Real-Time Water Quality Deployment Report

Rattling Brook Network

February 25, 2011 to March 31, 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.
- S/N 44604 was out of commission for this deployment period for a pH sensor replacement. S/N 46319 was deployed for this time period.
- S/N 47905 was out of commission for this deployment period due to a faulty DO sensor. S/N 43806 was deployed for this time period.
- Rattling Brook Big Pond was not deployed for this time period due to ice conditions.

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 along side the Field Sonde. Values for temperature and dissolved oxygen are compared between the two instruments. A grab sample is taken to compare with the Field Sonde for specific conductivity, pH and turbidity parameters. Based on the degree of difference between parameters recorded by the Field Sonde, QAQC Sonde and grab sample a qualitative statement is made on the data quality in Table 1 upon Deployment.
  - At the end of a deployment period, readings are taken in the water body from the Field Sonde before and after a thorough cleaning in order to assess the degree of biofouling. During calibration in the laboratory, an assessment of calibration drift is made and the two error values are combined to give Total Error (T_e). If T_e exceeds a predetermined data correction criterion, a correction based on T_e is applied to the dataset using linear interpolation. Based on the value for T_e, a qualitative statement is also made on the data quality in Table 1 upon Removal.

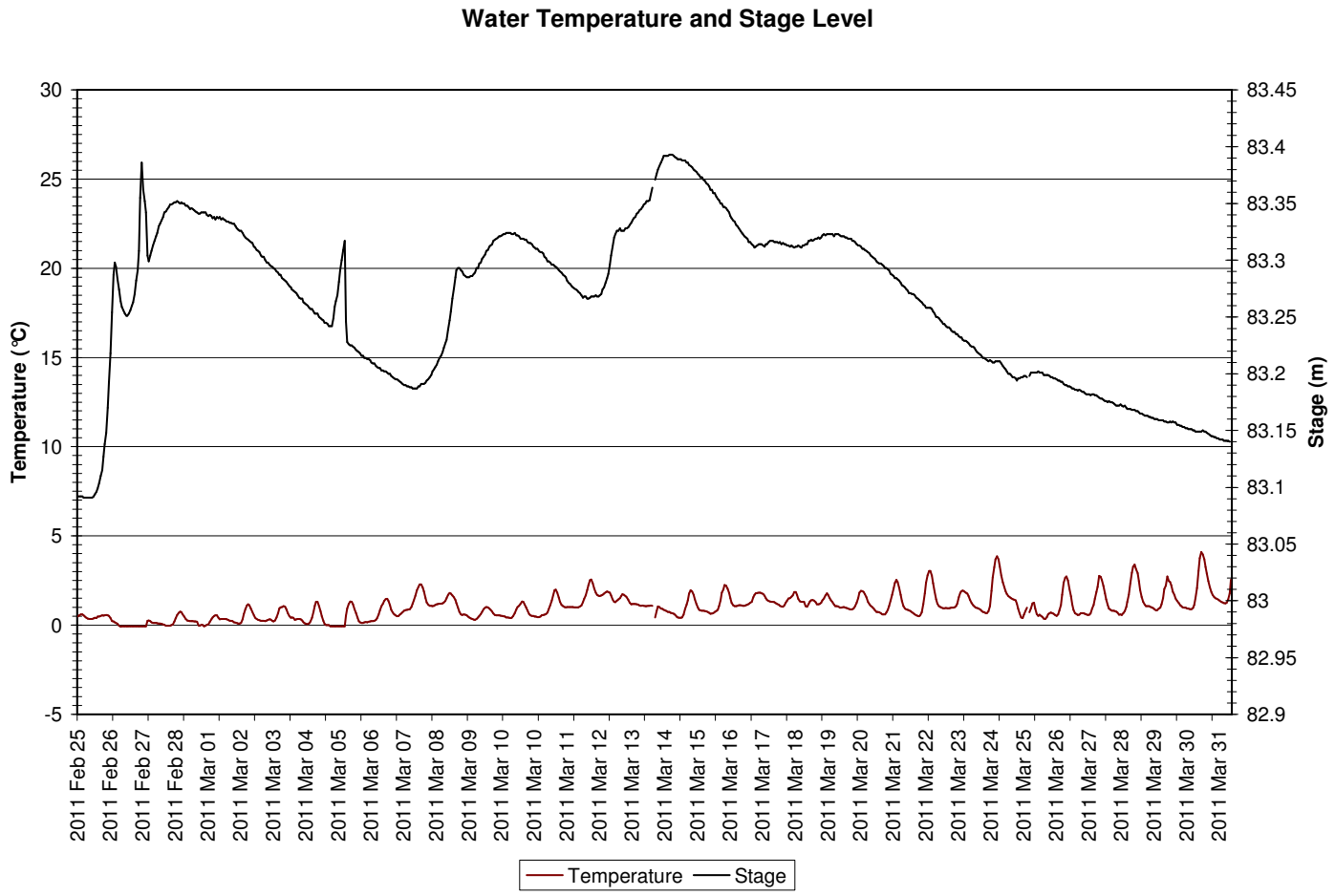
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	Instrument removed due to ice conditions						
Rattling Brook below Bridge	February 25, 2011	Deployment	Excellent	Good	Good	Marginal	Excellent
	March 31, 2011	Removal	Good	Excellent	Good	Fair	Good
Rattling Brook below Plant Discharge	February 25, 2011	Deployment	Good	Fair	Good	Poor	Excellent
	March 31, 2011	Removal	Good	Excellent	Excellent	Excellent	Excellent

- The highlighted cells above indicate instances where DO readings improved in scope from Deployment to Removal. This is unusual since the opposite is expected due to fouling and calibration drift that normally occurs over the course of a month. In this instance, an improvement in rank is likely due to a problem with the QAQC DO calibration during Deployment that was remedied for the Removal, resulting in better agreement between the Field and QAQC Sondes.

