Real-Time Water Quality Deployment Report

Paddy's Pond

May 25, 2018 to July 13, 2018

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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2018-05-25 to 2018-07-13

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- In the latter part of the deployment period, pH and turbidity levels were found to increase and remain elevated for some time. During removal activities, an algae bloom appeared to be underway near the north eastern portion of Paddy's Pond.

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.

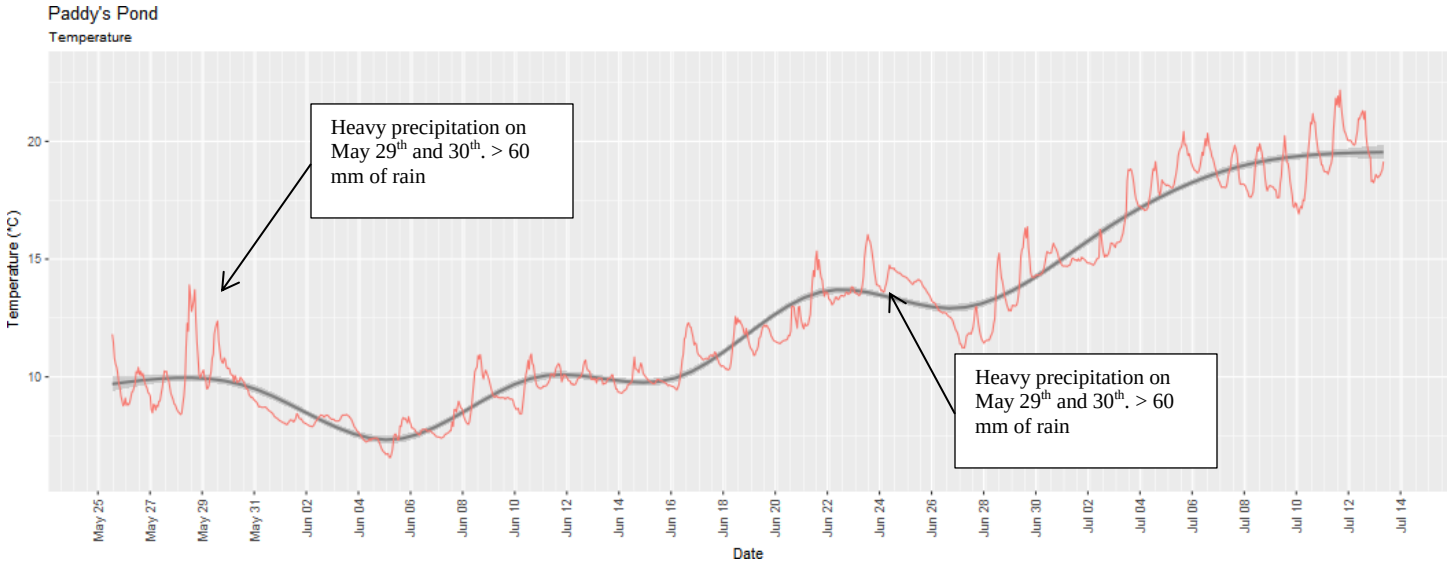
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	May 25, 2018	Deployment	Good	Good	Excellent	Excellent	Excellent
	July 13, 2018	Removal	Excellent	Good	Good	Good	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.

