Freshwater Mussel Survey for the Miramichi River Watershed

MREAC, 2010 & Overview of Past Three Years

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Acknowledgements

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1.0. Introduction

The Miramichi River Environmental Assessment Committee (MREAC) has completed a third year of freshwater mussel surveys in the Miramichi River watershed during the summer months of 2010. Prior to 2008 when MREAC began this project, only limited freshwater mussel surveys had been conducted in the Miramichi River watershed, a total of 19 sites by freshwater mussel specialist, Kate Bredin, in 2002 and 2006. A significant population of a rare freshwater mussel, the Brook Floater (*Alasmidonta varicosa*), was discovered in the Southwest Miramichi River in 2006. The Brook Floater has recently been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and has a National General Status Rank of "special concern" in New Brunswick. The existence of this rare species in a tributary of the Miramichi River made freshwater mussel surveys in the watershed even more important to more fully delineate this species' population and range.

Brook Floater found in Taxis River

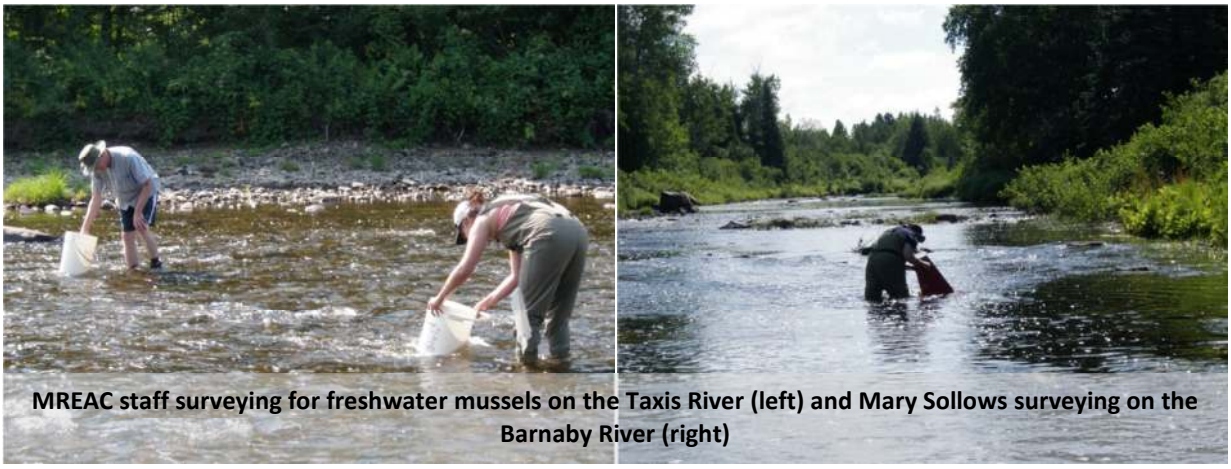
After completing 15 sites in 2008 and finding three different species of freshwater mussels, MREAC staff began to realize the rarity of the Brook Floater species as no specimens were discovered. MREAC then set out to complete another 15 sites in 2009 in order to encompass more of the watershed to have a better understanding of freshwater mussel populations and distribution. After finding three freshwater mussel species, including specimens of the rare mussel Brook Floater on the Barnaby and Taxis Rivers, MREAC decided to partake in another year of surveying. In 2010, an additional 15 sites were completed which focused on these two tributaries, gathering important information about this species' population on the Miramichi River.

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 on a number of tributaries. As freshwater mussels can be good water quality indicators, further understanding of their abundance and distribution throughout the watershed is important in assessing and monitoring water quality conditions within the Miramichi River and its many tributaries.

The first objective of this study was to expand the baseline knowledge of freshwater mussel species on the Miramichi watershed as indicators of both environmental quality and biodiversity. The secondary objective of this project in 2010 was to continue conducting freshwater mussel surveys in the Miramichi River watershed, to understand the Brook Floater population on two significant tributaries of the Southwest Miramichi River. Data collected will be shared with COSEWIC to assist with future Status Reports for this species. The data will also be contributed to another project MREAC is undertaking, namely Water Classification.

2.0. Methodology

The field method used was the same method used in the previous two years, which is 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 July 2010 once the river water temperature warmed enough to ensure that mussels were no longer burrowed in the riverbed, and ended in September 2010 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 student Danielle Currie. Also assisting with this project was freshwater mussel specialist Mary Sollows of the New Brunswick Museum and Philippe Rousselle, summer student with the Southern Gulf of the St. Lawrence River Coalition.



MREAC staff surveying for freshwater mussels on the Taxis River (left) and Mary Sollows surveying on the Barnaby River (right)

Sites were chosen based on 1) their location - either on the Barnaby or Taxis Rivers as these were the main focus of our study for this year; 2) accessibility; and, 3) sites that were not previously surveyed. Site locations and coordinates can be found in Table 1; and Figure 1 maps the survey sites within the Miramichi River watershed. Teams of 2-5 people searched at each site for a cumulative total of four person-hours. Each surveyor used a Glass-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.

