New Nouveau Brunswick

Your Environmental Trust Fund at Work

MREAC

Lake Monitoring

Miramichi River Environmental Assessment Committee (MREAC)

Report 2023

Lake Monitoring

Water Temperature Profiles

Report 2023

Harry Collins
Neil Collins

Miramichi River Environmental Assessment Committee

PO Box 85, 21 Cove Road
Miramichi, New Brunswick
E1V 3M2

Phone: (506) 778-8591
Fax: (506) 773-9755

Email: mreac@nb.aibn.com
Website: www.mreac.org

January, 2023

(Cover – Main Kennedy Lake 2023)

Acknowledgements

The Miramichi River Environmental Assessment Committee (MREAC) would like to thank the New Brunswick Department of Environment and Local Government (DELG) for their continued monetary support for Lake Monitoring. A special thank you is extended to Tim Humes, and Neil Collins, for their field support help in 2023.

Contents

List of Figures

1.0 Introduction & Background

In 2023 The Miramichi River Environmental Assessment Committee (MREAC) continued its monitoring of three Miramichi River watershed lakes; Kennedy Lake, Mullin Stream Lake, and North Renous Lake (Figure 1). With the controversy and related vandalism on Miramichi Lake in 2022, MREAC opted to skip 2023 in expectation of repeated interference with the monitoring efforts and equipment.

With support from the New Brunswick Environmental Trust Fund, MREAC lake monitoring began in 2013 on the Main Kennedy Lake. There are now ten years of data from this project (monitoring was not supported in 2018). Additional lakes were included over these years. The lakes monitored currently are Miramichi Lake, Mullin Stream Lake, North Renous Lake and the Main Kennedy Lake. In previous years monitoring was completed on Guagas Lake, Smith Lake and Tuadook Lake.

Some lakes in New Brunswick are showing signs of stress related to anthropogenic impacts. Cyanobacteria outbreaks are reported more frequently and are becoming more widespread in the province. The New Brunswick Department of Environment and Local Government (DELG) along with community-based organizations, including lake associations, are exploring and trying to remediate these issues. Enrichment appears to pose the greatest threat to these lakes and the degree of the problem often seems related to the scale of shoreline development. Warmer waters due to climate change are felt to be exacerbating the issue. Of note, lake monitoring on the Miramichi watershed to date serves to provide reference conditions, those expected to be found in undeveloped or only moderately developed lakes. The selected lakes for the Miramichi watershed monitoring have few to no camps or cottages along their shorelines. None of the three lakes MREAC monitored in 2023 have year-round residents along their shoreline. While relatively little impact is expected on these ‘wilderness’ lakes, only one is now exempt from the impacts of extensive forest harvesting nearby. The adjacent crown lands are under leasehold to the large forestry operations in the province. Kennedy Lake is now removed from such impacts, sheltered within the Kennedy Lakes Protected Natural Area. All the lakes continue to be impacted by the changing climate and the potential physical and biological impacts associated with climate change.

Monitoring occurs during the open water season by installing the temperature loggers after ice-out in the spring and extracting them in the fall before freeze-up. The watershed setting and monitoring results for 2023 are reflected in the maps and graphs that follow.

Temperature is the main parameter of interest in undertaking this project. Other parameters were taken in the field during site visits using hand-held monitoring equipment. Each of the lakes have been sampled over the past years for water chemistry analysis. The RPC laboratory in Fredericton was used for this work.