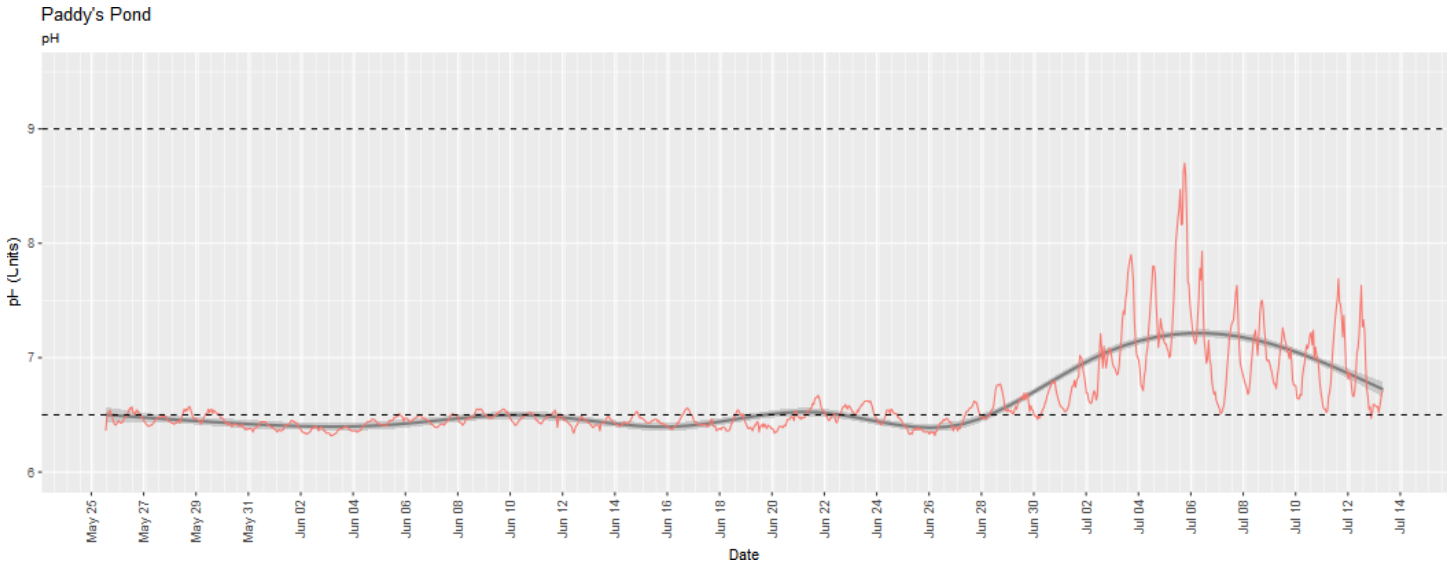


Mean	Median	Min	Max
12.57	11.58	6.57	22.17

- Water temperature increased over the course of the deployment period with a couple of intermittent cooling events resulting from cool air temperatures and heavy precipitation (May 29th – 30th, and June 24th – 26th).

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.