Data Interpretation

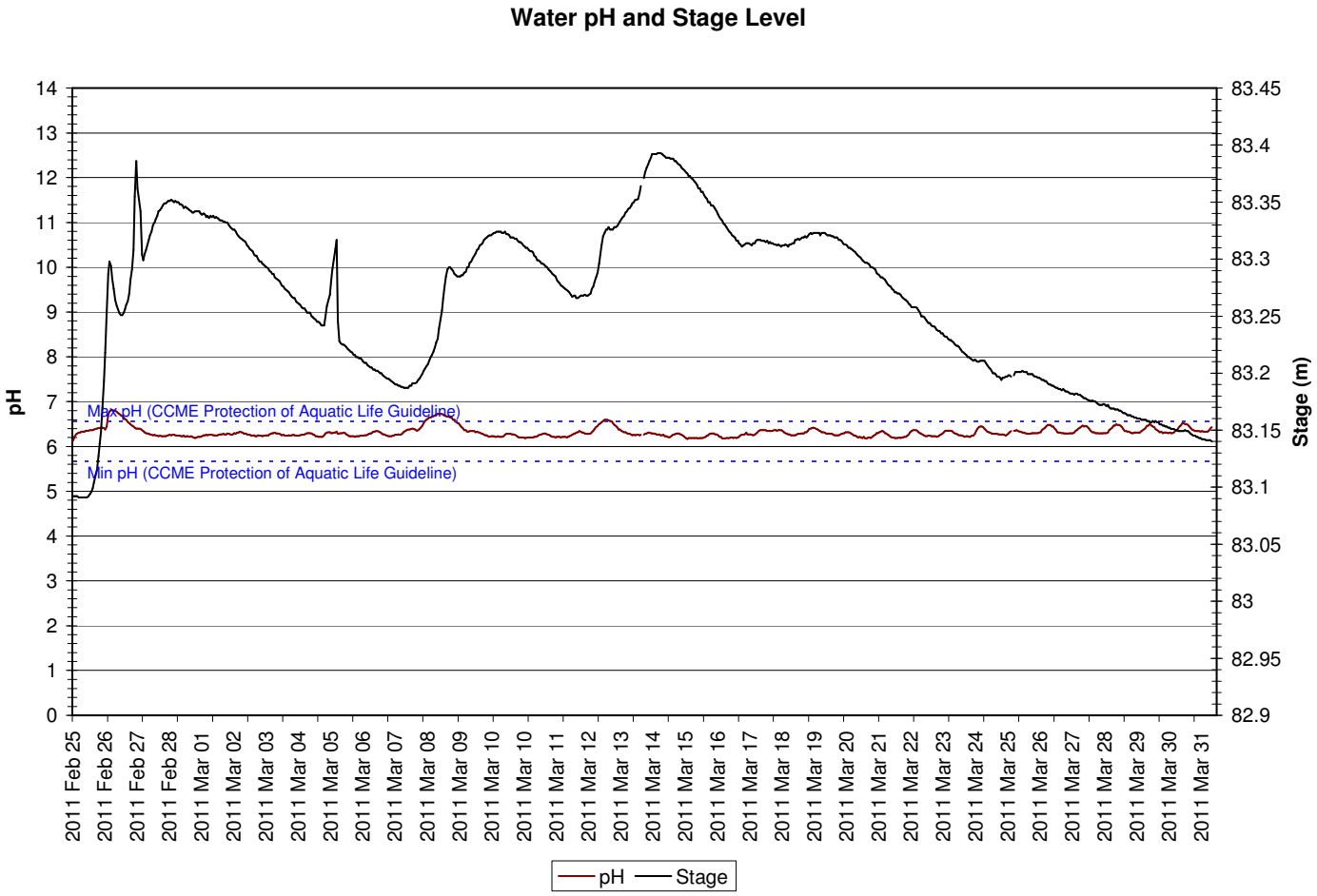
Rattling Brook below Bridge

Figure 1: Water temperature at Rattling Brook below Bridge from February 25 to March 31, 2011



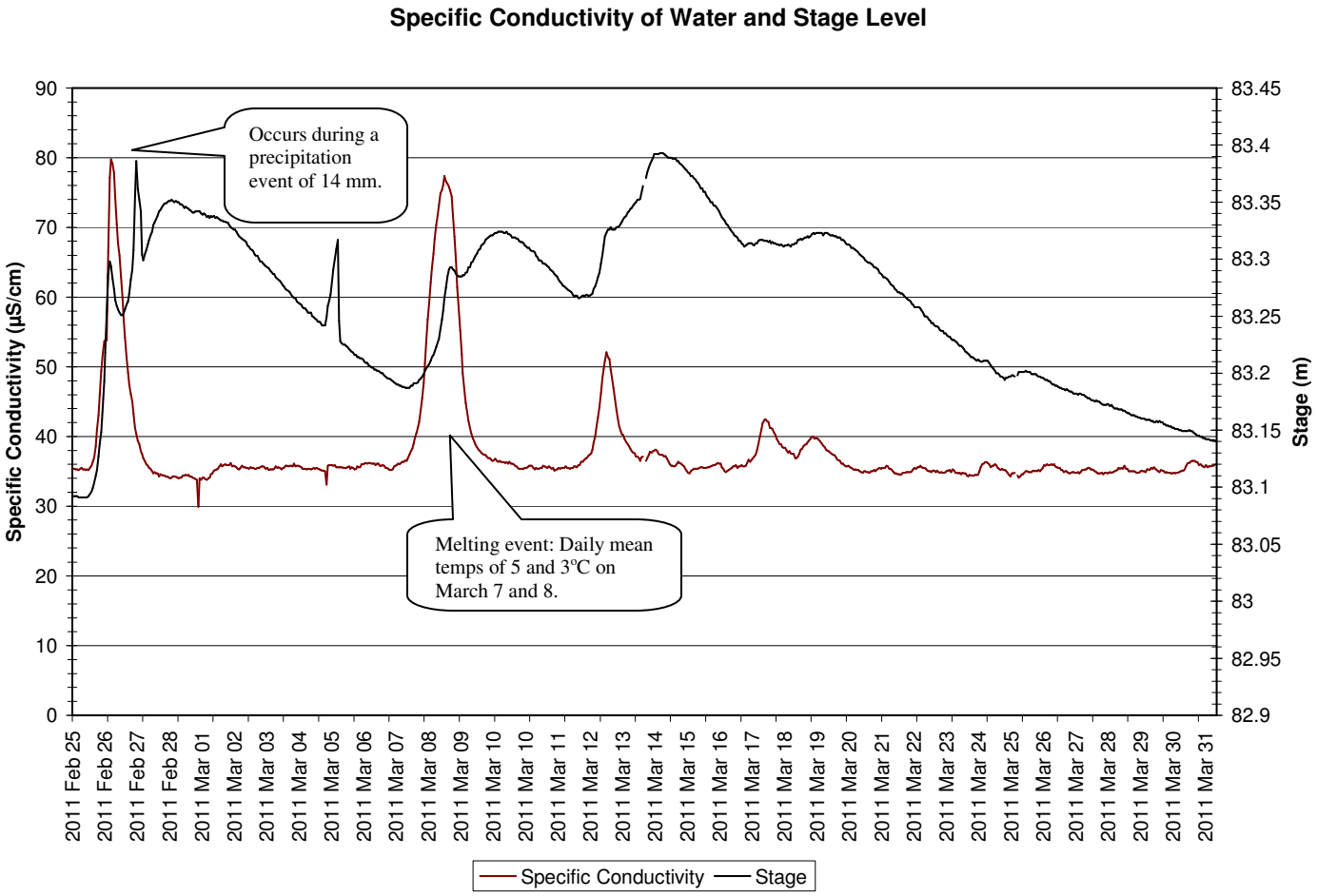
- Early in the deployment, water temperature began close to zero and declined to slightly below, indicating probable extension of ice cover on the river. Throughout the deployment, a warming trend is evident as day length increases.
- Temperature ranged from a low of -0.08°C to a high of 4.10°C.

