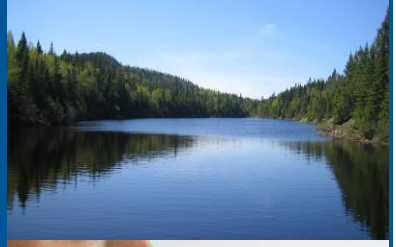
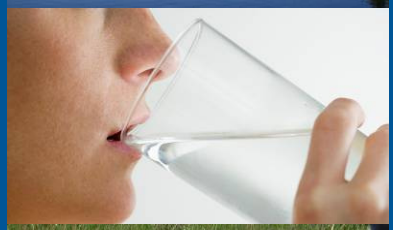








Real-Time Water Quality Deployment Report

Rattling Brook Network

June 17, 2011 to July 20, 2011

Newfoundland Labrador

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

Real-Time Water Quality Deployment Report

Long Harbour Network

June 17, 2011 to July 20, 2011

General

- Department of Environment and Conservation 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 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.

Table 1: Ranked Comparisons between Field and QAQC Sondes

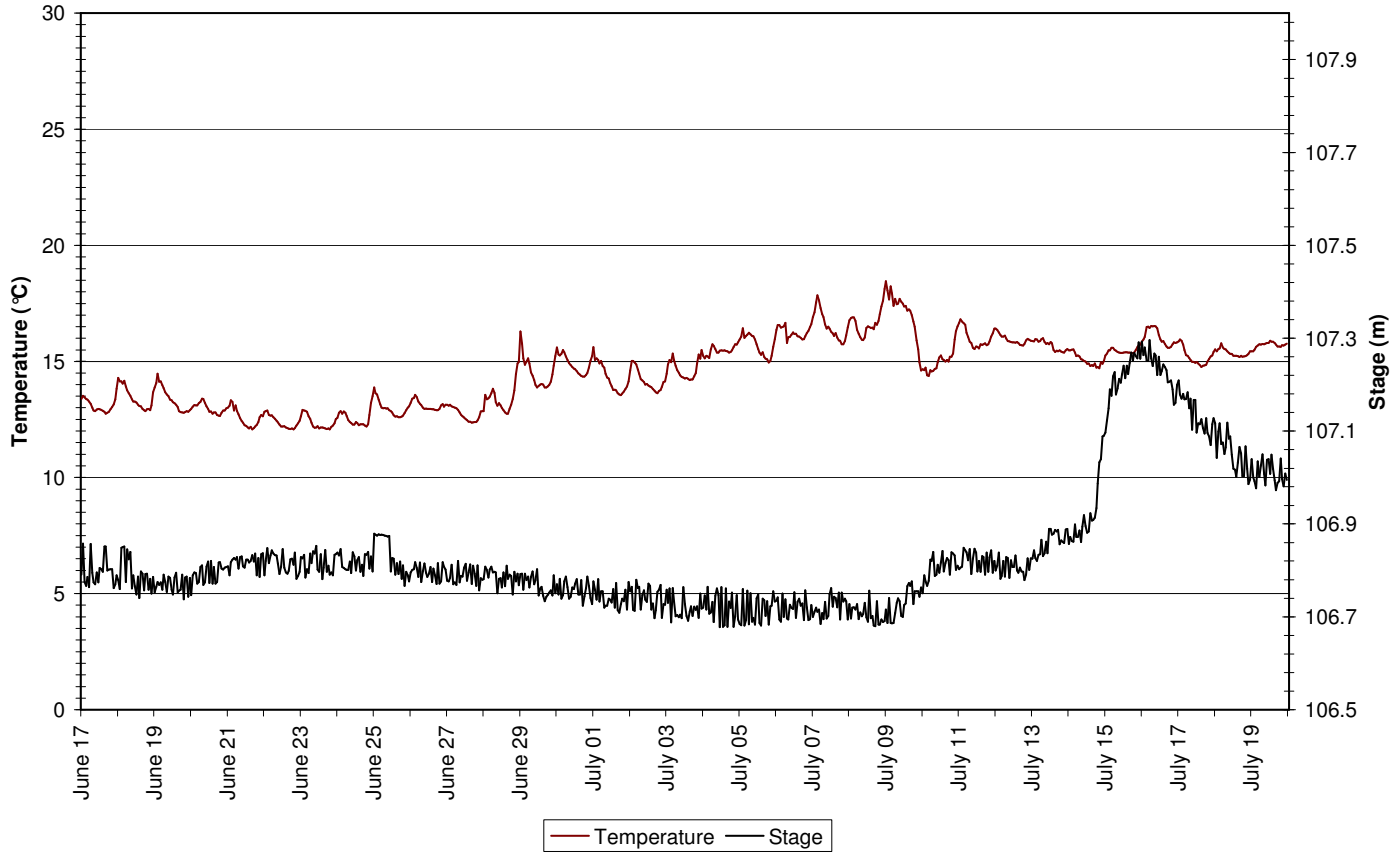
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	June 17, 2011	Deployment	Excellent	Fair	Excellent	Excellent	Excellent
	July 20, 2011	Removal	Excellent	Excellent	Excellent	Excellent	Fair
Rattling Brook below Bridge	June 17, 2011	Deployment	Good	Good	Good	Excellent	Excellent
	July 20, 2011	Removal	Good	Excellent	Excellent	Excellent	Good
Rattling Brook below Plant Discharge	June 17, 2011	Deployment	Excellent	Good	Marginal	Excellent	Excellent
	July 20, 2011	Removal	Excellent	Good	Marginal	Excellent	Excellent

- Two instances of “Marginal” readings were encountered during deployment and removal at Plant Discharge station. Since the same QAQC Sonde was used at Big Pond and Bridge station during deployment and removal without issues, the Marginal rankings may be due to a poor calibration of the Field Sonde.

Data Interpretation

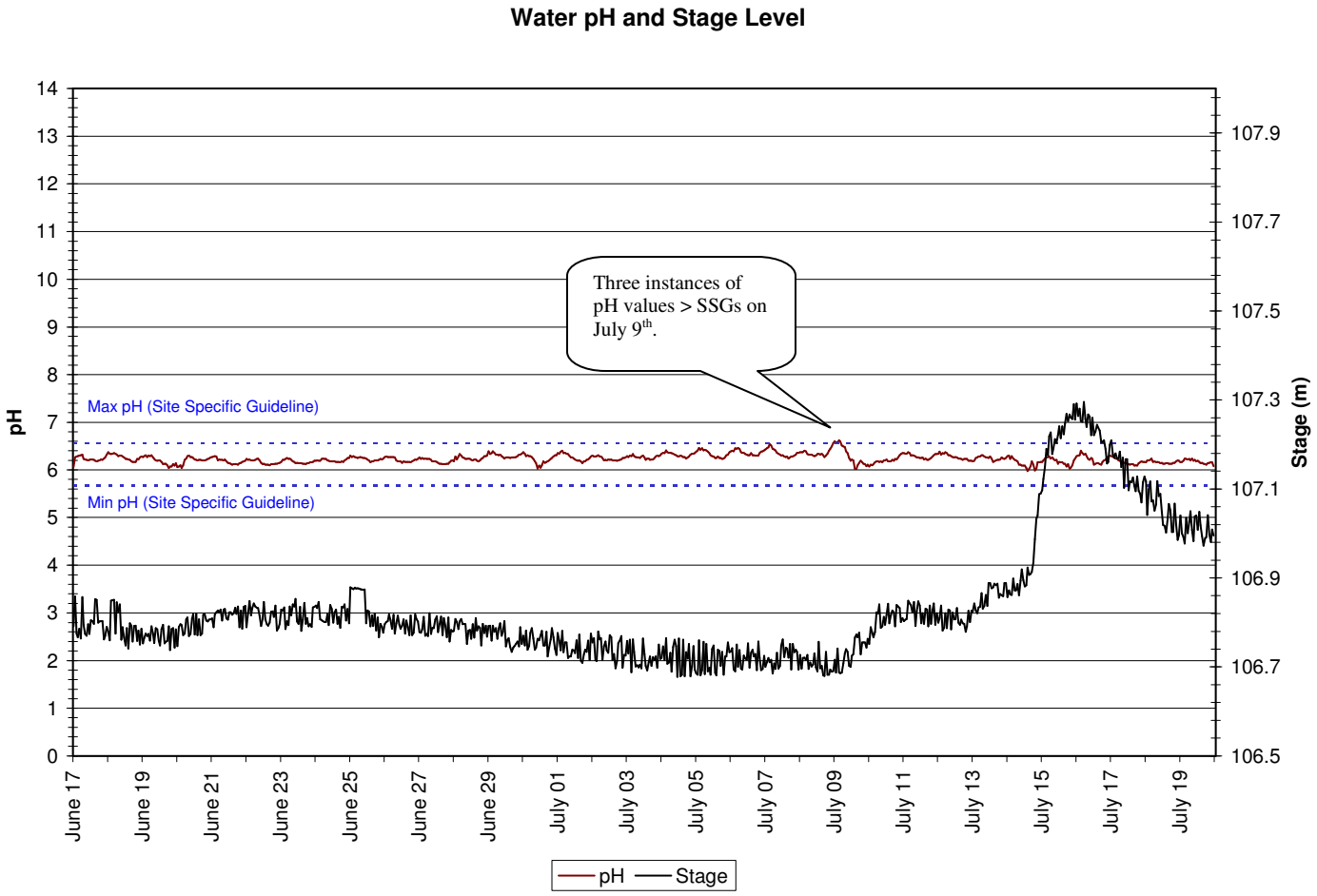
Rattling Brook Big Pond

Figure 1: Water Temperature at Rattling Brook Big Pond from June 17th to July 20th, 2011



