Aquatic Surveys of Irving Properties, Digby County, Nova Scotia

July 2013

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Executive Summary

On behalf of the Nature Conservancy of Canada (NCC), East Coast Aquatics Inc. (ECA) undertook field surveys of the area known as Irving properties 3 and 4, in Digby County, Nova Scotia between July 4 and July 29, 2013. The study area encompassed a portion of Long Tusket Lake shoreline and the complete shoreline of Little Tusket and Langford Lakes, as well as sections of the Silver River, Caribou River, tributaries, and associated riparian wetlands. The environmental components examined by ECA included fish, water quality, wetlands, and herptofauna.

Fisheries surveys were undertaken through electrofishing (10 sites), placement of minnow traps (14 sites) and directed angling (11 sites). A total of 81 individuals, representing six fish species, were documented. The overall abundance and diversity of fish species recorded was lower than anticipated, given the habitats examined. Water quality within the study area provides a partial explanation for these findings. Surface waters were found to have low conductivity (average 43.08 µS/cm) and very low pH (average 4.00 (excluding Colibri Lake and site EF9)). Within the Silver and Caribou rivers, water pH values as low as 3.82 and 3.86 were recorded. Water temperatures were very warm during the field survey, with surface temperatures in lacustrine settings approaching 25 °C. Langford Lake was found to be highly stratified, with hypoxic conditions observed within the hypolimnion where dissolved oxygen values of 0.1 mg/L were recorded. No evidence was found to suggest that the invasive fish species' Smallmouth bass (*Micropterus dolomieu*) and Chain pickerel (*Esox niger*) occur at present within the study. Smallmouth bass is known to occur in adjacent watersheds as well as further downstream within the Tusket River watershed at Pearl Lake.

Herptofauna were inventoried through the recording of opportunistic sightings, surveys of potential beach nesting sites, and a targeted nighttime survey. In total, 83 individuals, representing 12 herptofauna taxa, were documented at multiple locations. At least eight Snapping turtle (*Chelydra serpentine*) (Vulnerable) nests were documented within the study area, as well as one adult adjacent to the study area.

ECA completed preliminary assessments of wetlands within the study site, with an emphasis on riparian wetlands encountered during the fisheries assessments. The wetlands were classified using the Canadian Wetlands Classification system, dominant species recorded and hydric soils examined. A total of nine wetlands were investigated, although this represented a small fraction of the total number of wetlands present within the study area. Nine Atlantic Coastal Plain Flora (ACPF) species were identified, two of which are species of conservation concern: Lakeshore Yellow-eyed grass (*Xyris diformis)* and Beaked spikerush (*Eleocharis rostellata)*, both listed as Sensitive. The greatest density of ACPF species occurred at Wetlands 6 and 8, located on the eastern and southern shore of Long Tusket Lake, respectively.

This report is accompanied by a compact disk containing field data in Microsoft Excel spreadsheets as well as photographs documenting field conditions.

Introduction

East Coast Aquatics Inc. (ECA) was retained by the Nature Conservancy of Canada (NCC) to undertake biological field surveys of two properties in Digby County, Nova Scotia, know as Irving 3 and Irving 4 (Figure 1, 2 and 3). The area includes a portion of Long Tusket Lake shoreline and the complete shoreline of Little Tusket and Langford Lakes, as well as sections of the Silver River, Caribou River, a few smaller tributaries, and all the associated riparian wetlands.

The scope of these biological surveys was established through written and verbal communications between ECA and NCC, recognizing that:

- Aquatic inventories were the primary focus, and that fish surveys in particular were desired.
- The project budget was limited, and therefore a base proposal was developed with a number of options available which the NCC may wish to consider further depending on financial constraints.
- The project timeline was constrained by a delivery date of late July. This timeline produced some limitation on appropriateness of survey season for fish, herptofauna nesting, and plants identification, and the ability to assess the project area over a number of seasons in order to develop more comprehensive species inventories.
- NCC would undertake the final reporting on findings of the surveys, with ECA to provide a preliminary report of findings in a basic layout format such that it can be edited and incorporated into an NCC produced document.

