Real-Time Water Quality Deployment Report

Paddy's Pond

December 8, 2017 to March 29, 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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2017-12-08 to 2018-03-29

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- This deployment report covers the second winter of under-ice deployment at 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.

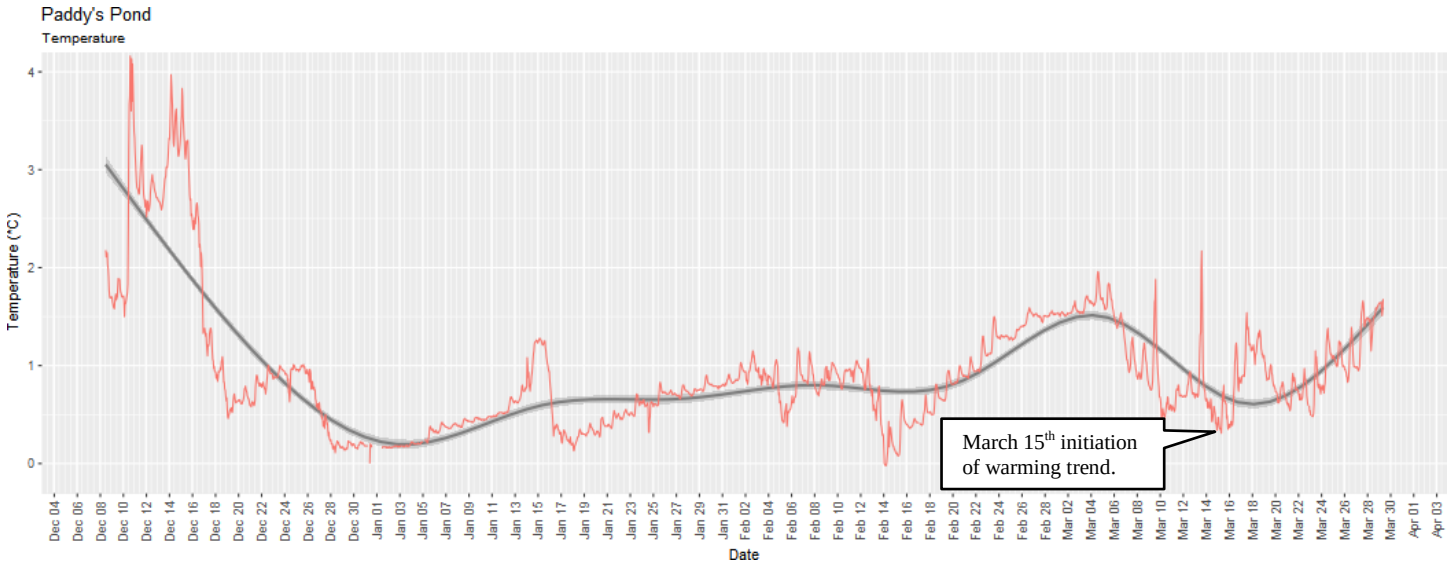
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	December 8, 2017	Deployment	Excellent	Good	Good	Good	Excellent
	March 29, 2018	Removal	Excellent	Fair	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.