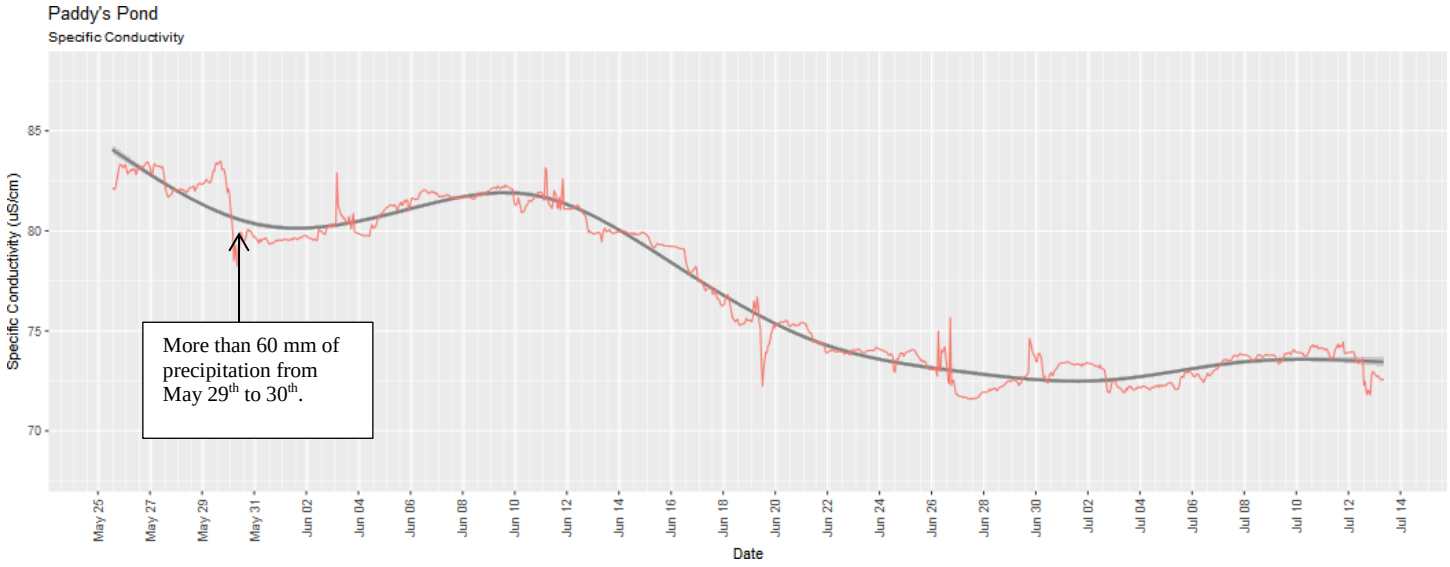


Mean	Median	Min	Max
6.61	6.48	6.32	8.70

- Most pH values fell just below the lower CCME guideline for the protection of early life stage aquatic life.
- pH was stable throughout most of the deployment, however, a rise and a substantial amplification of diurnal cycling was observed after heavy rain and cool temperatures on June 26th. Runoff into Paddy's Pond at this time may have carried the nutrients needed to encourage an algae bloom that impacted pH levels.

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.

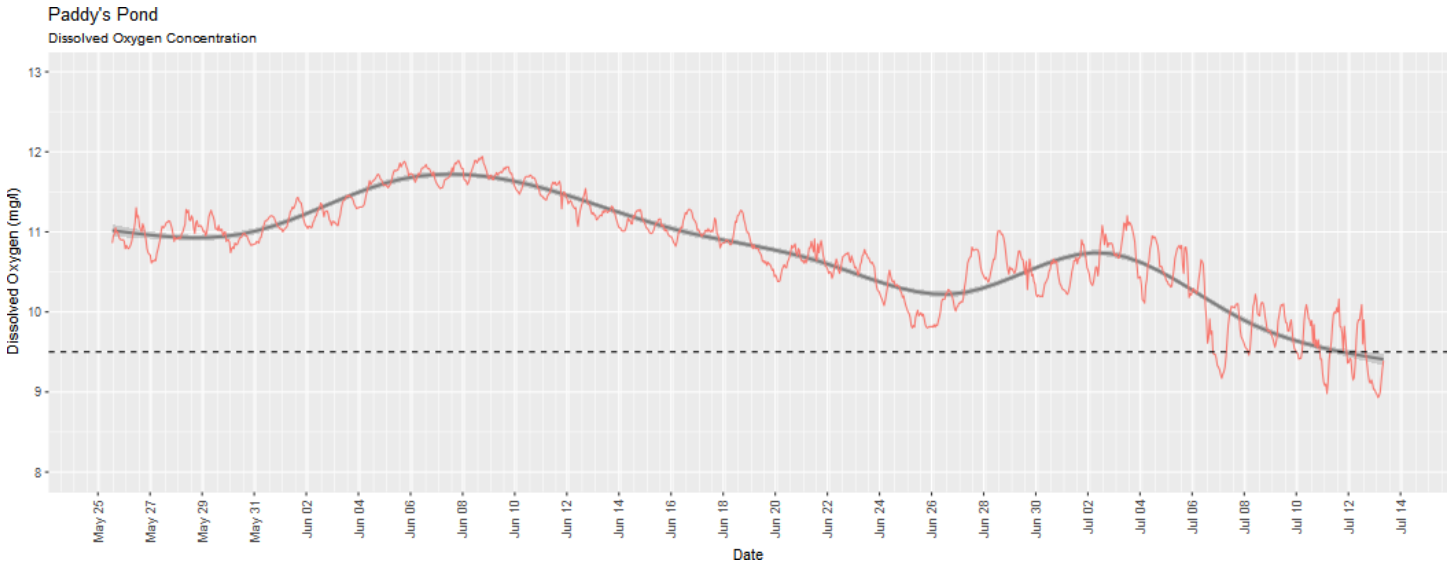


Mean	Median	Min	Max
77.00	75.53	71.59	83.48

- Overall, specific conductivity declined at Paddy's Pond from May to July. A brief rising trend from May 30th to June 10th was observed. Periodic peaks and drops are likely related to isolated weather conditions.

