Lower Kennebecasis Tributaries
Habitat Assessment Report
2009

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KENNEBECASIS WATERSHED RESTORATION COMMITTEE
New Nouveau Brunswick
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Acknowledgements

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To landowners whom were gracious enough to allow us to park vehicles and access the streams through their property, we tip our hat. The Canadian Rivers Institute also deserves mention for their technical advice when called upon. Lastly, Chris Connell from the NB Department of Natural Resources, for providing staff training and expertise, we thank you.

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Background:
Since its beginning in 1994 the Kennebecasis Watershed Restoration Committee (KWRC) has worked at restoring the Kennebecasis watershed using a top down approach. After completing a habitat assessment of 285km of stream in 1994 the Committee created a priority site list. Since that time, the KWRC has completed restoration on a number of sites on that list. In 2007 discussion amongst Committee members resulted in a need for further study of the smaller tributaries in the Lower Kennebecasis sub-watershed. The smaller tributaries in this sub-watershed have never been assessed. They are important to this sub-watershed as it has no large inputs below the Millstream River to buffer negative impacts.

Restoration work has been done on a great deal of the other sub-watersheds and now the KWRC is preparing to focus more directly on the Lower Kennebecasis. To best perform the restoration work, staff required an inventory of what is present within the watershed. This report will provide that inventory as well as make recommendations on where to direct future efforts of restoration within the Lower Kennebecasis sub-watershed.

Study Area:
The Lower Kennebecasis sub-watershed is approximately 30554Ha in size with a main stem length of 28km. Appendix 1 provides maps illustrating the location of the study area. The six smaller tributaries were selected as study areas due to the fact that they are the only buffering systems between the Millstream sub-watershed, and the Moosehorn Brook. Their potential as cold water feeder systems makes them valuable tools in combating the continual problem of rising water temperatures in the Kennebecasis River. Their size also made them manageable and will provide great opportunity in the future to fully restore a system if deemed necessary.

Methodologies:
A combination of two methods was utilized for this study. Due to time constraints, staffing, and funding a more rapid form of assessment was developed. A number of key habitat characteristics were investigated using field observations. The results were recorded on the field sheets in Appendix 2.

1. Location:
    - Tributary – the tributary in which the assessment was being done was recorded along with the date
    - Coordinates – using a Garmin Legend HCX the upstream and downstream coordinates of each reach were recorded using a letter and numeric label (ie. Thompson Brook would be TB-01)
    - Reach Length – for the majority of reaches the length was set at 100m however, Thompson Brook was completed by assessing each pool, riffle, run, as a separate reach and thus the lengths were measured using a tape measure and recorded on the Department of Natural Resources field sheet (Appendix 1)
2. Riparian Characteristics:

- vegetative cover – this was assessed using a percentage of cover. A field observation of bare ground, grasses, shrubs, and trees was taken.
- Shade cover – a visual estimate of how much shade the over hanging vegetation provided the stream being surveyed

3. Stream Channel Characteristics:
    - wet width – a measuring tape was used to take an average wet width of each reach with a minimum of three readings per reach
    - depth – a meter stick was used to assess the average depth of each reach with a minimum of three readings per reach
    - bank conditions – observations were taken on what percentage of the left and right banks were stable, slightly eroded, or heavily eroded
4. Aquatic Habitat Conditions:
    - Substrate composition – a visual assessment of the percentage of bedrock, boulder/rubble, gravel, sands/fines was recorded for each reach
    - Flow Conditions – a visual assessment was recorded on what percentage of reach was pool, riffle, or run

Notes were also taken on stream temperature and dissolved oxygen as well as other points of interest (ie. beaver activity, bridges, and dumpsites.) Once all the data was collected in the field, staff needed to compile it into a readable and condensed format. The complete data tables can be found in Appendix 2.

A total of six tributaries (see Table 1) were assessed through the summer and fall of 2009. Each of these tributaries was in the Lower Kennebecasis sub-watershed. The tributaries serve as cold water feeder streams which greatly buffer the warmer temperatures of the Kennebecasis River and thus the KWRC feels it important to maintain their habitat characteristics and when possible enhance them.