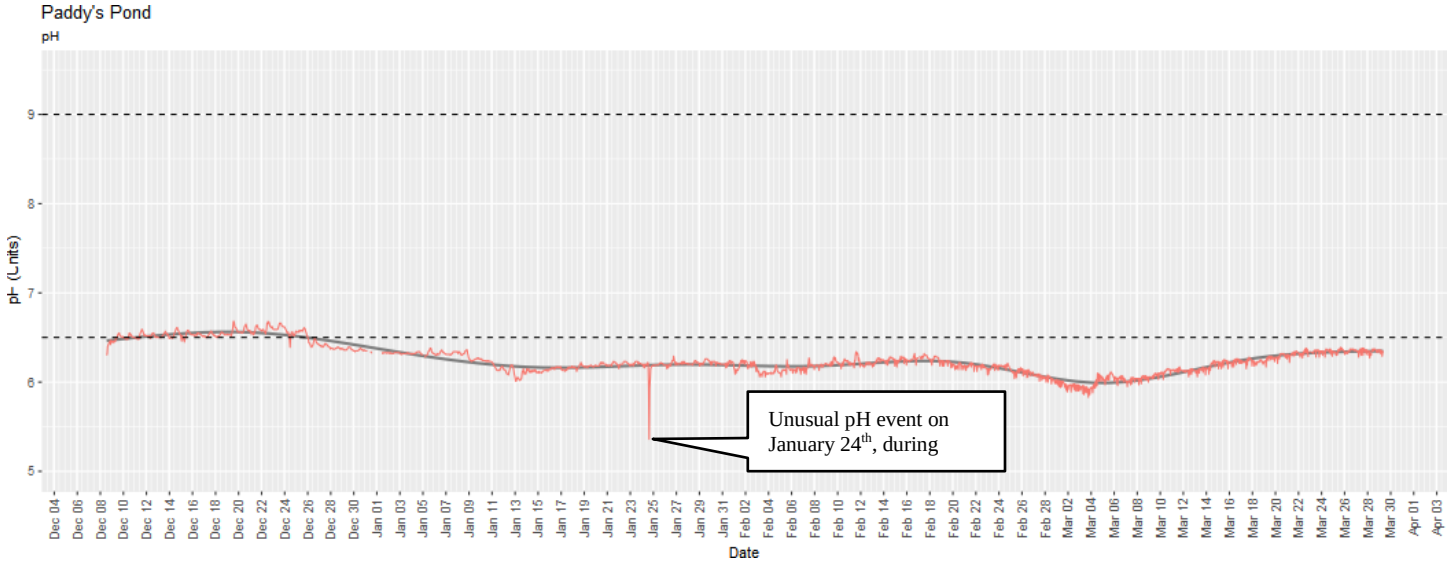


Mean	Median	Min	Max
0.94	0.81	-0.02	4.16

- Despite consistent ice cover at Paddy's Pond through much of the winter, water temperatures fluctuated between 0 – 1^{o}C.
- The winter minimum temperature was observed on February 14th. By mid-March, water temperatures began to rise into a spring warming trend, initiated by almost 20 mm of precipitation on March 15th when mean temperature was greater than 0^{o}C.

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.

