Real-Time Water Quality Deployment Report

Paddy's Pond

April 24, 2017 to June 2, 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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2017-04-24 to 2017-06-02

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.

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

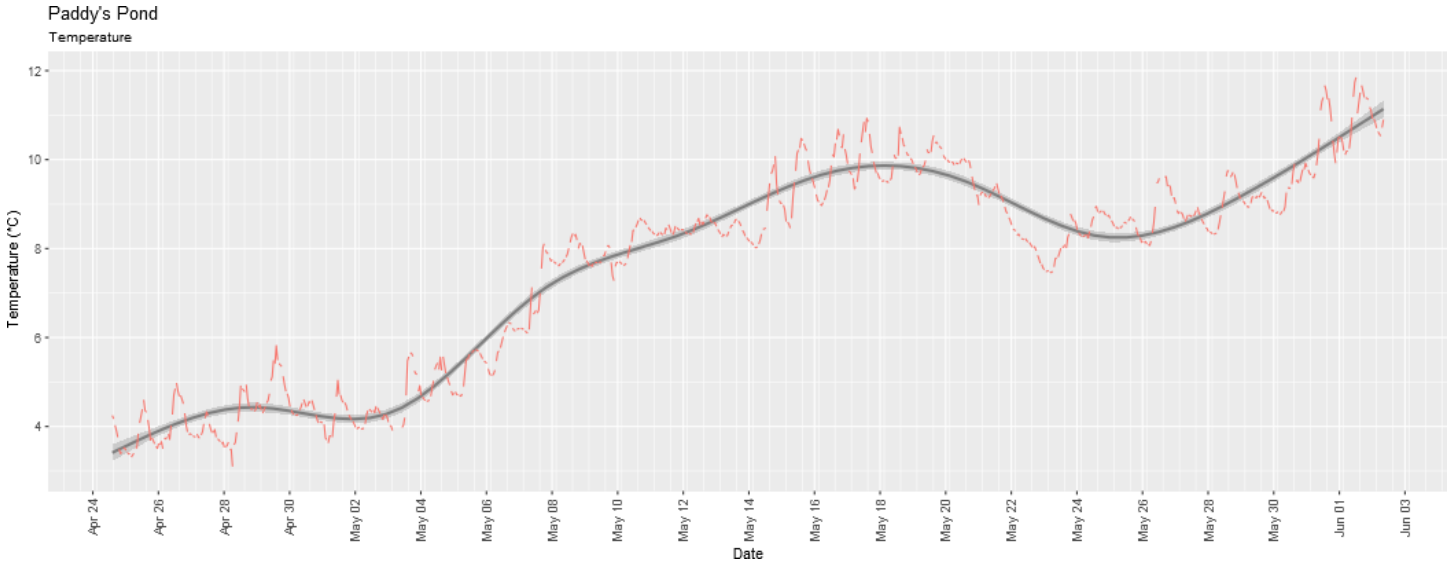
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	2017-04-24	Deployment	Poor	Excellent	Poor	Good	Good
	2017-06-02	Removal	Good	Fair	Fair	Excellent	Good

- QAQC rankings at deployment were lower than expected. During deployment, a Hydrolab HL-7 was the comparative instrument to the YSI Exo2 that has been used consistently over many deployments.
- QAQC rankings were better at removal when a regularly-used instrument was used.

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.

