Real-Time Water Quality Deployment Report

Minipi River below Minipi Lake

June 29 to
August 2, 2011

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division

Contents

General

- Department of Environment and Conservation staff monitors the real-time web pages regularly.
- This deployment report discusses water quality related events occurring at the station on Minipi River below Minipi Lake.
- On June 29, 2011, a real-time water quality monitoring instrument was deployed at the station on the Minipi River below Minipi Lake. The instrument was deployed for a period of 34 days. The instrument was removed on August 2.

Quality Assurance and Quality Control

- 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.
  - ► At deployment and removal, a QA/QC Sonde is temporarily deployed along side the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments**.** Based on the degree of difference between parameters recorded by the Field Sonde and QAQC Sonde at deployment and at removal, a qualitative statement is made on the data quality (Table 1).

Table 1: Ranking classifications for deployment and removal

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (°C)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	<+/-1
pH (unit)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Sp. Conductance (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Sp. Conductance > 35 µS/cm (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Dissolved Oxygen (mg/L) (% Sat)	<=+/-0.3	>+/-0.3 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Turbidity <40 NTU (NTU)	<=+/-2	>+/-2 to 5	>+/-5 to 8	>+/-8 to 10	>+/-10
Turbidity > 40 NTU (%)	<=+/-5	>+/-5 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20

- It should be noted that the temperature sensor on any sonde is the most important. All other parameters can be broken down into three groups: temperature dependant, temperature compensated and temperature independent. Because the temperature sensor is not isolated from the rest of the sonde the entire sonde must be at the same temperature before the sensor will stabilize. The values may take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray the water body.

Minipi River below Minipi Lake, Newfoundland and Labrador

- Deployment and removal comparison rankings for the station on Minipi River deployed between June 29 and August 2, 2011 is summarized in Table 2.

Table 2: Comparison rankings for Minipi River station June 29 – August 2, 2011

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Minipi River	June 29, 2011	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	August 2, 2011	Removal	Good	Excellent	Good	Good	Excellent

- At the Minipi River station, all parameters ranked either 'good' or 'excellent' at both deployment and removal.

Data Interpretation

- The following graphs and discussion illustrate water quality-related events from June 29 to August 2 at the station on Minipi River below Minipi Lake.
- With the exception of water quantity data (stage), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent QAQC protocol. Water Survey of Canada is responsible for QAQC of water quantity data. Corrected data can be obtained upon request.

Minipi River below Minipi Lake

- Water temperature ranged from 12.28 to 18.64^{o}C during this deployment period (Figure 1).
- Water temperature is increasing throughout the deployment period. This trend is expected due to the increasing ambient air temperatures in the summer season (Figure 2). Water temperature fluctuates diurnally.