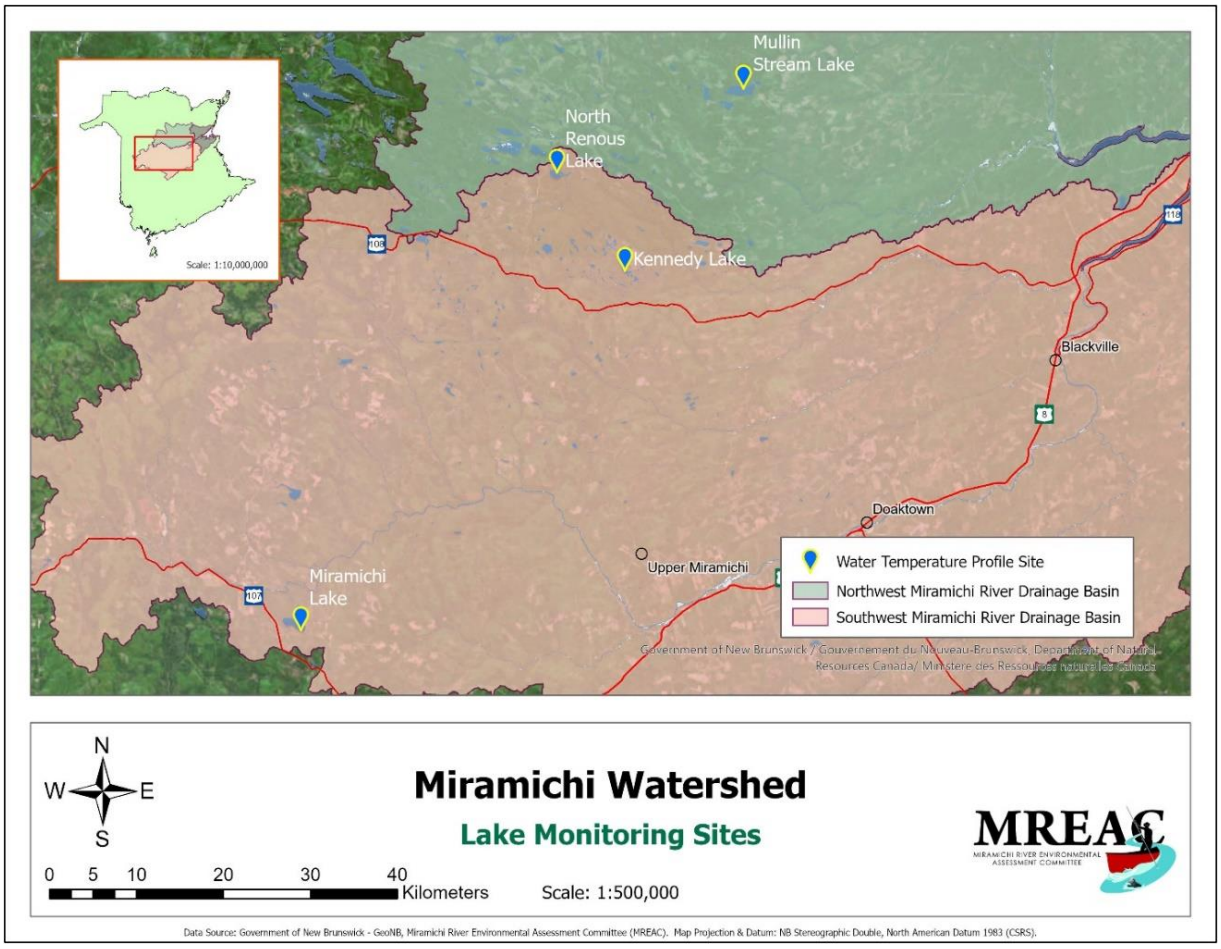

Figure 1: Water Temperature Profile Lake Monitoring Sites 2023 (Miramichi Lake excluded)

2.0 Discussion

MREAC staff and volunteers installed lines of Hobo (Tidbits or Pendant) temperature loggers – illustrated in Figure 2. Site selection of a deep location on each lake is made possible from

bathymetry maps produced by the province (Figure 3). The temperature loggers are evenly spaced along a single line, top to bottom, and anchored with a rock bag (4). Final adjustments are made to the line on site as needed with two buoys situated on the surface.