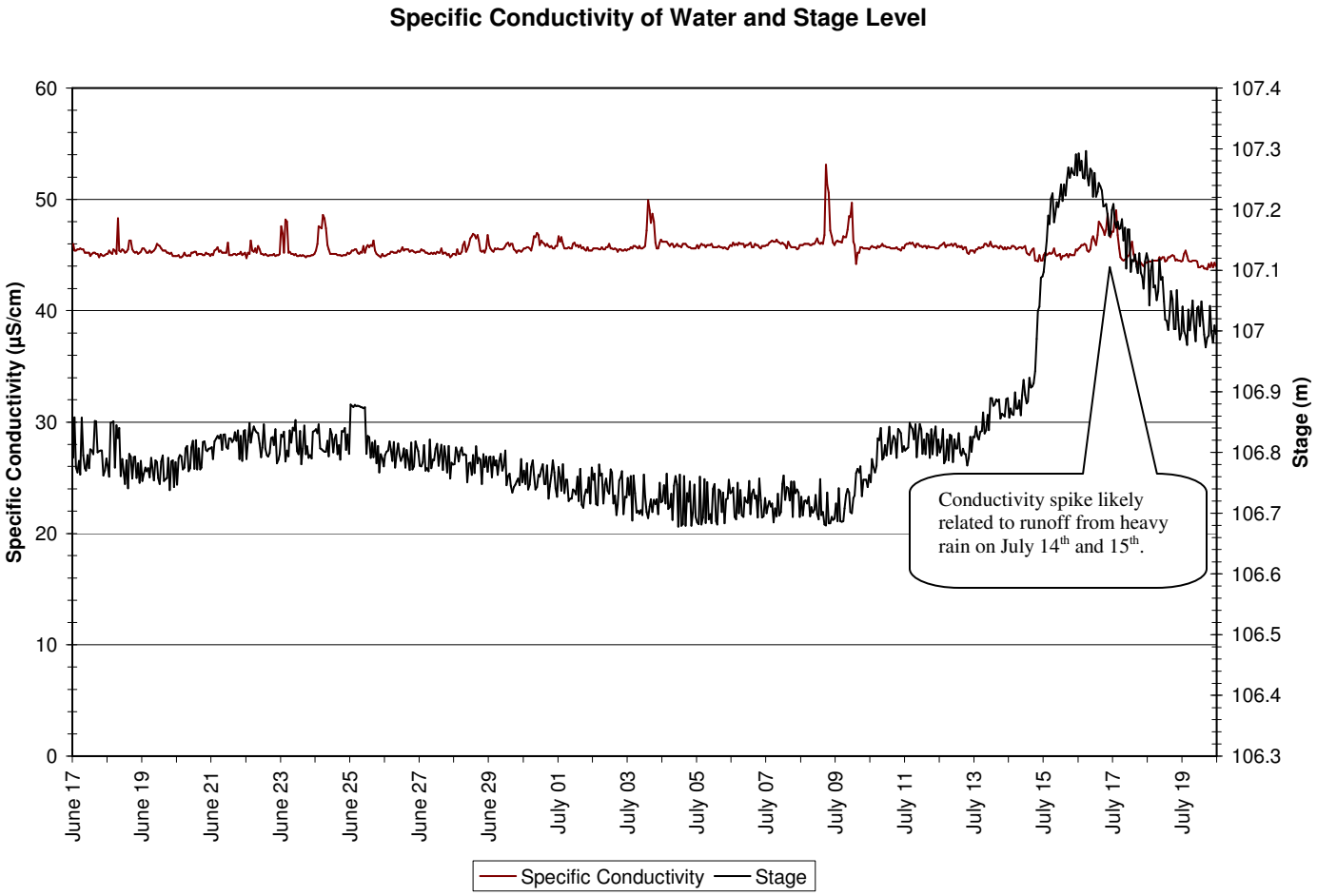
- In mid June, water temperatures were found to be near 12.0°C. Moving into mid-July, water temperatures increased to a maximum of 18.45°C. For the month, a median value of 14.92°C was calculated.

Figure 2: pH at Rattling Brook Big Pond from June 17th to July 20th, 2011



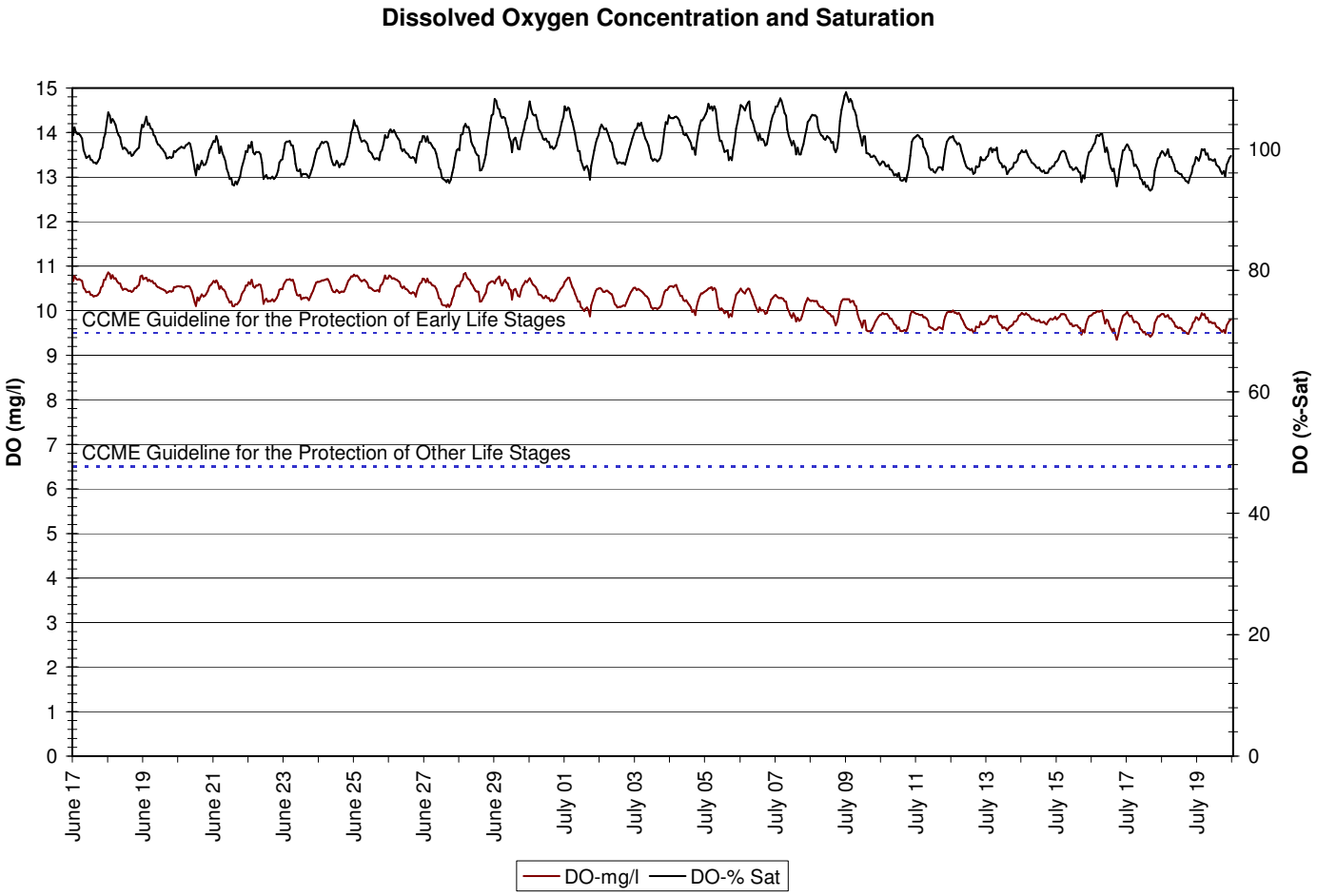
- At Big Pond station, pH values were almost entirely within the Site Specific Guidelines (5.67 – 6.56) except for three consecutive hours in the afternoon of July 9th. A median value of 6.23 units was derived which falls well within expectations.

