Freshwater Mussel Survey for the Miramichi River Watershed

MREAC, 2008

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MREAC
MIRAMICHI RIVER ENVIRONMENTAL ASSESSMENT COMMITTEE

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1.0. Introduction

The Miramichi River Environmental Assessment Committee (MREAC) undertook a freshwater mussel surveys at a range of locations within the Miramichi River watershed during the summer months of 2008. Freshwater mussels are evident in the Miramichi River and tributaries, but little is known about the variety of species, distribution and population size. The Miramichi River is world renowned for its Atlantic salmon, which is a host to the parasitic larval stage of some freshwater mussel species. Water quality is generally very good throughout the Miramichi River watershed as much of the land is uninhabited or crown land. However, some forestry, mining, agriculture and other industrial activities are carried out within the watershed and may locally impact water quality of a number of tributaries. As freshwater mussels can be good water quality indicators, further understanding of the abundance and distribution of species throughout the watershed is important to assessing and monitoring water quality conditions within the Miramichi River and its many tributaries.

Prior to this project, only limited freshwater mussel surveys had been conducted in the Miramichi River watershed, including surveys at a total of 19 sites by freshwater mussel specialist, Kate Bredin, in 2002 and 2006. A sizeable population of a rare freshwater mussel species, the Brook Floater (*Alasmidonta varicosa*), was discovered in the Southwest Miramichi River in 2006. The Brook Floater is currently being assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and has a National General Status Rank of "may be at risk" in New Brunswick. The existence of this rare species in a tributary of the Miramichi River makes freshwater mussel surveys of the watershed doubly important, to more fully delineate this species' population and range.

The main objective of this project was to conduct freshwater mussel surveys in the Miramichi River watershed, focusing on the Northwest Miramichi and other areas not yet surveyed. The second objective of the project was to search for additional records for Brook Floaters to assist with the Status Report for this species for the COSEWIC.

2.0. Methodology

The field method used was similar to that described in the report "*Inventaire des moules d'eau donce dans les rivieres Kouchibouquac, Kouchibouguacsis et Black du Parc national Kouchibouguac, Nouveau-Brunswick*" published in December 2002 by Parks Canada (Beaudet, et al., 2002). Field work began in June 2008 after staff training from Kate Bredin and ended in September 2008 when water temperatures had cooled and mussels were less likely to be visible at the surface. Surveyors consisted of MREAC staff: Kara Baisley, MREAC Biologist; Harry Collins, MREAC Executive Director; and MREAC summer students, Melissa Price and Sandra Ross. Volunteers Nelson Cloud and Nelson Poirier also assisted with surveying on occasion.