Figure 2: pH at Rattling Brook below Bridge from February 25 to March 31, 2011



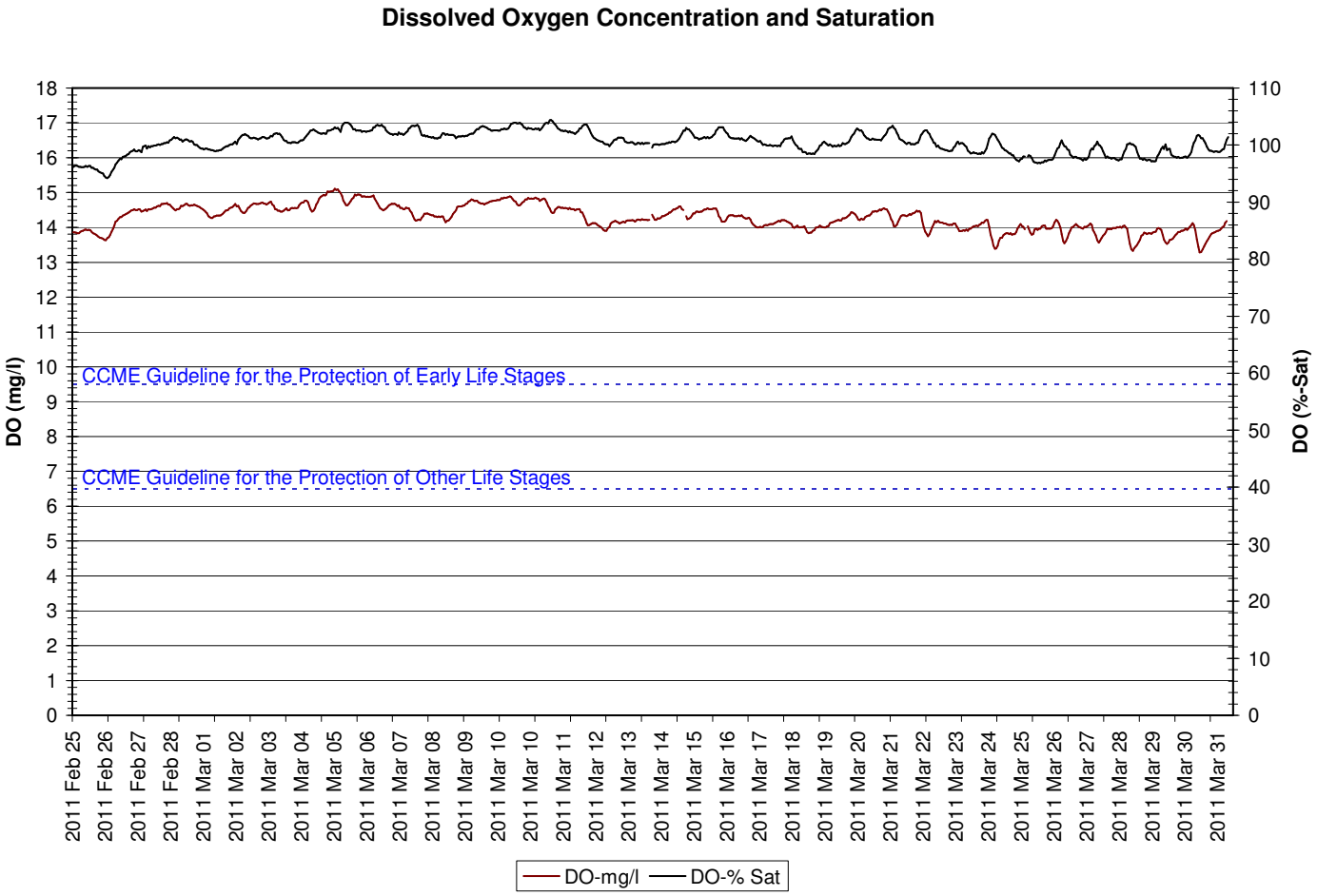
- pH remains stable during the deployment period and well within the Site-Specific Guidelines for pH (5.67 – 6.56). Values ranged from 6.13 to 6.81 with a median value of 6.29 units.