Figure 3: Specific Conductivity at Rattling Brook Big Pond from June 17th to July 20th, 2011



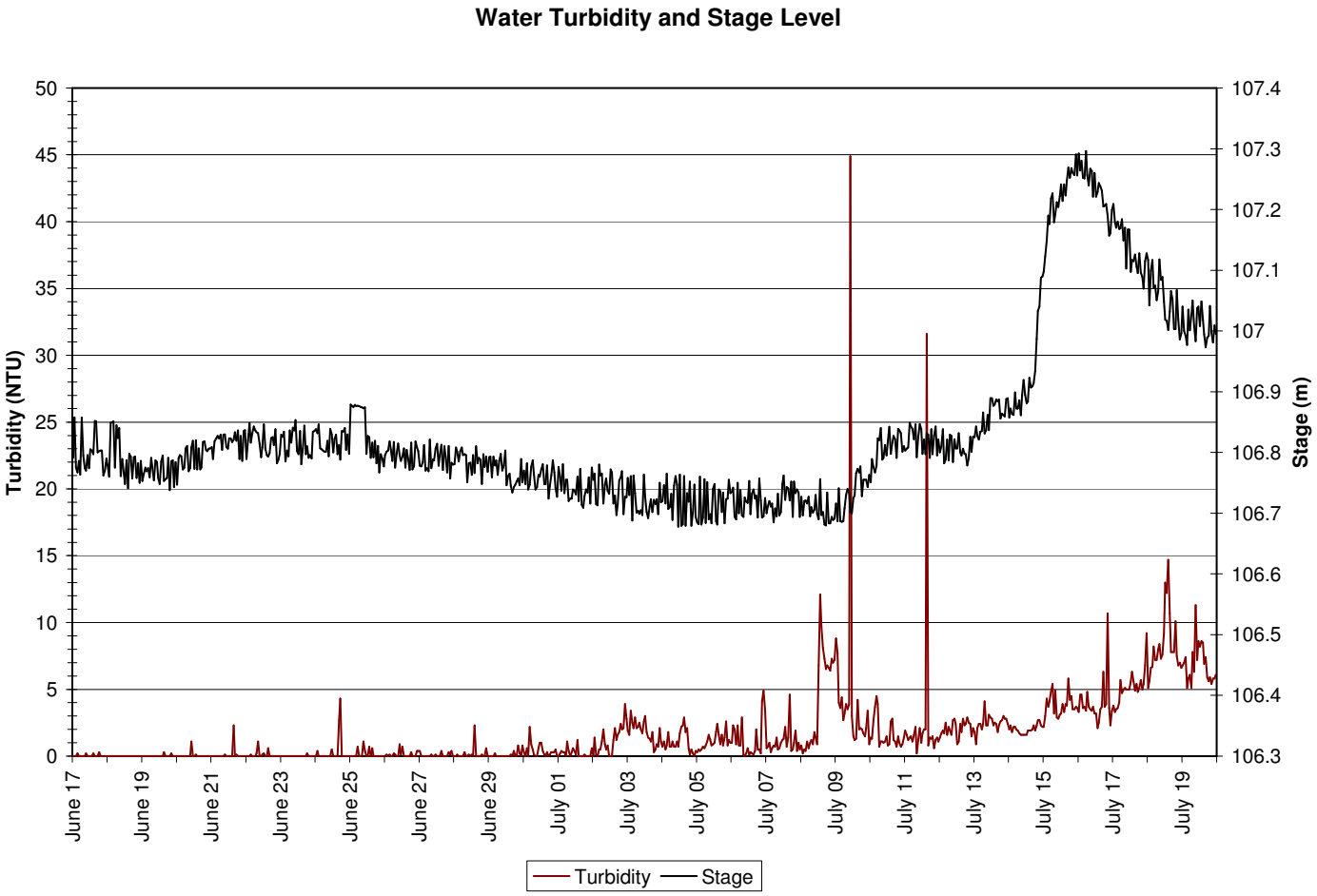
- Very little change was detected in specific conductivity from June 17th to July 20th. Though some minor peaks and valleys were observed, no gross monthly change was noticed.
- Conductivity values ranged from 43.7 to 53.1 µS/cm with a median value of 45.6 µS/cm.

Figure 4: Dissolved Oxygen at Rattling Brook Big Pond from June 17th to July 20th, 2011



- For most of the deployment period, DO concentrations were level and above the CCME Guideline of 9.5 mg/l for the protection of early life stage cold water biota. By the end of the deployment period, a total of ten observations were made at less than 9.5 mg/l. It should be noted, however, that concentrations above 9.5 mg/l are rare in the warm summer months.
- Values for dissolved oxygen ranged from 10.86 to 9.35 mg/l (median value: 10.25 mg/l).

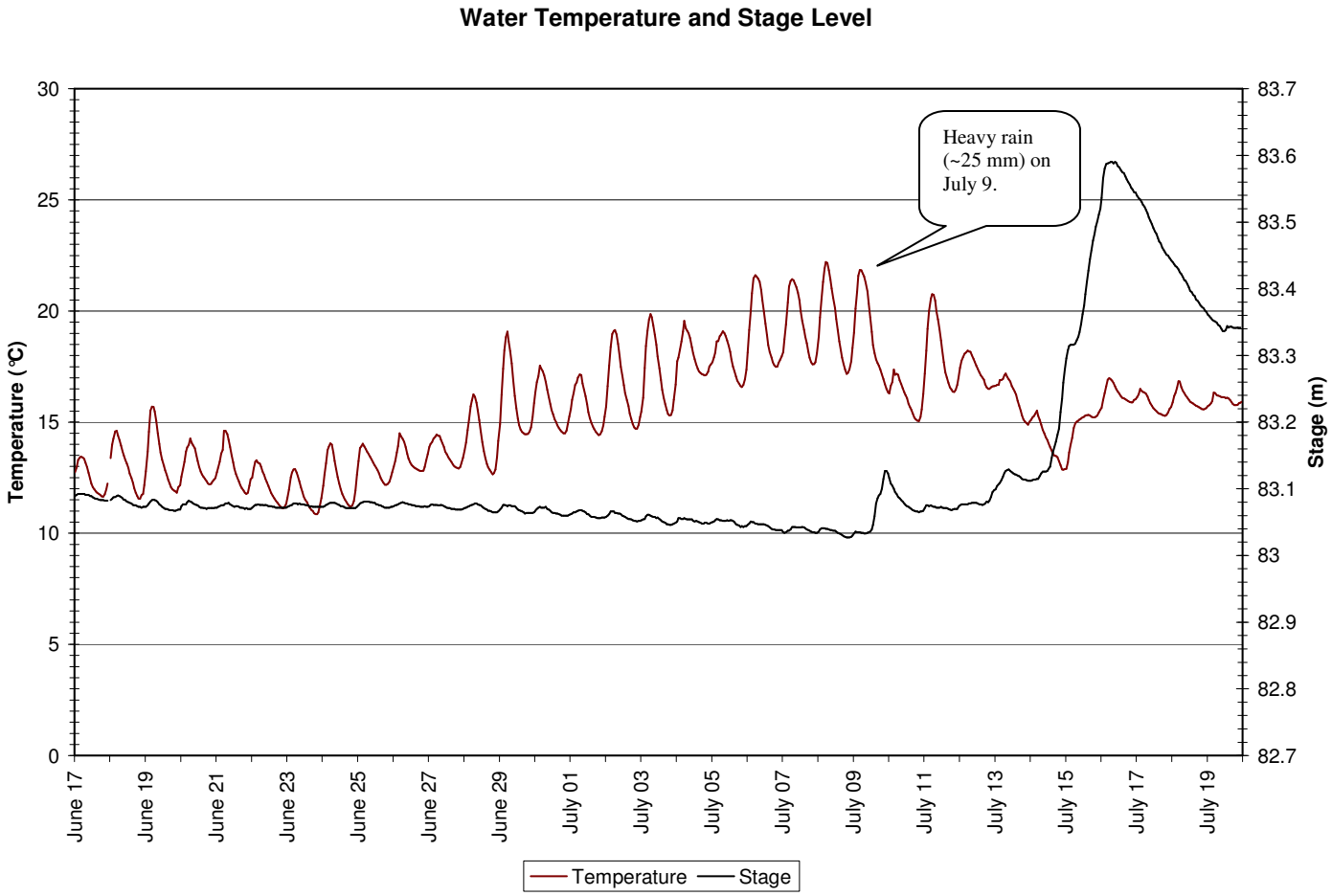
Figure 5: Turbidity at Rattling Brook Big Pond from June 17th to July 20th, 2011



- A rise in turbidity values began in early July and was seen to increase up until the end of the deployment period. During removal of the instrument at the end of this deployment period, it was noticed that some earthworks had been undertaken in the area and a silt-curtain was deployed just offshore. While it is possible that the earthworks and turbidity may be related, QAQC readings taken at the time of removal indicated that turbidity was low (Field Sonde: 5.7 NTU, QAQC Sonde: 0.0 NTU). It appears that the rising turbidity shown in Figure 5 is due to sensor fouling.
- Turbidity values ranged from 0.0 to 44.9 NTU with a median of 0.7 NTU.

