Real-Time Water Quality Deployment Report

Paddy's Pond

July 13, 2018 to August 24, 2018

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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2018-07-13 to 2018-08-24

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- All water quality parameters were found to be within expected levels for the year.

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.

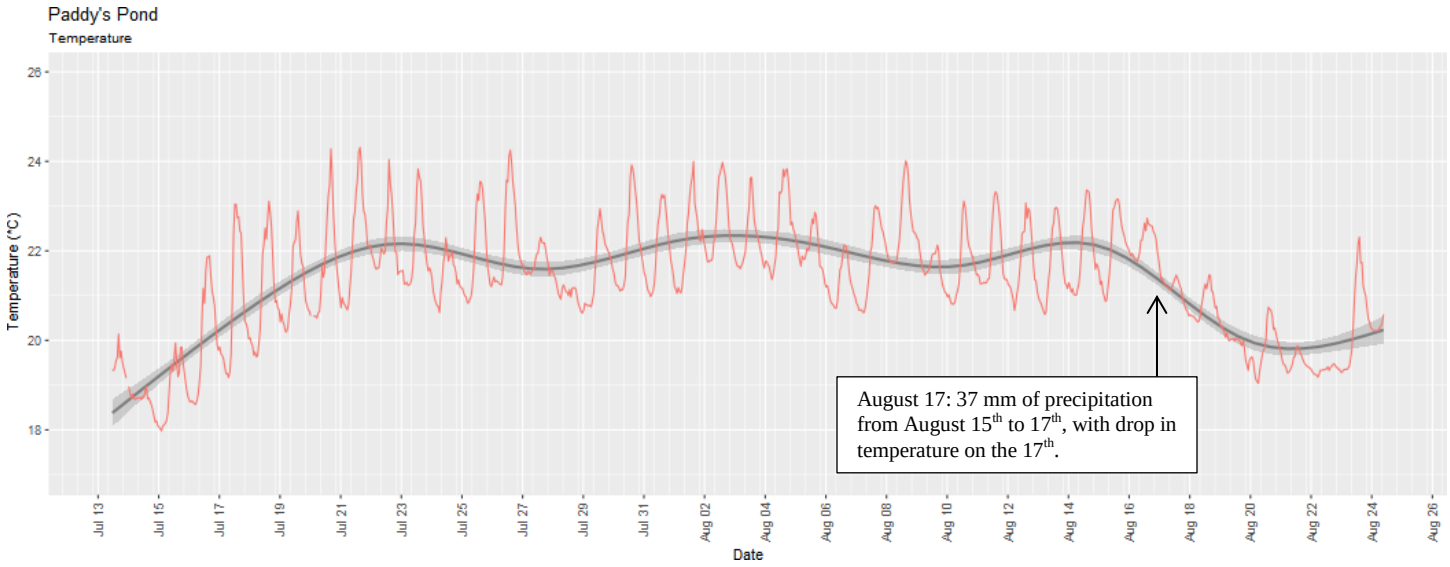
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	July 13, 2018	Deployment	Excellent	Excellent	Good	Good	Excellent
	August 24, 2018	Removal	Good	Excellent	Good	Marginal	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.