Table 1: List of Tributaries Assessed

#	***Name of Tributary***	***approx. length surveyed (km)***
1	Thompson Brook	2.2
2	Erb's Lake Brook	3.4
3	Duncan Brook	3.9
4	Clements Brook	10.8
5	Mercer Brook	3.6
6	Halfway Brook	4.1
	TOTAL	28

Results:
Most of the data was that based on observation and therefore subject to interpretation. The hard data collected from the habitat survey can be utilized with land use, soil, and forest cover maps to provide a further understanding of each of these small tributaries. The results shown in the tables below however are simply the hard data condensed into easily understood tables. The tables represent three main components of healthy watershed habitat; riparian characteristics, stream/channel characteristics, and habitat characteristics.

Table 2: Condensed data for riparian zone characteristics of tributaries in the Lower Kennebecasis sub-watershed.

Stream Location		Riparian Zone Characteristics										
		RB Cond.			LB Cond.			Vegetative cover				
Tributary Name	Sub-watershed	stable	lightly eroding	heavily eroding	stable	lightly eroding	heavily eroding	bare	grasses	shrubs	trees	%shade
Duncan Brook	Lower Kenn.	83	11	6	76	6	19	0	19	28	53	85
Halfway Brook	Lower Kenn.	50	40	11	47	43	10	0	25	37	38	70
Mercer Brook	Lower Kenn.	91.1	0	8.9	94.6	0	5.4	0	10.9	14.1	75	74.3
Clements Brook	Lower Kenn.	98	2	0	98	2	0	1	27	46	26	58
Erb's Lake Brook	Lower Kenn.	98	1	1	97	2	1	0.2	18	31	51	54
Thompson Brook	Lower Kenn.	96	0	4	95	0	5	5	33	33	28	53.2
TOTALS		**86.0**	**9.0**	**5.2**	**84.6**	**8.8**	**6.7**	**1.0**	**22.2**	**31.5**	**45.2**	**65.8**

Table 3: Condensed data for stream and channel conditions for Lower Kennebecasis Tributaries

Stream Location		Stream and Channel Conditions								
							Substrate Composition			
Tributary Name	Sub-watershed	Length	Depth	Wet Width	Temperature	Dissolved O2	bedrock	boulder/rubble	gravel	Sands/fines
Duncan Brook	Lower Kenn.	3900	0.27	2.23	14.7	10.7	0	12	68	20
Halfway Brook	Lower Kenn.	4100	0.22	2.38	14.8	9.97	1	49	16	33
Mercer Brook	Lower Kenn.	3600	0.14	1.5	0	0	4.6	33.4	42.8	19.2
Clements Brook	Lower Kenn.	10800	0.264	2.25	17.8	9.5	3.3	32	36	28
Erb's Lake Brook	Lower Kenn.	3446	0.1	1.33	0	0	7	57	25	11
Thompson Brook	Lower Kenn.	2272	0.2	2.08	0	0	1.5	40	34	24.5
TOTALS		**28118**	**0.20**	**1.96**	**7.88**	**5.03**	**2.9**	**37.2**	**37.0**	**22.6**

Table 4: Habitat characteristics for tributaries in the Lower Kennebecasis sub-watershed.

Stream Location		Habitat				
				Reach composition		
Tributary Name	Sub-watershed	Temperature	Dissolved O2	pool	riffle	run
Duncan Brook	Lower Kenn.	14.7	10.7	0	0	0
Halfway Brook	Lower Kenn.	14.8	9.97	23	0	77
Mercer Brook	Lower Kenn.	0	0	20.5	40.5	38.8
Clements Brook	Lower Kenn.	17.8	9.5	19	33	48
Erb's Lake Brook	Lower Kenn.	0	0	27	45	28
Thompson Brook	Lower Kenn.	0	0			
TOTALS		**15.77**	**10.06**	**22.4**	**29.6**	**48.0**

Results from this data indicate that the largest issue within these tributaries, similar to the rest of the watershed, is stream bank erosion and riparian zone degradation. In many areas the streams have severely eroding stream banks and poor shade cover being offered by the riparian vegetation. This fact contributes to the high level of sands/fines being observed in these systems which in 4 out of 6 tributaries composes greater than 20% of the substrate.

