Real-Time Water Quality Deployment Report

Rattling Brook Network

April 29, 2011 to June 16, 2011

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

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General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Rattling Brook Big Pond station has been redeployed following removal due to ice conditions since February 24th, 2011.
- A discussion of pH at Rattling Brook below Bridge was omitted due to a consistent error in readings. The problem was found to be a loose pH reference cell. This will be fixed for the next deployment.

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 **Error! Reference source not found.**). 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 **Error! Reference source not found.**.

Table 1: Qualitative QAQC Rankings

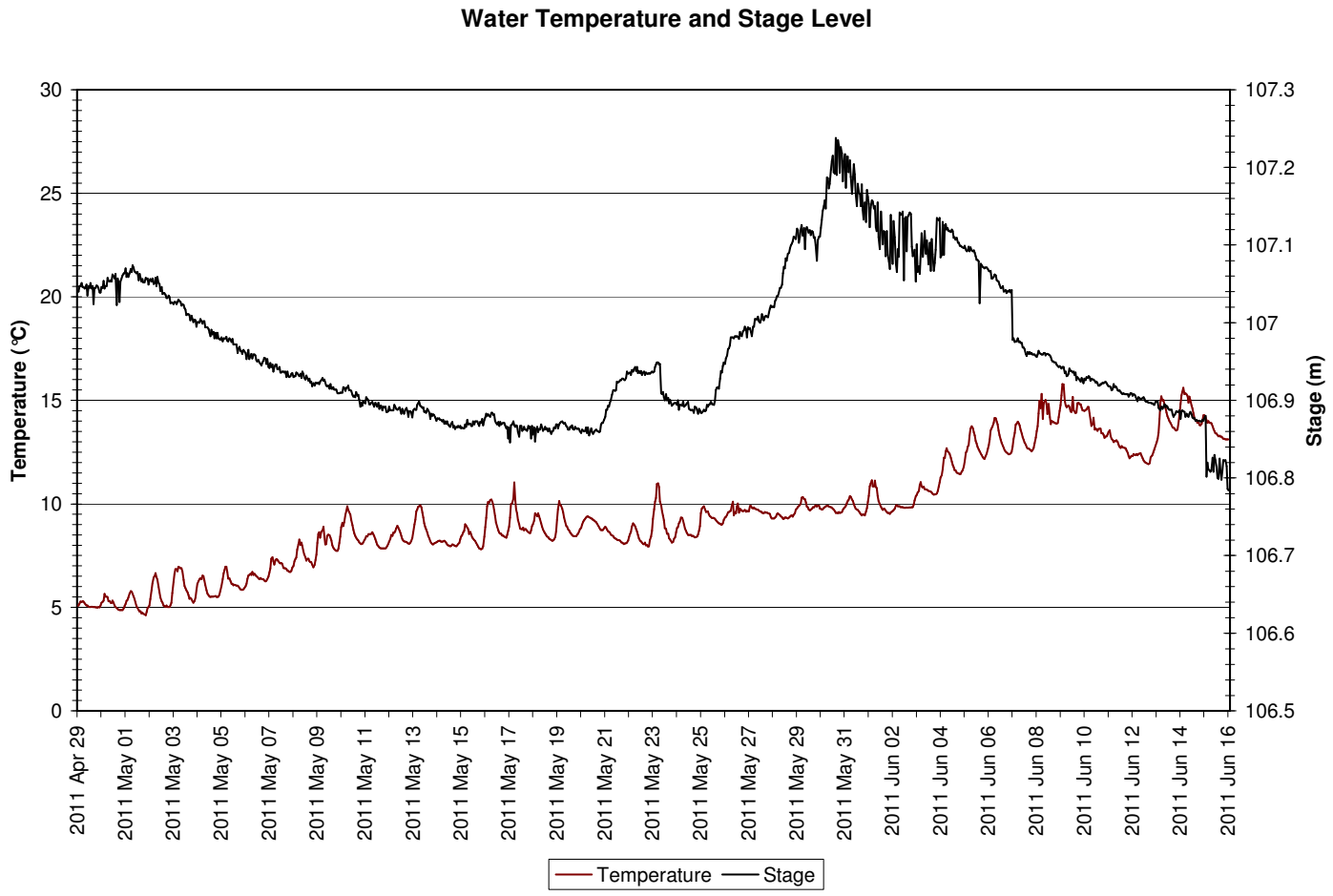
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	April 29, 2011	Deployment	-	-	-	-	-
	June 16, 2011	Removal	Excellent	Excellent	Excellent	Excellent	-
Rattling Brook below Bridge	April 29, 2011	Deployment	Excellent	Fair	Excellent	Excellent	-
	June 16, 2011	Removal	Good	Poor	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	April 29, 2011	Deployment	Good	Good	Good	Excellent	Good
	June 16, 2011	Removal	Excellent	Excellent	Good	Excellent	Good

- Rankings could not be derived for the deployment of Big Pond station on April 29, 2011 due to data loss. Furthermore, a turbidity reading could not be taken from the Field Sonde on June 16th.
- A "Poor" ranking for pH during the removal of Bridge station was due to a malfunction of the sensor over the course of the deployment period. The problem was traced to a loose seal around the pH reference probe. This has been corrected.

Data Interpretation

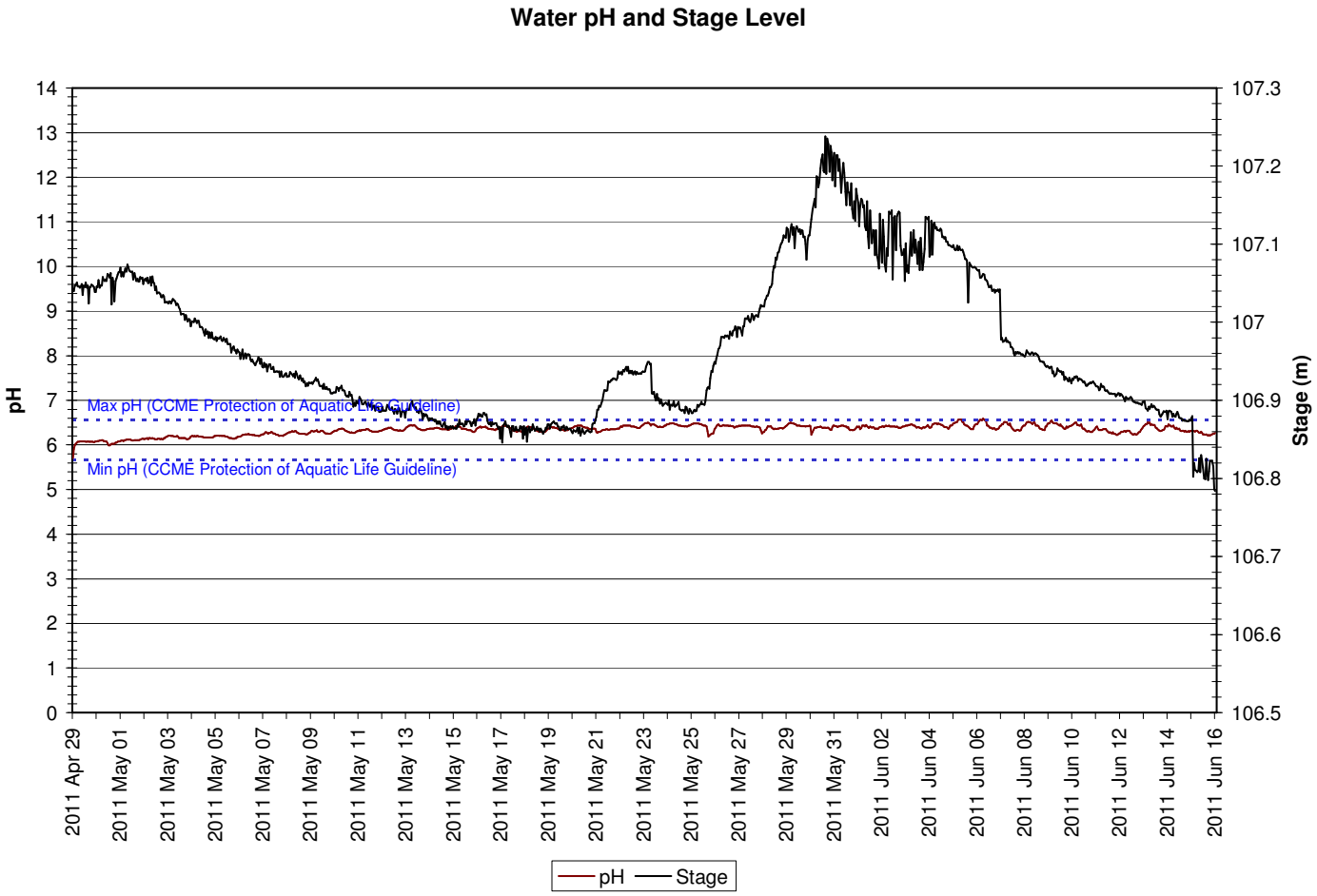
Rattling Brook Big Pond

Figure 1: Water Temperature at Rattling Brook Big Pond Station from April 29, 2011 to June 16, 2011