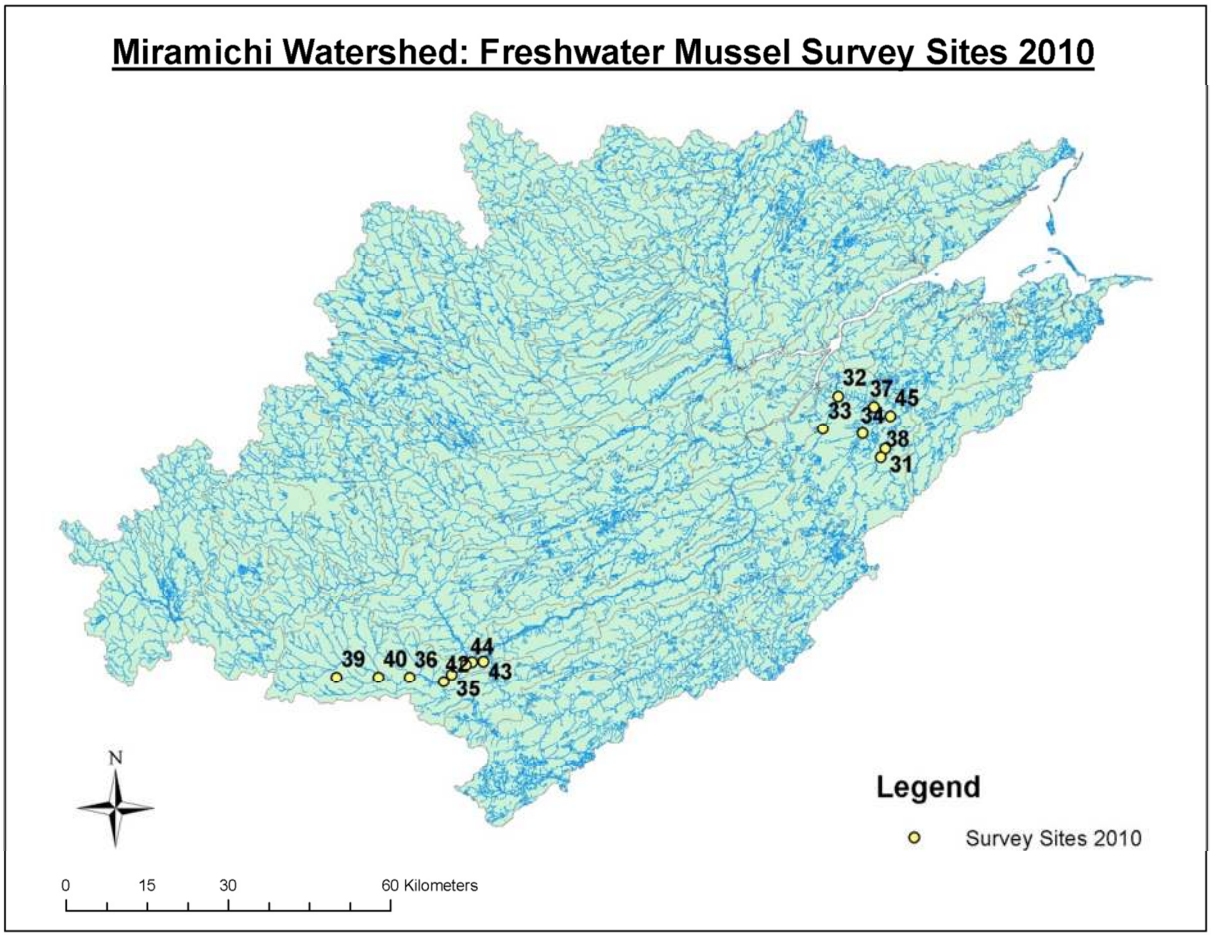
Surveyors normally removed visible mussels from the riverbed for identification and then placed them back. A few mussels were kept from each site as a sample collection. A laminated identification key was created to assist surveyors with on-site identification. Dead mussels present on shore were also 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 number of mussels for each species found was totalled. Water temperate, dissolved oxygen and pH were also recorded, along with habitat observations and site photos.

Table 1 - Survey site locations, including name, tributary, site number and coordinates

Location	Tributary	Site #	Latitude	Longitude
Hwy 126 near Collette	Barnaby	31	46°48.103	65°27.184
Semiwagon Road bridge	Barnaby	32	46°53.355	65°33.941
Semiwagon Stream	Barnaby	33	46°50.147	65°36.156
Right-hand branch of Barnaby River	Barnaby	34	46°49.661	65°30.452
McAllister Rd off of Taxis River Road	Taxis	35	46°25.830	66°30.172
Bridge on Hwy 625	Taxis	36	46°25.541	66°36.236
Truck stop on Hwy 126	Barnaby	37	46°52.289	65°28.751
At Collette on Lakelands Road	Barnaby	38	46°47.212	65°27.812
Near Maple Grove Station	Taxis	39	46°25.538	66°46.738
Near Mavis Mills	Taxis	40	46°25.558	66°40.682
Kiwi Way on Taxis River Rd	Taxis	41	46°27.057	66°27.174
Left fork @ end of Taxis River Rd	Taxis	42	46°25.095	66°31.290
Fess Fairley Lane (Taxis River Outfitters)	Taxis	43	46°27.117	66°25.532
Lane off of Taxis River Road	Taxis	44	46°26.818	66°28.106
Behind House on Hwy 126	Barnaby	45	46°51.343	65°26.372