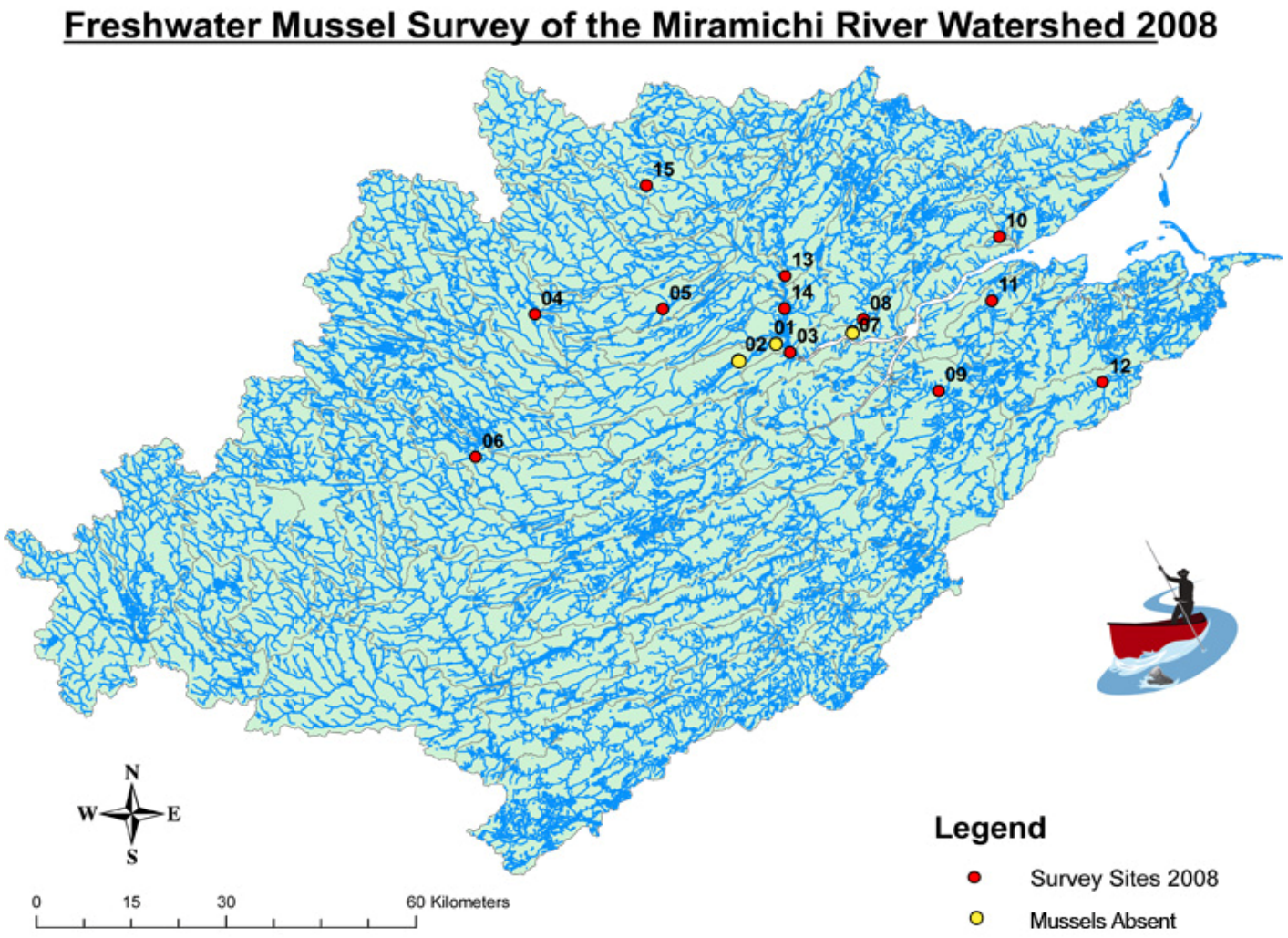
Sites were chosen based on 1) their location - either on the Northwest Miramichi, the main focus of our study, or on other un-surveyed large tributaries; 2) accessibility; and, 3) public reports of mussel sightings. Site locations and coordinates can be found in Table 1; Figure 1 maps the survey sites within the Miramichi River watershed. Teams of 2-4 people searched at each site for a cumulative total of four person-hours. Each surveyor used a Plexiglas-bottom viewing bucket and searched different sections of the survey site, concentrating on the river edges so that shorelines could also be inspected for empty shells. Waters deeper than 1.2 meters were not surveyed, preventing coverage of the entire river width for larger, deeper rivers. Two metre long poles with a mesh catch basket at the end were used to pick up mussels from the river bed in deep water.

Surveyors removed visible mussels from the water for identification and then placed them back. A laminated identification key was created to assist surveyors with on-site identification. Dead mussels present on shore were also counted and some shells were collected as samples. Sightings of the empty mussel shells helped identify key areas of the river where live mussels were likely to be discovered. A tally of dead and live mussels was kept by the surveyor for all species found. When the survey period ended, the numbers of mussels of each species found were totalled. Water temperate and pH were also recorded, along with habitat observations and site photos.

Table 1. Survey sites locations, including name, site number and coordinates.