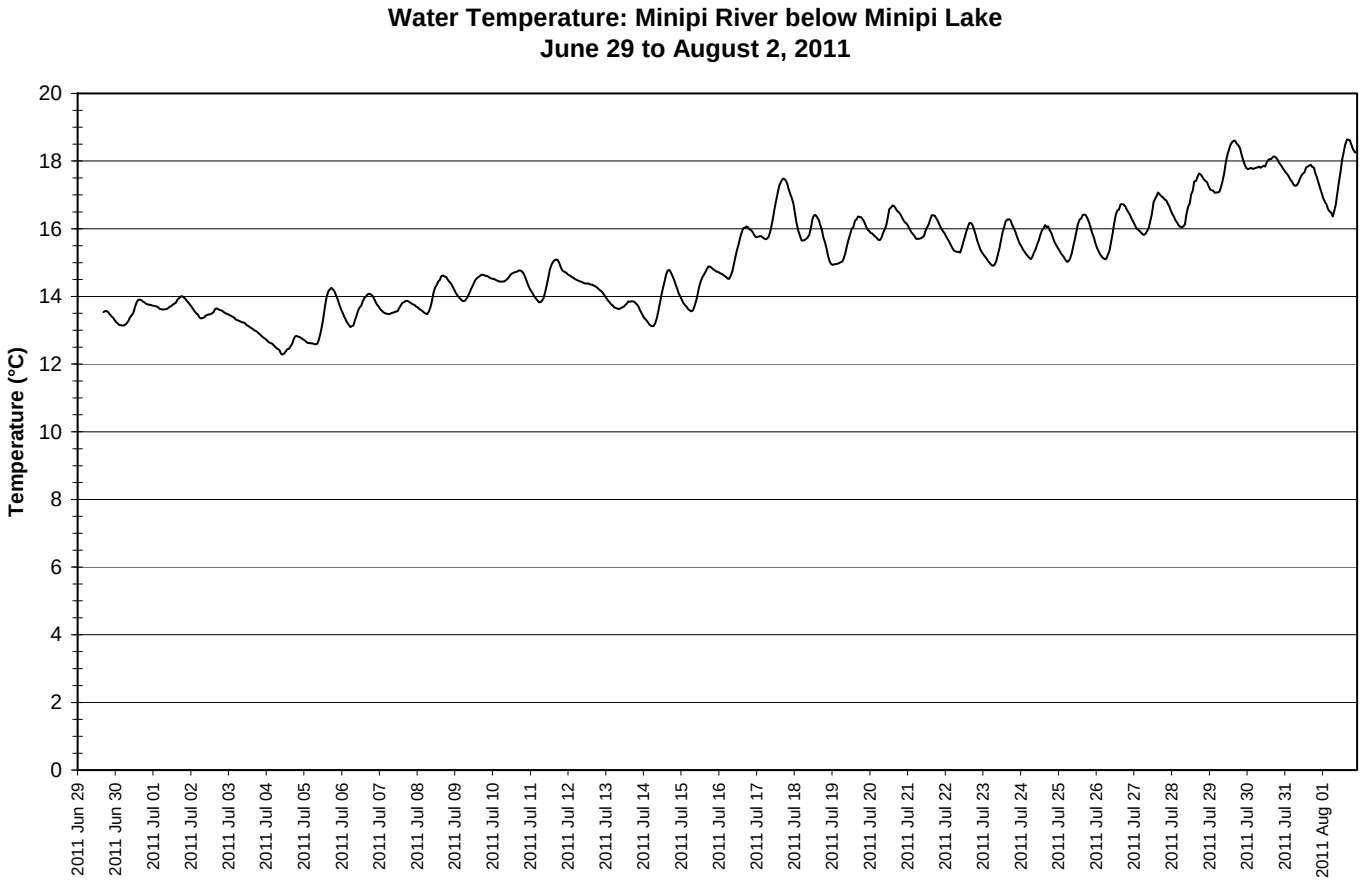


Figure 1: Water temperature at Minipi River below Minipi Lake

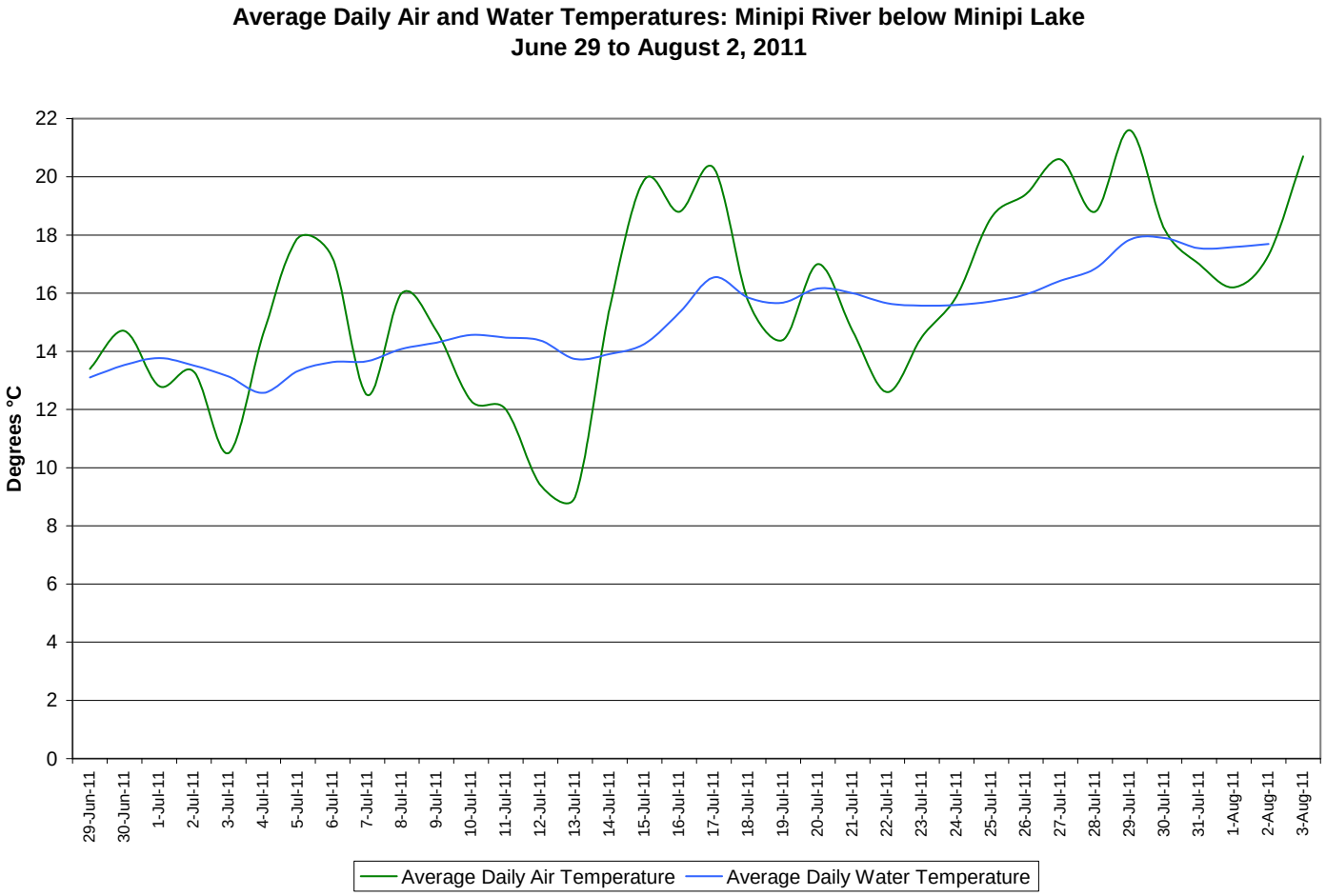


Figure 2: Average daily air and water temperatures at Minipi River below Minipi Lake

(weather data collected at Goose Bay)

- pH ranges between 6.50 and 6.83 pH units throughout the deployment period (Figure 3).
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly during the day and night.