Figure 1 - Map of the Miramichi River watershed showing MREAC freshwater mussel survey site locations for 2010



3.0. Results and Observations

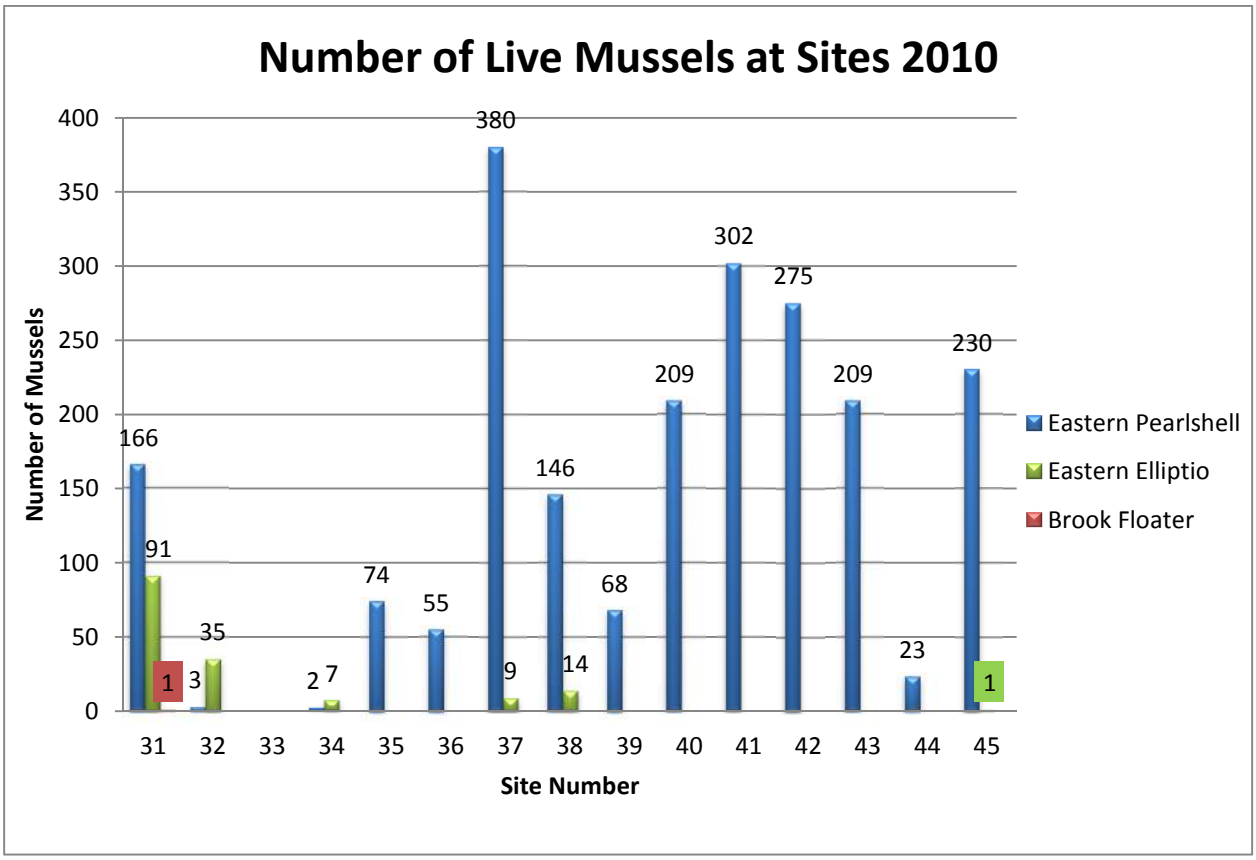
During this third year of sampling, MREAC completed an additional 15 sites of freshwater mussel surveys and discovered three different species during the summer. The total number recorded was 2,299 freshwater mussels. Table 2 shows the total number of live mussels recorded at each site and Figure 2 demonstrates these results in a bar graph.

The most abundant mussel found in 2010 was the Eastern Pearlshell (*Margaritifera margaritifera*) and, present at every site but one, recorded a total number of 2,142 live mussels. The largest count was at site 37 on the Barnaby River with a total of 380 mussels. Eastern Elliptio (*Elliptio complanata*) was the second most numerous mussel species found this year, and in much smaller numbers than the Eastern Pearlshell. The Eastern Elliptio was found at five sites with a total of 157 mussels recorded. The last discovered mussel was the Brook Floater (*Alasmidonta varicosa*), where a single mussel was found at one new site in 2010, which was on the Barnaby River. However, two empty shells were discovered on the shoreline at one of the sites on the Taxis River. Water quality information and river habitat observations are presented in Appendix A.