Location	Site	Longitude	Latitude
LSW Mir. Metepenagiag Center	01	46.95683	-65.85315
LSW Miramichi @ Cave In	02	46.93292	-65.93172
NW Miramichi @ Red Bank	03	46.94413	-65.82415
Guagus Lake	04	47.00167	-66.35345
Mullin Stream	05	47.00897	-66.08732
S. Branch Renous River	06	46.79170	-66.47713
NW Millstream (mouth)	07	46.97390	-65.69398
NW Millstream (upriver)	08	46.99158	-65.67132
Barnaby River	09	46.88513	-65.51608
Bartibog River	10	47.11085	-65.38565
Napan River	11	47.01703	-65.40345
Bay Du Vin River	12	46.89440	-65.17563
NW Miramichi @ Sevogle	13	47.05637	-65.83212
NW Miramichi @ Exmoor	14	47.00875	-65.83418
NW Mir. @ Fish&Game camp	15	47.19087	-66.12125

Figure 1. Map of Miramichi River watershed showing MREAC freshwater mussel survey site locations for 2008



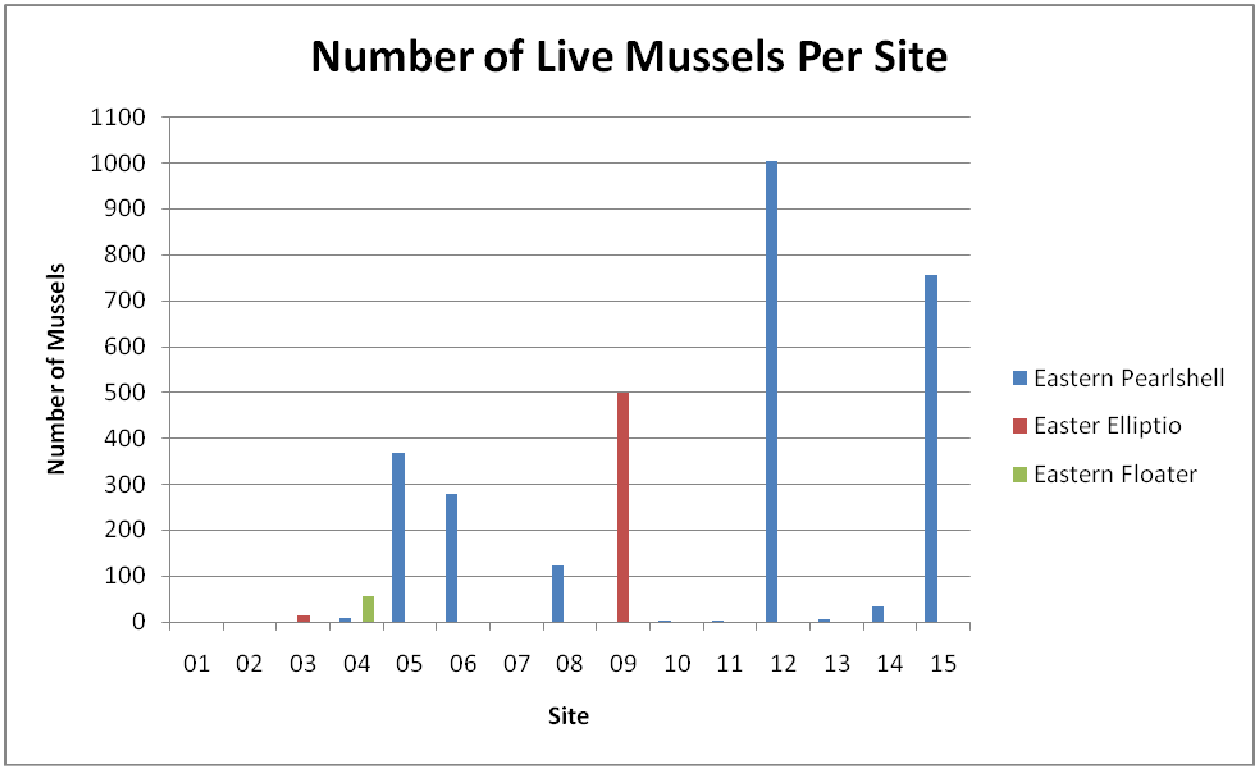
3.0. Results and Observations

MREAC conducted freshwater mussel surveys at 15 sites within the Miramichi River watershed. At three of the 15 sites surveyed no mussels were found, sites 01, 02 and 07. Three different mussel species were identified from twelve sites, with a total count of 3162 mussels recorded. Table 2 shows the total number of live mussels recorded at each site and Figure 2 demonstrates the results in a bar graph.