Figure 3: Specific conductivity at Rattling Brook below Bridge from February 25 to March 31, 2011



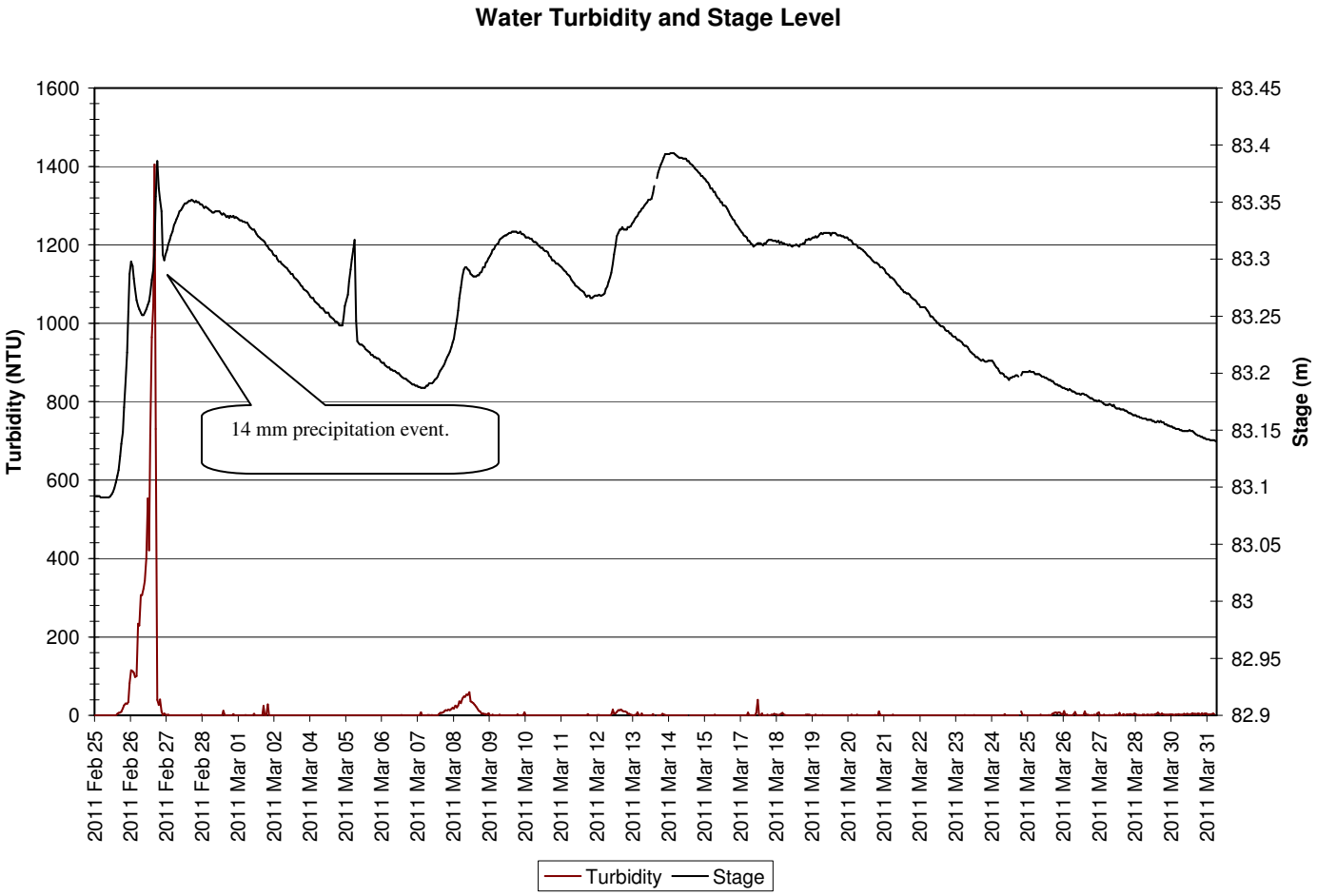
- Specific conductivity shows a tendency to peak during rapid changes in stage level. This indicates that an influx of water into the Rattling Brook river system during precipitation and melting events tends to carry a load of charged ions.

Figure 4: Dissolved Oxygen at Rattling Brook below Bridge from February 25 to March 31, 2011



- Dissolved oxygen saturation and concentration was well above the guidelines stated by the CCME for the Protection of Aquatic Life. Saturation ranged from 94.2 to 104.4% from February 25th to March 31st. Meanwhile, the concentration of DO ranged from 13.28 to 15.11 mg/l during the same time period.
- A marginal decreasing trend in DO is apparent throughout the deployment period, likely due to a concurrent warming trend in the river.