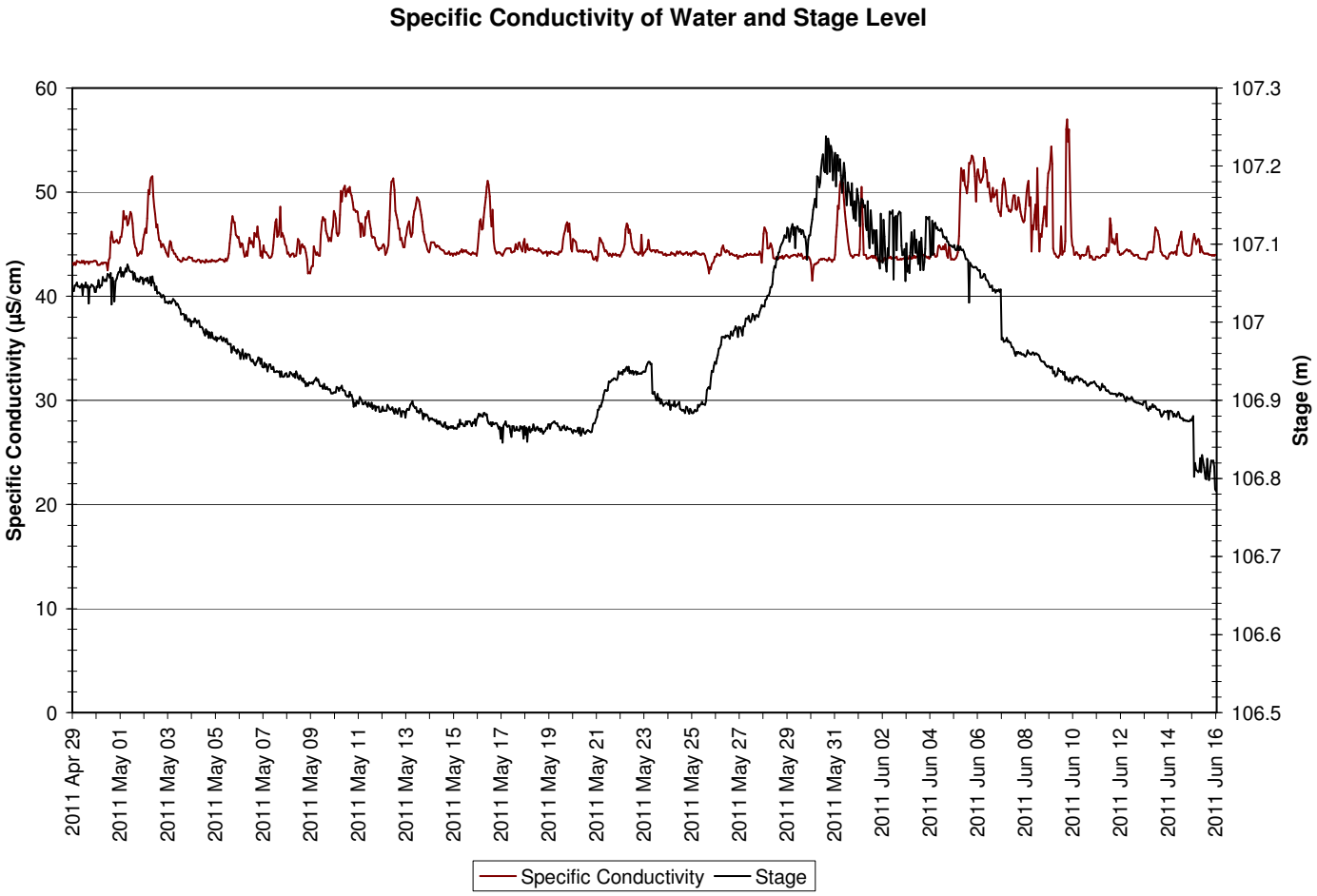
- Water temperatures are shown to rise consistently through this deployment period from late April to mid-June. Temperature rises from a low of 4.62°C to a high of 15.78°C with a median of 9.30°C.

Figure 2: pH at Rattling Brook Big Pond Station from April 29, 2011 to June 16, 2011



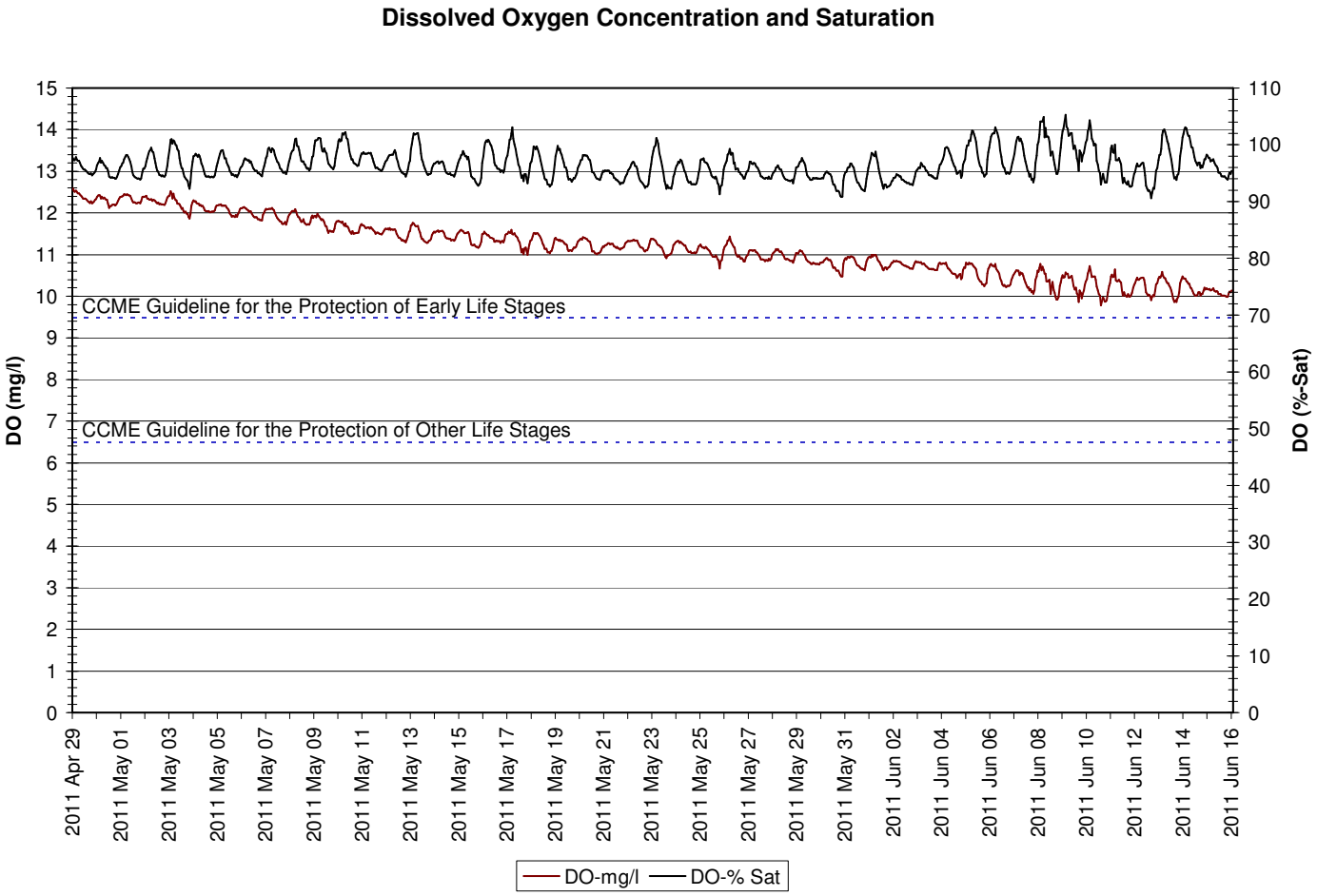
- Site Specific Guidelines at Rattling Brook Big Pond indicate that pH values should fall between 5.67 – 6.56.
- From April 29th to June 16th, only four instances of values out of this range were recorded. pH ranged from a low of 5.70 to 6.59 with a median of 6.36.
- No major fluctuations in pH are recognized in conjunction with stage level.