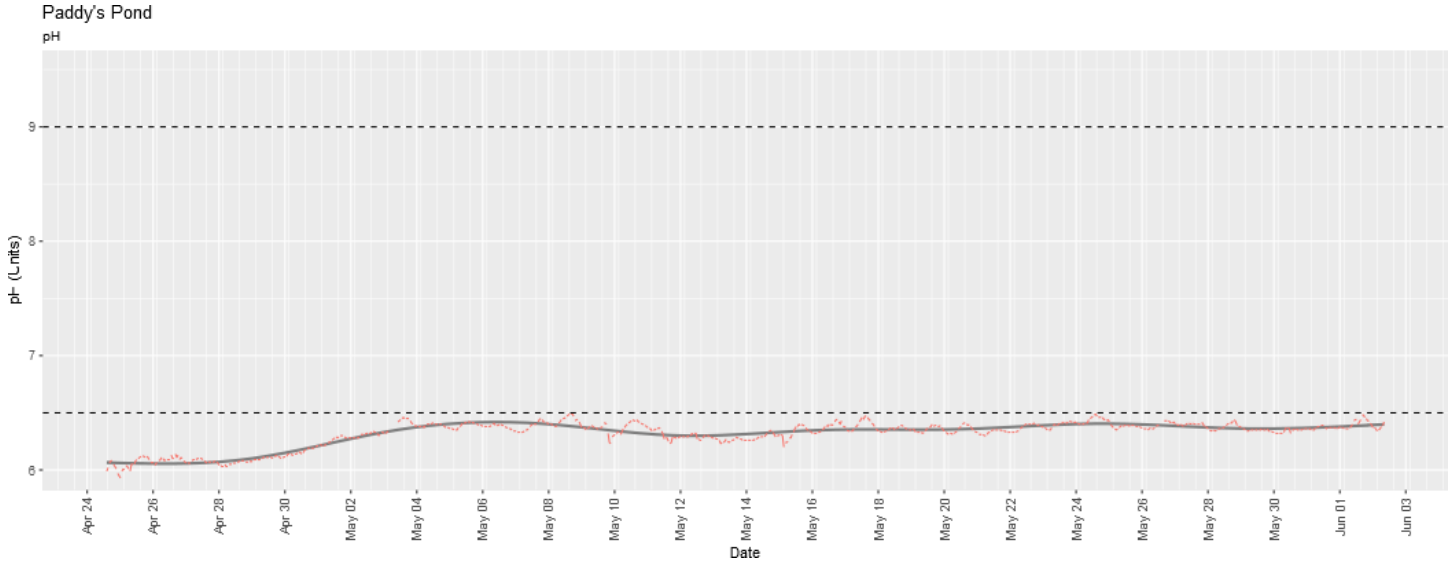


Mean	Median	Min	Max
7.56	8.34	3.10	11.85

- The spring water temperature rise is evident with a notable warming period on May 3rd and cooling period on May 19th. Increasing water temperatures can be expected until the first or second week of 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.

