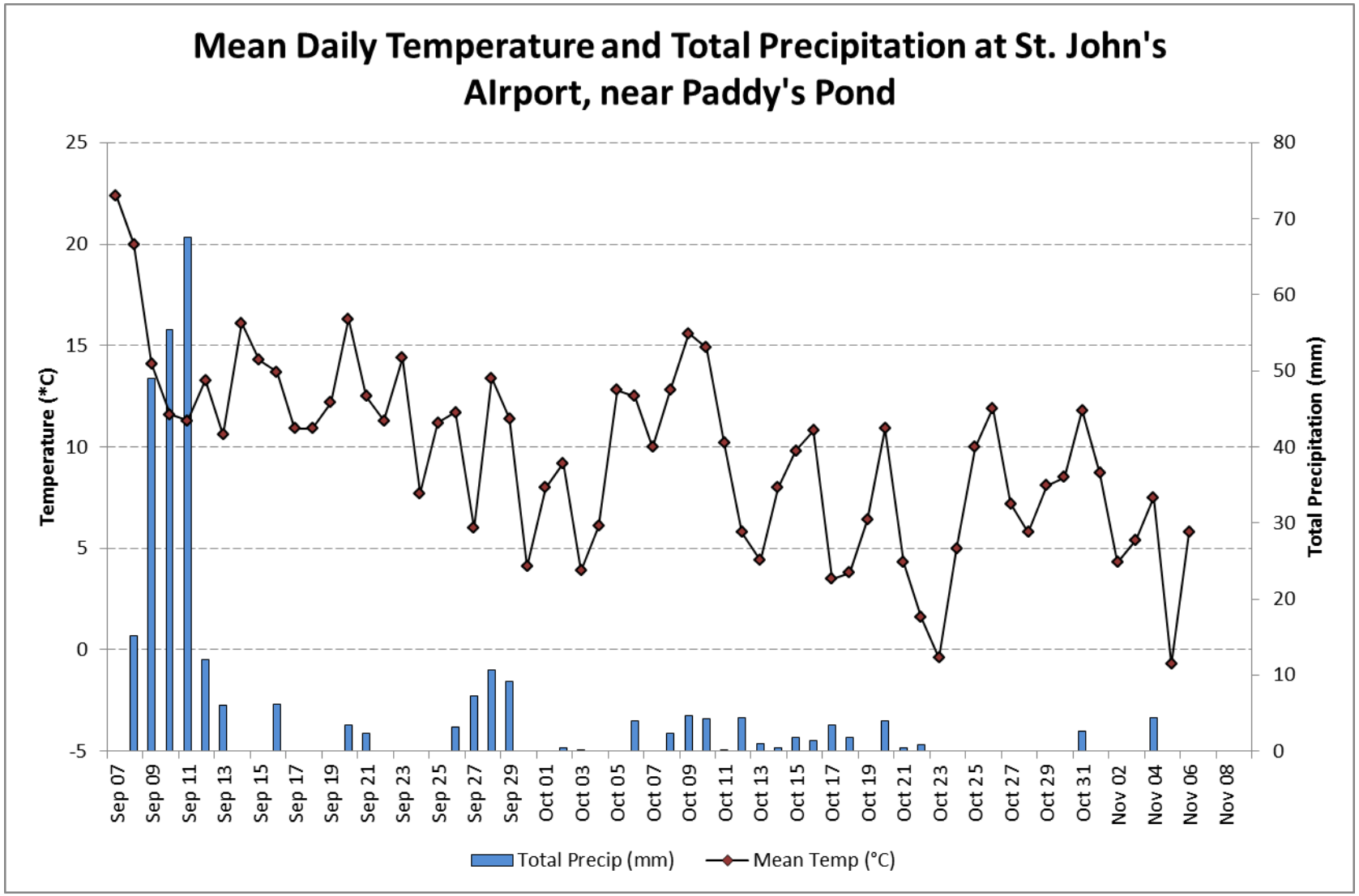
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.3	0.3	0.1	8.6

- Turbidity levels were low for this deployment period and generally fell between 0.0 and 0.5 NTU. Occasional instances were found above 1.0 NTU, but these were sparse, intermittent, and likely due to random fluctuations. Even during peak rainfall in early September, turbidity only briefly spiked to 8.6 NTU for a single reading.

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
-5
80
70
60
50
40
30
20
10
0
Sep 07
Sep 09
Sep 11
Sep 13
Sep 15
Sep 17
Sep 19
Sep 21
Sep 23
Sep 25
Sep 27
Sep 29
Oct 01
Oct 03
Oct 05
Oct 07
Oct 09
Oct 11
Oct 13
Oct 15
Oct 17
Oct 19
Oct 21
Oct 23
Oct 25
Oct 27
Oct 29
Oct 31
Nov 02
Nov 04
Nov 06
Nov 08
Total Precip (mm)
Mean Temp (°C)