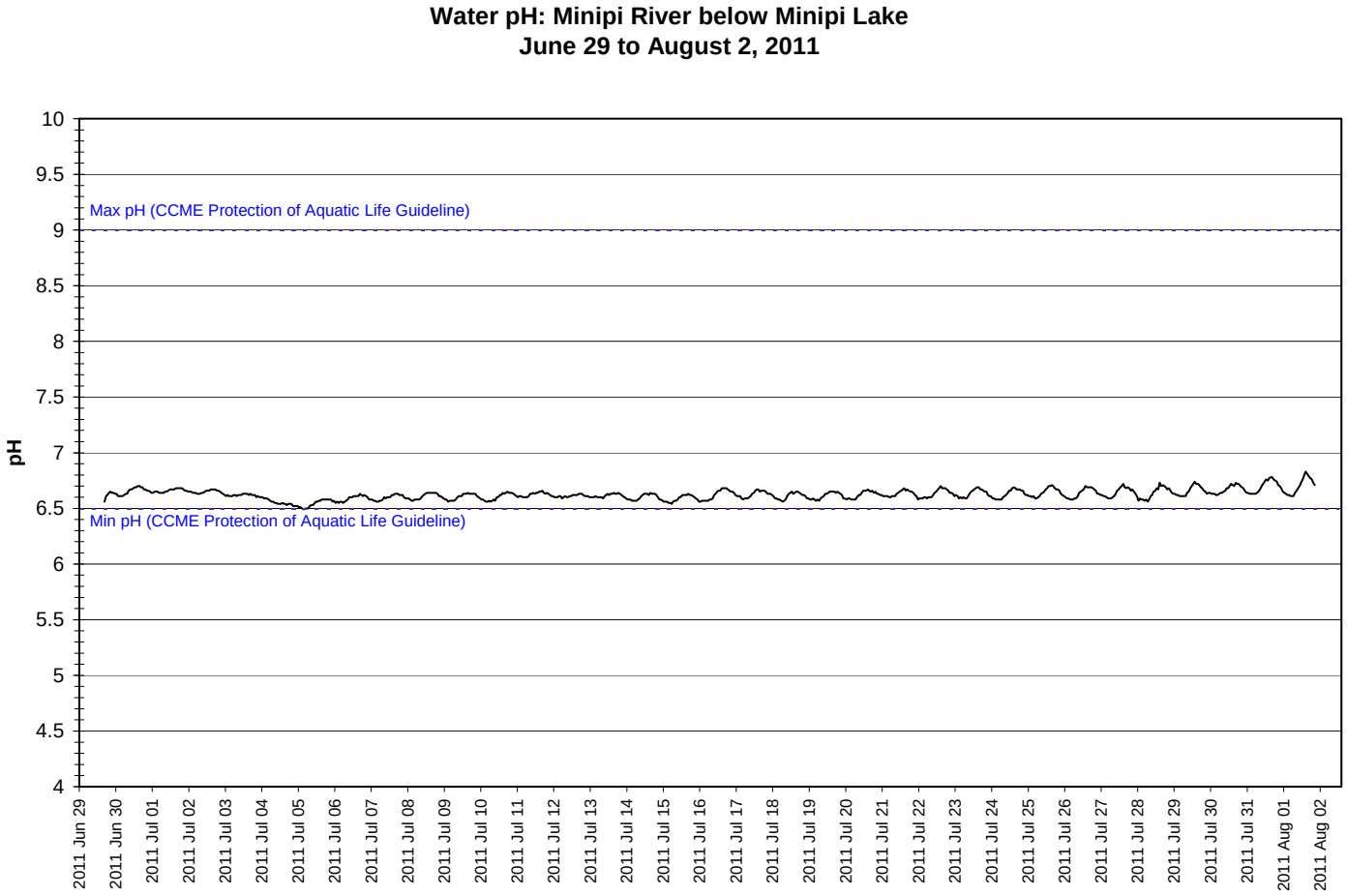


Figure 3: pH at Minipi River below Minipi Lake

- Specific conductivity ranges from 13.0 to 16.0µS/cm during the deployment period, averaging 13.0µS/cm (Figure 4). Due to a programming error at this station, specific conductivity is recorded to zero decimal places. In an attempt to rectify the programming error, Environment