N.S. J.D. Irving, Limited. 3 property, Scotian South Shore.

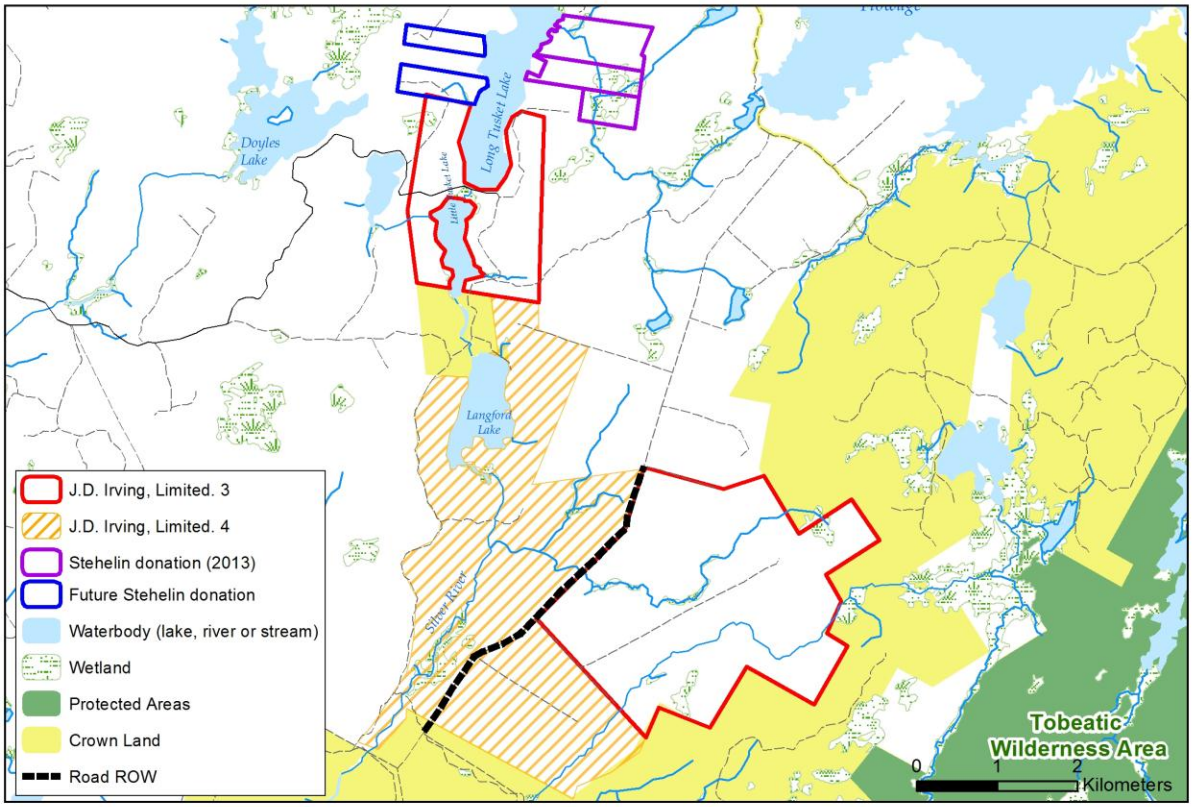


Figure 1. J.D. Irving, Limited. properties 3 and 4 in the Tusket River Watershed.