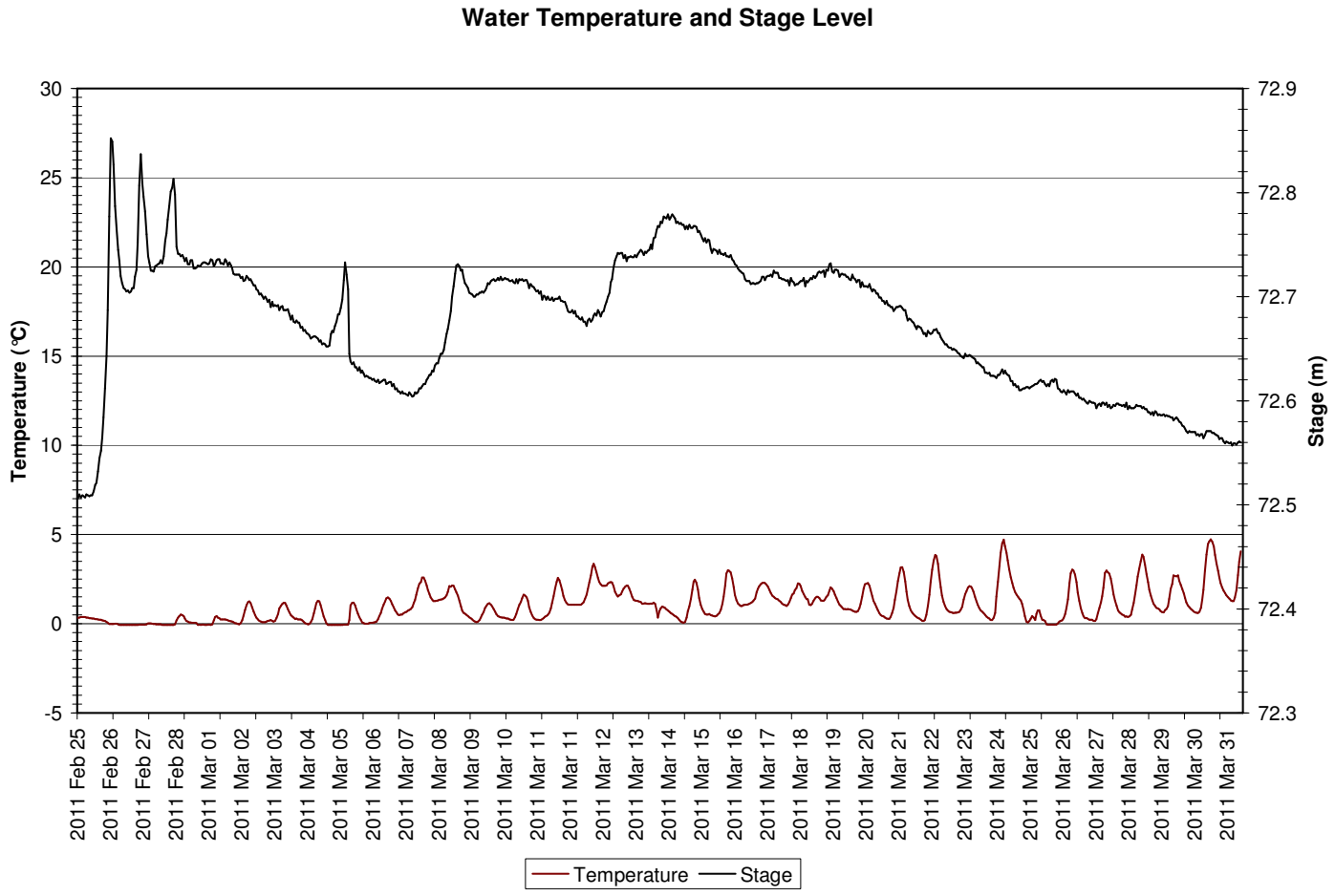
Figure 5: Turbidity at Rattling Brook below Bridge from February 25 to March 31, 2011



- Turbidity was generally low during this time period with a median value of 0.0 NTU. As observed in the figure above, however, there was a period of very high turbidity early in the deployment. Starting at 5:30am on February 26th turbidity rose to a maximum of 1405 NTU by 8:30 am on February 27th. This high turbidity event coincides with 14 mm of precipitation.

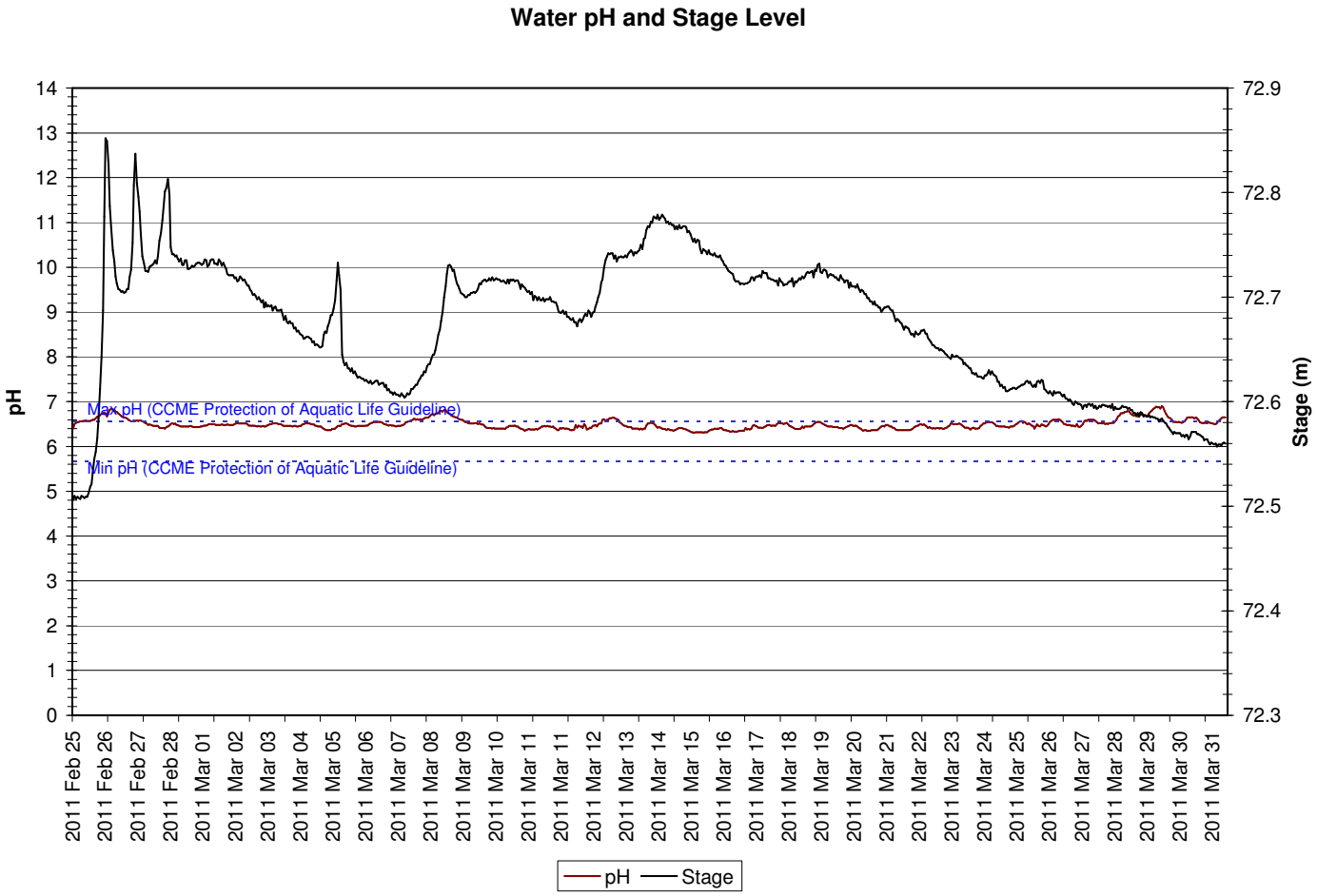
Rattling Brook below Plant Discharge

Figure 6: Water temperature at Rattling Brook below Plant Discharge from February 25 to March 31, 2011