Figure 3: Specific Conductivity at Rattling Brook Big Pond Station from April 29, 2011 to June 16, 2011



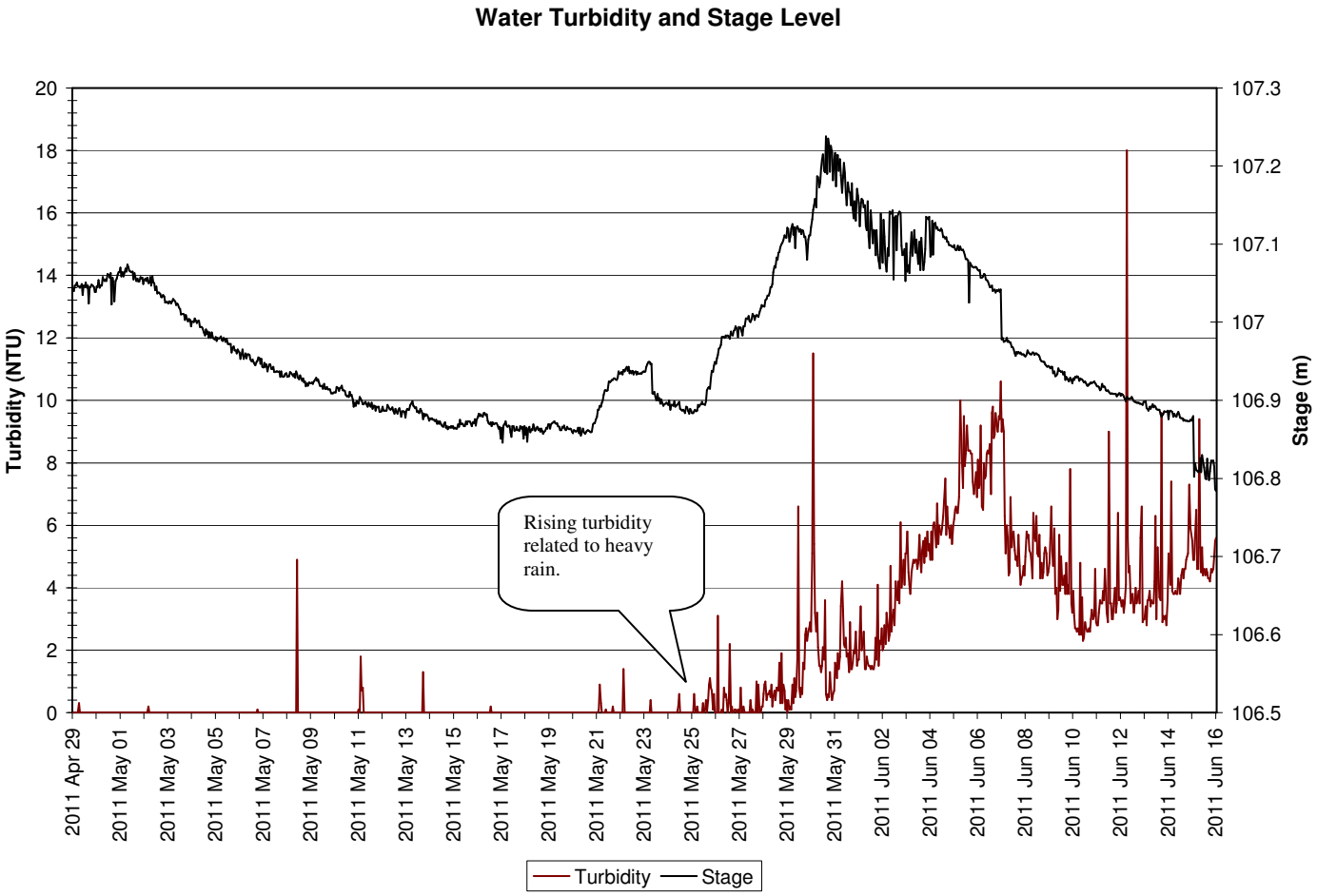
- Specific conductivity is characterized by large upward swings from a baseline near 45 µS/cm. These swings are temporal in nature and return to baseline relatively quickly.
- Generally, conductivity spikes are associated with precipitation events. The conductivity peak beginning on June 5th and ending after June 10th cannot be associated with any particular weather or construction event. At this time, it is thought that the elevated conductivity may be due to natural factors and is of no concern.

Figure 4: Dissolved Oxygen at Rattling Brook Big Pond Station from April 29, 2011 to June 16, 2011



- Oxygen saturation throughout this deployment period has remained near 100% and has even surpassed it on occasion. Saturation values ranged from 90.6 to 105.3% with a median of 96.1%.
- Concentration values declined through the month as water temperatures increased into mid-June and ranged from 12.59 to 9.78 mg/l – all above the CCME Guideline for the Protection of Early Life Stages. At this rate, oxygen levels are expected to drop below the upper guideline of 9.5 mg/l early in the next deployment period (late June).

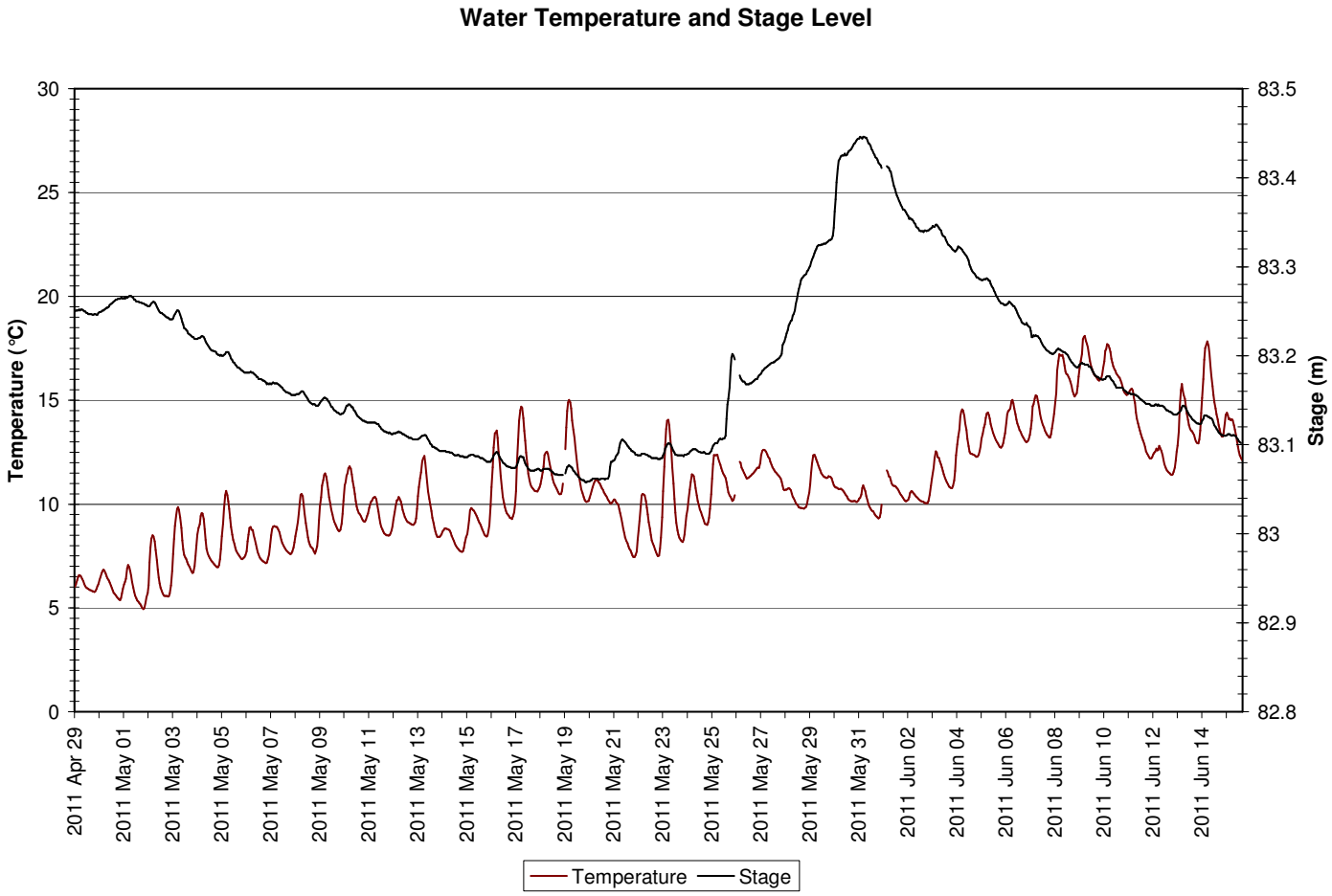
Figure 5: Turbidity at Rattling Brook Big Pond Station from April 29, 2011 to June 16, 2011