Canada made a visit to the station on July 19. The error was not resolved and data collected after this time is not accurate and has been removed from the data set.
- Specific conductivity is generally stable at this station.

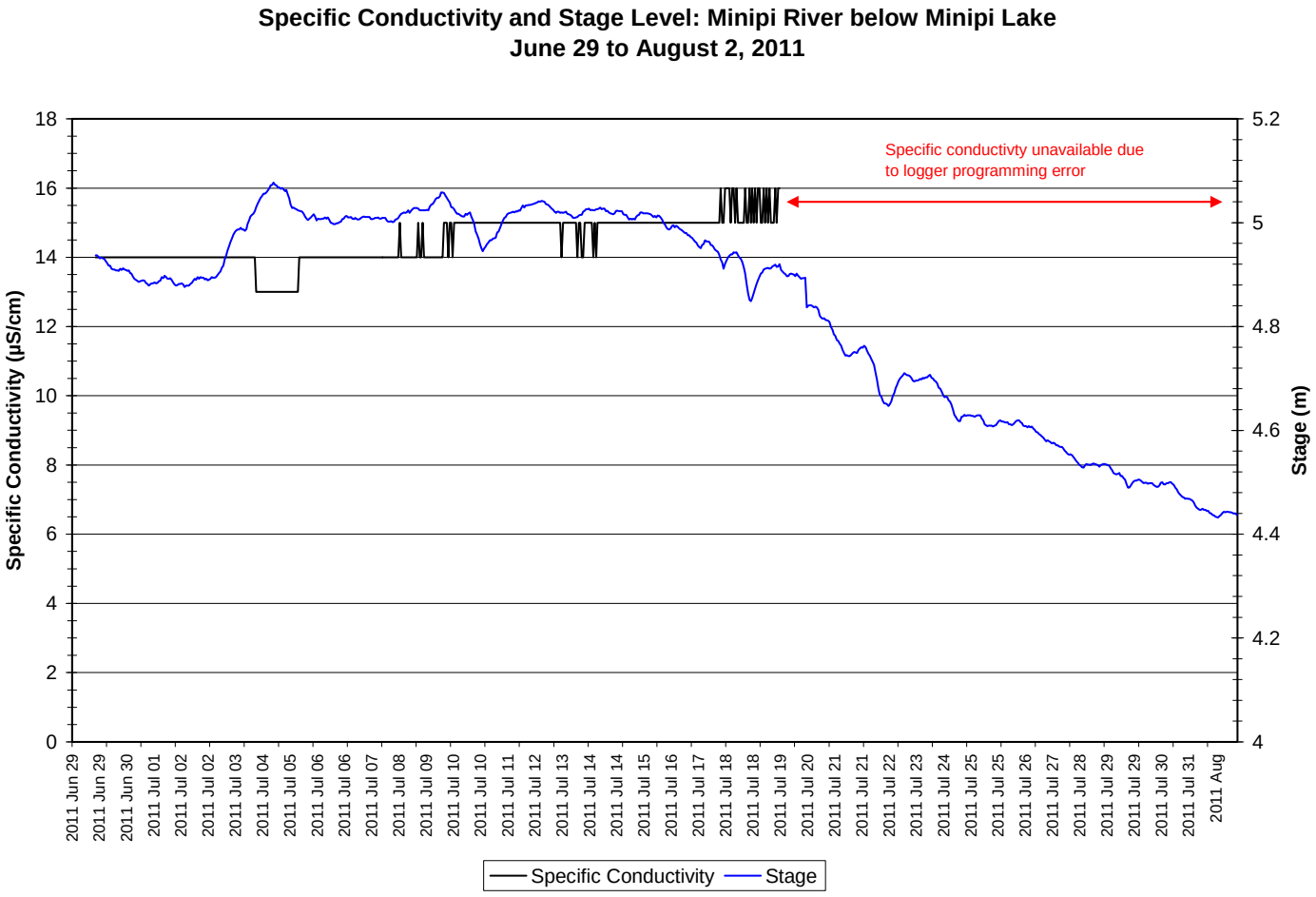


Figure 4: Specific conductivity and stage level at Minipi River below Minipi Lake