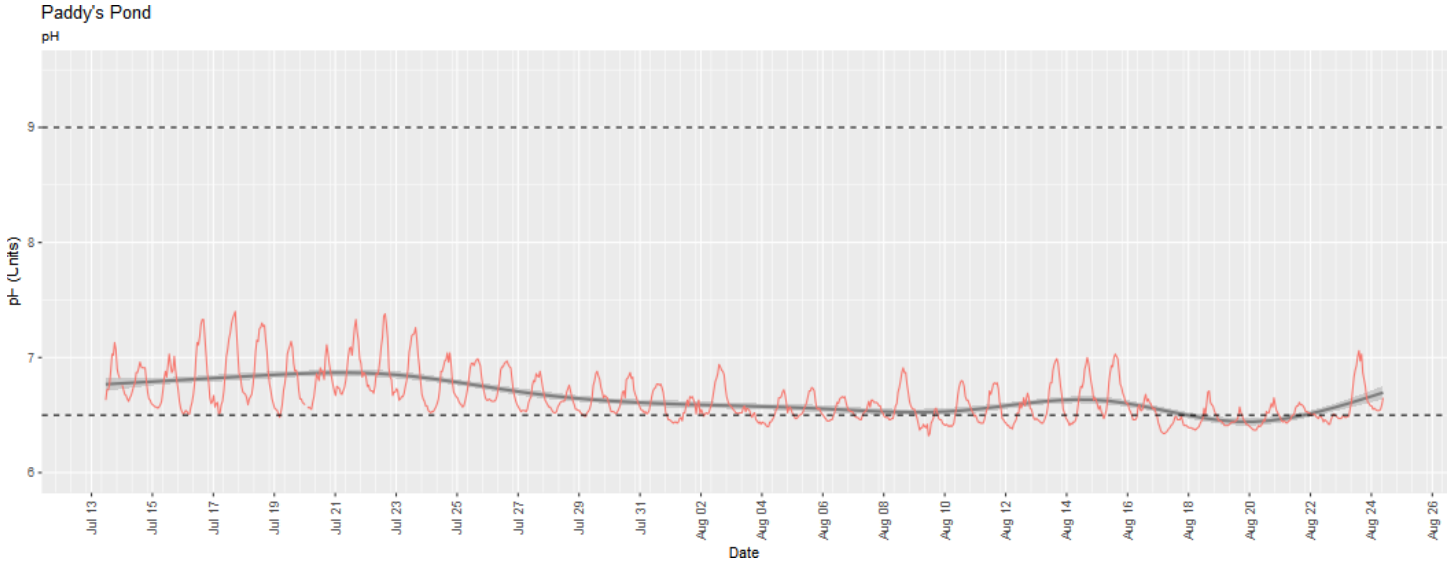


Mean	Median	Min	Max
21.35	21.43	17.98	24.31

- Water temperatures peaked in mid- to late-July, and plateaued until a decrease was observed following August 17th. Periodic warming trends can be expected into the fall; however, a general downward trend should be expected until December.

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.

