

Real-Time Water Quality Deployment Report Rattling Brook Network

August 12, 2011 to September 27, 2011



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



General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- At this time, habitat compensation efforts were directed towards a stretch of river containing Rattling Brook below Bridge station. This station was offline from the August 16th to September 2nd. No data was collected at this time, resulting in a large gap in graphs from below Bridge station.
- The addition of crushed spawning gravel to the river reach where Bridge station resides has resulted in a dynamic streambed. Conductivity and turbidity events are expected to be greater than normal until the bed settles. Additionally, a shifting of gravel in high flow may result in sensor blockages and fouling.

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.

Station	Date	Action	Comparison Ranking				
			Temperature	рН	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	August 12, 2011	Deployment	Fair	Excellent	Excellent	Excellent	Excellent
	September 27, 2011	Removal	Good	Excellent	Excellent	Good	Excellent
Rattling Brook below Bridge	August 12, 2011	Deployment	Good	Good	Good	Excellent	Excellent
	September 27, 2011	Removal	Good	Good	Good	Good	Excellent
Rattling Brook below Plant Discharge	August 12, 2011	Deployment	Fair	Good	Excellent	Excellent	Excellent
	September 27, 2011	Removal	Excellent	Excellent	Good	Marginal	Excellent

Table 1: Qualitative QAQC Ranking

Data Interpretation

Rattling Brook Big Pond

Figure 1: Water Temperature at Rattling Brook Big Pond from August 12th to September 27th, 2011





- Water temperatures normally peak towards the end of August as air temperatures begin to fall heading into the fall season. Temperatures did not change much compared to the previous month in terms of max, min, or median values. During this deployment period, water temperatures ranged from 20.86 to 14.74°C (median value: 16.81°C).
- In 2010, during the same time period, temperatures were somewhat warmer with a median temperature 1.54°C warmer than 2011.

Figure 2: pH at Rattling Brook Big Pond from August 12th to September 27th, 2011



Water pH and Stage Level

 Consistently mild acidity and a lack of dramatic change in pH is characteristic of Rattling Brook Big Pond. pH values were almost totally within the Site Specific Guidelines of 5.67 – 6.56 units. The actual recorded range from 5.72 to 6.63 with a median value of 6.40.

Figure 3: Specific Conductivity at Rattling Brook Big Pond from August 12th to September 27th, 2011



Specific Conductivity of Water and Stage Level

- On the whole, conductivity was stable during this deployment period. Some instances of peaks and dips are evident due to precipitation events.
- Conductivity values fell between 43.4 to 54.7 μ S/cm with a median value of 44.6 μ S/cm.

Figure 4: Dissolved Oxygen at Rattling Brook Big Pond from August 12th to September 27th, 2011



Dissolved Oxygen Concentration and Saturation

- Dissolved oxygen hovered just under the CCME Guideline for the Protection of Early Life Stage cold water biota during this deployment. At this time of year, few organisms are stressed by low DO conditions as later life stages are generally achieved long before fall.
- Concentrations of dissolved oxygen ranged from 8.39 to 9.61 mg/l (median: 93.6 mg/l).

Figure 5: Turbidity at Rattling Brook Big Pond from August 12th to September 27th, 2011



Water Turbidity and Stage Level

- Turbidity values were low during the course of this deployment and fell between 0.0 and a maximum of 36.9 NTU. The median turbidity at this time was found to be 0.2 NTU.
- Construction efforts are ongoing in this area in relation to a water intake structure for the Hydromet facility. From August 24th to 30th, a period of variable turbidity could not be associated with any particular weather event. It is possible that the turbidity encountered is related to construction.

Rattling Brook below Bridge

Figure 6: Water Temperature at Rattling Brook below Bridge from August 12th to September 27th, 2011



Water Temperature and Stage Level

Water temperature appears to have peaked around or just before the time Bridge station was brought back online following habitat compensation work. Temperatures fell between 21.71 to 12.75°C (median value: 16.25°C).

Figure 7: pH at Rattling Brook below Bridge from August 12th to September 27th, 2011



Water pH and Stage Level

- pH values appear to present a declining trend falling from near the upper Site Specific Guideline at deployment to near the lower guideline by removal in late September.
- pH ranged from 5.75 to 6.51 units (entirely within the guidelines) and had a median value of 6.18 pH units. No major fluctuations were recognised during the deployment.