- Turbidity levels clearly begin to increase towards the end of this month. Though the values appear excessive at first glance, even the highest value recorded on June 12th was 18.0 NTU. The increase in turbidity began on May 24th/25th in conjunction with several periods of heavy precipitation.

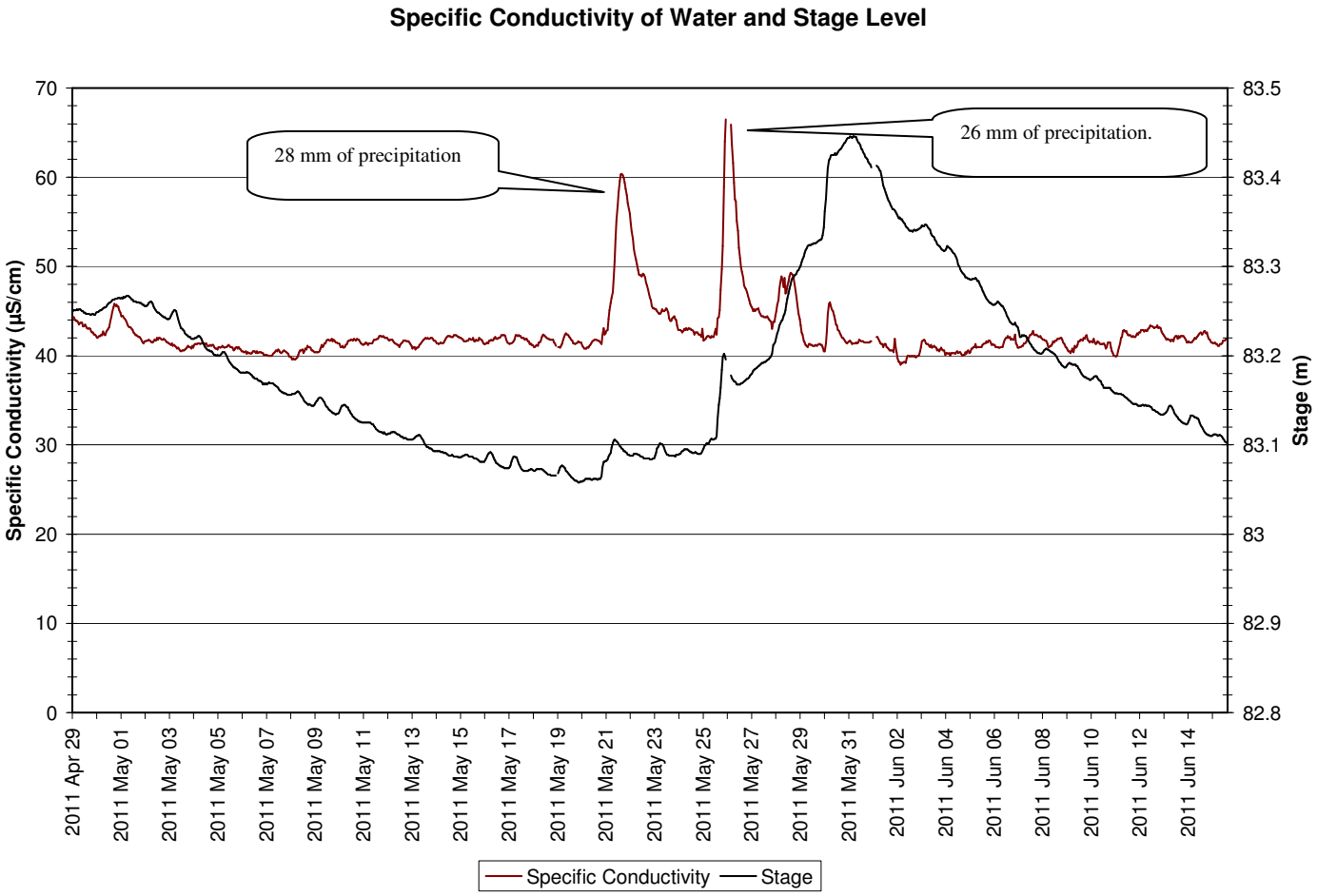
Rattling Brook below Bridge

Figure 6: Water Temperature at Rattling Brook below Bridge Station from April 29, 2011 to June 16, 2011



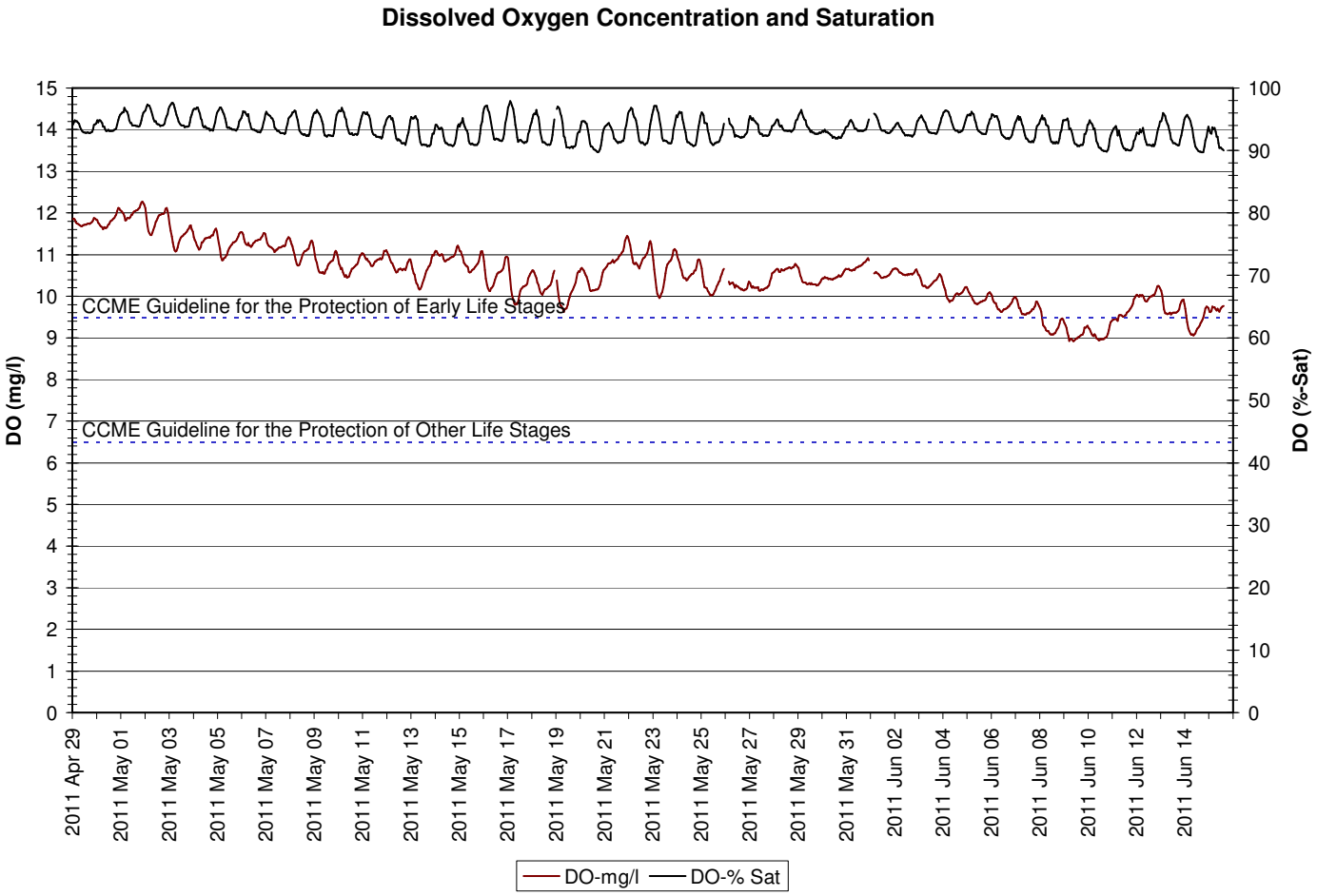
- As spring progressed, water at Bridge station warmed from 4.94 to a maximum of 18.11°C. A median temperature of 10.50°C was encountered.
- During a particularly large increase in stage level peaking on May 31st, water temperature did not show the normal daily flux (observe the first week of deployment). This is likely due to the moderating effect of heavy precipitation and cloud cover at the time.