Table 2 - Number of live mussels recorded at survey sites

Location	Site #	Eastern Pearlshell	Eastern Elliptio	Brook Floater
Hwy 126 near Collete	31	166	91	1
Semiwagon Road bridge	32	3	35	0
Semiwagon Stream	33	0	0	0
Righthand branch of Barnaby River	34	2	7	0
McAllister Rd off of Taxis River Road	35	74	0	0
Bridge on Hwy 625	36	55	0	0
Truck stop on Hwy 126	37	380	9	0
At Collette on Lakelands Road	38	146	14	0
Near Maple Grove Station	39	68	0	0
Near Mavis Mills	40	209	0	0
Kiwi Way on Taxis River Road	41	302	0	0
Left fork @ end of Taxis River Road	42	275	0	0
Fess Fairley Lane (Taxis River	43	209	0	0
Lane off of Taxis River Road	44	23	0	0
Behind House #12573 on Hwy 126	45	230	1	0
Total		**2142**	**157**	**1**

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



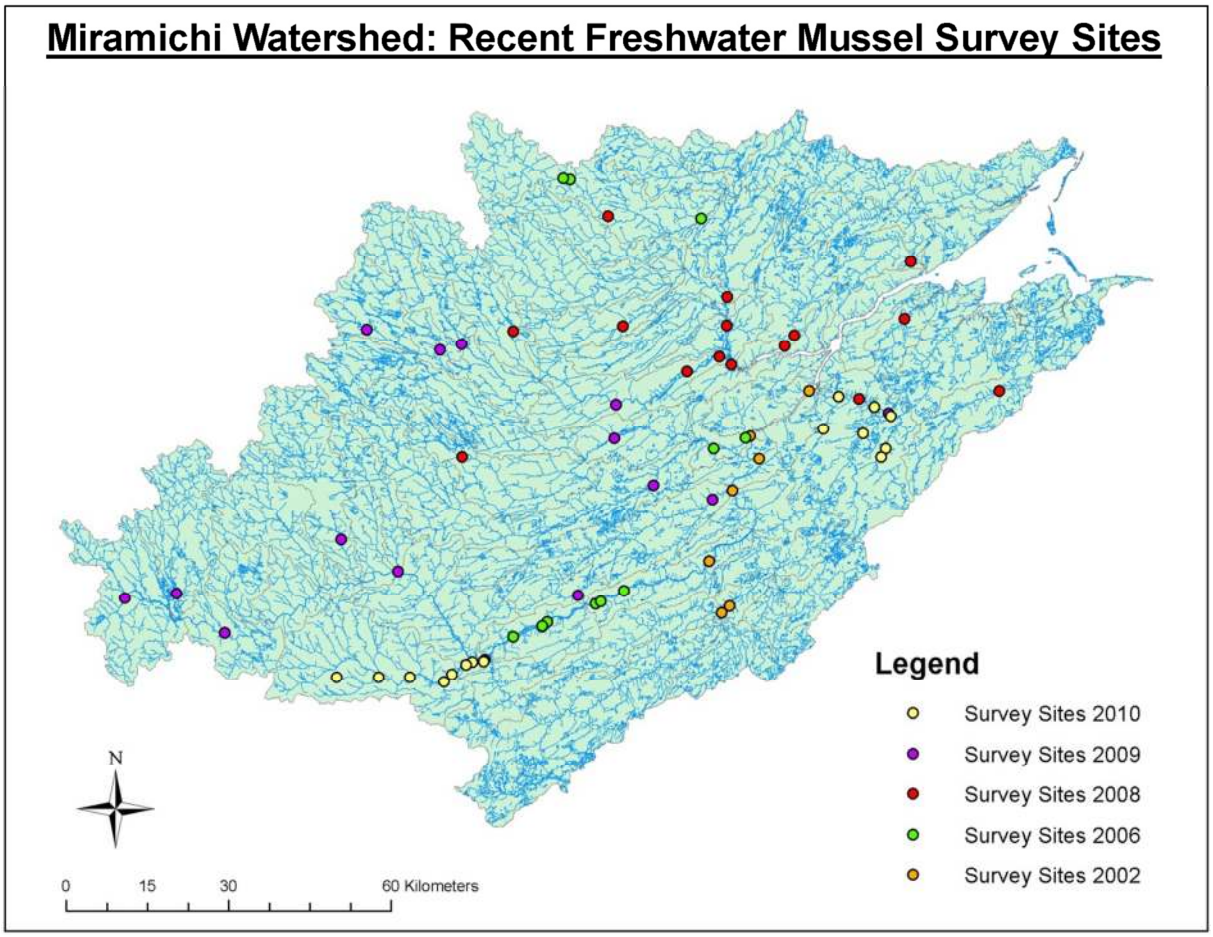
The Barnaby River was sampled twice during MREAC's previous years of survey efforts, finding only one Brook Floater at one site in 2009. Also during one of MREAC's other sampling projects, in 2008 a Brook Floater shell was discovered at the other Barnaby River site. Due to these rare findings of Brook Floater, it was decided that the Barnaby River would undergo a more intense survey regime in 2010 to help understand the extent of this species in this vital tributary. After the investigation this year, one specimen was found at one of the seven sites surveyed on the Barnaby River, bringing the total of two Brook Floaters found in this river system from two of the nine sites surveyed.