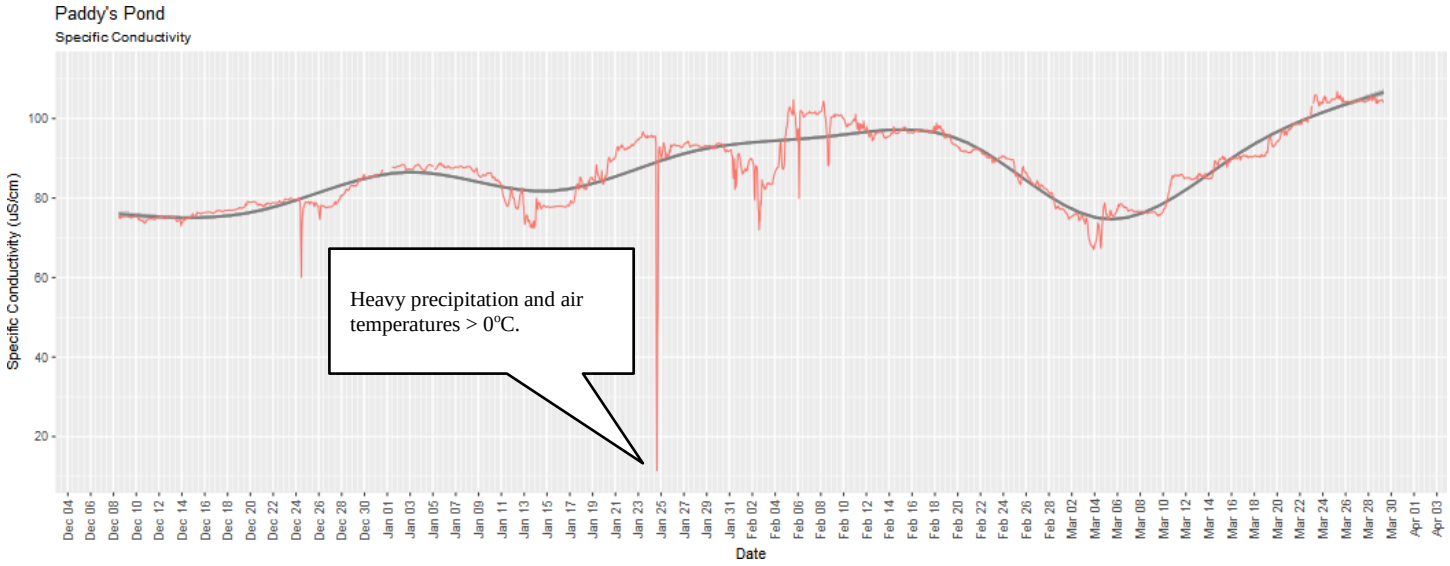


Mean	Median	Min	Max
6.26	6.23	5.36	6.68

- A tendency towards acidification was observed at Paddy's Pond during this deployment period. This tendency may be explained by the reduction of carbon dioxide uptake through photosynthesis by aquatic vegetation. The resultant rise in carbon dioxide and subsequent rise in carbonic acid concentration (via disassociation of carbon dioxide) decreases pH level.
- pH level began to increase from March 4th onwards following a rising trend in water temperature.

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.

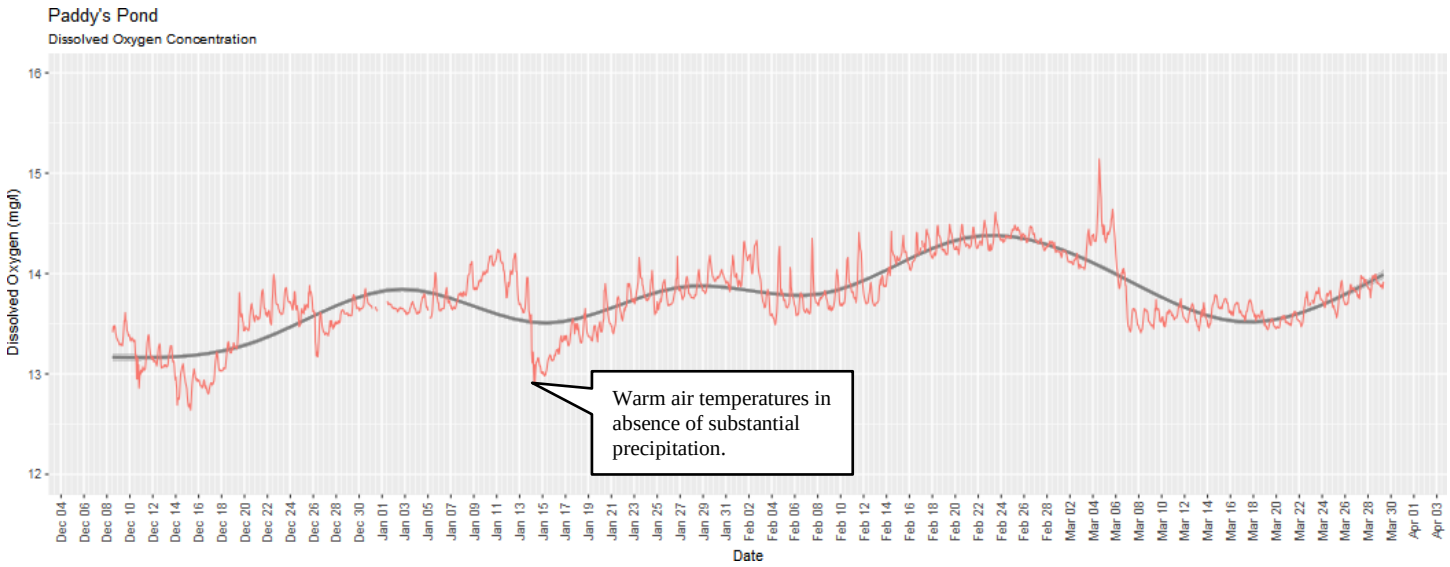


Mean	Median	Min	Max
86.94	87.10	11.45	106.75

- A long and slow increase in specific conductivity is prevalent during this deployment period. This increase in conductivity was observed at Paddy's Pond during the same time frame in 2017 and is observed in other urban streams during the winter season as a result of road salt usage. With springtime freshwater inputs and runoff, conductivity is expected to decline into the summer season.