Figure 7: Specific Conductivity at Rattling Brook below Bridge Station from April 29, 2011 to June 16, 2011



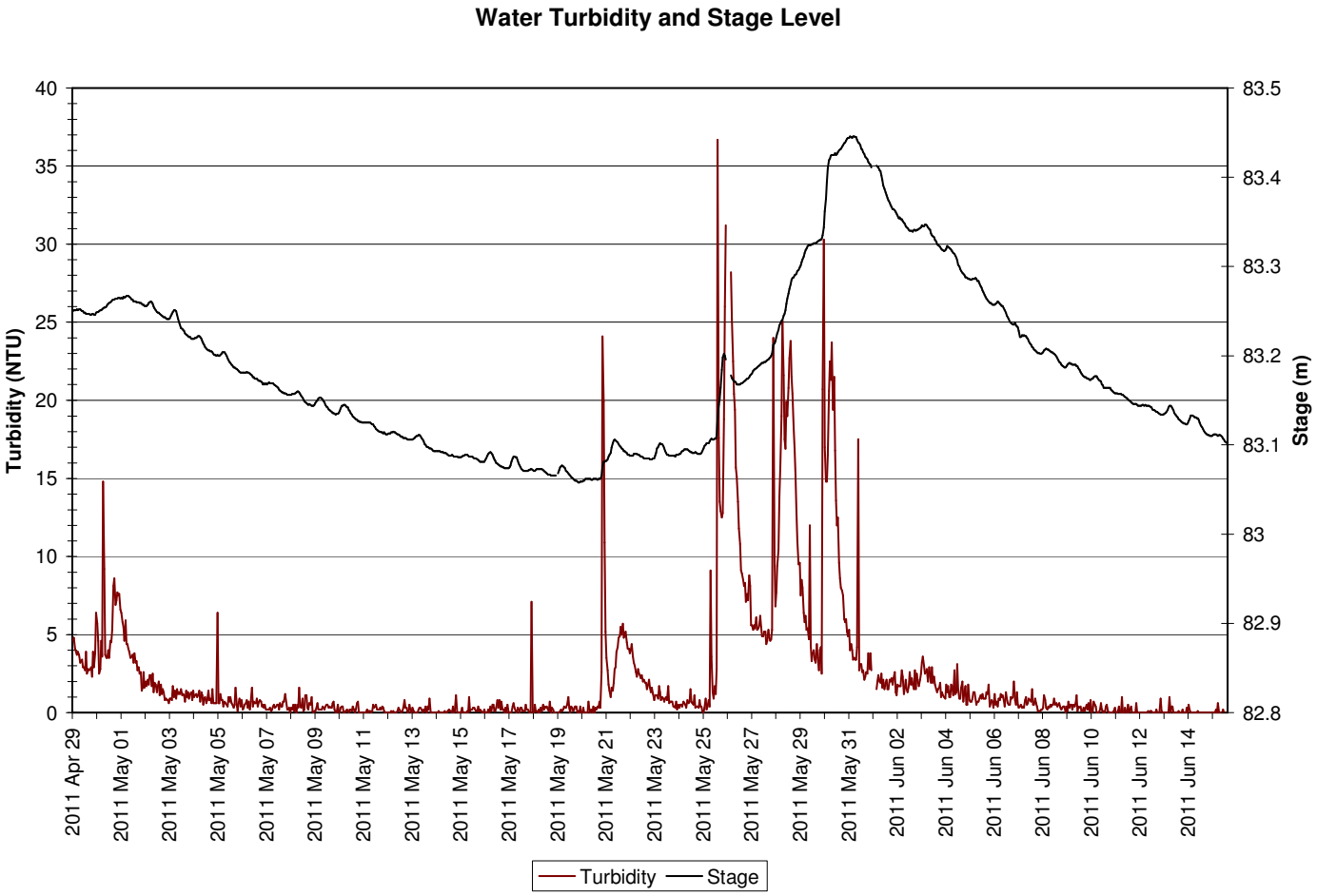
- Conductivity at Rattling Brook below Bridge did not show any trend up or down for this deployment period.
- Values fell between a minimum of 39.0 and 66.5 µS/cm (median value: 41.7 µS/cm). Two peaks were identified in the figure above that were related to heavy precipitation.

Figure 8: Dissolved Oxygen at Rattling Brook below Bridge Station from April 29, 2011 to June 16, 2011



- Oxygen saturation appears to have declined slightly over this deployment period, possibly related to increased respiratory activity by aquatic organisms as water temperatures increase towards the summer. Concentration of dissolved oxygen showed a notable decline over the month with a maximum concentration of 12.27 mg/l and a minimum value of 8.92 mg/l (median 10.55 mg/l).
- On June 8th at 11:30 am, DO concentration dropped below the CCME Guideline for the protection of Early Life Stage cold water biota (guideline value: 9.5 mg/l). This guideline, however, is established nationally and may not necessarily be reflective of the sensitivities encountered in native species in Newfoundland. No fish kills or similar phenomena were reported.