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.

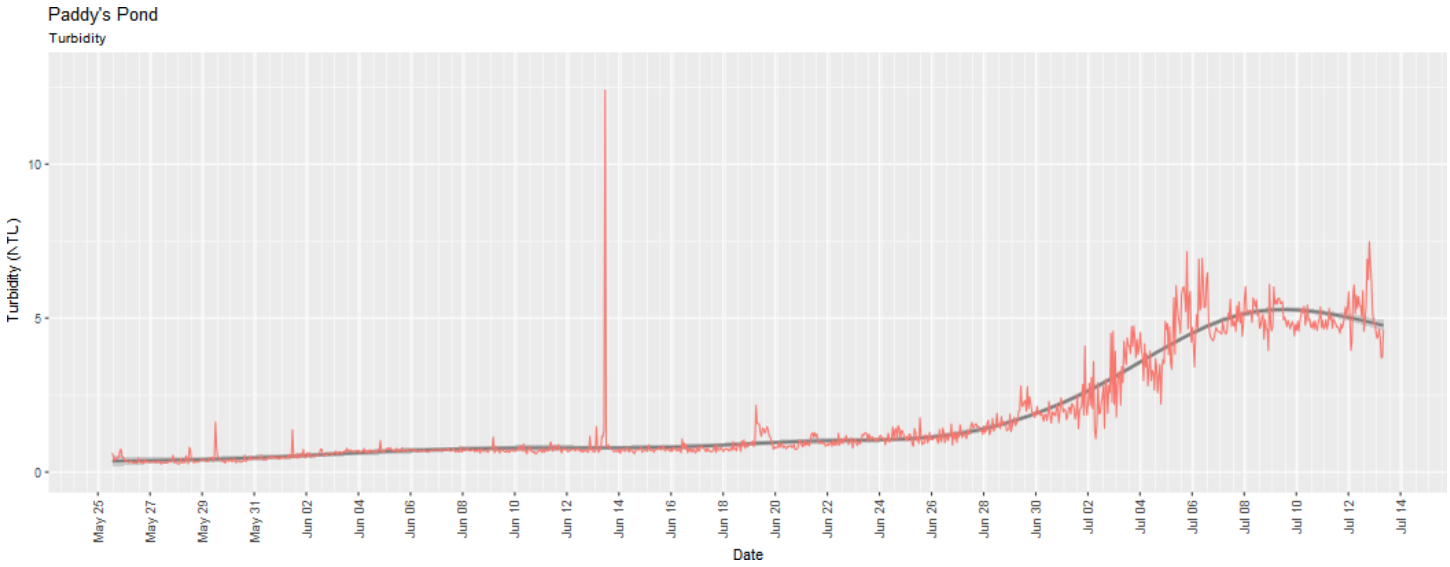


Mean	Median	Min	Max
10.77	10.86	8.93	11.94

- As water temperatures gradually increased during this deployment period, a simultaneous decline was observed in dissolved oxygen levels. Oxygen concentrations were above the CCME guideline for the protection of early life stage aquatic organisms until the second week of July. This is somewhat longer than some other water bodies on the island.