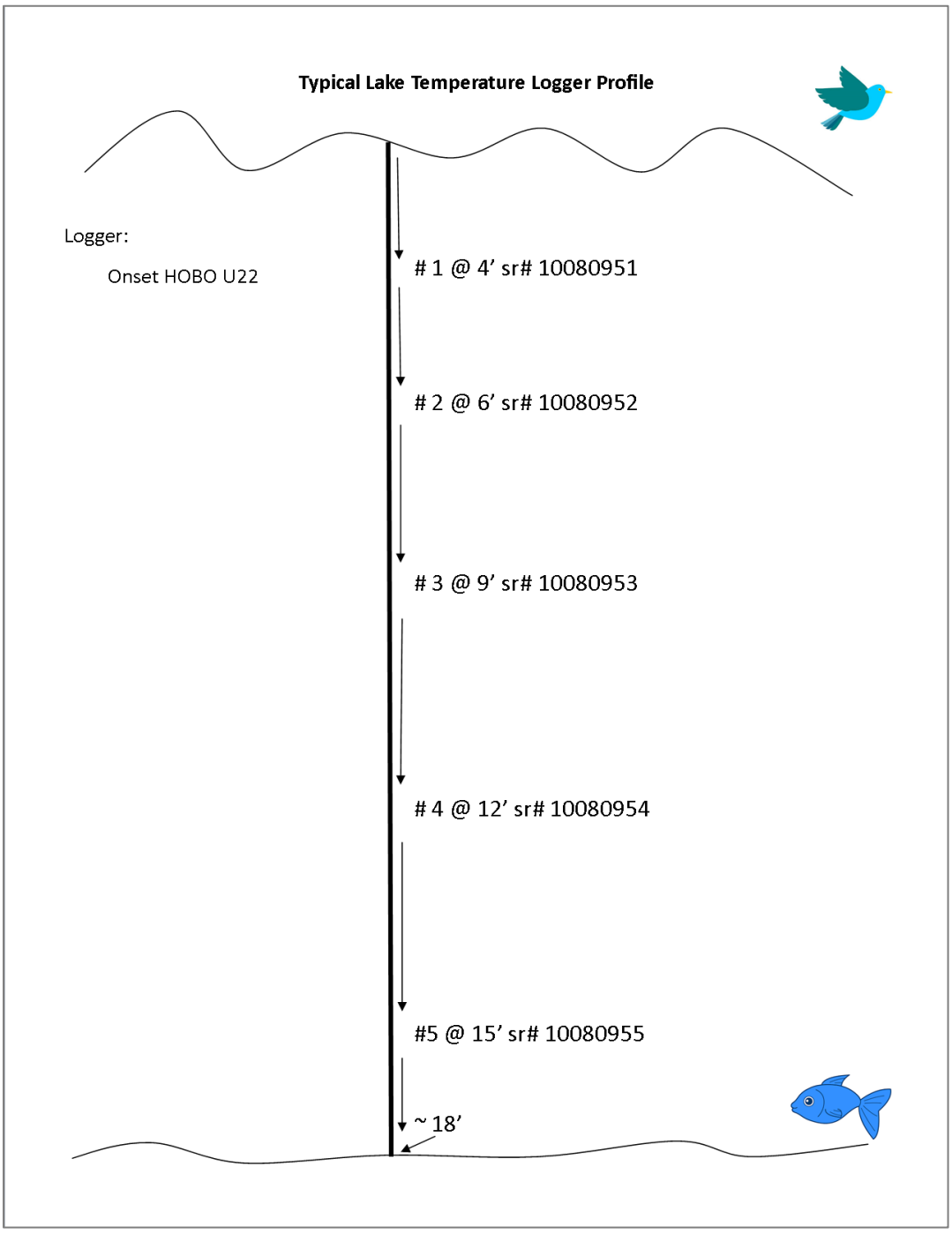

Figure 2: Typical Lake Water Temperature Data Logger Profile

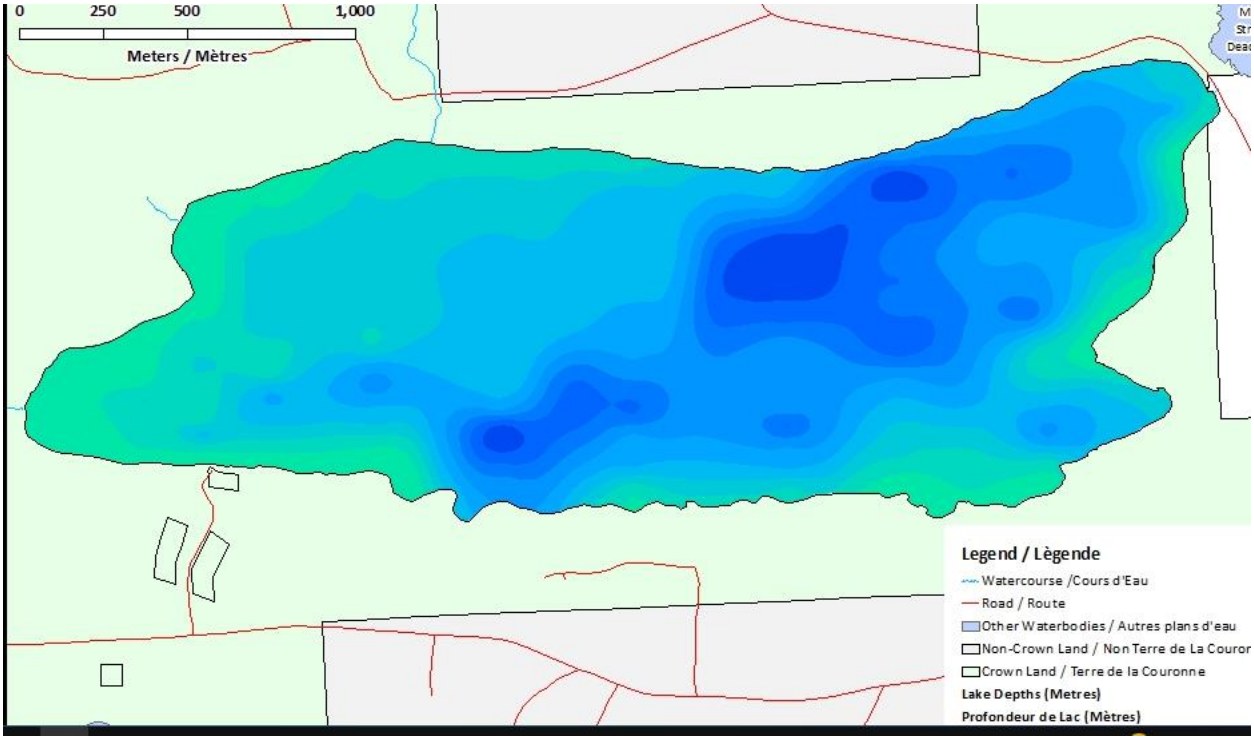

Figure 3 Bathymetry Map - Mullen stream Lake (GeoNB)

Figure 4: Water Temperature Data Loggers & Logger Line with Rock Bag

The top of each line was flagged with an identification tag as a MREAC “Science” project (Figure 5) and provides MREAC’s coordinates for those coming across the station and wanting to follow up. All three lines were successfully recovered in 2023. MREAC will resume monitoring of the Miramichi Lake in 2024 if the controversy has subsided. No rotenone treatment of the lake is currently planned for future years.

The lakes monitored on the Miramichi watershed are all relatively remote and, unlike many other lakes in New Brunswick, have very little shoreline development. The Main Kennedy Lake is host to two campsites and requires two portages and travel over two lakes to access the sample site (Figure 5). These lakes all reflect healthy water quality environments. North Renous Lake , and Mullin Stream Lake (Figure 7) have a small number of seasonal dwellings (camps or cottages).