- The saturation of dissolved oxygen ranged from 92.4 to 98.0% and a range of 8.85 to 10.04mg/l was found in the concentration of dissolved oxygen with a median value of 9.53mg/l (Figure 5).
- All values were above the minimum CCME Guideline for the Protection of Other Life Stage Cold Water Biota of 6.5 mg/l. Most values were above the minimum CCME Guideline for the Protection of Early Life Stage Cold Water Biota value of 9.5 mg/l. The guidelines are indicated in blue on Figure 5.
- Dissolved Oxygen content decreases slightly over the deployment period. This trend is expected given the increasing air and water temperatures (Figure 2). Dissolved oxygen content fluctuates diurnally, displaying the inverse relationship to water temperature. In the latter half of the deployment period, dissolved oxygen content falls to just below the minimum guideline for early life stages. This period corresponds with the highest water temperature readings of the season.

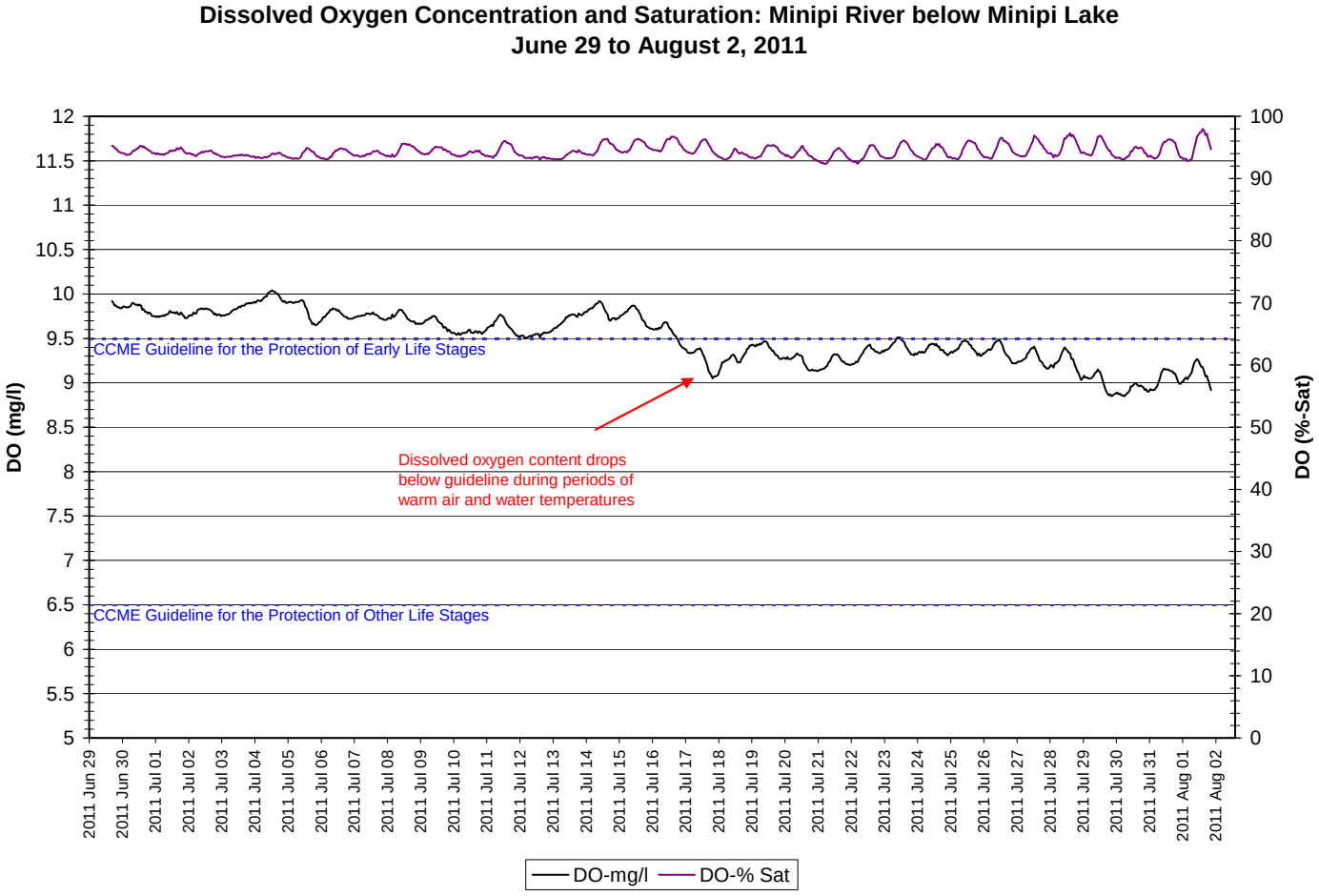


Figure 5: Dissolved oxygen and percent saturation at Minipi River below Minipi Lake