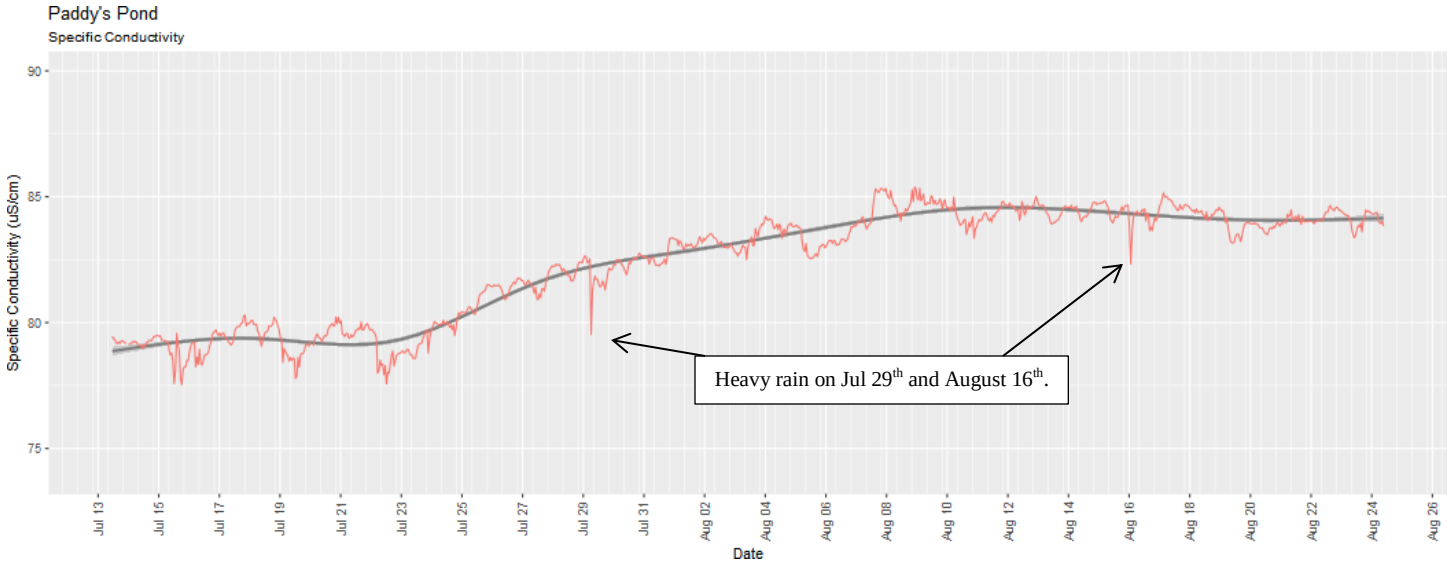


Mean	Median	Min	Max
6.65	6.59	6.32	7.40

- Over the course of this deployment, a slight decline in pH was observed, although most values were found to be at or just below the CCME guideline for the protection of aquatic life.
- Almost as notable is the reduction in diurnal cycles from the start to the end of the deployment – the difference between daily maximum and minimum values decreased substantially. This difference could be related to a gradual change in photosynthetic species over time. The highest pH was recorded on July 17th at 5:15 pm when photosynthetic activity was high, and carbon dioxide consumption was highest. During high carbon dioxide uptake, a reduced concentration of carbonic acid would be observed allowing pH 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.

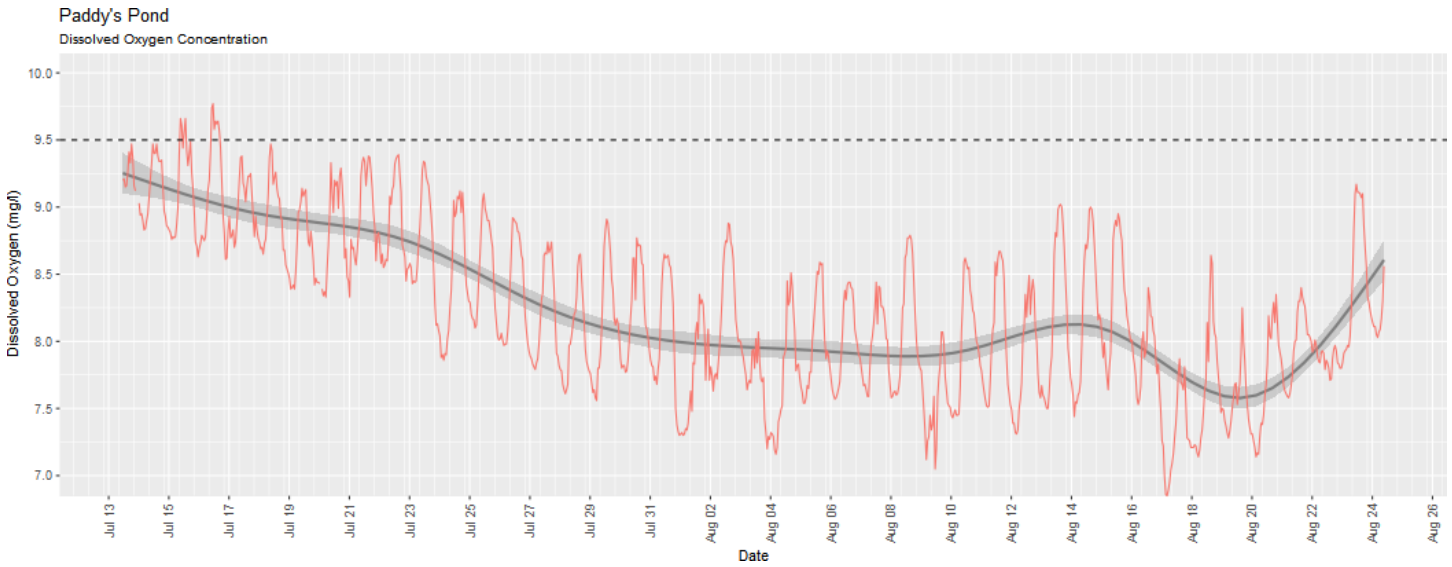


Mean	Median	Min	Max
82.37	83.17	77.53	85.38

- Specific conductivity increased during this deployment period and peaked in early August. This increase in conductivity is likely related to a concentrating effect imposed by decreasing inflow due to dry conditions and evaporation of water from the pond. As a result, dissolved solids are left behind. Sharp drops in conductivity are related to sudden inflows from precipitation.