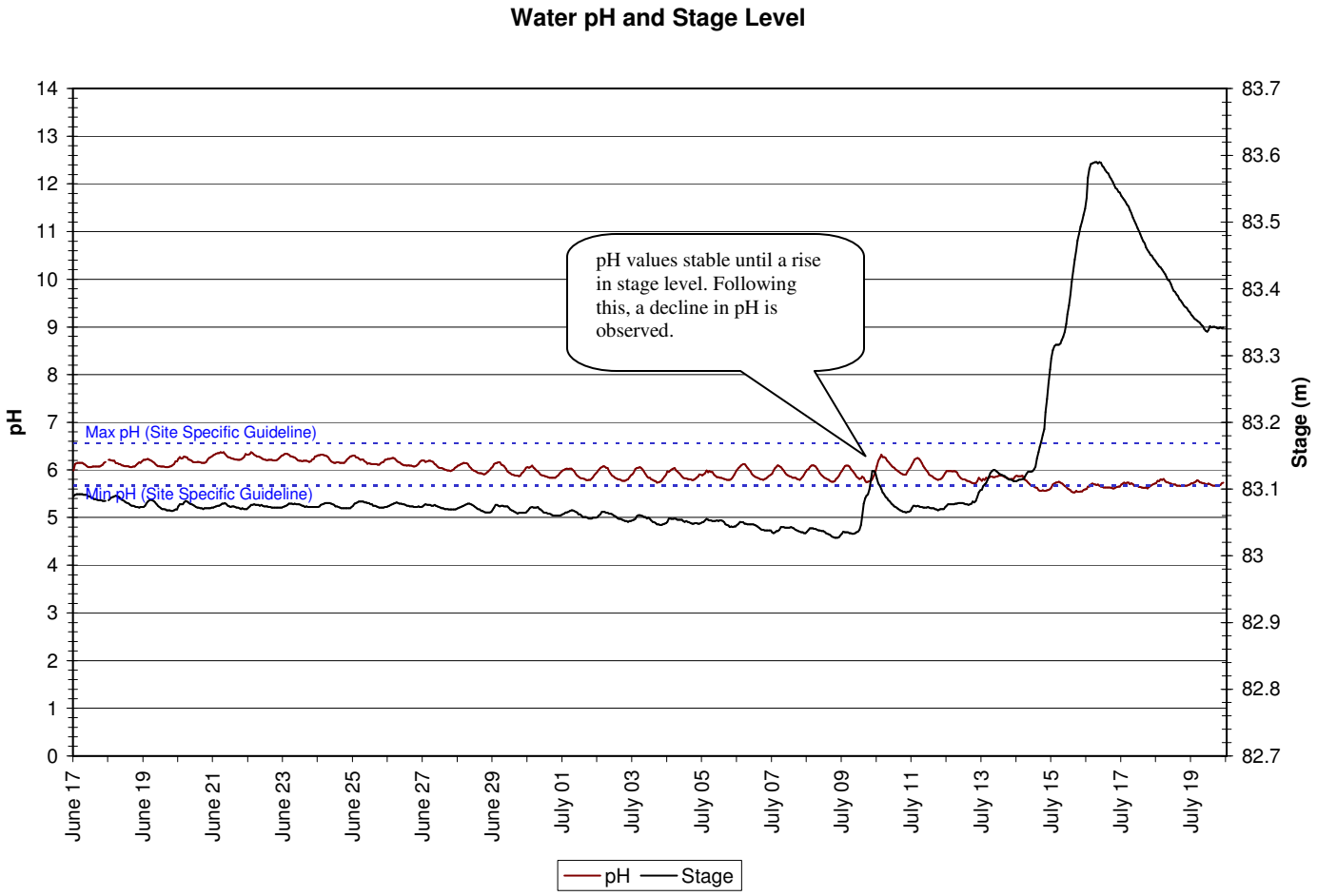
Rattling Brook below Bridge

Figure 6: Water Temperature at Rattling Brook below Bridge from June 17th to July 20th, 2011



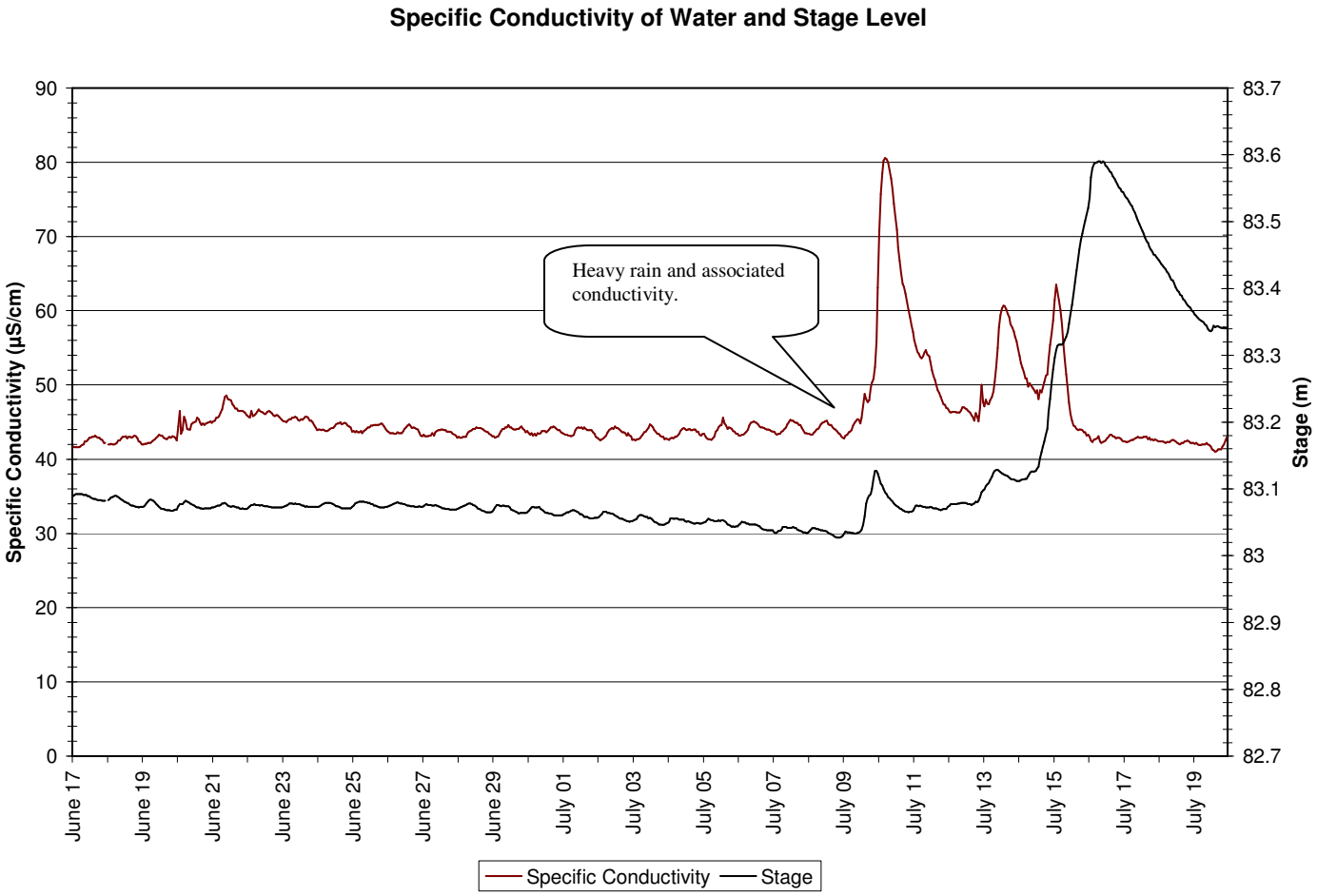
- Daily temperature cycles at Bridge station are much more obvious than those seen at Big Pond station. A greater ratio of surface area to volume at Bridge station relative to Big Pond creates greater interface between air and water allowing for easy exchange of temperature.
- Over the course of the month, the water temperatures ranged from 10.86 to a high of 22.20°C (median value: 15.52°C). An upward trend is observed heading into the first week of July, followed by a decline due to a preponderance of cool, cloudy days.