- Turbidity values typically remain at 0NTU for the majority of the deployment period (Figure 6).
- Turbidity readings >0NTU occur infrequently, at low magnitudes and for a maximum of 1 hour. This site is pristine with no background turbidity values.

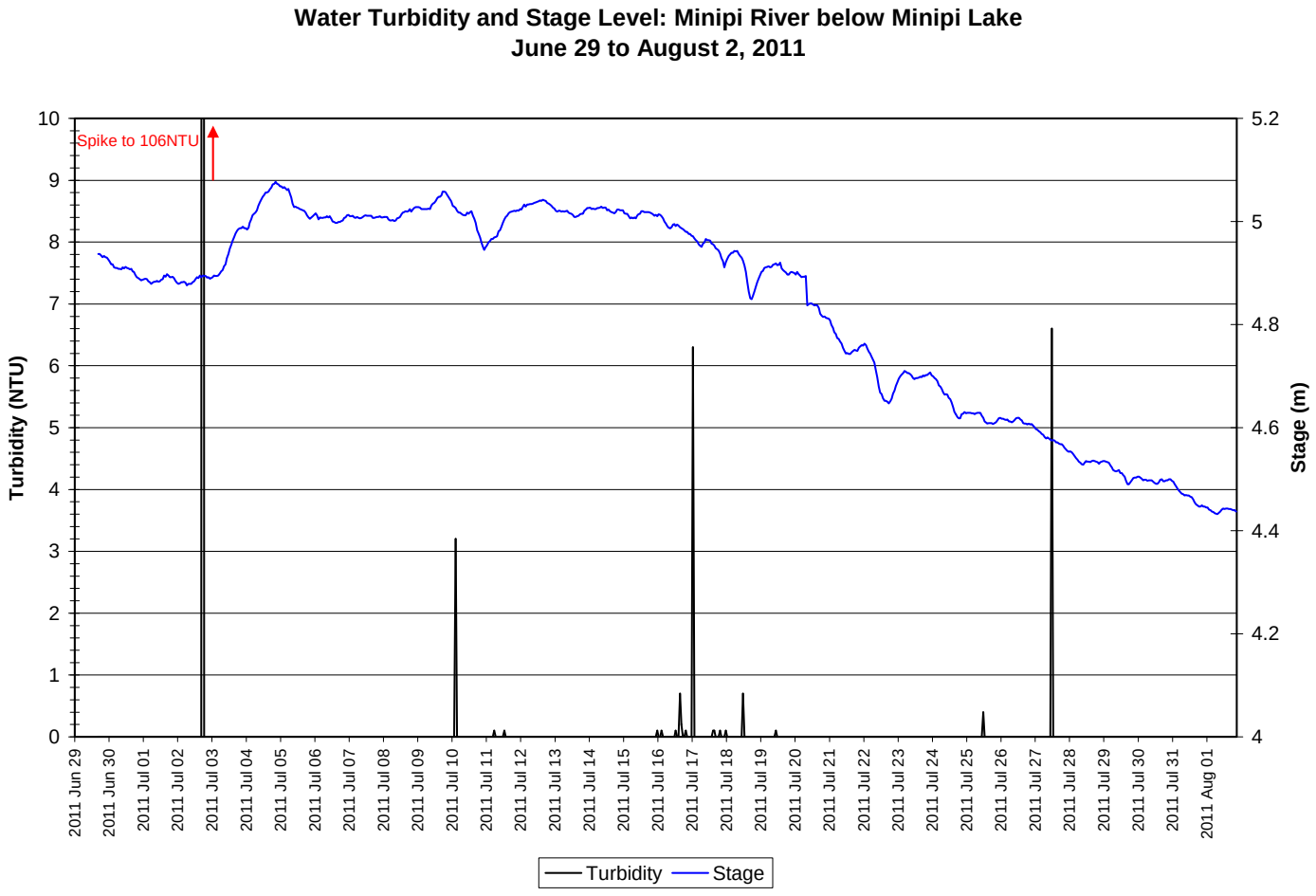


Figure 6: Turbidity and stage level at Minipi River below Minipi Lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level (Figure 7). Stage is generally decreasing throughout the deployment period with varying precipitation records.
- It is important to note the distance between where the precipitation data was collected (~100km to Goose Bay) and the area that drains the Minipi River at this point (~2300km^2). There is no significant correlation between precipitation and stage during this time at this station.