Discussion and Recommendations:

Like they are for most river systems, the headwaters of the Lower Kennebecasis sub-watershed are vital to maintaining water quality and habitat health. Even though headwater streams are small and may appear to have no fish present, they still contribute greatly to habitat diversity, the food chain, and water chemistry. The six tributaries assessed by the KWRC in 2009 varied in land use, habitat ecology, and topography. Despite this fact the threats to the health of these streams is basically the same. Degrading riparian zones is contributing to elevation in stream temperatures, sediment inputs, and loss of valuable aquatic habitats.

> *Duncan Brook* – This is likely the smallest and least complex system included in the 2009 Habitat Assessment. Duncan Brook is relatively healthy with the riparian zone mainly intact and most of the stream banks appearing stable. In one location lawns were noticed to be cut right to the water's edge but this made up a small percentage of the system. Culverts and crossings appeared functional but may need to be further assessed. Recommend monitoring this system to insure long term sustainability and performing a more detailed assessment on the culverts on this tributary.

Thompson Brook – A site on this farm had already been identified as needing a great deal of restoration. In 2009 this work began. The issues identified on this system were the change in drainage patterns due to the construction of the highway. Channel stability, even in forested areas, was inconsistent. This was further exacerbated by the presence of beavers in the headwaters and middle reaches. In the lower reaches agriculture became the prevalent issue with cattle being allowed free access to the stream and causing heavy erosion and sediment flow into the brook. This will be alleviated in 2010 through work completed by the KWRC in 2009. Another large problem in this lower reach is the susceptibility of the culvert on Riverview Drive. The culvert is old, perched, and likely undersized and needs to be replaced. In the fall of 2009 the inability of this culvert to properly drain the system likely resulted in significant damage to the farm immediately upstream. It is recommended that further work is done to restore the highly degraded riparian area and eroding banks in the lower reaches of this system. Further, the culverts in this system should be checked to insure proper sizing and alignment so that fish can access this cold stream.

Erb's Lake Brook – A wetland and lake make up the headwaters of this system and provide ideal habitat for a variety of species, including trout. The presence of a hung culvert however makes it difficult for fish to reach these waters, so the only fish present are smaller native stock. The middle reaches are fast flowing, have steep banks, and are well vegetated, with a few small areas of exception. The only segmentation occurs at a large 209m culvert that moves the brook under the four lane highway. The lower reaches further inhibit fish passage up the stream as the riparian area is heavily degraded to non-existent and stream banks are frequently eroded. Further, more detailed assessment of the culverts and bridges in this system is recommended. An effort should be made to approach the landowner on the lower reach and aid them in implementing better management practices for the protection of the aquatic resources.

Clement's Brook – Clement's Brook is the largest of the tributaries assessed in 2009 and as such was also the most diverse. A wetland area created mainly by beavers dominates the upland portion of this system. Logging and some light agriculture are noticeable but create little negative impact. Similar to the other tributaries culverts seem to be causing segmenting of the system in both the upper and middle reaches of this system. The lower reaches are again dominated by agriculture and the riparian zone requires attention. Throughout most of this system the banks are relatively stable, and once the riparian issues were addressed this system would be very healthy.

Mercer Brook – This small system quickly flows down a steep hill with many cascades. Some logging and recreational vehicle impacts can be easily seen in the upper and middle reaches, but these are relatively insignificant. The lower reaches have been heavily impacted by resource extraction and logging, with some cut blocks imposing on the 30m setback and the banks are unnatural berms, with gravel and sediment continually eroding off of them during high water

events. The very bottom of this system consists of beaver ponds. Despite the logging and historical mining, Mercer Brook is likely the most intact system that was surveyed in 2009. Monitoring of the logging activity in this area is recommended.

Halfway Brook – Halfway Brook runs through a great deal of agricultural land and reflects the impacts of such land use. Bank erosion is a big issue here and an effort needs to be made to restore the riparian area and stabilize the banks. Some ideal habitat exists in the middle and upper sections and if the issues in the lower reaches can be addressed it would bode well for not only Halfway Brook but the Kennebecasis River as well.