Figure 5 On Access Route to Main Kennedy Lake

Figure 6: Deploying Water Temp. Profile Logger Line – Mullin Stream Lake May 12, 2023

Timber harvesting is the largest potential land-use impact with clear cutting normally completed on a rotational basis as outlined in a long-term forest harvesting management plan. Due to its location within the Kennedy Lakes Protected Natural Area, Main Kennedy Lake is exempted from the impacts from nearby forest harvesting. Some recreational activities occur on each of the lakes, mostly sport fishing, or hunting.

Physical characteristics, as a reflection of both geology and topography, show these Miramichi lakes as all relatively small ranging from 100.1 hectares (Main Kennedy Lake) to 315.1 hectares (Mullen Stream). They are also shallow with maximum depths ranging from 5.5 meters (Main Kennedy and North Renous) to 6.7 meters (Mullen Stream).

Results of the monitoring periods are depicted in the respective profiles from each lake in Figures 8 to 10. In 2023 the open water season was very wet with significant and frequent rainfall events distributed throughout the monitoring period. Despite this, each of the temperature graphs show temperatures at and near the lake surface that significantly exceeded

23°C, a temperature at which cold-water fishes (trout and salmon) are stressed. In 2023 Mullin Stream Lake had a very brief period in late July when the entire water column exceeded that threshold.

A review of the temperature profile indicates that significant stratification occurred on each lake until turbulent weather events in early August resulted in a "turn over". Toward the end of August stratification became evident but with a more limited range and significantly lower water temperatures. Strong stratification was evident on all three lakes in late spring and early summer. The North Renous Lake was most evenly stratified. Data from the Main Kennedy may have been comparable, but the bottom-most temperature logger failed. The North Renous Lake is the coolest of the lakes in profile, the Mullen Stream Lake the warmest. Specific data highlights from the three lakes are as follows:

- Main Kennedy Lake: The bottom logger (#5) failed early in the season giving unreliable data. The warmest surface water temperatures in 2023 reached 26.9°C on July 25, 2023,
- Mullin Stream Lake: All loggers performed reliably throughout the monitoring period. The highest temperature of 27.5°C occurred on July 9th, 2023.

- North Renous Lake: In 2023, the five loggers behaved as expected. The highest temperature of 27.7°C was recorded on July 9th.