Figure 7: pH at Rattling Brook below Bridge from June 17th to July 20th, 2011



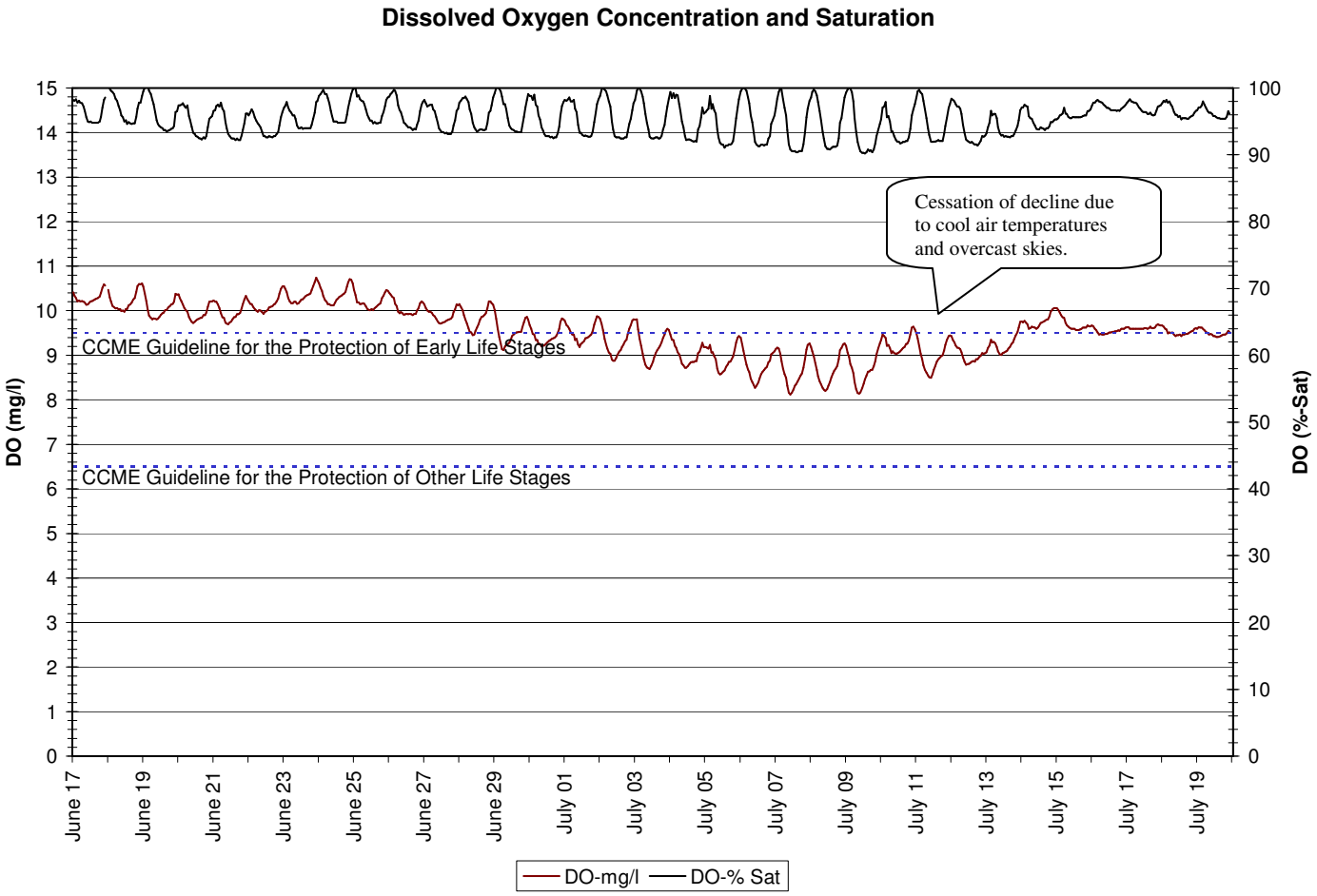
- pH values fell almost entirely within the Site Specific Guidelines (SSGs) of 5.67 – 6.56 until approximately July 13th when values decreased to straddle the lower limit of the SSGs. The decline coincides with periods of especially heavy rain amounting to nearly 58 mm over three days.
- Overall, pH values fell between 6.37 and 5.53 with a median value of 5.98.

Figure 8: Specific Conductivity at Rattling Brook below Bridge from June 17th to July 20th, 2011



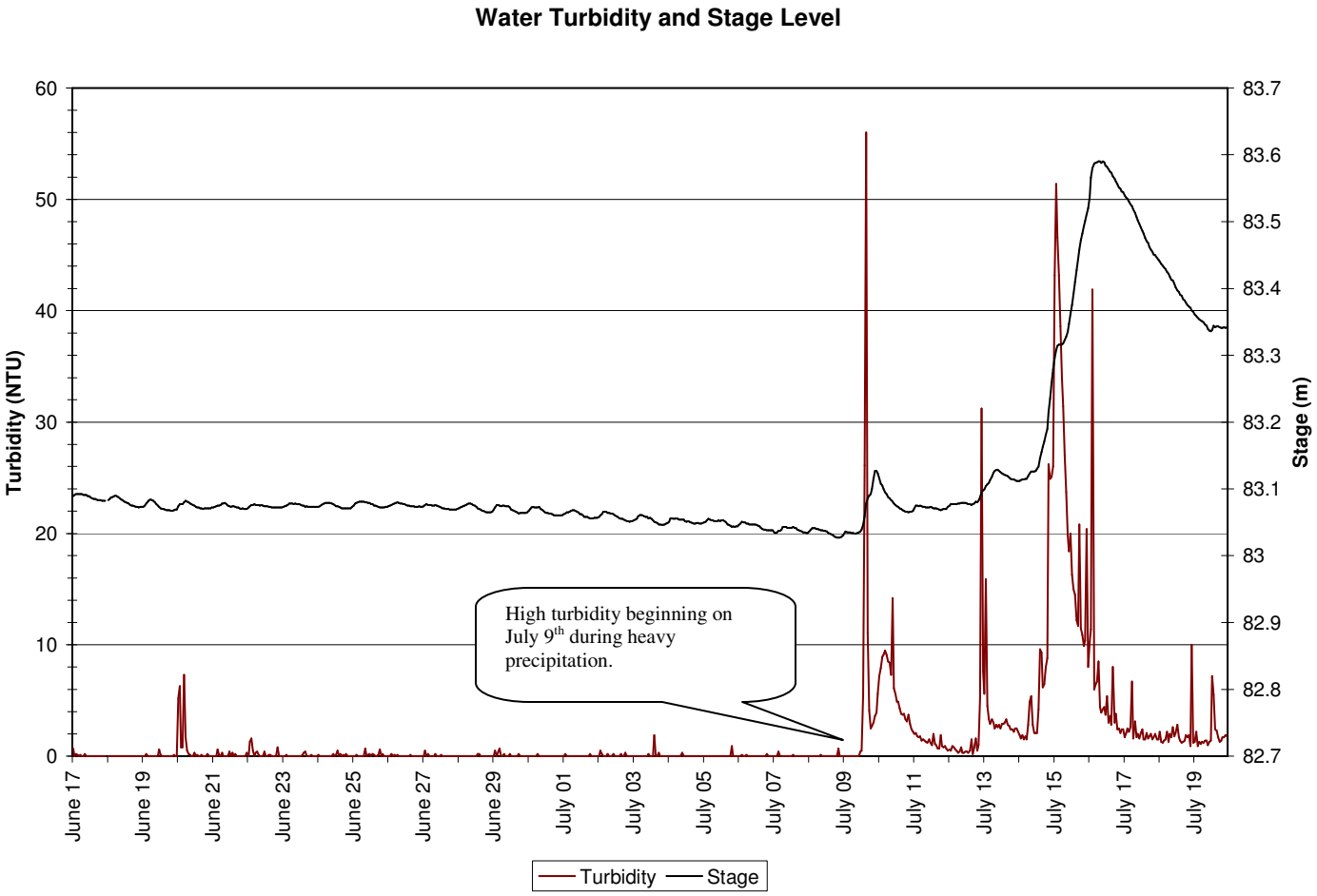
- Conductivity, like pH, was steady for most of June and the first week of July until periods of heavy precipitation induced spikes in flow. Specific Conductivity fell between 41.0 – 80.6 µS/cm with a median value of 44.0 µS/cm.

Figure 9: Dissolved Oxygen at Rattling Brook below Bridge from June 17th to July 20th, 2011



- Typically, as summer progresses, dissolved oxygen concentrations gradually fall until late August or early September as water temperatures begin to decrease. During this deployment period, however, dissolved oxygen ceased the downward decline that began in late June and began to increase into mid July. During this time, mean daily air temperatures were cooler than normal and consistently overcast skies reduced incoming solar radiation.
- Dissolved oxygen concentrations ranged from 8.12 to 10.74 mg/l with a median value of 9.59 mg/l.