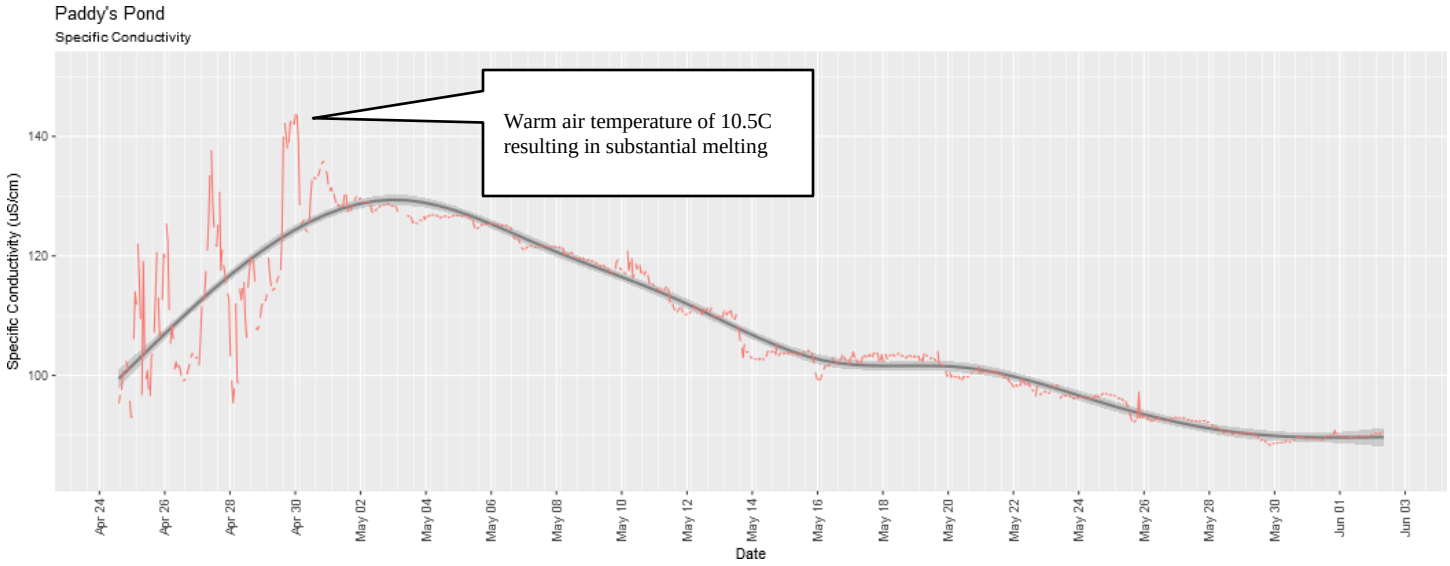


Mean	Median	Min	Max
6.32	6.35	5.93	6.49

- A slight increase in pH over the deployment period may be related to an increase in biological activity, especially photosynthesis. Between deployment and removal, there were notable changes in the amount of algae and plant life in the monitoring area. This change in vegetative productivity decreases the concentration of carbon dioxide in the water column, thereby increasing pH slightly.
- All pH values during this deployment period were found to be slightly below the nationally-established CCME pH guidelines of 6.5 to 9.0. This is not unexpected given that natural waters throughout Newfoundland and Labrador are generally acidic in nature.

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.

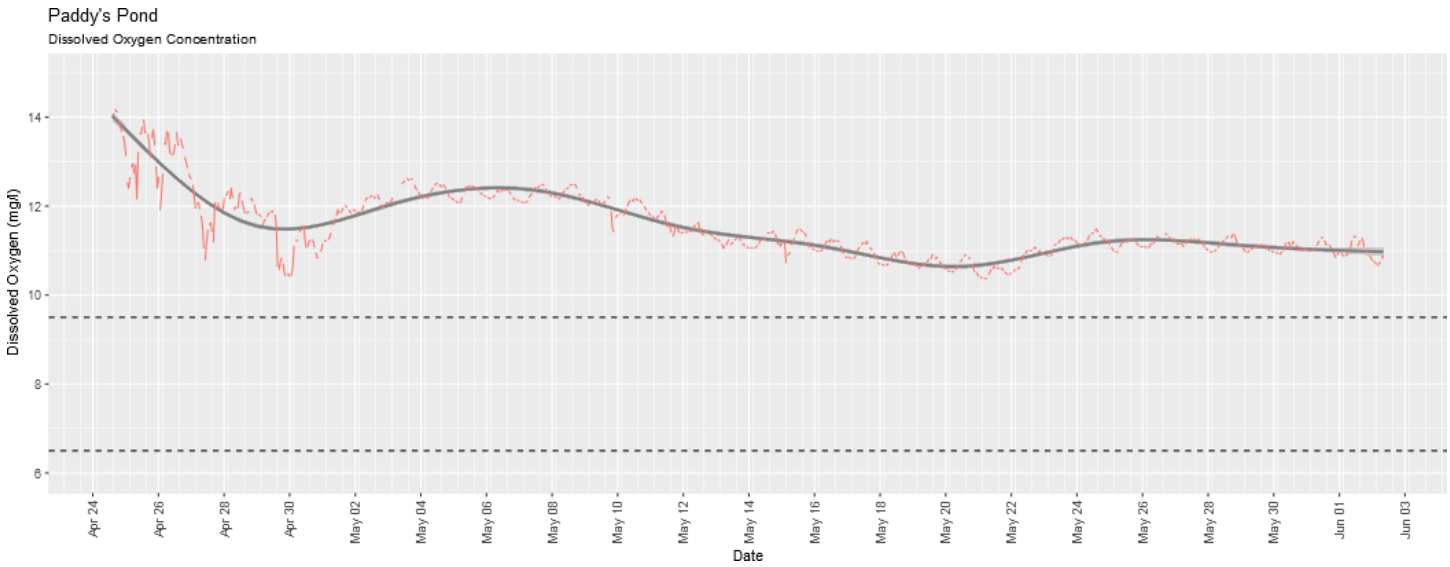


Mean	Median	Min	Max
107.69	103.50	88.35	143.81

- A decline in specific conductivity is seen as fresh meltwater and rain flushed out the relatively high-salinity waters that predominated over winter. Peak specific conductivity coincided with warm air temperatures on April 29th when silt and solids were released from frozen snow pack and ice into Paddy's Pond before being flushed from the system.