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.

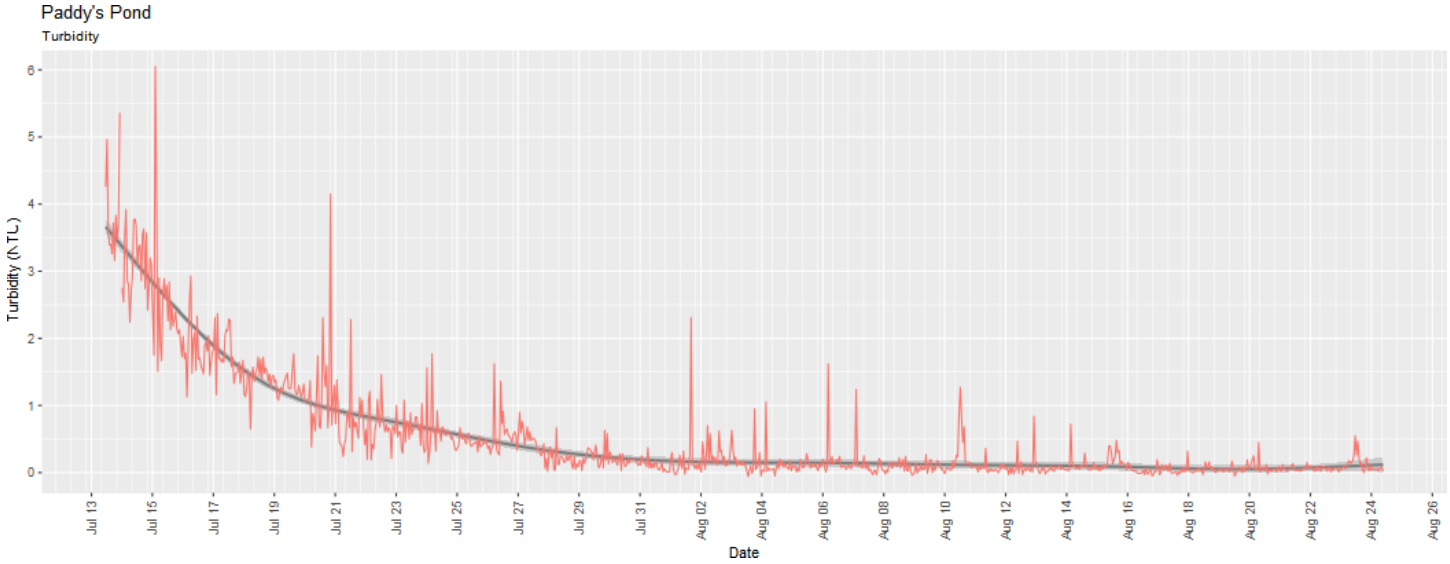


Mean	Median	Min	Max
8.25	8.17	6.85	9.77

- Declining dissolved oxygen values are mostly related to rising and plateaued water temperatures related to warm summer conditions. As water temperatures begin to decline towards the end of the deployment period, a rise in dissolved oxygen is also seen.
- All dissolved oxygen concentrations were found to be above the minimum CCME guideline of 6.5 mg/l dissolved oxygen for the protection of aquatic life.