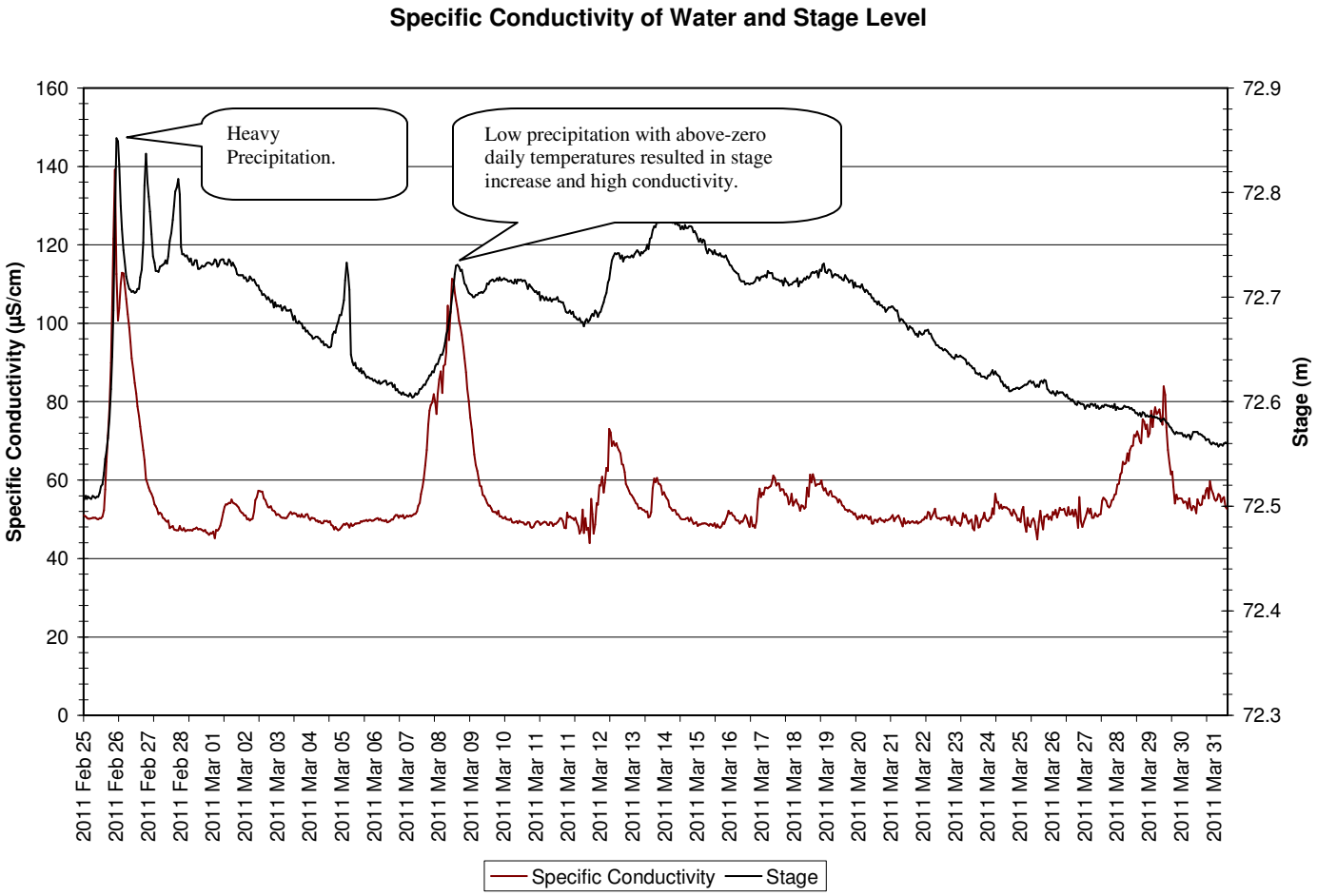
- During this deployment period, water temperature began to increase into late March. In late February, temperatures as low as -0.07°C were recorded. Later in March, however, temperatures increased to a maximum of 4.74°C.

Figure 7: pH at Rattling Brook below Plant Discharge from February 25 to March 31, 2011