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.

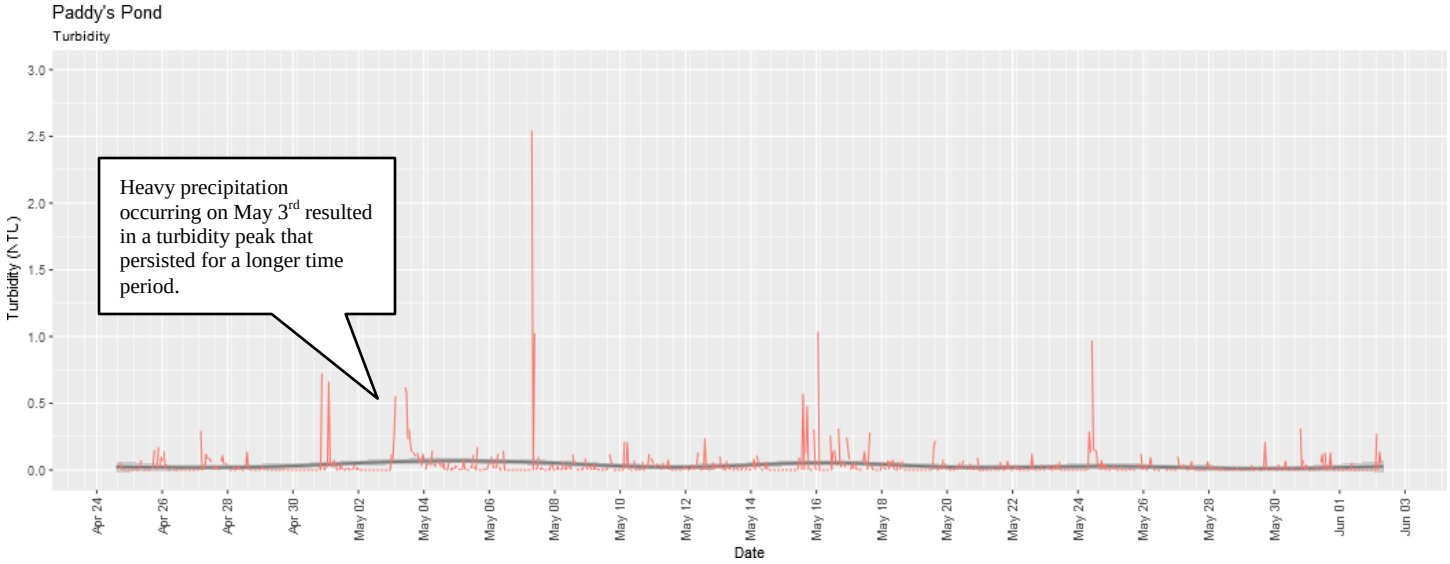


Mean	Median	Min	Max
11.54	11.26	10.37	14.18

- As water temperature increases a concurrent decline in dissolved oxygen is observed. All dissolved oxygen levels were found to be above the CCME guideline of 9.5 mg/l for the protection of early life stage aquatic organisms.