Table 2. Number of live mussels recorded at survey sites

Location	Site	Eastern Pearlshell	Eastern Elliptio	Eastern Floater
LSW Mir. Metepenagiag Center	01	0	0	0
LSW Miramichi @ Cave In	02	0	0	0
NW Miramichi @ Red Bank	03	0	16	0
Guagus Lake	04	7	0	57
Mullin Stream	05	368	0	0
S. Branch Renous River	06	280	0	0
Northwest Millstream (mouth)	07	0	0	0
Northwest Millstream (upriver)	08	124	0	0
Barnaby River	09	0	500	0
Bartibog River (Fins&Feathers)	10	4	0	0
Napan River (Johnson's Bridge)	11	4	0	1
Bay Du Vin River (Rte.11 Bridge)	12	1005	0	0
NW Mir. River @ Sevogle	13	5	1	0
NW Mir. River @ Exmoor	14	33	1	0
NW Mir. River @ Fish&Game camp	15	756	0	0
Total		2586	518	58

Figure 2. Bar chart demonstrating the number of live mussels of three species found at each site



At eight of the 12 sites where mussels were present, only one mussel species was present; and four of the sites two mussel species were present. The most abundant mussel in the Miramichi watershed was the Eastern Pearlshell (*Margaritifera margaritifera*) with 2586 live individuals recorded from 10 sites, equalling 82% of the live mussels recorded during this project. The 10 sites where this mussel was found were: sites 04, 05, 06, 08, 10-15. The largest count was at site 12 on the Bay Du Vin River, where 1005 live *M. margaritifera* were recorded.

The second most abundant mussel species found was the Eastern Elliptio (*Elliptio complanata*) with 518 live *E. elliptio* found at 4 different sites, totalling 16% of the live mussels recorded. Survey sites with *E. elliptio* included sites 03, 09, 13 and 14 with the highest number (500) recorded at site 09, Barnaby River.

The third mussel species found during this project was the Easter Floater (*Pyganodon cataracta*), which was found at two sites. The Eastern Floater is a slow water species and was found at Guagus Lake and on a slow section of the Napan River. This species represented 2% of the total live mussels recorded with a total of 58 mussels discovered. The percentages of live mussels for each species discovered are represented in Figure 3. Figure 4 shows survey locations for the three major freshwater mussel sampling efforts in the Miramichi River watershed within the last ten years, including 15 sites sampled during this study, and surveys by Bredin in 2002 (Bredin

2002) and 2006-07 (COSEWIC in press), for a total of 34 freshwater survey sites in the watershed. Water quality information and river habitat observations are presented in Appendix A.

Figure 3. Species percentages of total live mussels recorded during summer of 2008