Turbidity

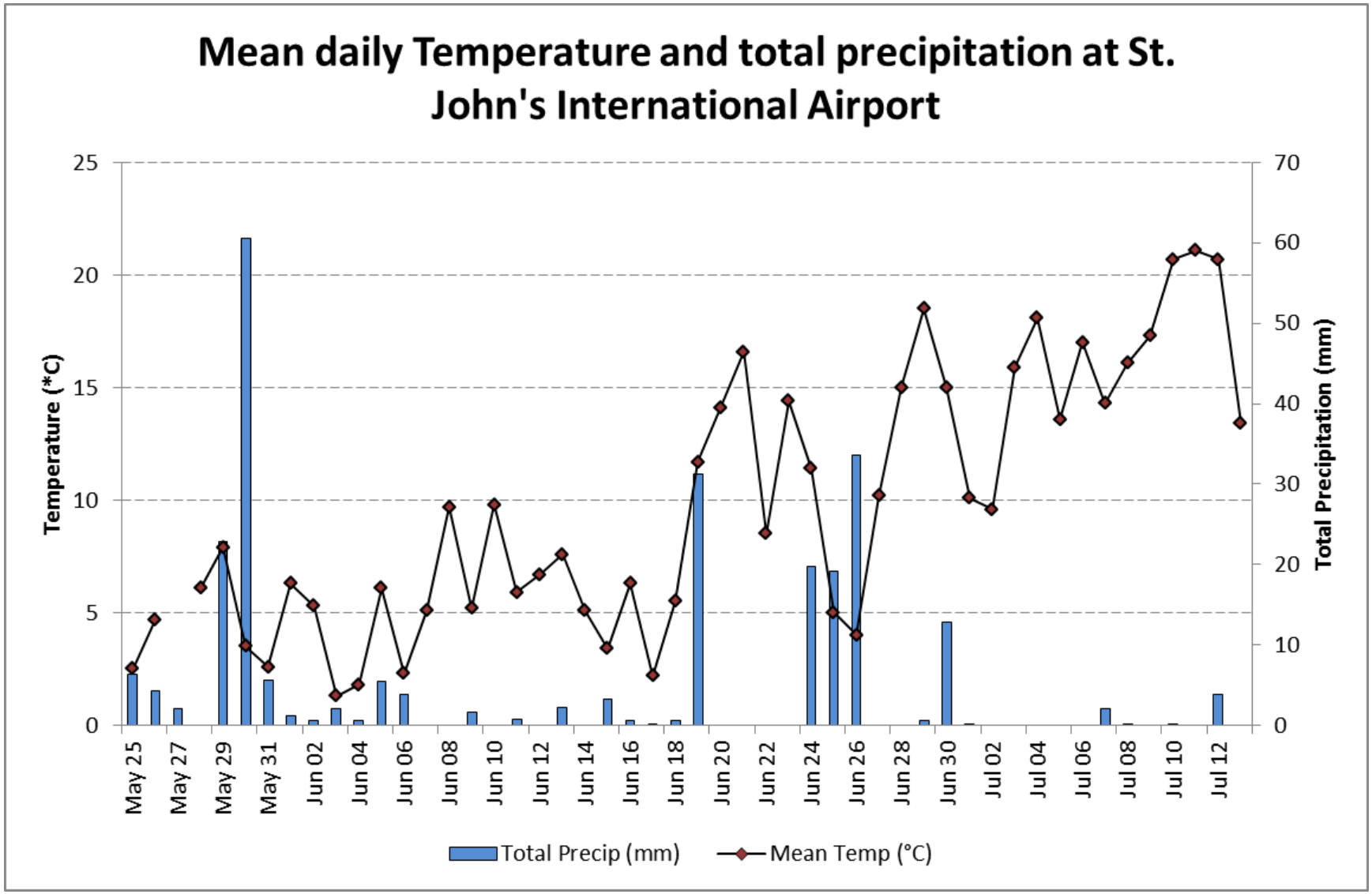
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
1.7	0.9	0.3	12.4

- A steady rise in turbidity was seen during this deployment period, especially from late July, onwards. This increasing turbidity is likely due to an algae bloom that was visually identified during maintenance work on July 13th. Near the end of the deployment period, there is a suggestion that the elevated turbidity levels are beginning to decline.

Appendix


Mean daily Temperature and total precipitation at St. John's International Airport
Temperature (*C)
Total Precipitation (mm)
25
20
15
10
5
0
70
60
50
40
30
20
10
0
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
Total Precip (mm)
Mean Temp (°C)