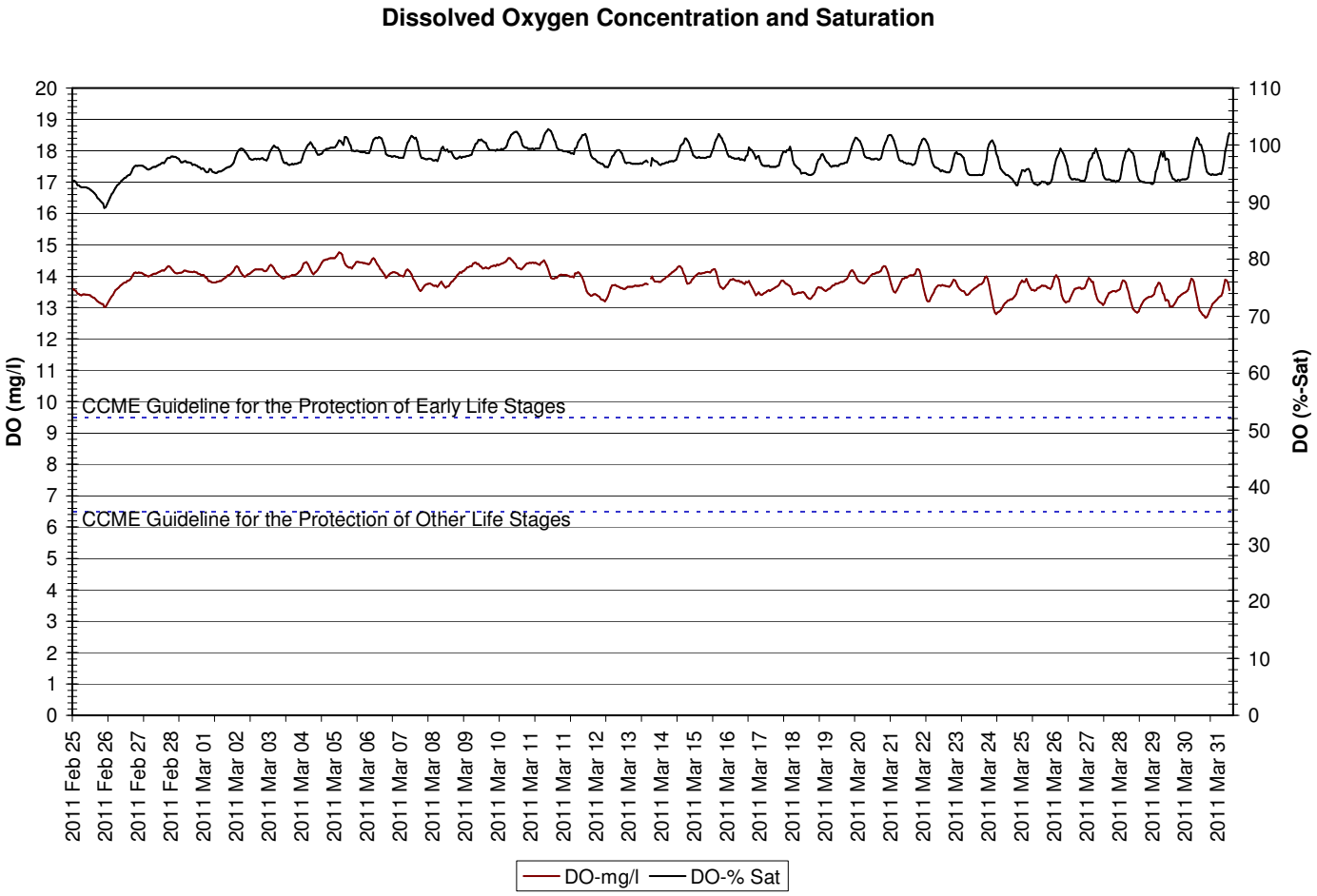
- pH was found to fall within the upper limits of the Site-Specific Guidelines for the Rattling Brook system (5.67 – 6.56). Values ranged from 6.31 to 6.90 with a median pH of 6.47. A slight upward trend is observed in pH over the course of this deployment period.

Figure 8: Specific conductivity at Rattling Brook below Plant Discharge from February 25 to March 31, 2011



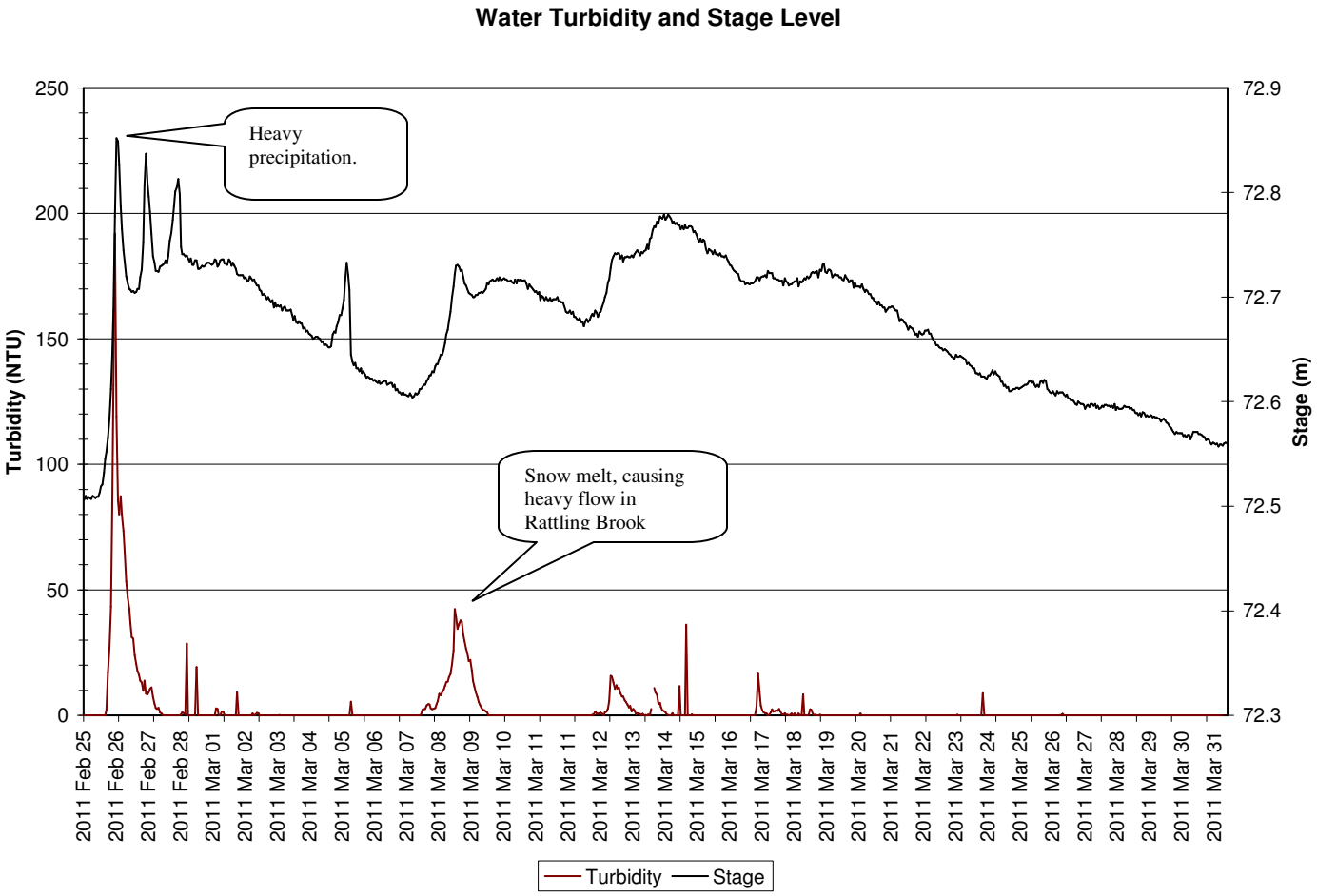
- A marginal rise in conductivity over the deployment period is observed concurrent with the increasing water temperature. As snow begins to melt and the ground thaws, salts are released into the river channel.
- Some instances of larger-than-normal conductivity spikes are seen in high intensity precipitation events. Conductivity ranged from 43.9 to 139.2 µS/cm with a median of 51.3 µS/cm.