Turbidity

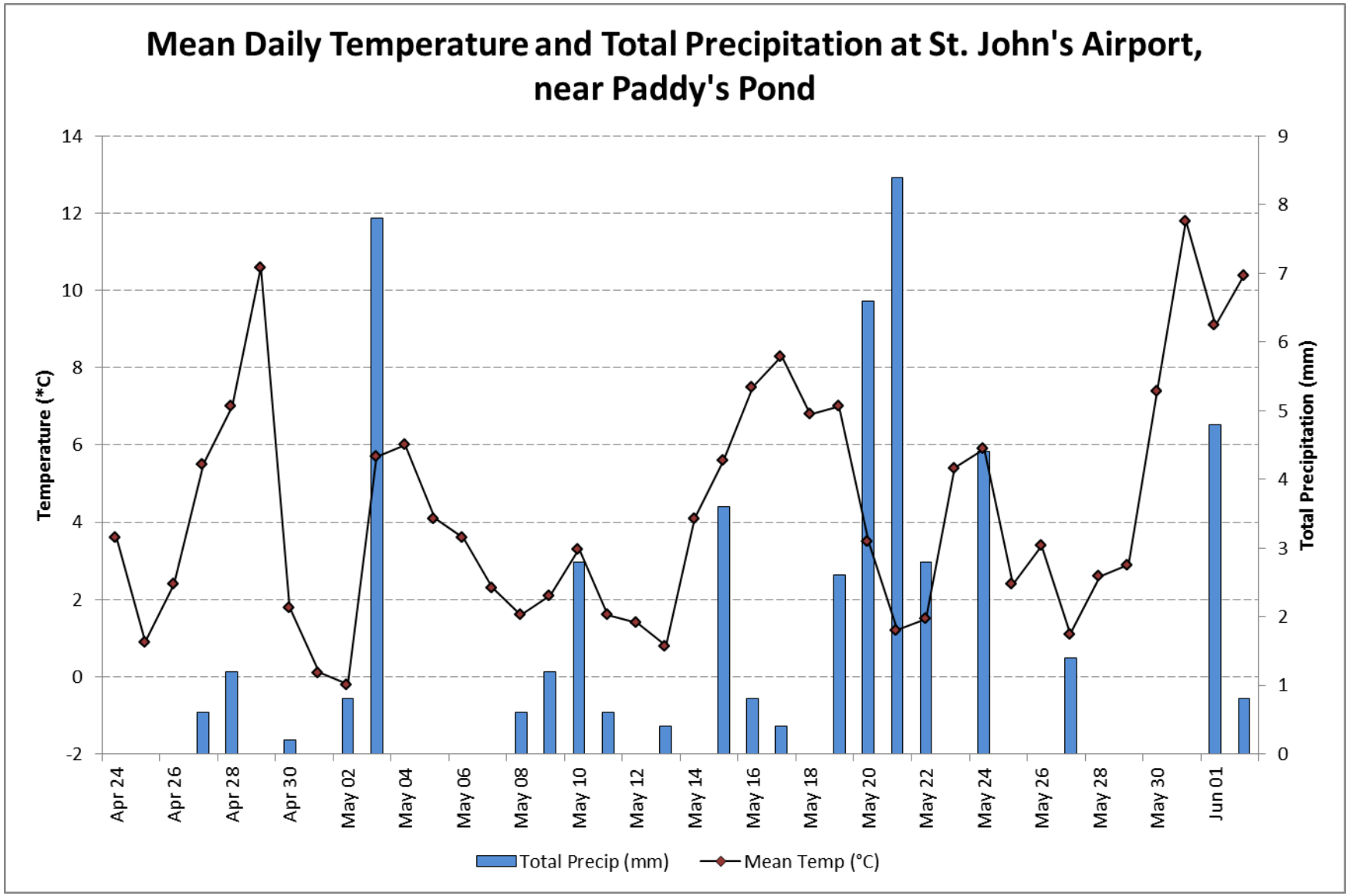
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.03	0.00	0.00	2.54

- Turbidity levels were low from late April to early June with a few instances of turbidity events, especially in relation to heavy precipitation.

Appendix


Mean Daily Temperature and Total Precipitation at St. John's Airport, near Paddy's Pond
Temperature (*C)
Total Precipitation (mm)
14
12
10
8
6
4
2
0
-2
9
8
7
6
5
4
3
2
1
0
Apr 24
Apr 26
Apr 28
Apr 30
May 02
May 04
May 06
May 08
May 10
May 12
May 14
May 16
May 18
May 20
May 22
May 24
May 26
May 28
May 30
Jun 01
Total Precip (mm)
Mean Temp (°C)