Figure 8: Specific Conductivity at Rattling Brook below Bridge from August 12th to September 27th, 2011



Specific Conductivity of Water and Stage Level

- The latter part of this deployment period follows the addition of large quantities of spawning gravel to the river in the Bridge station area. The addition of gravel will naturally increase the conductivity of the water in the area since gravel will normally carry fine silt and salts.
- During the same time period in 2010, a median conductivity value of 39.0 μ S/cm was found while this year, the median value was found to be 44.4 μ S/cm (Min: 41.9 μ S/cm, Max: 87.1 μ S/cm).
- On September 20th, with the increase in flow through this section of Rattling Brook, a large peak in conductivity was present. It is expected that, as time goes on, settling and washing of the new rock layer will reduce the elevated conductivity.

Figure 9: Dissolved Oxygen at Rattling Brook below Bridge from August 12th to September 27th, 2011



Dissolved Oxygen Concentration and Saturation

- An upward trend in dissolved oxygen was observed following the redeployment of Bridge station following the completion of habitat compensation work. A small interruption of the trend occurred in relation to heavy rain on September 20th.
- Dissolved oxygen concentrations ranged from 8.08 to 100.8 mg/l with a median 9.32 mg/l.

Figure 10: Turbidity at Rattling Brook below Bridge from August 12th to September 27th, 2011



Water Turbidity and Stage Level

- As expected, following major work on the stretch of Rattling Brook where Bridge station resides, turbidity conditions were highly erratic with frequent occurrence. As the spawning gravel that was laid down during the habitat compensation work settles and fines are washed out of the streambed, turbidity events such as this are expected to return to normal.
- Values ranged from 0.0 to 106.9 NTU with a median value of 0.6 NTU. Such a low median value indicates that turbidity events, though high in some cases, quickly return to baseline levels.

Rattling Brook below Plant Discharge





Water Temperature and Stage Level

• Water temperatures ranged from 22.56 to 12.01°C during this deployment period. A downward trend has begun as fall approaches and ambient air temperature decreases.

Figure 12: pH at Rattling Brook below Plant Discharge from August 12th to September 27th, 2011



Water pH and Stage Level

- pH at Plant Discharge station hovered at and just above the upper Site Specific Guideline for the Rattling Brook network. Values ranged from 6.35 to 6.99 with a median value of 6.64 units.
- After the large precipitation event on September 20th, pH remained elevated for the remainder of the deployment.

Figure 13: Specific Conductivity at Rattling Brook below Plant Discharge from August 12th to September 27th, 2011





- Aside from peaks in conductivity, a general rise in values over the course of the deployment period is apparent. Two large peaks in conductivity dominate the deployment period and are associated with precipitation on August 16th and September 20th.
- Values ranged from 49.2 to 147.9 μ S/cm with a median of 58.3 μ S/cm. On September 16th at 10:30 am, conductivity reached the highest value ever recorded at this station 147.9 μ S/cm.

Figure 14: Dissolved Oxygen at Rattling Brook below Plant Discharge from August 12th to September 27th, 2011



Dissolved Oxygen Concentration and Saturation

Dissolved oxygen increased overall during this deployment period and fell between 7.44 and 9.97 mg/l (median: 8.54 mg/l). All values were above the critical CCME Guideline for the Protection of Other Life Stage cold water biota. No particular events occurred regarding DO that is of concern.

Figure 15: Turbidity at Rattling Brook below Plant Discharge from August 12th to September 27th, 2011



Water Turbidity and Stage Level

- Turbidity values were similar in scope to those found at Bridge station during this deployment period. Values ranged from a low of 0.0 NTU to a maximum of 734.0 NTU (median: 1.4 NTU).
- On August 16th very heavy rainfall caused a series of sustained high-level turbidity periods.

Conclusions

- Habitat compensation has completed around below Bridge and below Plant Discharge stations. Conductivity and turbidity values are expected to be somewhat elevated while disturbed streambeds settle.
- Conditions around habitat compensation areas will be monitored to ensure that conditions return to normal in short order.

Appendix



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