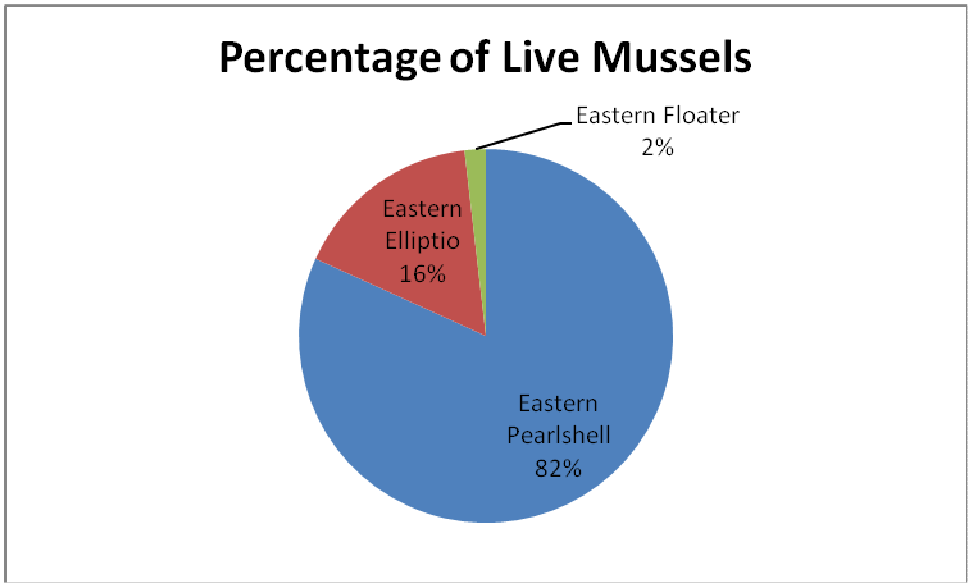
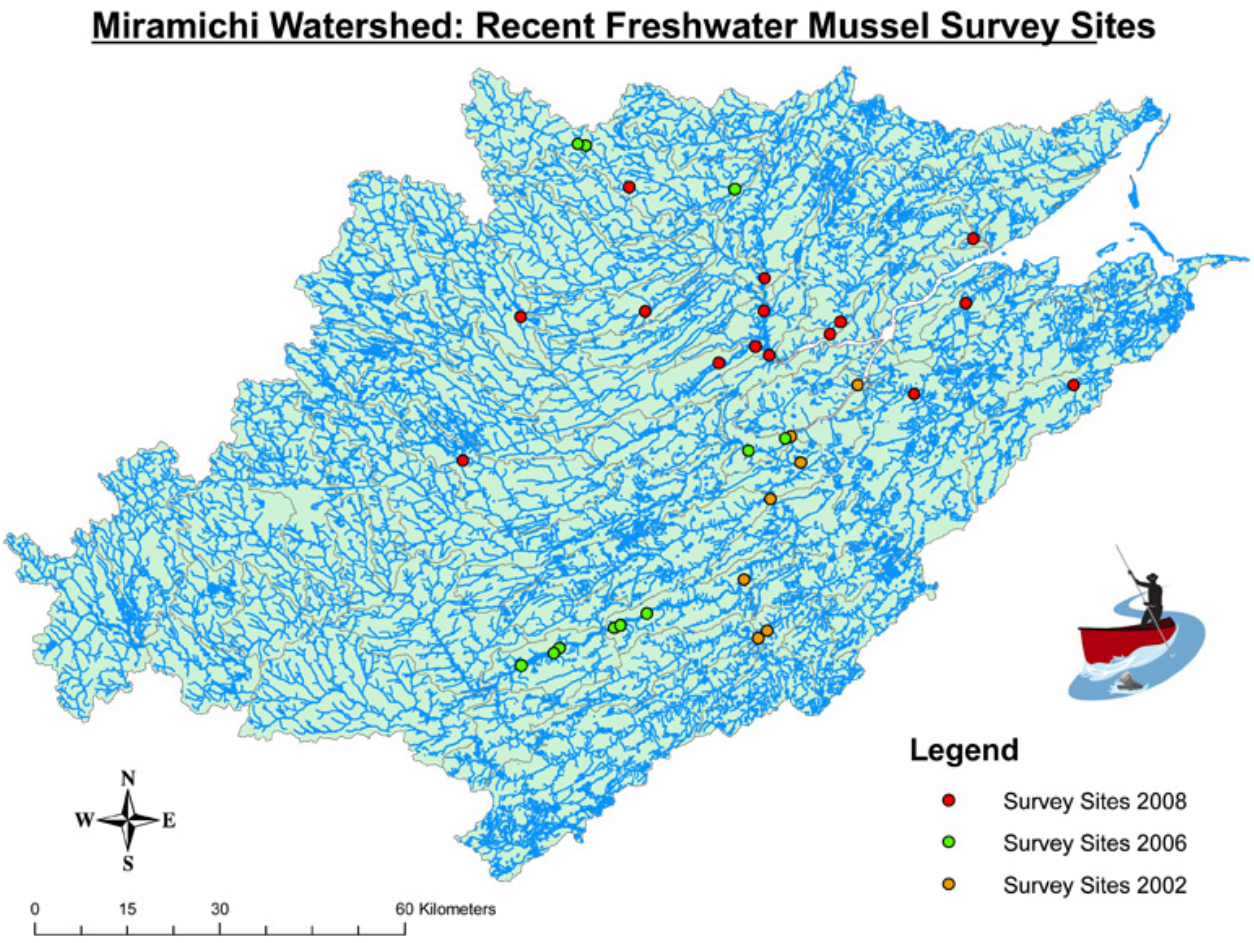