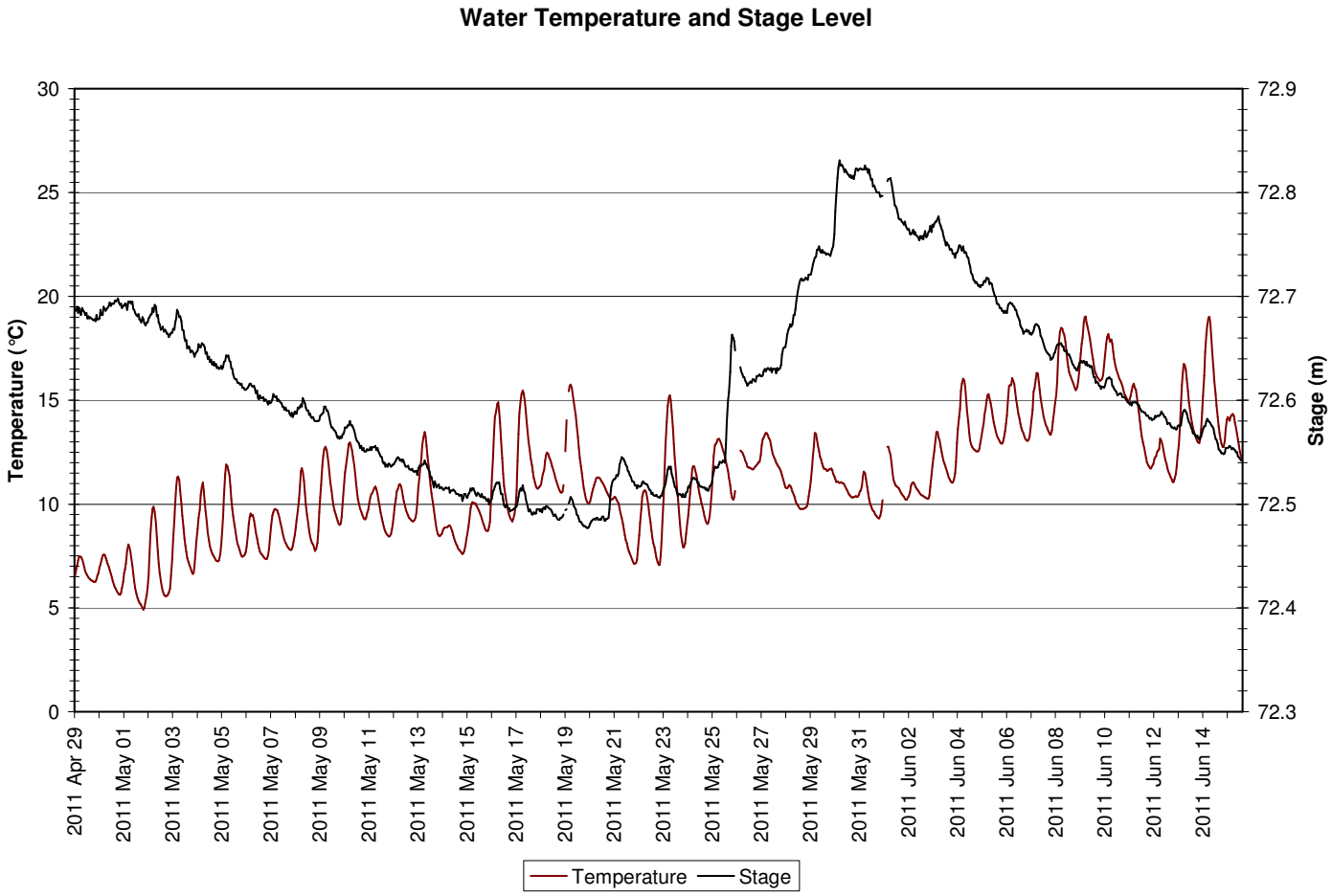
Figure 9: Turbidity at Rattling Brook below Bridge Station from April 29, 2011 to June 16, 2011



- Turbidity was found to be variable at Bridge station for this deployment period. At the time of deployment, turbidity was found to be somewhat elevated above normal with a value near 5 NTU. Turbidity did decrease into early/mid-May but then increased again into late May during heavy precipitation.
- Values ranged from 0.0 NTU to 36.7 NTU with a median value of 0.6 NTU.

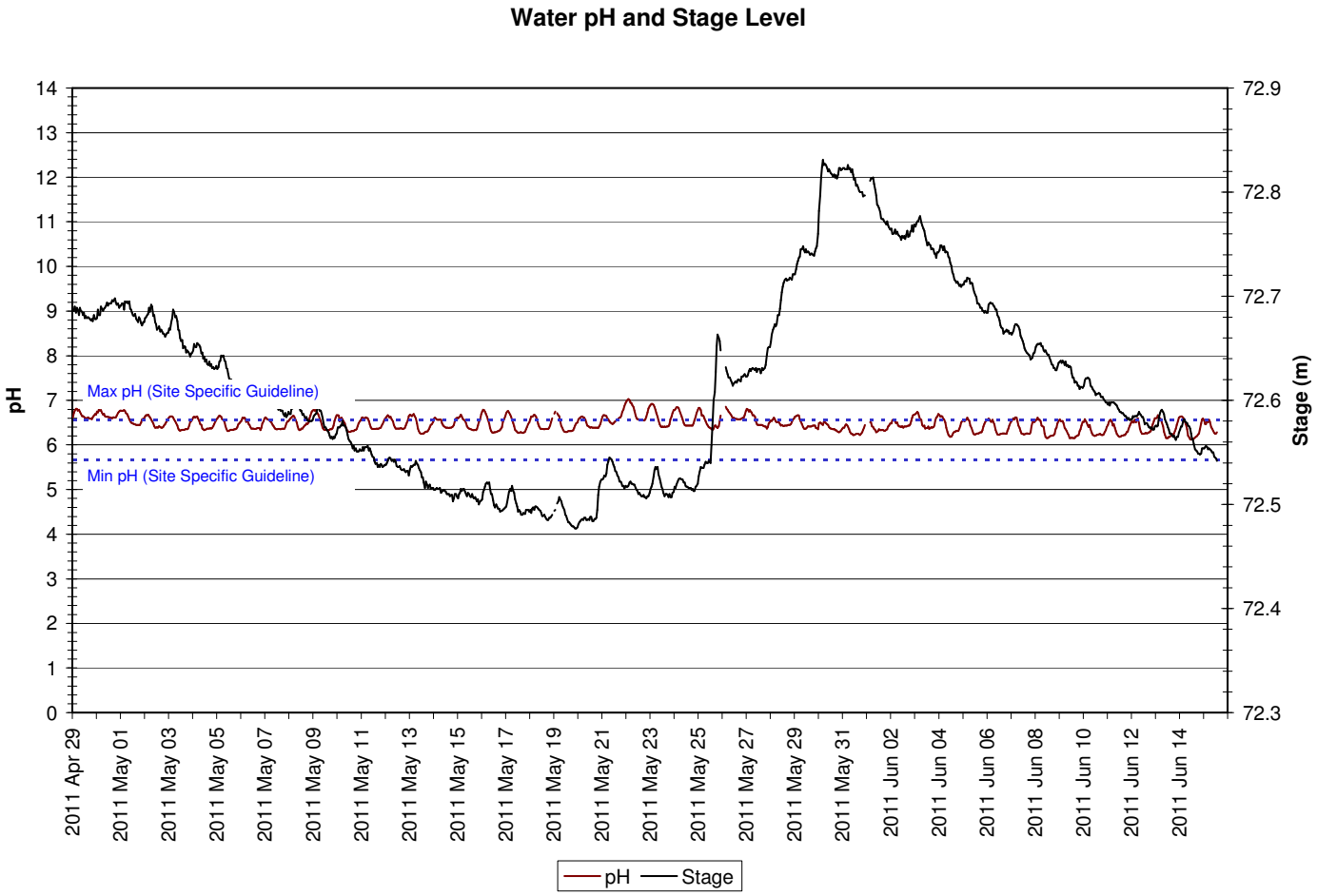
Rattling Brook below Plant Discharge

Figure 10: Water Temperature at Rattling Brook below Plant Discharge Station from April 29, 2011 to June 16, 2011