Another Brook Floater population was discovered in 2009 on the Taxis River where three were found. This year, eight sites were surveyed on the Taxis River resulting in no new findings of Brook Floaters. However, two empty shells were found at site 42 along the shoreline in a small midden. This brings the total result after nine sites surveyed on this tributary; one site resulted in the discovery of three live Brook Floater mussels.

Figure 3 illustrates the survey site locations for the five major freshwater mussel sampling efforts in the Miramichi River watershed within the last ten years. This includes the 45 sites sampled by MREAC over

the past three summers, and the 19 survey sites by Kate Bredin in 2002 (Bredin, 2002) and 2006 (COSEWIC, 2009), for a total of 64 freshwater mussel survey sites completed to date on the Miramichi River.

Figure 3 - Map of the Miramichi River watershed showing site locations of major freshwater mussel surveys completed within the last ten years: by MREAC in 2008-2010 and Bredin in 2002 and 2006 (Bredin, 2002, COSEWIC, 2009)



4.0. Discussion & Review

This year completes a third year of MREAC's Freshwater Mussel Survey project. The first year in 2008 focused on covering areas of the Miramichi River watershed that had not been surveyed, in order to have a broader understanding of freshwater mussel species and population size in new tributaries. With a special interest in finding Brook Floater mussels to help with their status assessment, MREAC focused on the Southwest Miramichi River tributaries during the second year of study in 2009, as it was discovered by Ms. Kate Bredin during her years of study (2002 & 2006) and not during MREAC's. This second year of searching was more rewarding as Brook Floaters were discovered at two of MREAC's sites on two different tributaries, the Barnaby and Taxis River. Both of these rivers are new discoveries of Brook Floater as the recently published "Assessment and Status Report on the Brook Floater, *Alasmidonta varicosa,* in Canada" (COSEWIC, 2009), does not indicate these rivers to have confirmed Brook Floater populations. With these new findings of Brook Floater mussels, MREAC had set out to do one more year of Freshwater Mussel Surveys (2010), focused on these two tributaries in order to gather information about the population size and extent throughout these systems.

Taxis River is next to Boiestown, NB, where much of the watershed is encompassed by crown land and forestry represents the most significant land-use impact. With limited historical data from the area, data collected during this project provides background information for any future activity. This is even more important for the Barnaby River as a new large scale cranberry facility is currently being developed in the Rogersville area. With the knowledge of three freshwater mussel species present in this river, including the "special concern" species Brook Floater, having this background information before the development will help monitor water quality in this river as the industry progresses.

Data collected from this project will be contributed to COSEWIC's future status assessment for this rare species. Also, as these rivers are tributaries of the Southwest Miramichi, data collected from these surveys will be contributed to the data set for the Water Classification program, and play a part in the ultimate classification process of the tributaries of the Miramichi River.

Fifteen sites were surveyed in 2010 by MREAC for freshwater mussels. Only one of the 15 sites did not have any findings of freshwater mussels, site 33 on Barnaby River's Semiwagon Stream. This site was shallow, slow flow, and a chocking amount of vegetation in the water which may be the reason why this site was absent of freshwater mussels. However, aquatic life was present as a crayfish was discovered and a variety of different damselfly and dragonfly species were flying around.