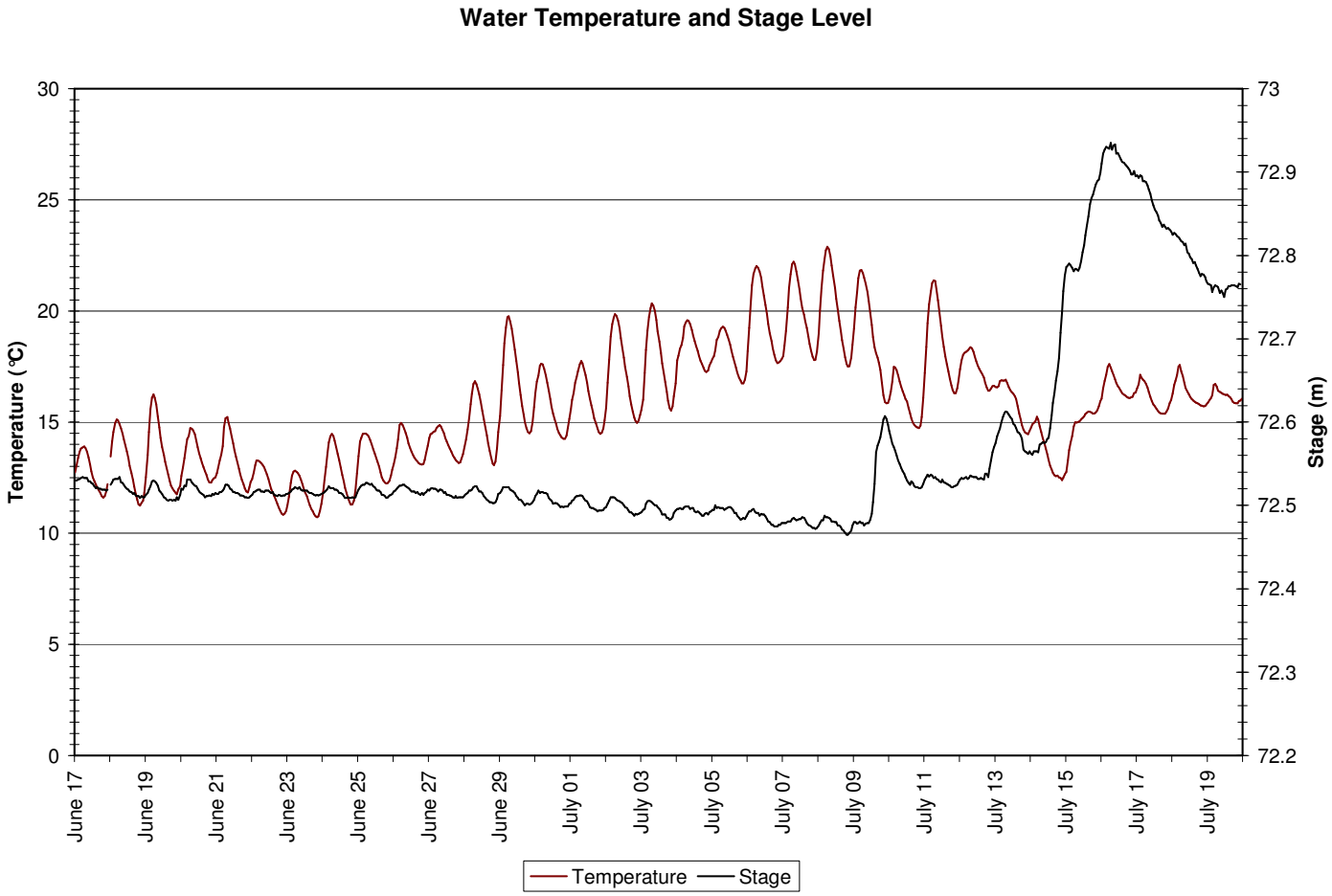
Figure 10: Turbidity at Rattling Brook below Bridge from June 17th to July 20th, 2011



- Turbidity levels at Bridge station were low for the early part of this deployment period and increased a great deal towards mid-July (beginning on July 9th during a particularly heavy rain event).
- Values fell between 0.0 and 56.0 NTU with a median value of 0.0 NTU, indicating that, despite the high levels of turbidity seen in the latter portion of the deployment, more than 50% of turbidity observations were 0.0 NTU.

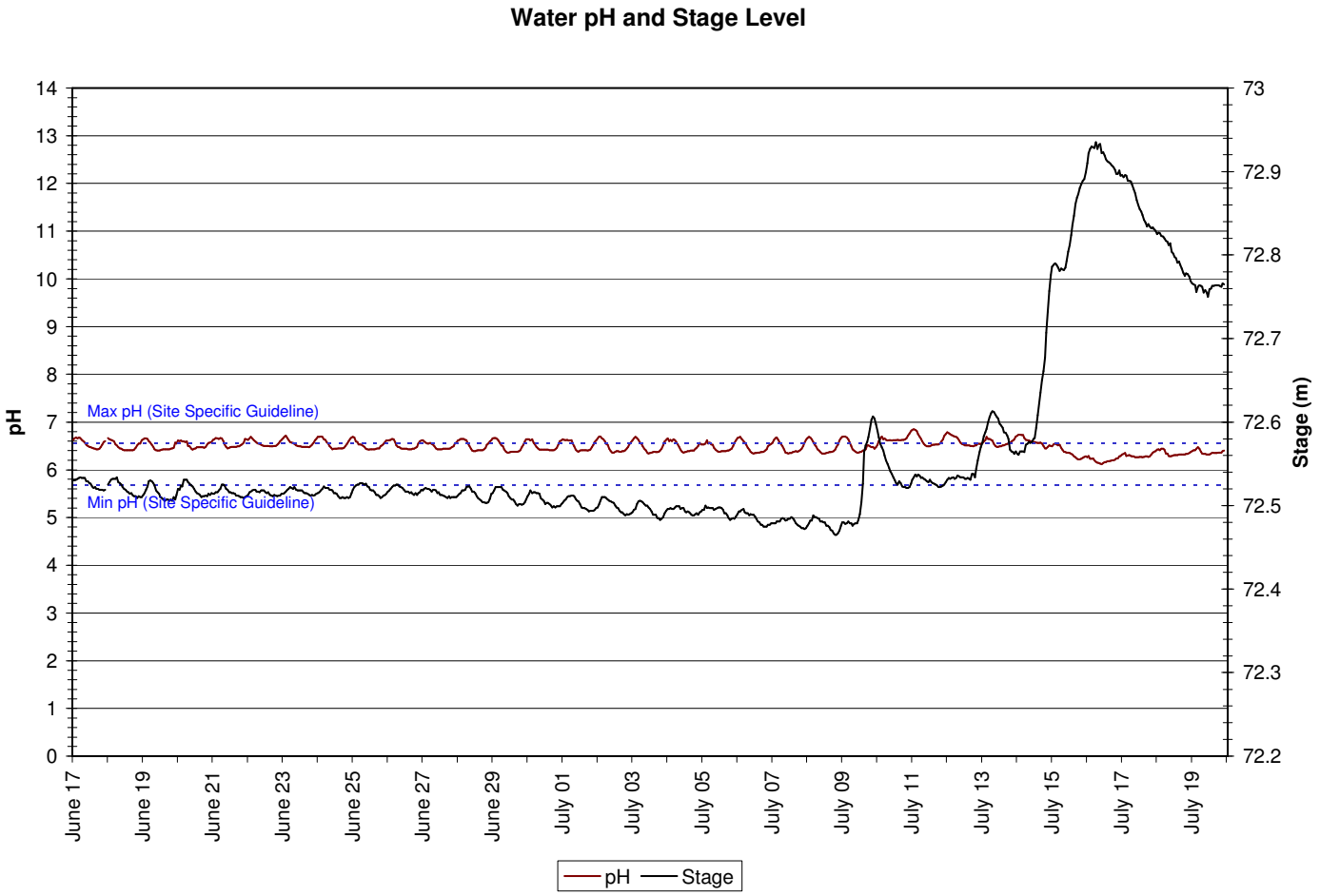
Rattling Brook below Plant Discharge

Figure 11: Water Temperature at Rattling Brook below Plant Discharge from June 17th to July 20th, 2011