Figure 4. Map of the Miramichi River watershed showing site locations of major freshwater mussel surveys completed within the last ten years: by MREAC in 2008 and Bredin in 2002 and 2006-07 (Bredin 2002, COSEWIC *in press*)



4.0. Discussion

Out of the 15 sites sampled during this 2008 project, only 12 resulted with the discovery of freshwater mussels. Eastern Pearlshell, Eastern Elliptio and Eastern Floater were the mussels discovered during this project, with a total of 3162 live mussels recorded. From the 12 sites where mussels were discovered only two of the sites did not have Eastern Pearlshell, but instead these sites were popular Eastern Elliptio sites.

The rare species, Brook Floater, was not encountered during this project. This suggests a scarcity of this species and continued surveys in the Miramichi River watershed would be important to accurately understand this species population size and species status.

4.1. Eastern Pearlshell (Margaritifera margaritifera)

Eastern Pearlshell are commonly found in cool streams and rivers that support salmonids (trout, salmon) which are used as hosts to carry their glochidia (larva). These mussels prefer sand, gravel and cobble substrate, with a range of flow conditions. They also have an amazing ability to withstand fast flowing, rocky conditions due to their thick, durable shell which is unlike most mussel species. They are also commonly found in soft-water (acidic) with low levels of calcium (Nedeau, 2000).

The Eastern Pearlshell was the most common freshwater mussel found during this project, found at the most number of sites (10) and having the highest live number of mussels recorded (2586). Site conditions varied with sand, cobble and rock, to slow, moderate and fast water flow, all favourable habitat conditions for this species.

Three of the four Northwest Miramichi River sites contained this species and it was the most abundant species found at each of the sites. However, the Little Southwest Miramichi River as a tributary of the Northwest Miramichi with two sites surveyed (01 and 02) did not produce any mussels. The Little Southwest has been impacted in the past with clay sediment, and a river alteration project that was completed in 2000 to remediate this problem.

4.2. Eastern Elliptio (*Elliptio complanata*)

The Eastern Elliptio has a wide array of habitats, ranging from small streams to large rivers to lakes, and substrates of clay, sand, mud and cobble. These mussels do not favour semi-liquid silt

or rocky substrates or water that is too deep. They also have a high tolerance for disturbed or polluted sites, "suggesting that it has a wide environmental tolerance and a capacity to quickly colonize new habitats" (Nedeau, 2000).

This freshwater mussel species was the second most common species during this project and was found at four sites with a total of 518 live mussels recorded. These mussels are similar in appearance to the Eastern Pearlshell and can be difficult to identify. However, they have a thinner shell and are less elongated, and not commonly found in fast flowing, rocky rivers like the Eastern Pearlshell (Nedeau, 200).

Site 09 on the Barnaby River had the highest count of Eastern Elliptio with a total of 500 mussels. The water flow at this site was slow and the substrate was sandy on the bank of the river bend where over 300 live mussels were recorded within only a few meters. The rest were found along a riffle area. The other three sites where Eastern Elliptio was found were the Northwest Miramichi River sites; all consisting of slow to moderate water flow and sandy or cobble substrates.

4.3. Eastern Floater (*Pyganodon cataracta*)

The Eastern Floater is commonly found in small streams, rivers, ponds and lakes that have sandy or muddy substrates and slow moving riverine environment. They have a thin, fragile shell that allows the mussel to be light and "float" above soft substrates, such as the deep silt substrates found in some ponds and rivers. Thus consequently, these mussels cannot survive in a rocky or fast flowing area (Nedeau, 2000).

This mussel species was discovered at two of the survey sites, one site being Guagas Lake and the other Napan River along a steady stretch of the river that resembled lake conditions. Guagus Lake had the highest number of Eastern Floaters with 57, and one was found in the Napan River.

5.0. Conclusion

MREAC completed a freshwater mussel survey during the summer of 2008, surveying 15 sites resulting with a total of 3162 mussels recorded of three different species. The rare species Brook Floater was not discovered during this project. From the 15 sites, 12 resulted with at least one mussel species and four resulted with two species present.