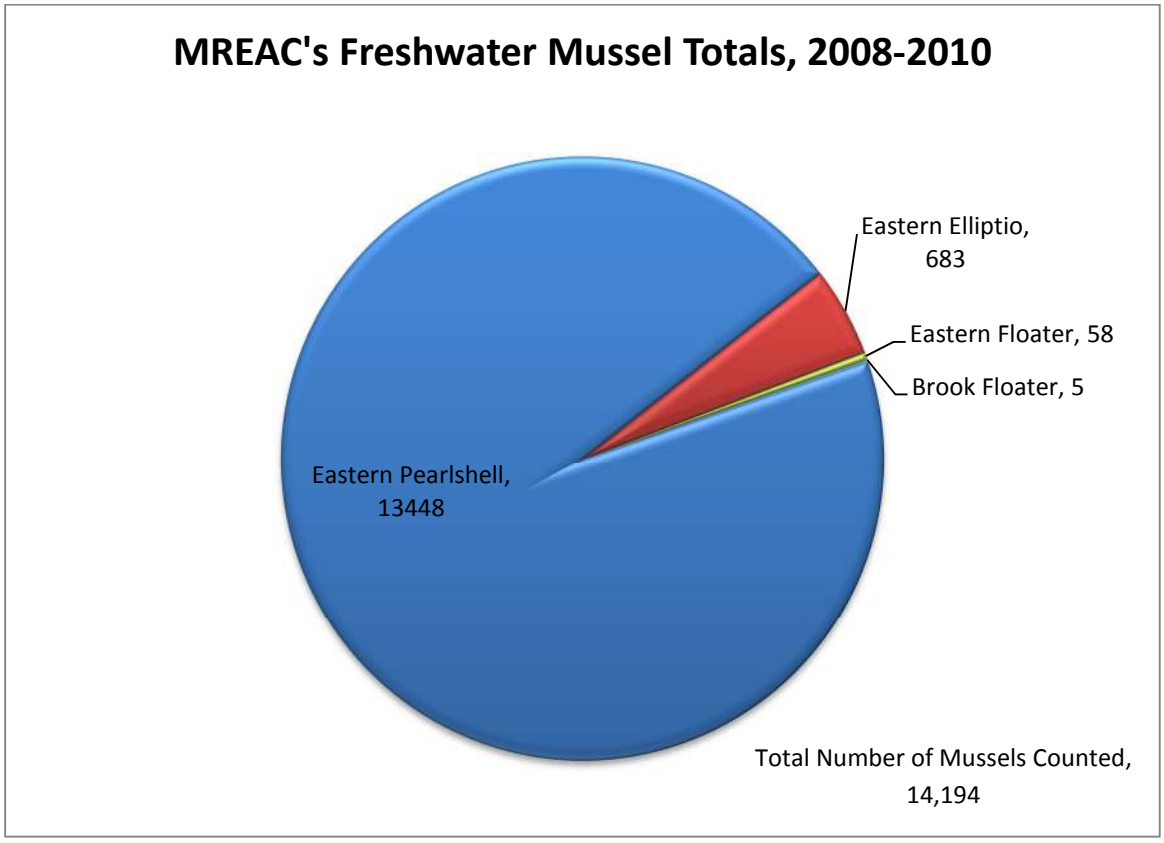
Three species of freshwater mussels were discovered this summer. Eastern Pearlshell was found at 14 of the sites and resulted in the highest total with 2,142 mussels. Eastern Elliptio was only discovered on the Barnaby River at six sites with a total of 157 mussels counted. The rare species Brook Floater, which was the main focus of the project this year, was only found at one site, site 31 on the Barnaby River, with only one mussel discovered. Two shells of Brook Floater were discovered on the Taxis River at site 42, but no live specimens were found this year.

Aside from the one site on the Barnaby River that resulted in no mussel finds, all of the other six sites on this river system resulted in at least two freshwater mussel species present, Eastern Pearlshell and Eastern Elliptio. All three species were found at site 31 with the discovery of a Brook Floater. Taxis River resulted in only finding Eastern Pearlshell during this year's concentrated survey and found at all eight sites.

As previously mentioned, 2010's additional 15 sites brings the total number of freshwater mussel survey sites completed by MREAC over the past three years to 45 sites throughout the Miramichi River watershed. During this project, four species of freshwater mussels were discovered throughout the system, Eastern Pearlshell (13,448), Eastern Elliptio (683), Eastern Floater (58) and Brook Floater (5). Table 3 illustrates these totals in a pie chart.

One other freshwater mussel species can be found in the Miramichi River, Eastern Lampmussel, discovered by Ms. Bredin on the Southwest Miramichi but not found by MREAC. With this additional species, the Miramichi River watershed is home to five known freshwater mussel species.

Figure 4 - Graph indicating MREAC's three year recorded totals for all discovered freshwater mussel species for the Miramichi River watershed



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).

Eastern Pearlshell in its natural habitat on the Taxis River

The Eastern Pearlshell is the most common freshwater mussel found during this project, located at 14 of the 15 sites, with a total of 2,142 live mussels recorded. Site conditions varied with sand, cobble, rock and boulders, to slow, moderate and fast water flow, all favourable habitat conditions for this species. The Taxis River had the higher number of Eastern Pearlshell (1,215) when compared to that recorded from the Barnaby River (927). However, the highest number of this mussel species was discovered at site 37 on the Barnaby River with a total of 380 mussels. The Taxis River is world renowned for its Atlantic Salmon fishing and the Barnaby River is very popular for trout fishing. During the surveys, some parr were spotted along with dace and sticklebacks. With healthy salmonid populations on these rivers, it was no surprise to find a healthy Eastern Pearlshell population.

Looking at the past three years, this species dominates the Miramichi River watershed with a total of 13,448 mussels found at 39 of the 45 sites surveyed. This species was found at a number of different tributaries such as the Northwest Miramichi, Barnaby, Renous, Taxis, with the largest count of 2, 523 found at the Upper Little Southwest Miramichi River.

This species is currently being looked at by COSEWIC and may be assessed in the future as studies show that elsewhere Eastern Pearlshell populations are decreasing. This species may be given the status of “special concern”, like the Brook Floater, and data from MREAC’s project will be contributed to the assessment. Looking at the Miramichi River population for Eastern Pearlshell (13,448) and comparing that with the Brook Floater population (5), it may seem odd to categorize these two species with the same status. However, these freshwater mussel species are found in other watersheds, some with struggling salmonid populations, and where the overall picture for Eastern Pearlshell may be grim, the Miramichi River looks to provide an important habitat for this freshwater mussel species.