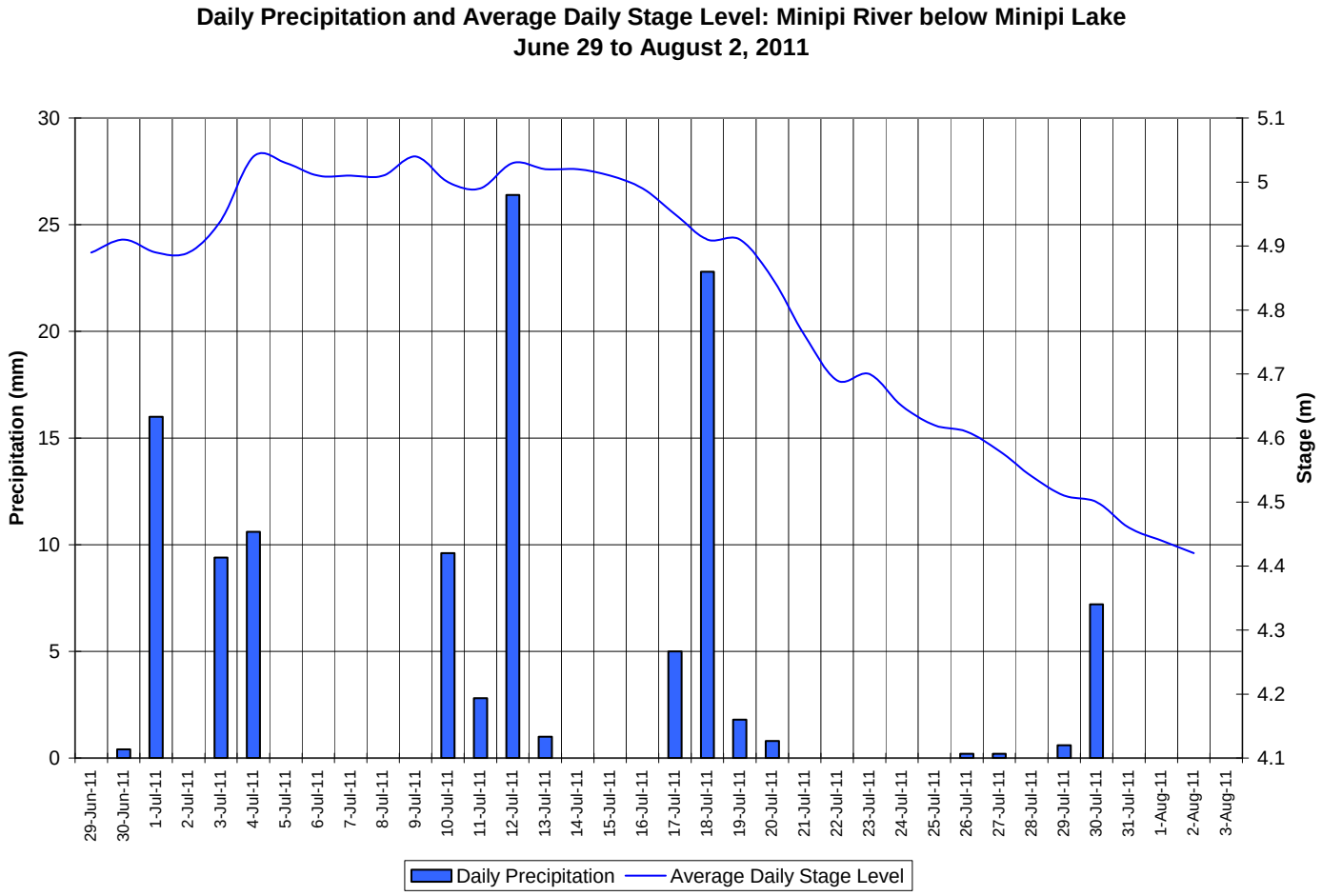


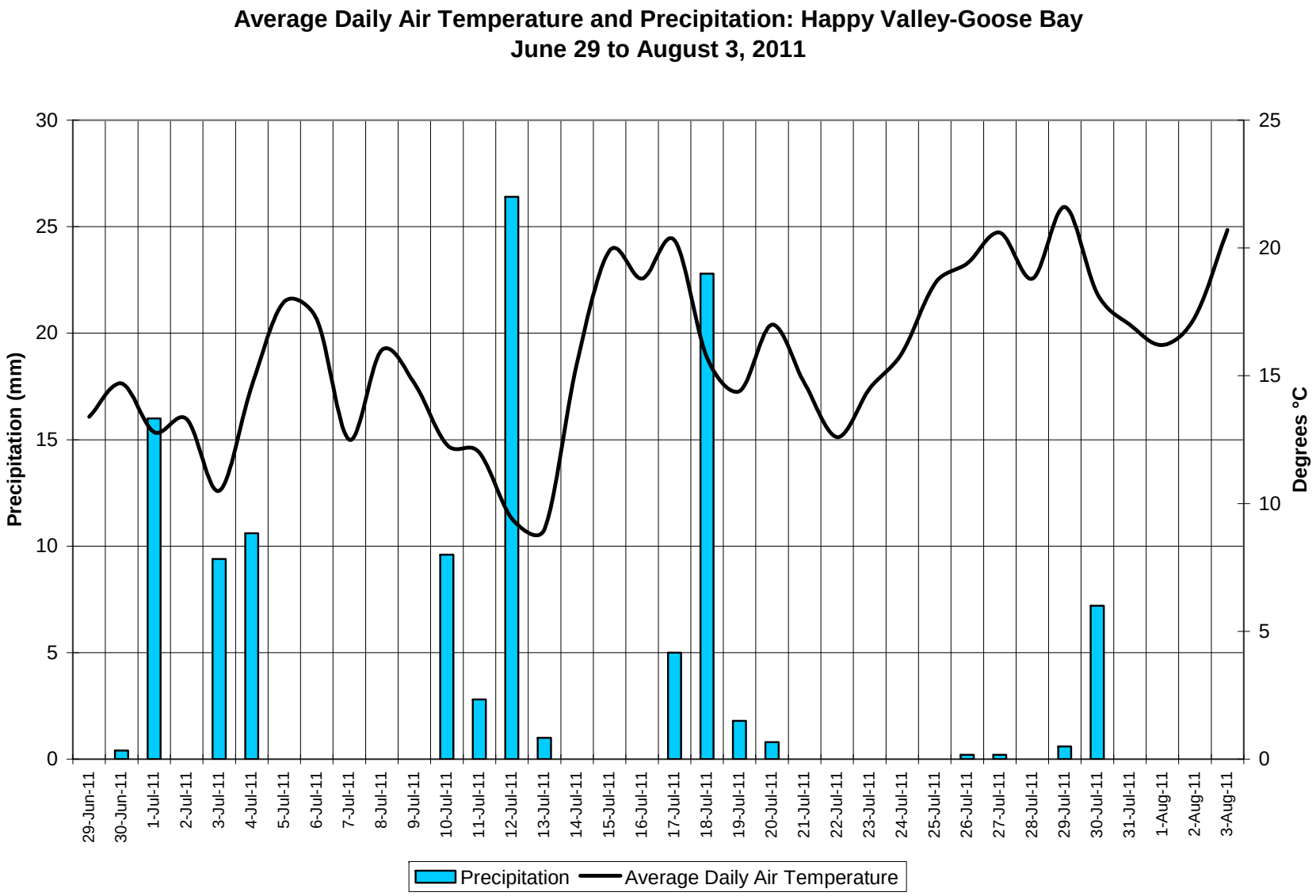
Figure 7: Stage and precipitation at Minipi River below Minipi Lake

Conclusions

- An instrument at the water quality monitoring station on the Minipi River below Minipi Lake was deployed on June 29 and removed on August 2.
- In most cases, weather related events or increase/decreases in water level could be used to explain the fluctuations. Most values recorded were within ranges as suggested by the CCME Guidelines for the Protection of Aquatic Life for pH and dissolved oxygen. In the last 2 weeks of the deployment period, dissolved oxygen drops just below the minimum CCME Guideline for the Protection of Aquatic life in early life stages due to the increasing water temperatures.

Prepared by:
Grace Gillis
Department of Environment and Conservation
Water Resources Management Division
Phone: 709.896.5542
Fax: 709.896.9566

Appendix 1


Average Daily Air Temperature and Precipitation: Happy Valley-Goose Bay
June 29 to August 3, 2011
Precipitation (mm)
Degrees °C
0
5
10
15
20
25
30
29-Jun-11
30-Jun-11
1-Jul-11
2-Jul-11
3-Jul-11
4-Jul-11
5-Jul-11
6-Jul-11
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29-Jul-11
30-Jul-11
31-Jul-11
1-Aug-11
2-Aug-11
3-Aug-11
Precipitation
Average Daily Air Temperature