Figure 7 Mullen Stream Lake From Shoreline

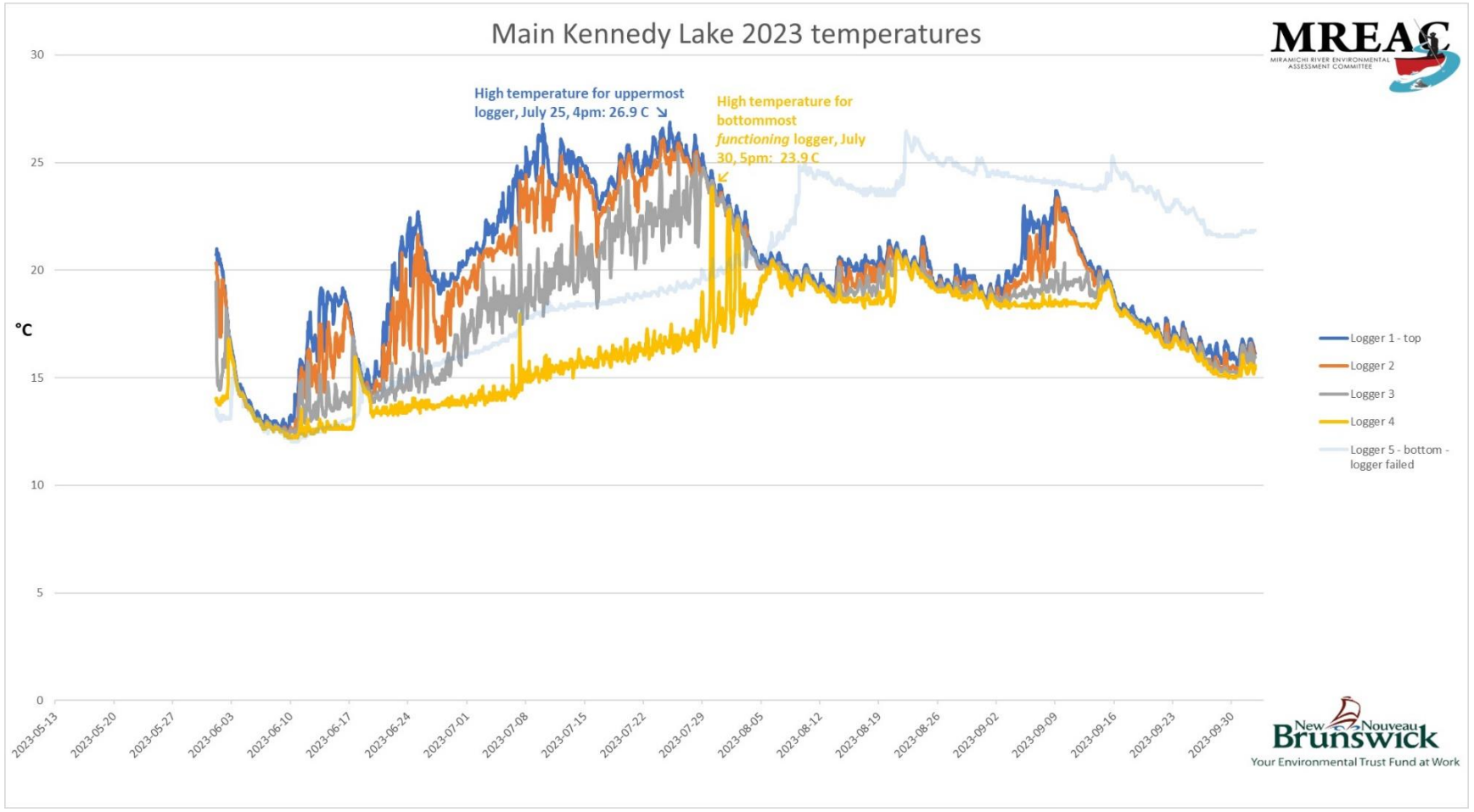

Figure 8: Main Kennedy Lake Water Temperature Profile 2023

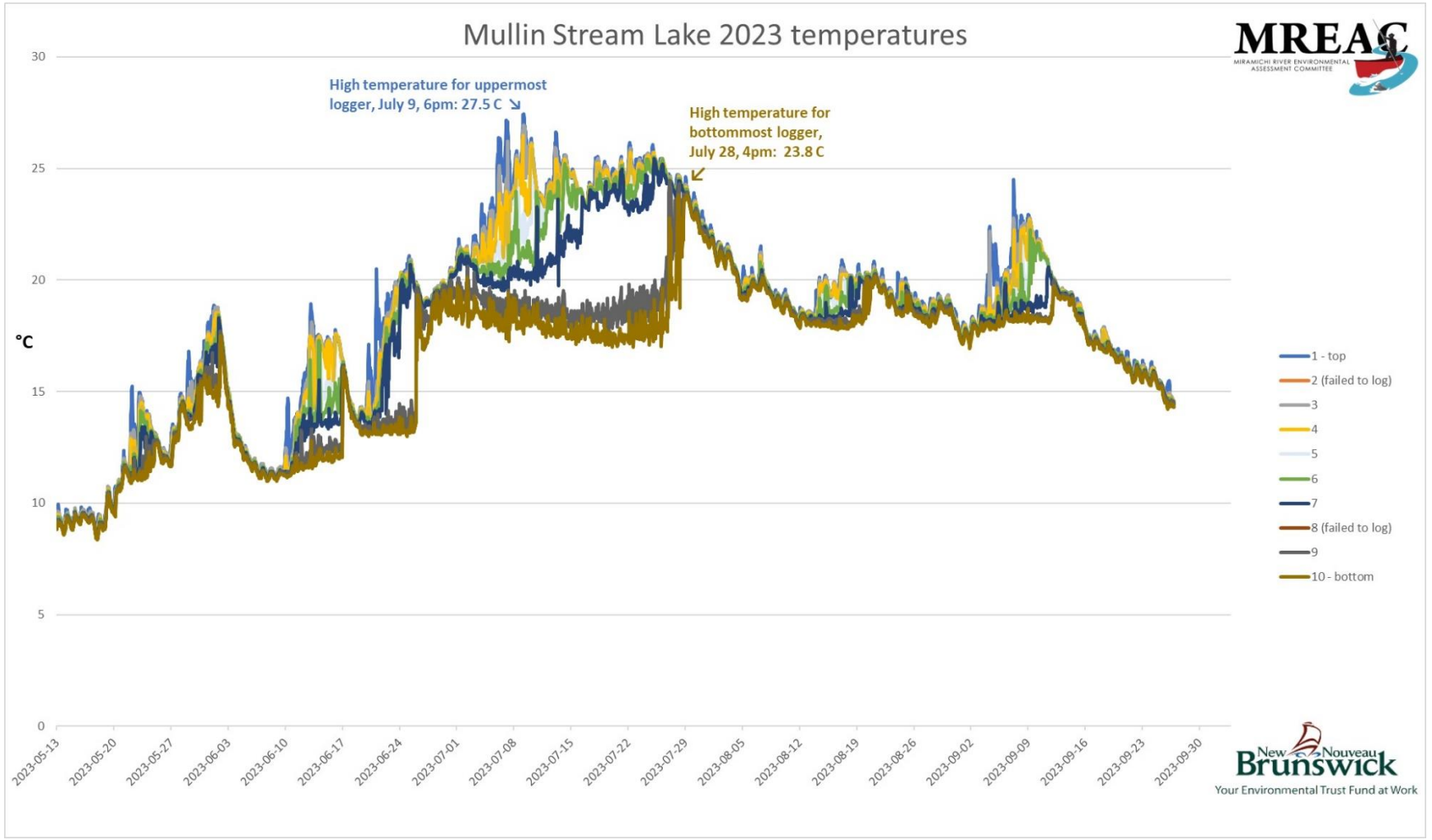

Figure 9: Mullin Stream Lake Water Temperature Profile 2023

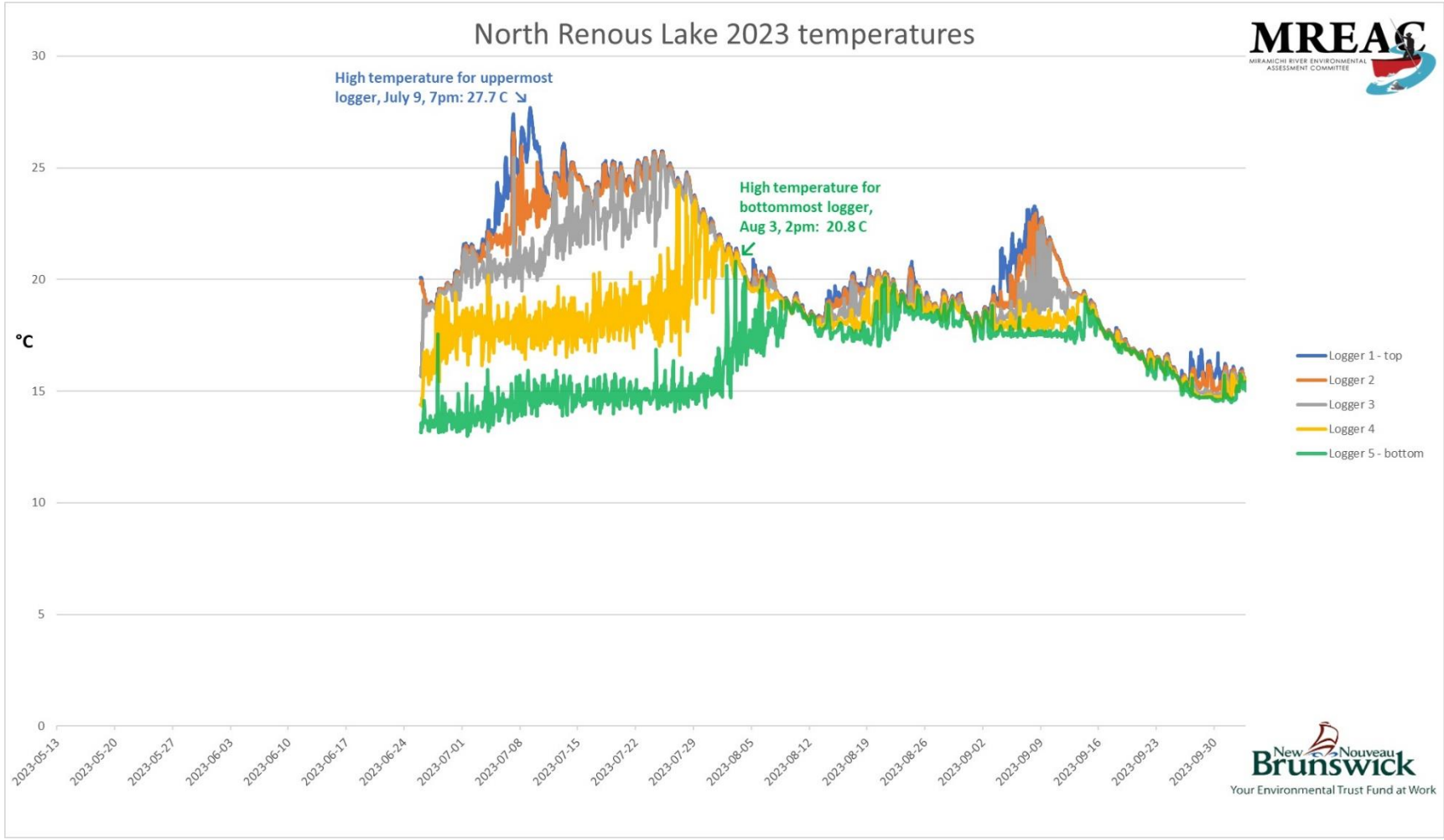

Figure 10: North Renous Lake Water Temperature Profile 2023

3.0 Conclusion

The remoteness and limited access of this series of lakes on the Miramichi watershed provide a significant measure of protection from anthropogenic impact. In 2023, MREAC staff and volunteers collected data from the Main Kennedy Lake for the 10th year. Mullin Stream Lake was sampled for an eight year. North Renous Lake was added in 2019, now