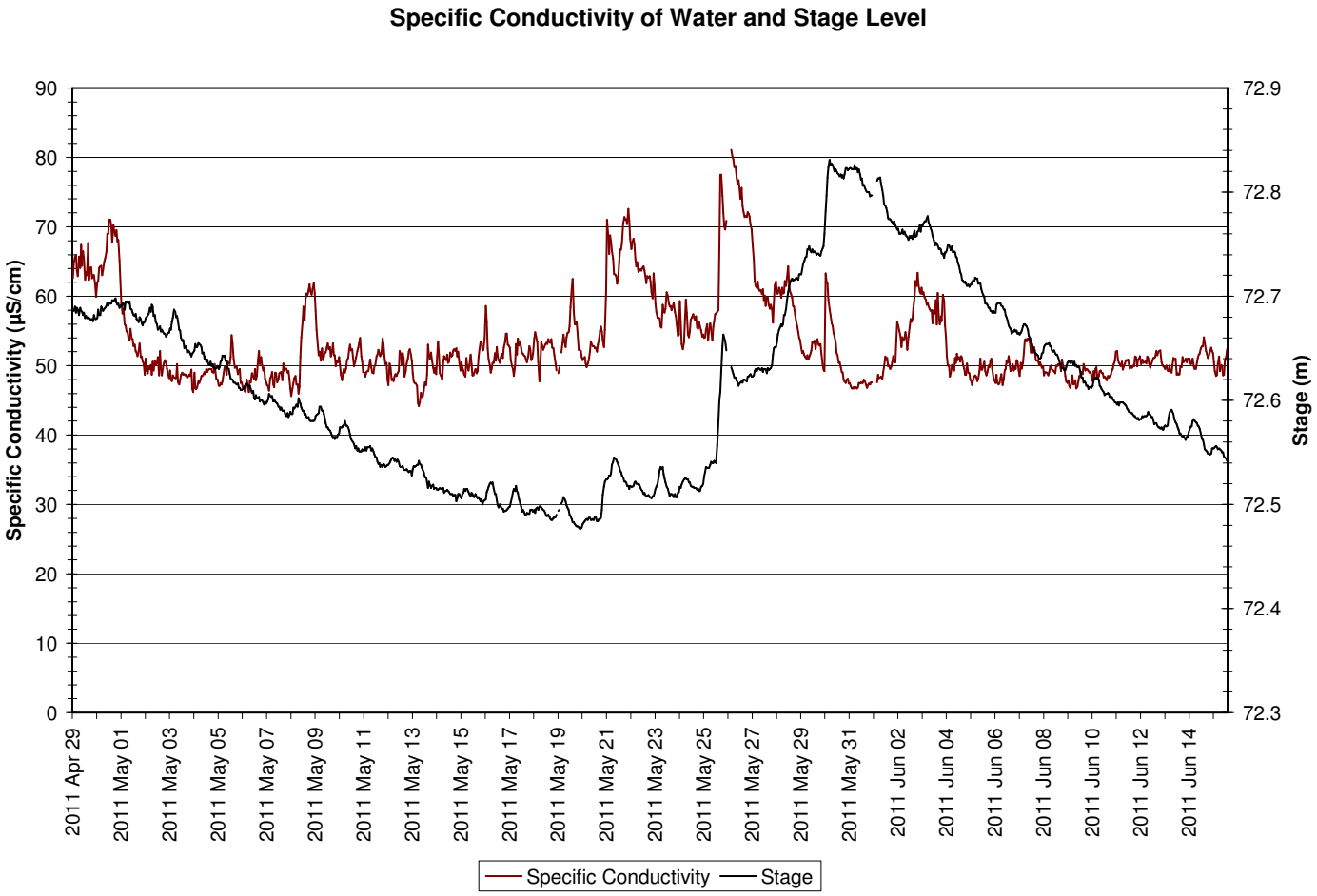
- Water temperature increased from April 29th to June 16th with a low of 4.92 to a high of 19.03°C (median value: 10.88°C).

Figure 11: pH at Rattling Brook below Plant Discharge Station from April 29, 2011 to June 16, 2011



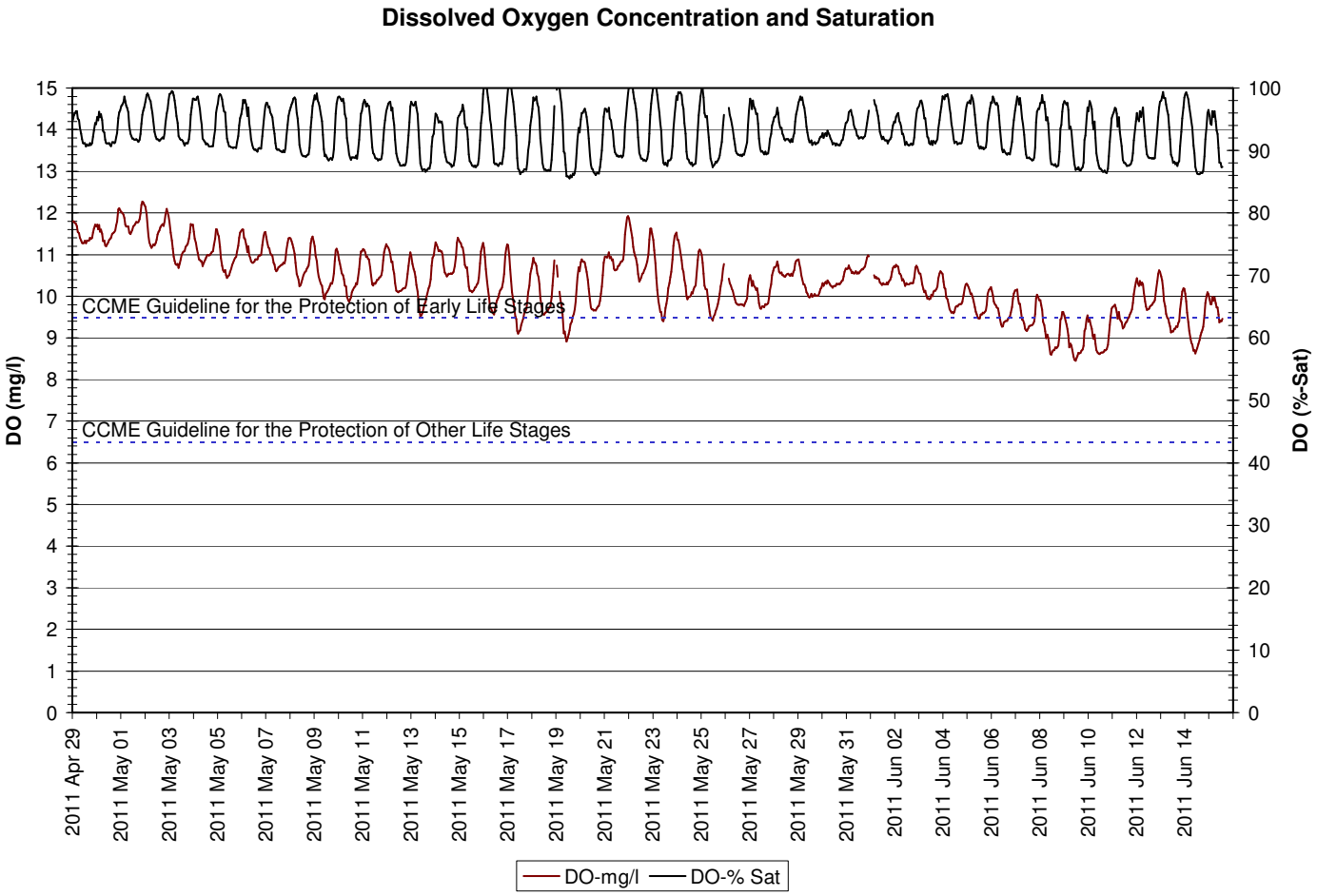
- pH values hovered at the upper Site Specific Guideline for pH (6.56 units). On June 14th, pH was found to be at its most acidic for the deployment period with a value of 6.12. May 22 was identified as the most basic conditions with a value of 7.03. The median value for the whole deployment was 6.45.