Turbidity

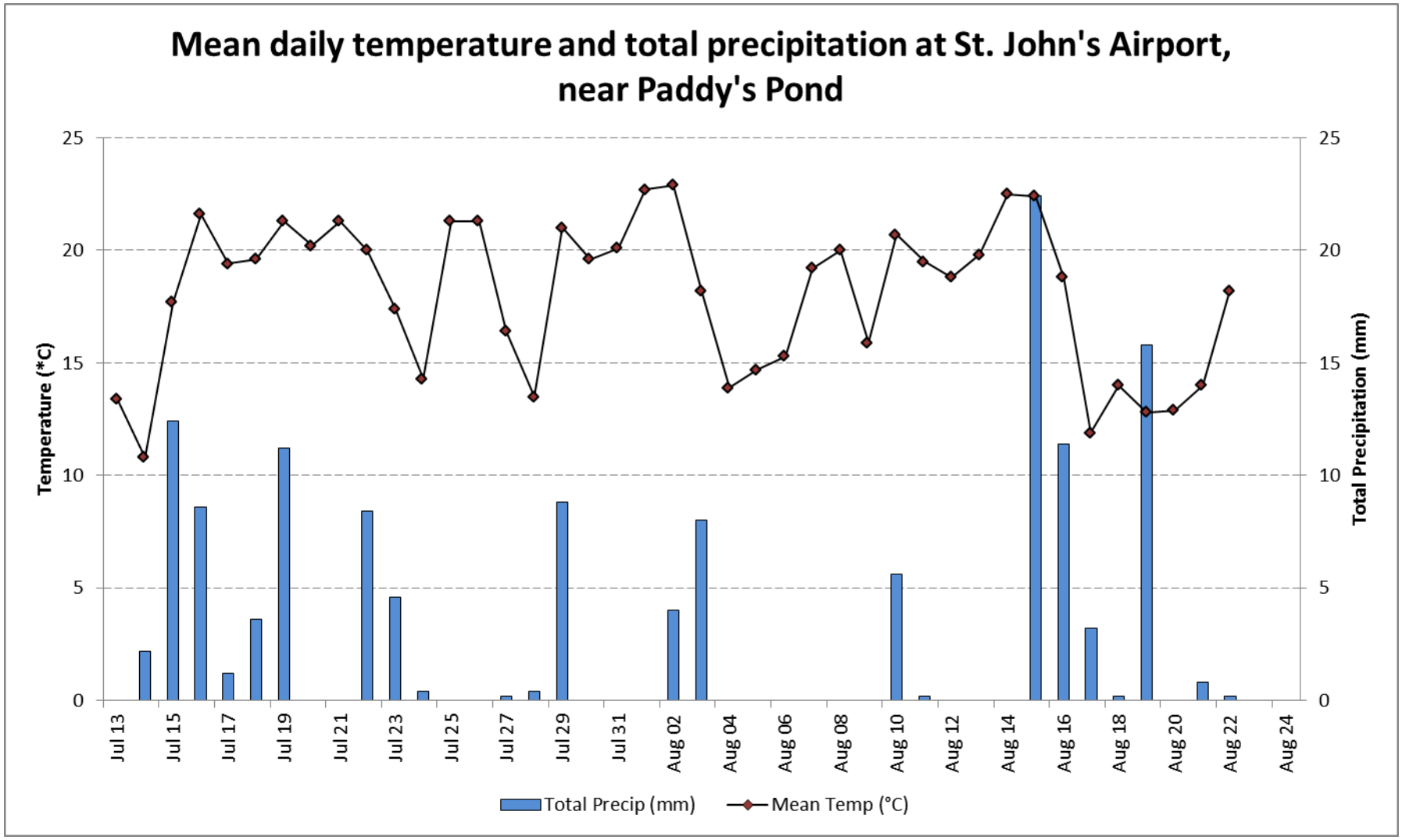
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.54	0.15	-0.06	6.05

- At the initiation of this deployment period, an algal bloom was present within the water column. Turbidity levels were mostly resolved by early August as the algal bloom came to an end. Most turbidity values thereafter were low, keeping the deployment median to 0.15 NTU.

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
Jul 13
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
Aug 14
Aug 16
Aug 18
Aug 20
Aug 22
Aug 24
Total Precip (mm)
Mean Temp (°C)