The cumulative number of survey sites completed for freshwater mussel surveys on the Miramichi River, including MREAC's and Ms. Bredin's work, now total 34 sites. With the Miramichi River watershed being over 13,400km^2, continued surveys are required in order to have a more complete and accurate representation of the freshwater mussel population and distribution. In particular a more comprehensive search is required for the rare species, Brook Floater.

6.0. References

Beaudet, Tremblay and Martel. 2002. *Inventaire des moules d'eau donce dans les rivieres Kouchibouquac, Kouchibouguacsis et Black du Parc national Kouchibouguac, Nouveau-Brunswick*. Kouchibouquac, NB: Parks Canada

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Caisse, Caroline. 2005. *Freshwater Mussel Inventories of the Chockpish, Bouctouche, Little Bouctouche and Cocagne Watersheds, New Brunswick in 2003 and 2004*. Kent Watershed Coalition.

COSEWIC *in press* Interim Status Report on the Brook Floater, *Alasmidonta varicosa*.

Nedeau, McCollough, Swartz. 2000. *The Freshwater Mussels of Maine.* Augusta, Maine: Maine Department of Inland Fisheries and Wildlife.

Appendix A

Date	Location	Site	Dist. (m)	Substrate	Water Flow	pH	°C	Notes
19-Jun-08	LSW Mir. Metepenagiag Center	01	120	rocky, cobble	medium			
19-Jun-08	LSW Miramichi @ Cave In	02	80	rocky, cobble	medium			
19-Jun-08	NW Miramichi @ Red Bank	03	20	sandstone, sand	slow			Some vegetation, eel grass, mussels found in clusters
20-Jun-08	Guagus Lake	04	250	silt, sand, stream w/ rock, sand pockets	very slow, fast		16.9	vegetation, soft bottom, stream was fast with pools on the side, slower water where mussels found, some next to rocks
20-Jun-08	Mullin Stream	05	130	boulders, cobble, sand pockets	fast		16.8	
16-Jul-08	S. Branch Renous River	06	320	boulders, cobble, sand & pebbles	fast		23.3	mussels very spread out, with 1 family ~ 80
18-Jul-08	Northwest Millstream (mouth)	07	30	Shall	very slow	7.66	19.7	deep, dark, shall bottom, found nothing, not suitable site for mussels
18-Jul-08	Northwest Millstream (upriver)	08	300	cobble, rock, sandy pockets	medium-swift	7.68	21.8	some shallow areas, some deeper areas, some sandy spots on the banks. Mussels were sporadic with 1 large cluster
18-Jul-08	Barnaby River	09	180	sandy, cobble with some shall	Very slow, riffle	7.40	24.7	sporadic in riffle area along sandy banks, a lot ~300 in slow area on sandy bank
22-Jul-08	Bartibog River (Fins & Feathers)	10	270	rocky (shall), some sand, some silt	slow, riffles	7.62	22.2	deep in middle, lots of shells, may find more alive further upstream
30-Jul-08	Napan River (Johnson's Bridge)	11	500	rock, coarse sand, mud, organic matter	mod. w/ slow	7.63	20.1	deep in middle & dark, hard to see, easy stir up. Floater found in almost still, muddy/sandy area. Margi found in riffle
30-Jul-08	Bay Du Vin River (Rte.11 Bridge)	12	280	rock, cobble, sandy	slow, riffles	7.80	27.2	cluster and spread out, found in shallower, riffle areas. A lot of fish, various species, green algae growing on mussels
27-Aug-08	NW Mir. River @ Sevogle	13	400	slabs, rock, some coarse sand	med. - fast	7.64	16.7	Old ASF camp, once had a fish gate across the river, few places for mussel to burrow
05-Sep-08	NW Mir. River @ Exmoor	14	220	rock, coarse sand	slow, calm	7.90	21.6	many mittons on banks, live mussels found sporadic, nice clear day easy to see, could not cross river due to drop off near other side
10-Sep-08	NW Mir. River @ Fish & Game camp	15	200	rock, coarse sand, some boulders	swift, fast	7.80	14.2	Varity of sizes, found large mitton of 150 shells. Site was Miramichi Fish and Game Club camp