Figure 12: Specific Conductivity at Rattling Brook below Plant Discharge Station from April 29, 2011 to June 16, 2011



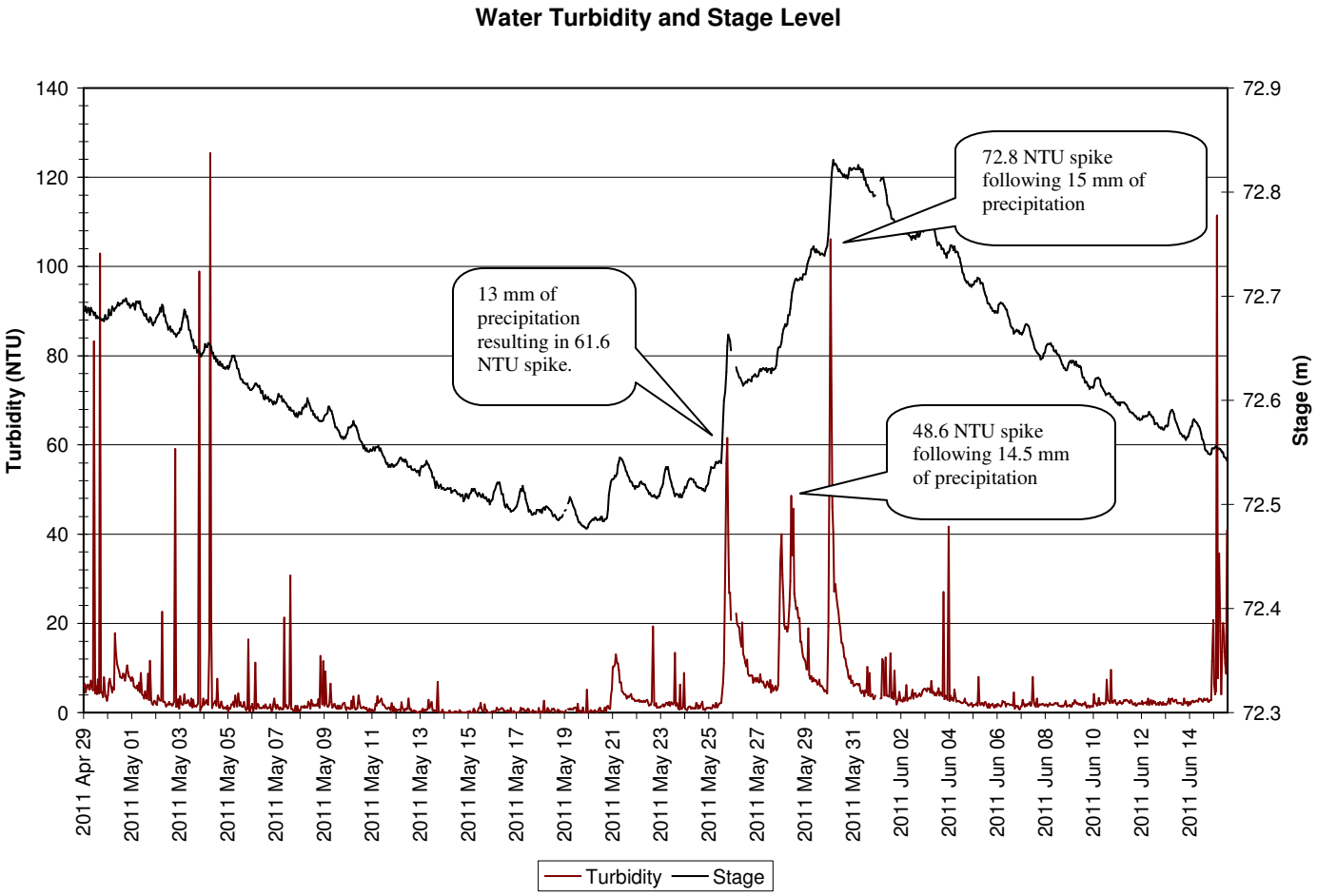
- Specific conductivity tends to be much more variable and higher than Bridge station. No clear trend can be deciphered in the figure above; however, the fluctuations observed are frequent and large.
- Conductivity ranged from 44.2 to 81.1 µS/cm with a median of 51.1 µS/cm.

Figure 13: Dissolved Oxygen at Rattling Brook below Plant Discharge Station from April 29, 2011 to June 16, 2011



- While the concentration of dissolved oxygen at Bridge station did not fall below the CCME Guideline of 9.5 mg/l until June 8th, at Discharge station this occurred three weeks earlier on May 17.
- Concentration values ranged from 12.27 to 8.45 mg/l (median value: 10.34 mg/l). Values are expected to decline into August as water temperatures continue to increase.

Figure 14: Turbidity at Rattling Brook below Plant Discharge Station from April 29, 2011 to June 16, 2011

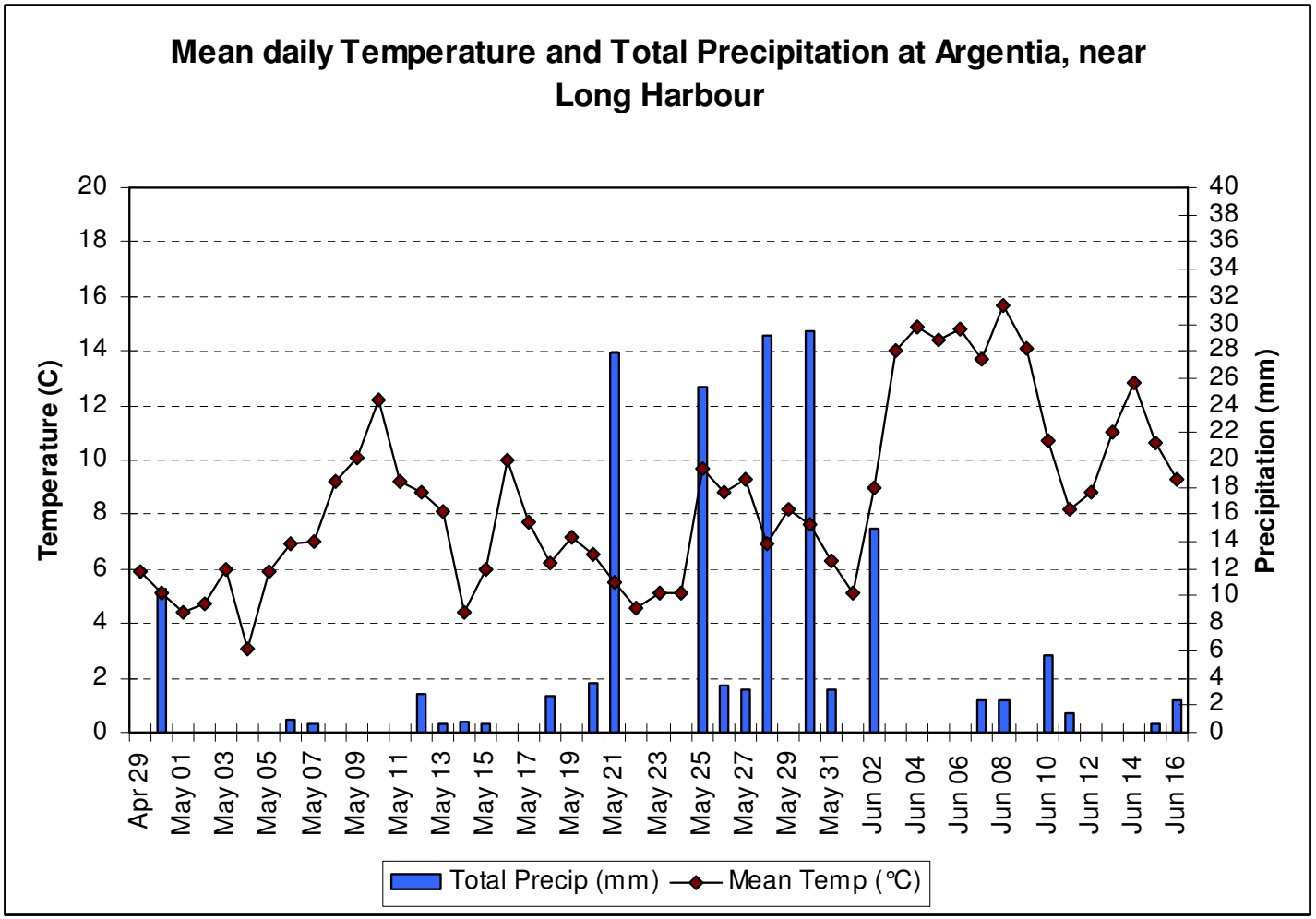


- Between May 21 and June 4th, turbidity was found to be highly variable with frequent spikes. These values appear to be closely related to precipitation occurring through the same time period as indicated.
- Values ranged from 0.0 to 125.4 NTU. However, with a median value of 2.1 NTU through the month, it appears that levels were above normal since a typical median turbidity value at this station is 0.0 NTU.

Conclusions

- Rattling Brook Big Pond has been redeployed following winter ice conditions.
- An issue with the Bridge station pH probe resulted in unusually high pH values being recorded. Since the pH data at Plant Discharge station was typical in range, the Bridge station pH data was omitted from this report. The problem is being addressed.
- No major water quality events have been detected that warrant immediate investigation.

Appendix



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