Closing:

The objective of this project was to develop a tool to direct future restoration efforts and to that end this was a successful project. While some of the actions identified can be immediately commenced the remainder will require numerous discussions and further study. The planting of riparian vegetation can begin once funding and landowner agreement is attained. Bank stabilization projects require a great amount of cooperation by funding sources and landowners but can be addressed over time. The issue of numerous culverts of questionable function will require further study and discussion with the NB Department of Transportation.

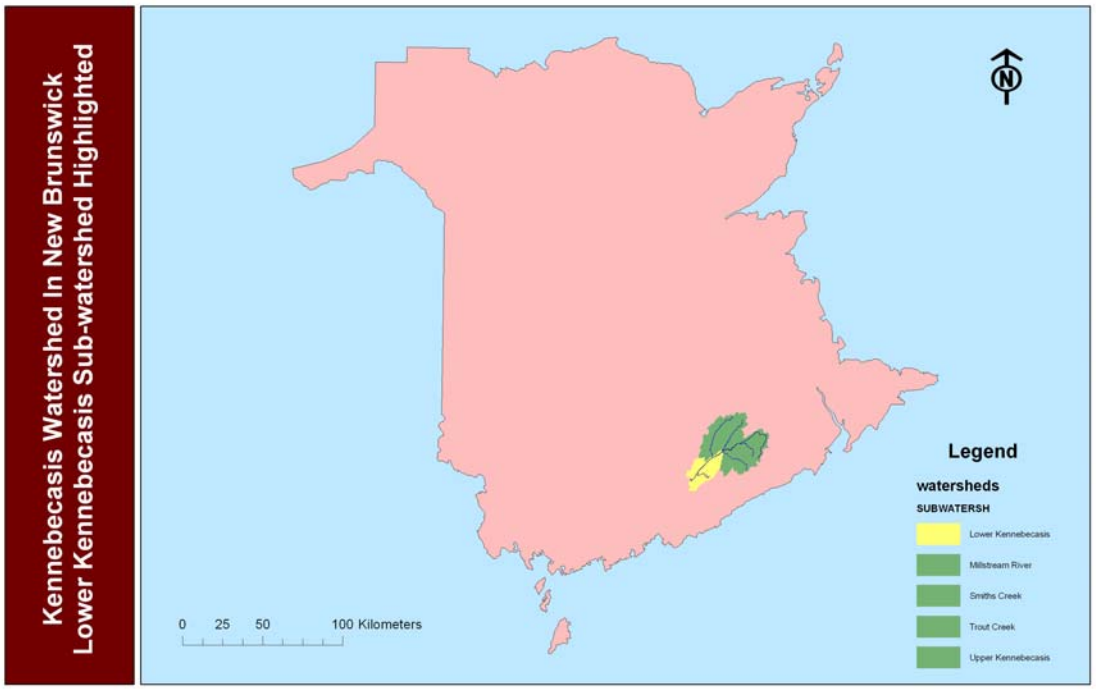
Overall the Committee validates this project as a success. The future work within the Lower Kennebecasis is now laid out and the KWRC is moving forward to get it completed.