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 found only at the Barnaby River sites. Six of the seven sites had at least one Eastern Elliptio present, and was always accompanied by Eastern Pearlshell. 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, 2000). The Barnaby River is a slow flowing, rocky and cobble substrate river with a healthy and diverse aquatic life variety. Blacknose dace was very abundant at many of the sites, along with some other fish species including parr and some crayfish were seen at sites.

Eastern Elliptio found at Barnaby River

From the 45 sites surveyed during this project, Eastern Elliptio was found at 11 sites throughout the Miramichi River watershed, with a total of 683 specimens counted. Three sites were on the Northwest Miramichi River and the remainder eight sites where on the Barnaby River. In 2008, site 09 on the Barnaby River resulted in the highest count of Eastern Elliptio with 500 live mussels. The Eastern Elliptio is the second most abundant mussel in the Miramichi River system.

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 deep silt substrates found in some ponds and rivers. Thus consequently, these mussels cannot survive in a rocky or fast flowing area (Nedeau, 2000).

Eastern Floatr found at Guagas Lake

This mussel species was only discovered in 2008 at two sites during MREAC's 45 site survey effort of the Miramichi River watershed. One site, site 04, was at Guagas Lake where the highest number of Eastern

Floater were discovered with a total of 57 mussels counted. The other site, site 11, was on Napan River where only one specimen of this mussel species was found along a steady stretch of the river that resembled lake conditions.

During a visit to Kennedy Lakes by MREAC staff for a different project, Eastern Floater mussels were observed in Second Fowler Lake, making their presence known to exist in this lake. However, a formal survey was not conducted as lake sites were not the desired survey habitat for this project.

4.4. Brook Floater (*Alasmidonta varicosa*)

Brook Floater in natural habitat on the Taxis River

The Brook Floater is considered to be a "habitat specialist that require running water environments such as shallow rivers or streams with moderate to high water flows" (COSEWIC, 2009). They usually prefer sand or fine gravel but can be found in pockets of sand with cobble and rocky bottoms. They are threatened by aquatic habitat degradation from silt, nutrients and sewage, poor agriculture and land management practices. They are medium in size with a swollen, kidney shaped shell and a distinguishable cantaloupe coloured foot. Their known host fish species are Ninespine Stickleback, Blacknose Dace, Yellow Perch and Golden Shiner (COSEWIC, 2009).

Its global range of distribution consists of most of the Eastern United States, New Brunswick and Nova Scotia. However, with the population declining in the US, most probably due to the increase number of dams and impoundments, the Canadian population is an important link to the species survival as discoveries of new populations continue. With federal laws such as the Fisheries Act, and provincial laws such as the Clean Water Act in New Brunswick, the Brook Floater does have some protection in Canada (COSEWIC, 2009).

One Brook Floater specimen was found at one site this year, site 31 on the Barnaby River. This site was upstream from the previous year's discovery. The substrate at the site was rocky with cobble and sandy pockets, and a slow to medium water flow, all ideal conditions for this species of freshwater mussels. Also at this site, Blacknose Dace and Sticklebacks were observed.

With this new discovery of Brook Floater, the total number of specimens found by MREAC after surveying 45 sites on the Miramichi River to five mussels counted; two mussels were found at two sites on the Barnaby River and three mussels were found at one site on the Taxis River. After counting over 13,000 mussels and only discovering five Brook Floater specimens, this further illustrates the rarity of this mussel in the Miramichi River watershed, as well as globally, thus making the Southwest Miramichi River a vital link to this species survival.

4.5. Eastern Lampmussel (*Lampsilis radiata*)

The Eastern Lampmussel inhabits a variety of aquatic habitats, ranging from small streams to large rivers to ponds and lakes. They can live in a variety of habitats, preferring sand or gravel. Their shells are yellowish-green when young and brownish-green or black when they get older, and usually have a number of green rays. These mussels are often confused with Eastern Elliptio, however this species is usually more oval-shaped, laterally inflated and the green lateral rays are more prominent. The Eastern Lampmussel has a whitish or pinkish nacre compared to the Easter Elliptio which has a more purplish nacre. The Eastern Lampmussel prefers warm water fish species such as Yellow Perch, Largemouth Bass and Smallmouth Bass as host fish (Nedeau, 2000).

Even though MREAC did not discover this mussel species during the three years of freshwater mussel surveys, Ms. Bredin has found this species on the Southwest Miramichi River, therefore making this species noteworthy for this final report as it is present on the Miramichi River. This species is more commonly found in Southern New Brunswick.

5.0. Conclusion

With the conclusion of 2010's summer season, MREAC completed an additional 15 sites of freshwater mussel surveys on the Miramichi River watershed, focusing sites on the Barnaby and Taxis Rivers. During this third year of the project, MREAC counted a total number of 2,300 mussels. The vast majority of these mussels were Eastern Pearlshell, with some Eastern Elliptio and one new specimen of Brook Floater. With this more intense focus on the Barnaby and Taxis Rivers and only discovering one new specimen, these rivers have demonstrated to be a vital part to this species survival.