with five years of data. Shorter term data sets from three other Miramichi watershed lakes (Guagas, Smith, and Tuadook) is available through the MREAC office.

Somewhat moderated temperatures and frequent heavy rain events in 2023 made a significant contrast to the hot and dry conditions of a typical summer. The habitat conditions for cold water fishes were thus marginally more tolerable in 2023. However, surface water temperatures were warm, and it is noted that the warmest temperature of 27.7°C was recorded on the North Renous Lake in early July. There was little range among the highest temperatures on the three lakes.

MREAC hopes to continue lake monitoring into future years with value accruing as the ecological status of the lakes becomes clearer and potential trends, (e.g., climate change and other ecological stresses) are noted. We leave further analysis of this data to NB ELG hydrologists. The entire data suite from all three lakes is available upon request. MREAC likewise has retained the data from lake monitoring for the entirety of the project.

Appendix Lake Monitoring 2023 - Water Quality

Date	Location	Temperature °C	Disloved Oxygen (mg/l)	pH	Salinity (ppt)
12-May-23	Mullen Stream Lake	14.9	14.15	6.07	0.01
31-May-23	Main Kennedy Lake	18.8	14.14	6.51	0.01
03-Oct-23	Main Kennedy Lake	15.4	9.39		
26-Jun-23	North Renous Lake.	19.7		7.43	
04-Oct-23	North Renous Lake.	15.6	8.55		