Appendix One

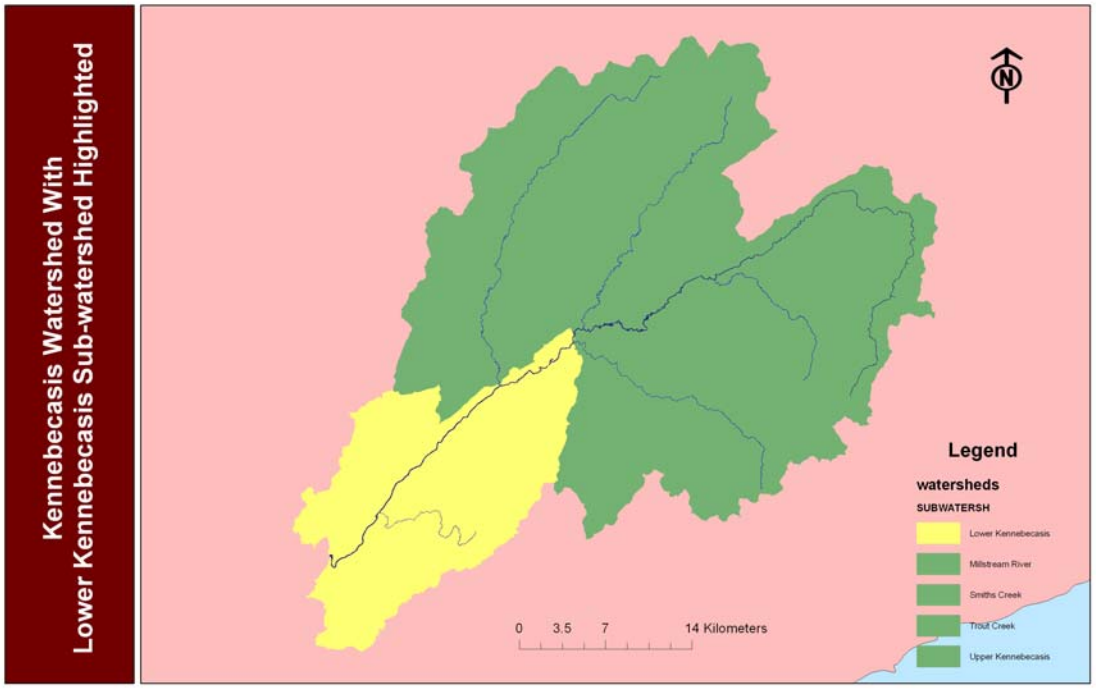
Maps Illustrating Study Area

1. Map of New Brunswick
2. Map of Kennebecasis Watershed
3. Map of Lower Kennebecasis sub-watershed
4. Land use map of Thompson and Duncan Brook
5. Land use map of Erb's Lake and Clement's Brook
6. Land use map of Mercer Brook
7. Land use map of Halfway Brook

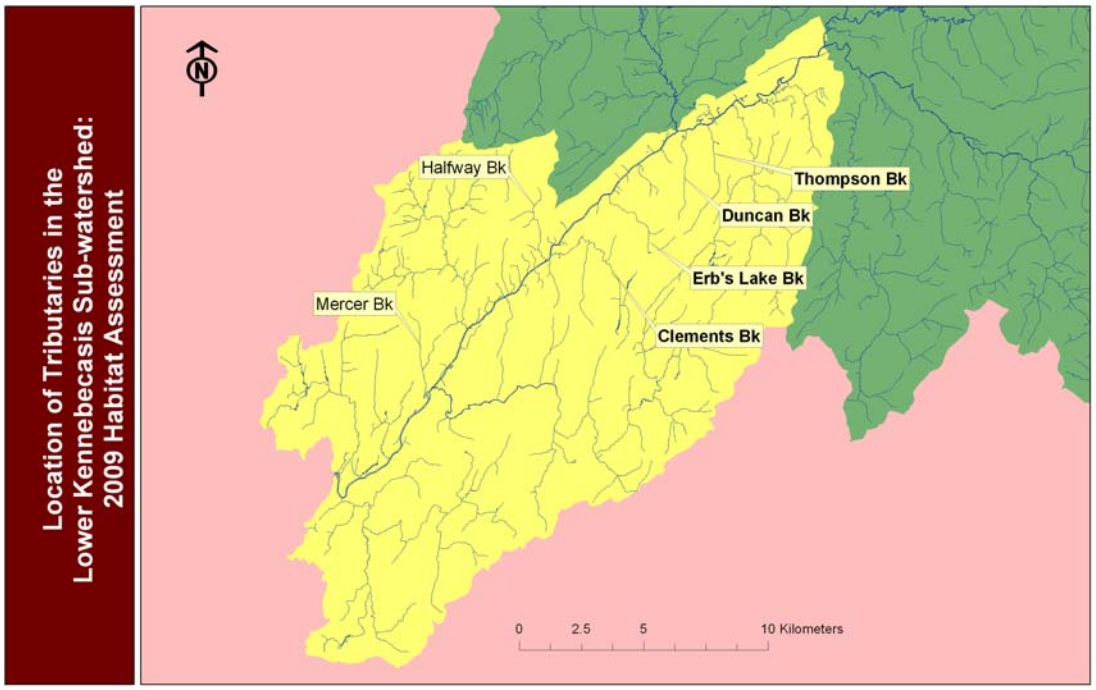
Map 1: This map shows the location of the Kennebecasis watershed within New Brunswick. The lower Kennebecasis sub-watershed is highlighted in yellow.