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.

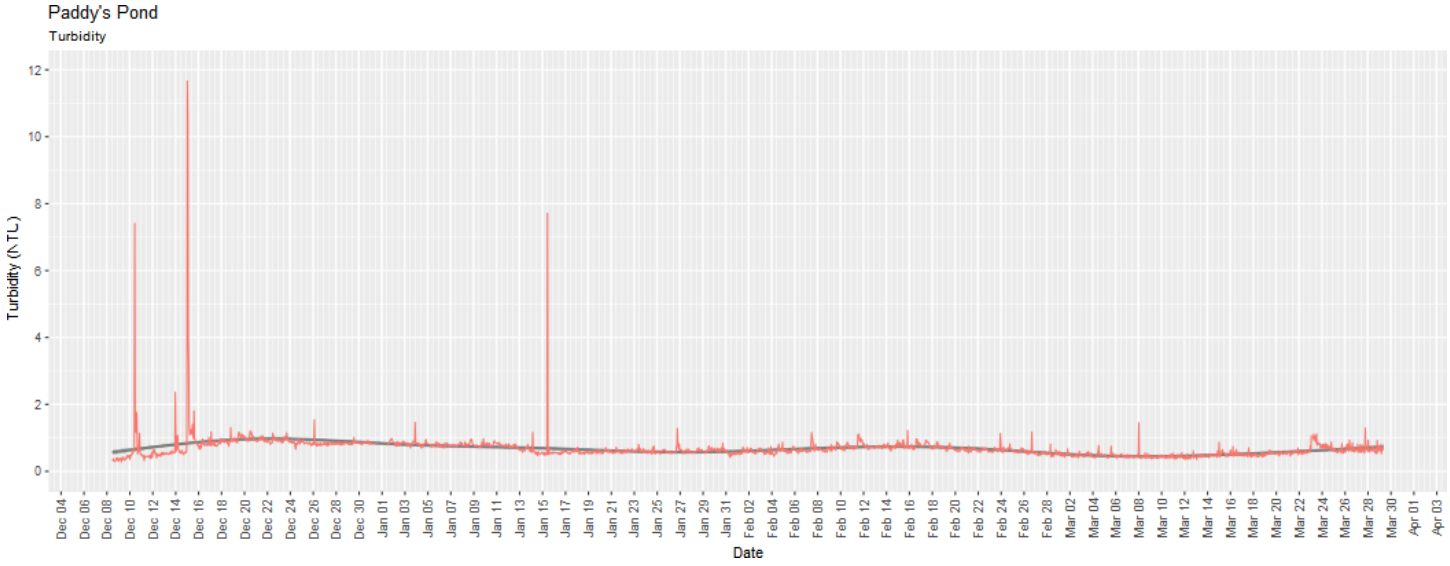


Mean	Median	Min	Max
13.75	13.71	12.64	15.14

- Dissolved oxygen concentration increased over the course of the deployment period in the presence of low water temperatures.