Figure 9: Dissolved oxygen at Rattling Brook below Plant Discharge from February 25 to March 31, 2011



- While dissolved oxygen levels at Plant Discharge station are far above the CCME Guidelines, they are not quite as high as those recorded at Bridge station. Here, the concentration of oxygen was found to range from 12.67 to 14.76 mg/l. Likewise, the saturation was also found to be slightly lower than Bridge station and ranged from 89.0 to 102.8%.
- The disparity in oxygen levels between the upstream Bridge station and Plant Discharge station is likely due to stream morphology: a prolonged period of riffle and rapids above Bridge station ensures water is always heavily oxygenated while upstream of Plant Discharge station is a pond and a prolonged stretch of wide, slow-flowing water.

Figure 10: Turbidity at Rattling Brook below Plant Discharge from February 25 to March 31, 2011

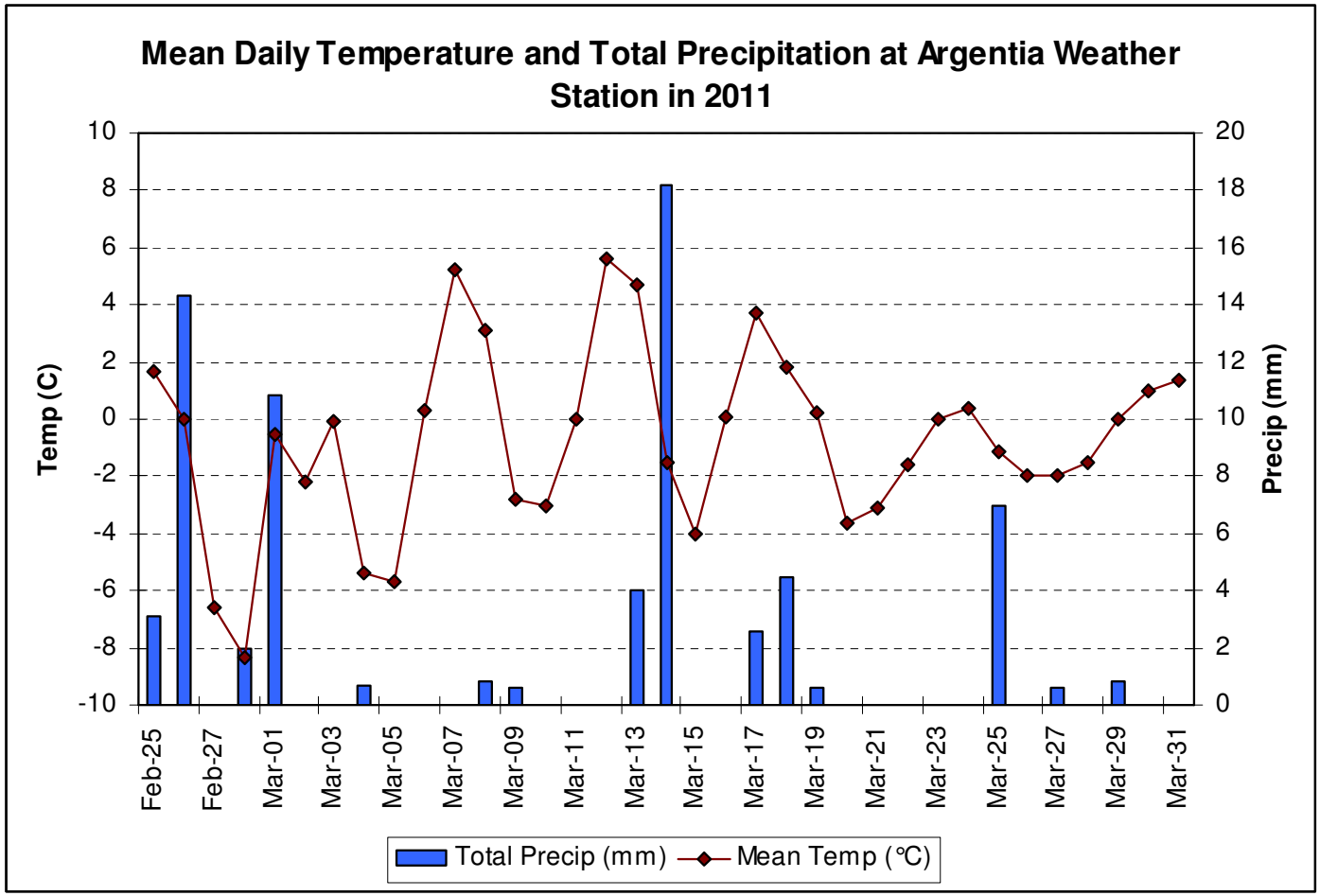


- Turbidity events during this deployment period are generally found in conjunction with increases in stage level. Early in the deployment period, on February 25th and 26th, heavy precipitation increased turbidity levels to 192 NTU. Later, on March 8th and 9th, mild daytime temperatures resulted in snow melt increasing flow in Rattling Brook. Such increased flow pushed turbidity levels to a max of 42.3 NTU.
- For the deployment period, turbidity was generally absent with a median value of 0.0 NTU. The maximum value was 192 NTU.

Conclusions

- Ice conditions precluded the deployment of a multi-parameter sonde at Big Pond station. As water temperatures increase and ice cover diminishes, the instrument will be redeployed.
- Both Bridge and Plant Discharge stations performed well during the deployment from early February to March.
- All parameters appear to be within expected ranges during the reported period.

Appendix



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