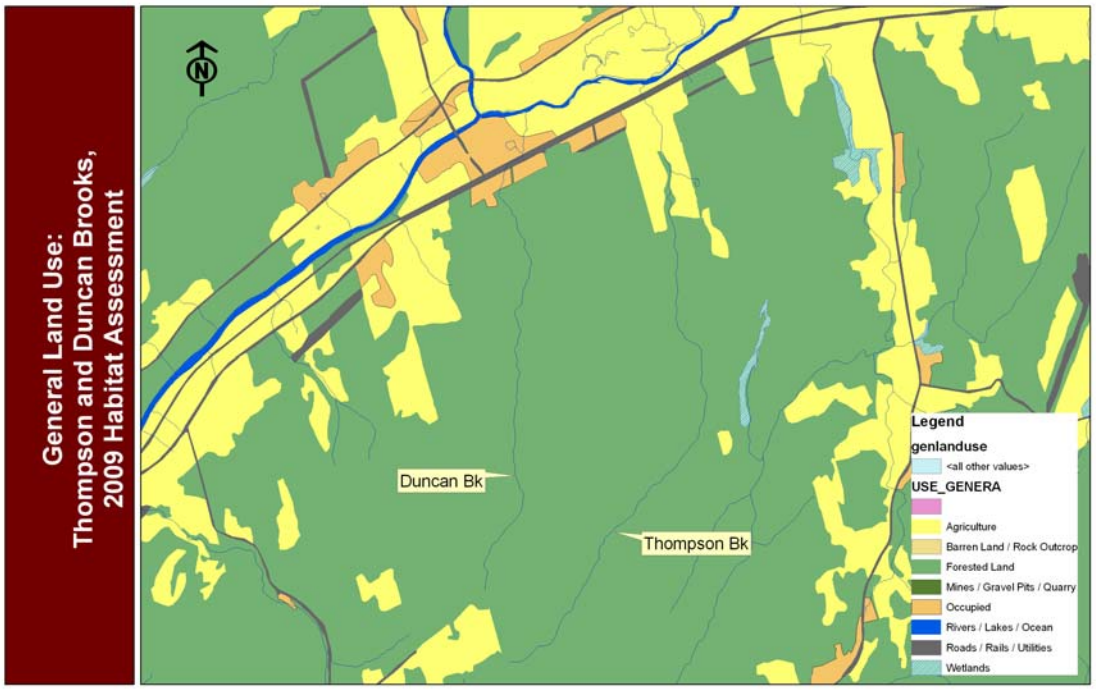
Map 2: This map provides an outline of the Kennebecasis watershed and illustrates the position of the lower Kennebecasis sub-watershed within it.



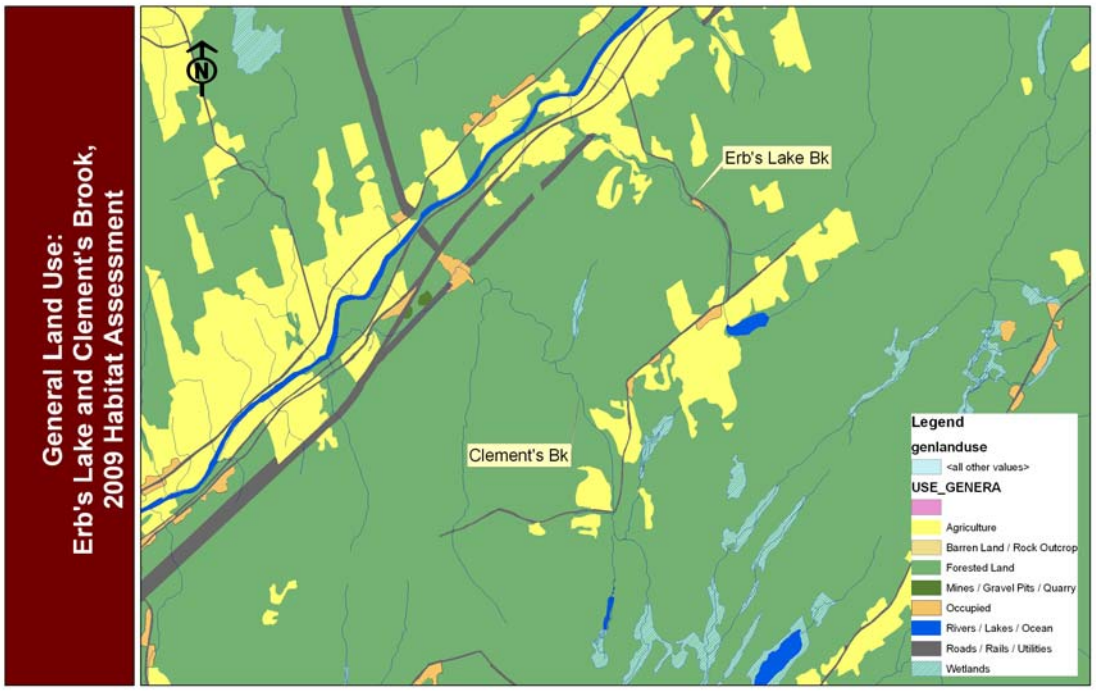
Map 3: This map illustrates the location of each of the six surveyed tributaries within the lower Kennebecasis sub-watershed.