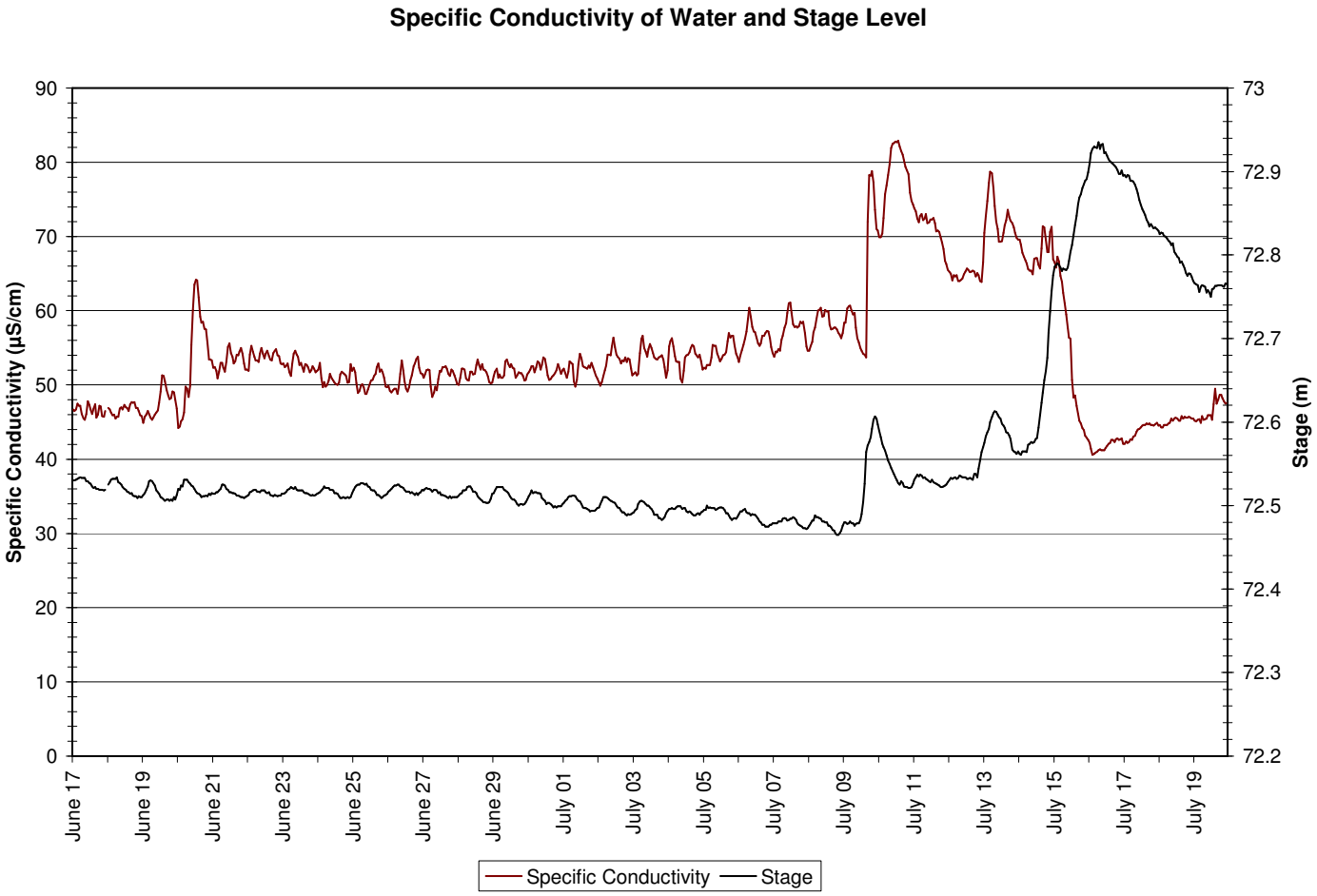
- Through the latter part of June and into July, water temperature rises to a maximum of 22.89°C on July 8th. A temperature minimum was encountered a little more than a week previous on June 24th, falling to 10.72°C.
- Water temperature fell sharply mid-July onwards due to cool air temperatures and precipitation.

Figure 12: pH at Rattling Brook below Plant Discharge from June 17th to July 20th, 2011



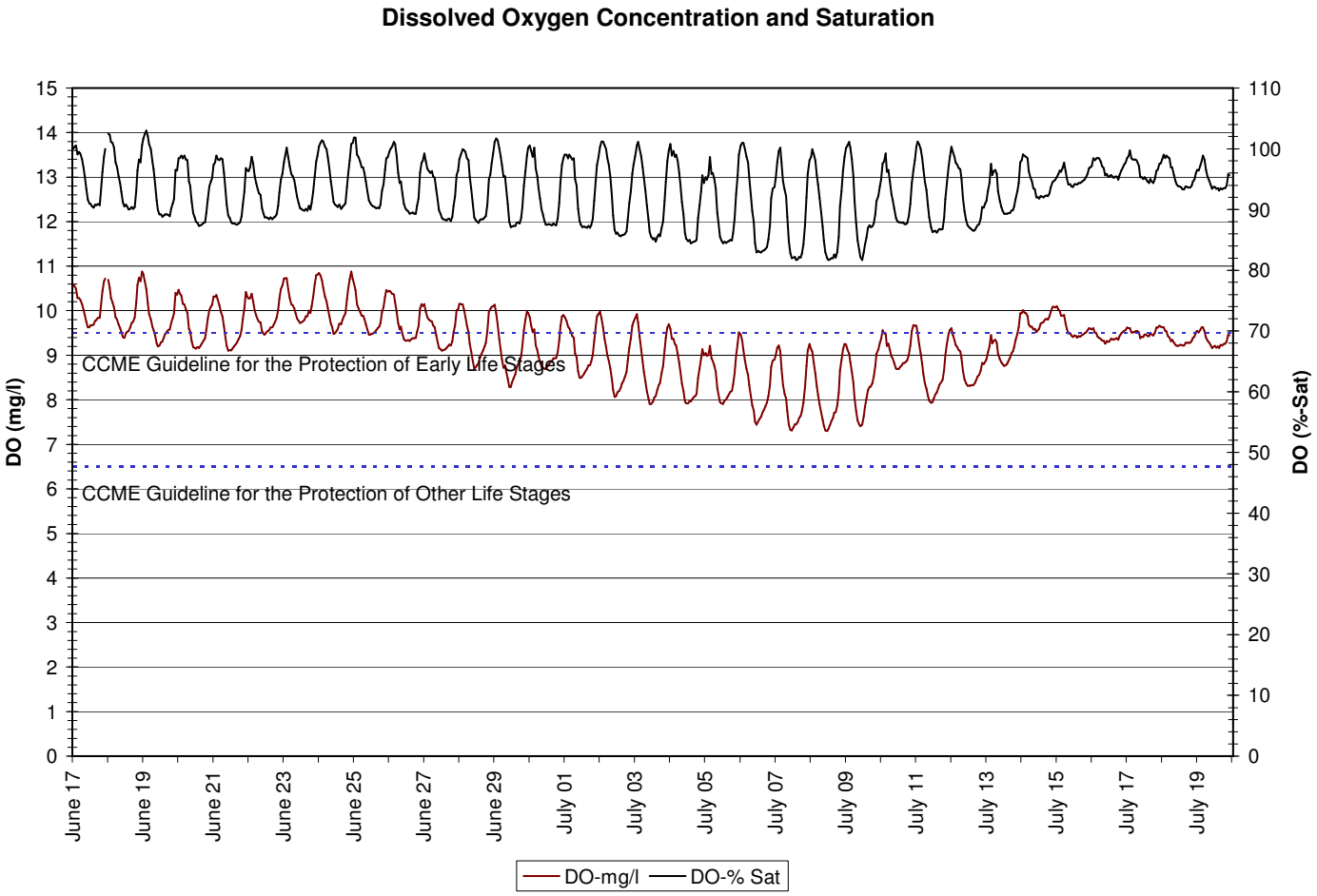
- pH levels were found to reside near the upper limit of the Site Specific Guidelines for the Rattling Brook system (5.67 – 6.56 units). Values ranged from 6.12 – 6.85 with a median of 6.49.
- Near the end of the deployment period, a drop in values was observed in conjunction with an increase in stage level. This appears to be the result of heavy rain on July 14th and 15th.