With the addition of 2010's 15 survey sites, MREAC has now completed three years of freshwater mussel surveys (2008, 2009 & 2010). This brings MREAC's total number of completed survey sites to 45. During MREAC's three years of surveys, a total number of 14,194 freshwater mussels were counted with the discovery of four of the five known mussel species for the Miramichi River watershed. This includes an exceptionally small number (5) of specimens of the rare species Brook Floater, continuing its reputation of being a rare freshwater mussel species and designating the Southwest Miramichi River as a crucial part to their survival.

6.0. References

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Appendix A

Date	Location	River	Site #	Dist. (m)	Substrate	Water Flow	DO (mg/L)	pH	Temp (°C)	Notes
09-Jul-10	Hwy 126 near Collete	B	31	350			8.97	8.0	24.1	Lots of algae on rocks, some grass in water. Fish present (minnows, stickelback). Lots of dragonflies, damselflies.
20-Jul-10	Semiwagon Road bridge	B	32	170	rocky, cobble, sandy pockets	steady slow flow, one riffle area	8.14	5.5	24.3	A lot of fish
20-Jul-10	Semiwagon Stream	B	33	700	rocky with some sandy, cobble pockets	slow flow	8.64	5.5	20.9	Lots of veg. in water, some fish, lots of damselflies and some dragonflies. No mussels, 1 crayfish found. Dark at places. Bridge crossing of dirt road off hwy 126
20-Jul-10	Right hand branch of Barnaby river	B	34	600		slow flow	8.13	5.5	26.6	A lot of grass, scum on rocks, dark and murky. Some fish, damselflies. Some algae. Started at old wooden bridge, used for snowmobile trail
21-Jul-10	McAllister Road off of Taxis River Rd	T	35	300	rocky cobble with some boulders	steady medium flow	8.98	6.0	26.4	Some fish (parr and dace) and aquatic larvae in water. Scum on some rocks, some algae some veg. Started site at ATV ford.
21-Jul-10	Bridge on Hwy 625	T	36	250	rocky, cobble pockets, boulders	swift, riffles	8.22	6.0	26.2	Some fish (parr and dace). Slippery rocks, scum on rocks. Some algae. Sunny, clear sky.
03-Aug-10	Truck stop on Hwy 126	B	37	330	large slabs of bedrock, cobble pockets, shale	medium flow	8.78		21.9	Algae (weird, spongy, green algae patches), some vegetation, some fish (dace), some scum on rocks, overcast
06-Aug-10	At Collette on Lakelands Rd	B	38	350	rocky, cobble, sandy pockets,	medium flow with	7.93	6.0	20.4	Sunny clear sky, vegetation and algae in water, some fish (dace), many shell fragments

					with some mud	riffles				
16-Aug-10	Near Maple Grove Station	T	39	400	very rocky, some boulders, some sandy pockets		9.42	6.0	19.6	Mussels found at entry in deep hole, sandy, muddy edges. No veg, algae in water, some fish (dace). Seen 1 small crayfish, collected pieces of another. Cloudy, showers.
17-Aug-10	Near Mavis Mills	T	40	200	rocky with cobble patches	medium flow	8.86	6.0	20.7	A lot of fish (dace and others). A lot of algae in water. No veg. in water. Perfect Brook Floater habitat but none found. Sunny with clouds.
25-Aug-10	Kiwi Way Store on Taxis River Rd	T	41	600	slabs of bedrock, rocky & cobble pockets	slow flow, deep pool	9.13	5.5	19.6	Slabs of bedrock and concrete at entry, site behind Convenience Store. Snail and turtle found. Different orange bubble algae seen.
25-Aug-10	Left fork @ end of Taxis River Rd	T	42	500	sm. boulders, rocky, cobble with sand pockets	slow flow, deep pool	8.32	6.0	20.9	Deep pool with small boulders at entry, various size fish, snail found at site, crayfish seen along with many claws. Two Brook Floater shells found in middon.
20-Sep-10	Fess Fairley Lane (Taxis River Outfitters)	T	43	270	rocky w/ some boulders, lots of cobble pockets	med, steady, 1 riffle	10.06	5.5	13.8	Site at end of Lane in front of Taxis River Outfitter's camp. Seen some fish (dace, parr), little bit of green algae, brown fuzz on rocks, no veg.
20-Sep-10	Lane off of Taxis River Road	T	44	400	bedrock spots, rock w/ cobble pockets	slow to medium flow	10.05	5.5	16	Site was end of lane going behind house, camp at end. Stream 1 was bedrock and stream 2 sand with rock. Found 1 crayfish claw, seen several snails and some worms?
27-Sep-10	Behind House #12573 on Hwy 126	B	45	320	very rocky with cobble pockets	slow flow	10.88		11.7	Site is behind residential home. Found 1 snail. Many mussels were deep, almost buried