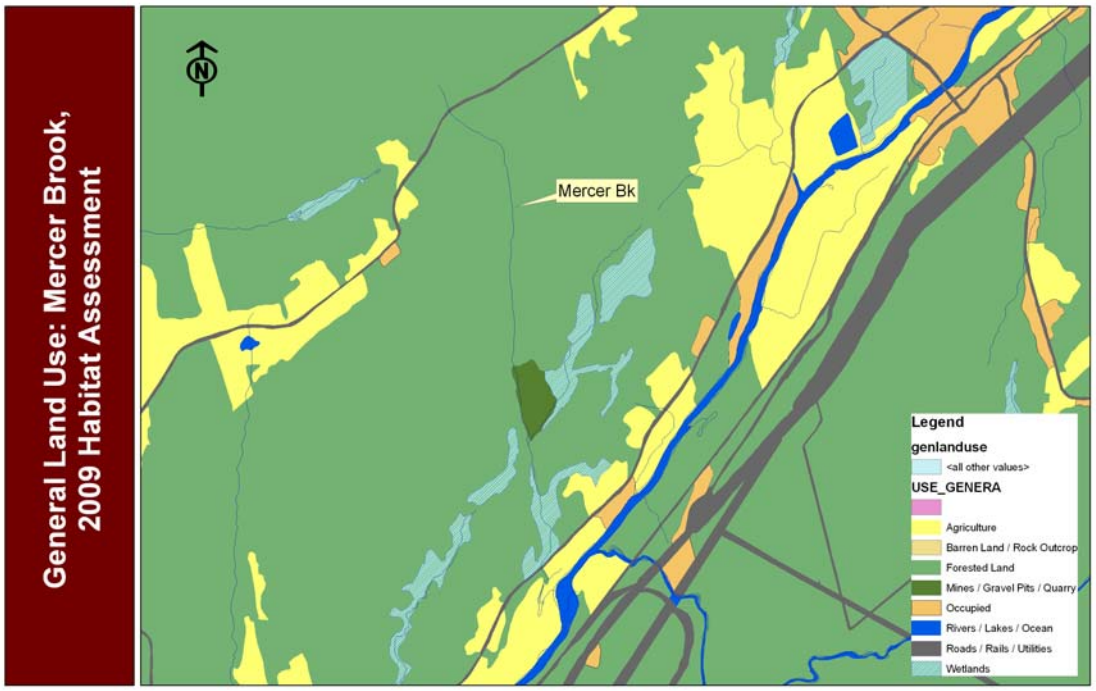
Map 4: This map shows the general land use around Thompson and Duncan Brook.



Map 5: This map shows the general land use around Erb's Lake Brook and Clement's Brook.



Map 6: The general land use around the Mercer Brook tributary.



Map 7: The general land use around the Halfway Brook tributary.

Appendix Two

Tabular Results
For the
2009 Habitat Assessment Survey