Figure 13: Specific Conductivity at Rattling Brook below Plant Discharge from June 17th to July 20th, 2011



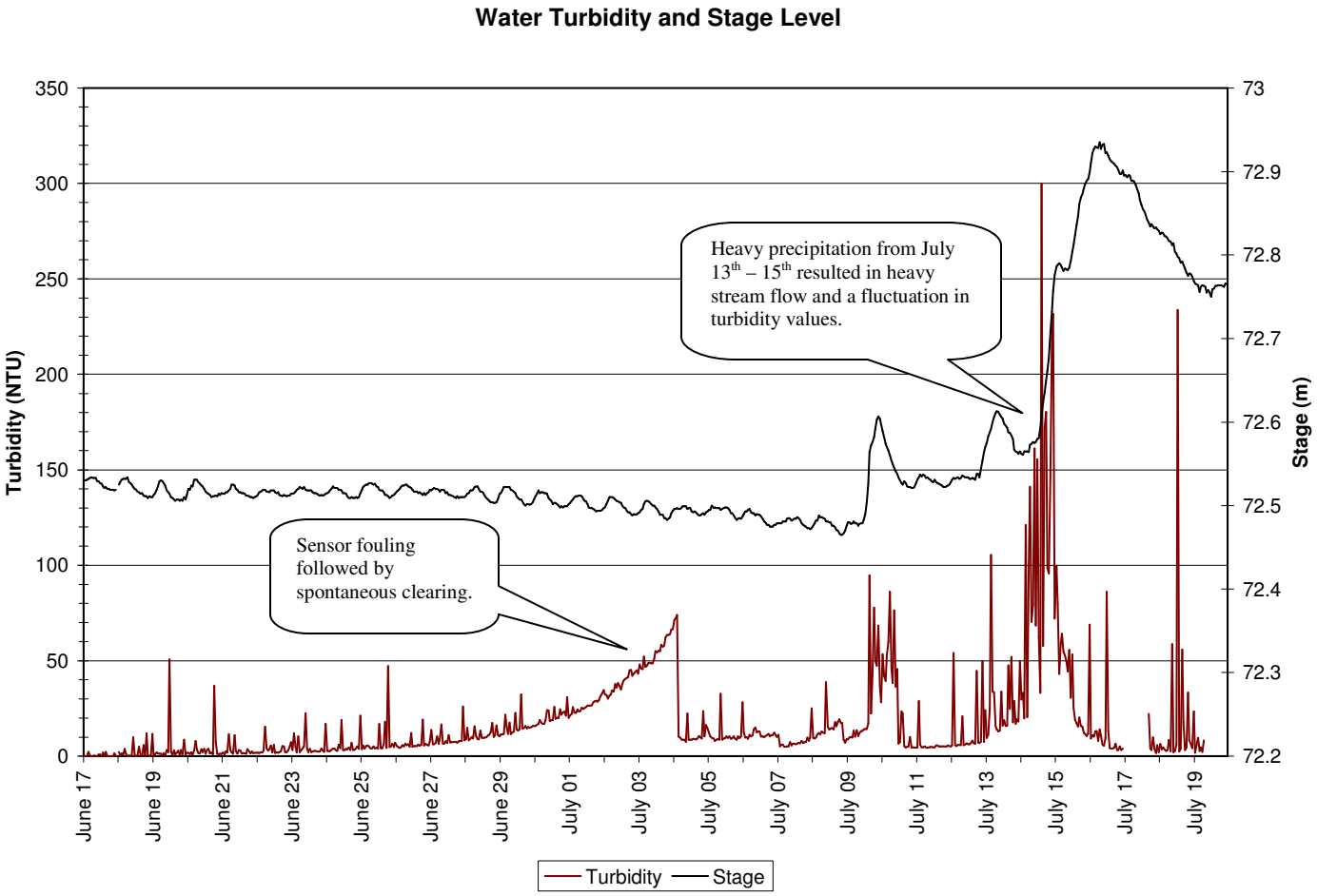
- Conductivity increased consistently over the month from a low of 40.6 to a maximum of 82.9 µS/cm (median value: 52.7 µS/cm). It is somewhat unusual to observe conductivity increase so consistently in a month; however, the fact that the trend is mirrored at Bridge station indicates that this is not sensor fouling. Examination of conductivity in the months ahead will indicate whether this merits further attention.

Figure 14: Dissolved Oxygen at Rattling Brook below Plant Discharge from June 17th to July 20th, 2011



- From late June to mid-July, dissolved oxygen concentration fell below the CCME guidelines for the protection of early life stage cold water biota. As a result of cooling water temperatures through most of July, however, the concentration of DO increased in the latter parts of the deployment period, rising above the CCME Guideline.
- Regardless of the CCME Guideline for early life stages, most aquatic organisms have progressed beyond these stages at this point of the year reducing any risk associated with DO levels < 9.5 mg/l.
- DO values ranged from 10.88 – 7.30 mg/l with a median of 9.37 mg/l.

Figure 15: Turbidity at Rattling Brook below Plant Discharge from June 17th to July 20th, 2011

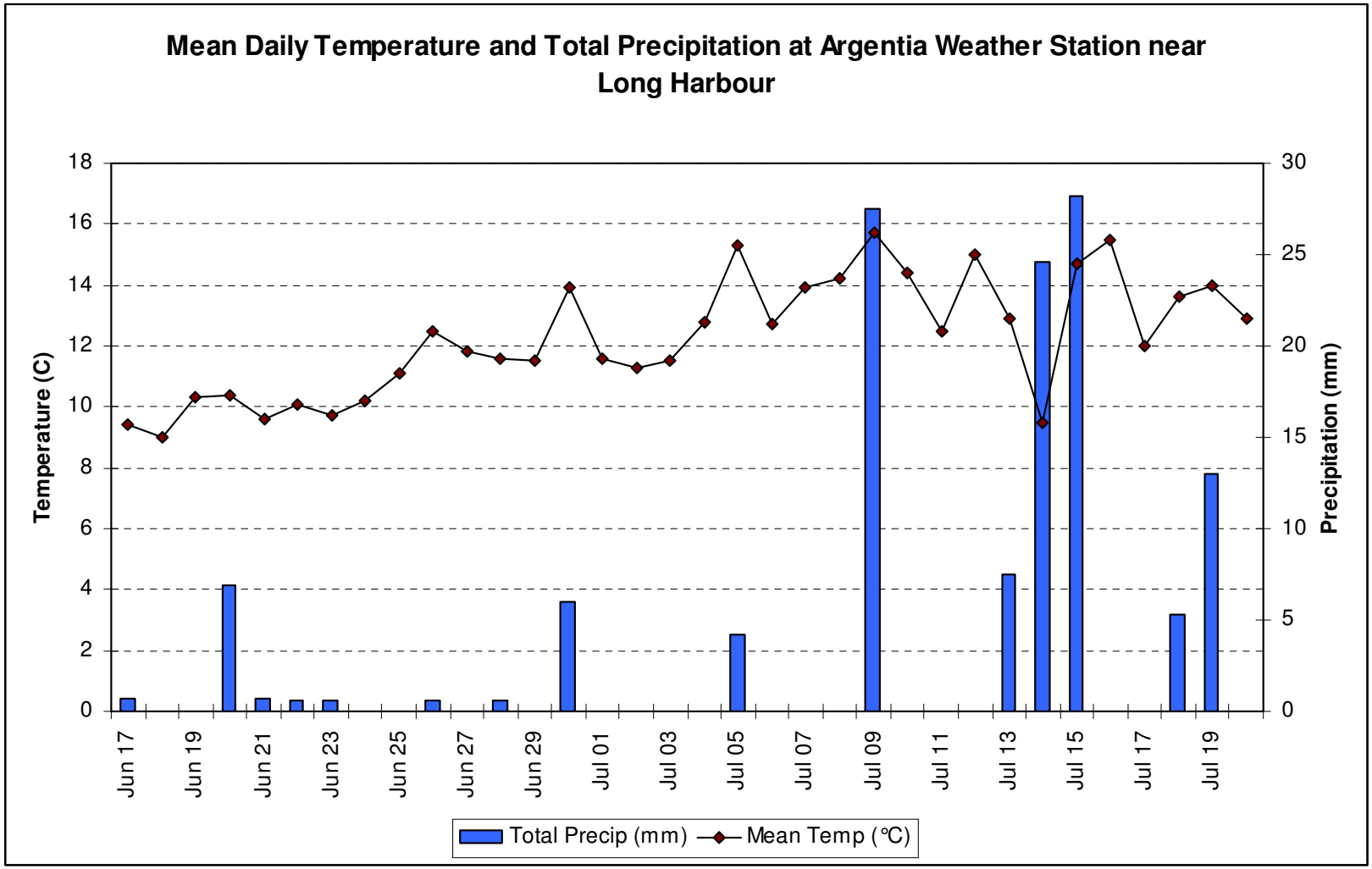


- Like other parameters above, turbidity was shown to be elevated and highly variable towards the end of this deployment period. Values ranged from 0.0 to 299.5 NTU (median value: 9.0 NTU).
- Beginning near June 22nd, a steady increase in turbidity was recorded. The exponential form of this increase is a tell-tale sign of fouling – therefore, the values from June 22nd to July 4th are highly suspect and should be disregarded.
- During this deployment period, a total of 96 turbidity exceedences were encountered (values > 40 NTU).

Conclusions

- For the most part, all parameters depicted at the three Ratting Brook stations during this deployment reflect the normal seasonal warming trends encountered during the early summer. However, consistent overcast skies and frequent precipitation in later July muted these trends and reversed them in many cases (especially water temperature and dissolved oxygen).
- Habitat Rehabilitation projects are planned for some sections of Rattling Brook and should begin within the mid-to latter parts of Summer 2011. As a result of this work, Bridge and/or Discharge stations may be taken offline during the work.

Appendix



Prepared by:
Ryan Pugh
Department of Environment and Conservation
Water Resources Management Division
Phone: 709.729.1681
Fax: 709.729.3020