Turbidity

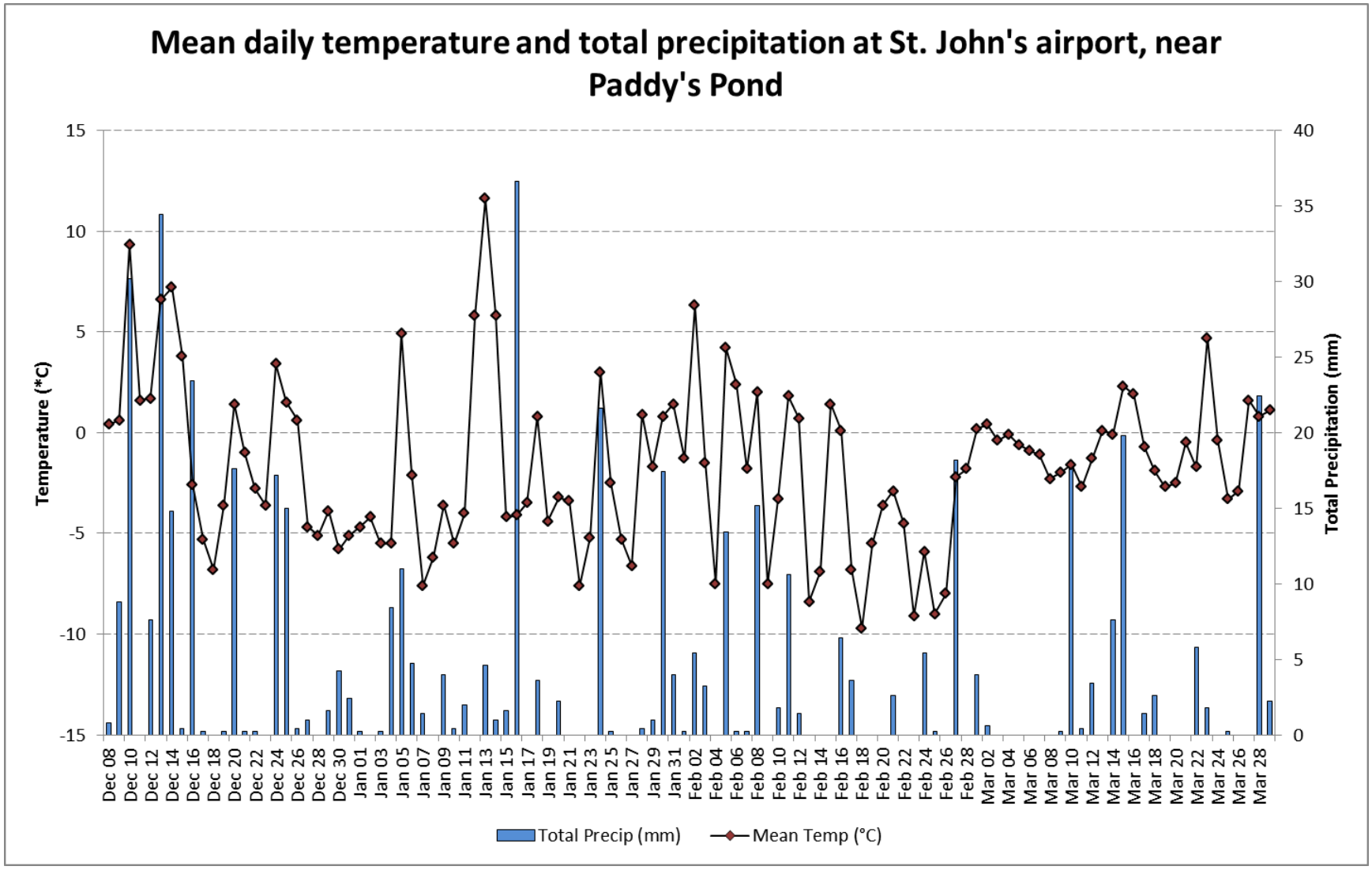
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Mean	Median	Min	Max
0.68	0.63	0.28	11.66

- Turbidity levels during this deployment period were low with occasional spikes and peaks that were also of low value.

Appendix


Mean daily temperature and total precipitation at St. John's airport, near Paddy's Pond
Temperature (*C)
Total Precipitation (mm)
15
10
5
0
-5
-10
-15
40
35
30
25
20
15
10
5
0
Dec 08
Dec 10
Dec 12
Dec 14
Dec 16
Dec 18
Dec 20
Dec 22
Dec 24
Dec 26
Dec 28
Dec 30
Jan 01
Jan 03
Jan 05
Jan 07
Jan 09
Jan 11
Jan 13
Jan 15
Jan 17
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Feb 02
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Feb 18
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Feb 22
Feb 24
Feb 26
Feb 28
Mar 02
Mar 04
Mar 06
Mar 08
Mar 10
Mar 12
Mar 14
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Total Precip (mm)
Mean Temp (°C)