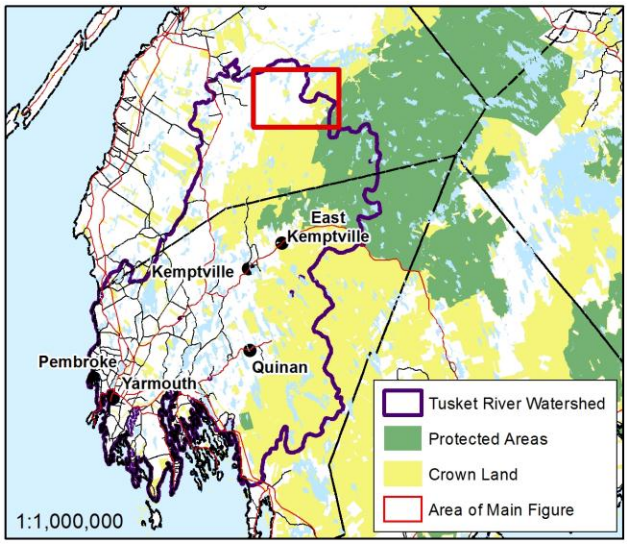


Figure 2. Tusket River watershed showing location of the property of interest.

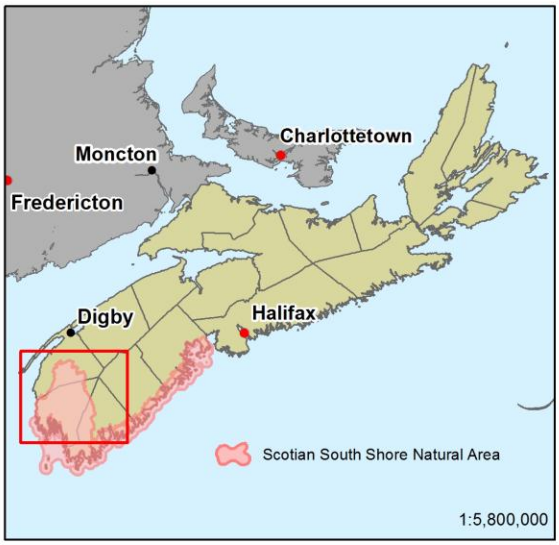


Figure 3. Nova Scotia.

Fish

Methodology

ECA conducted fish presence surveys of targeted watercourses using a Smith-Root backpack electrofisher (Model 12-B). Electrofishing was conducted under a Fisheries and Oceans Canada Scientific License (Permit number 328116). Surveyed watercourses included first, second and third order wadeable tributaries and adjacent near-shore lacustrine habitat. In accordance with the manufacturer's instructions, the electrofisher unit was initially set at a frequency of 60Hz, pulse width of 3ms and voltage of 500v (setting J5), then evaluated under field conditions. Settings were adjusted stepwise until satisfactory results were obtained. Final electrofisher settings are recorded on the data sheets. A 50+ m single pass presence/absence survey of each watercourse was conducted in an upstream direction, unless otherwise noted. The surveys sought to incorporate all fish bearing habitats (pools, undercut banks, riffles, large woody debris) within the sample reach. Caught fish were released unharmed on-site after being measured and identified.

Baited minnow traps were deployed for 12 to 24 hours in still-water riparian and lacustrine habitats, at depths ranging from 0.5 to 2.0 m. Caught fish were released unharmed on-site after being measured and identified.

Directed angling was undertaken in both riverine and lacustrine settings, using a variety of approaches (spin casting, fly casting, and trolling). Angling was undertaken during morning, daytime and evening periods, with a variety of baits used. The unit effort, documented as rod-hours, was recorded for each location. Caught fish were released unharmed on-site after being measured and identified.

Water quality measurements were recorded using a YSI ProPlus multiprobe water meter, calibrated in accordance with the manufacturer's directions. Water quality measurements were recorded at electrofishing and minnow trap locations. Water quality profiles were also conducted in Long Tusket Lake, Little Tusket Lake and Langford Lake.

Results

Water quality profiles were conducted at a single location on each of Long Tusket Lake, Little Tusket Lake and Langford Lake (Figure 4), with the results presented in Table 1. Waters within the lakes was found to be very warm at the surface, approaching moderate temperatures at depth. The lakes had consistently low specific conductivity and total dissolved solids levels. Langford Lake was found to be strongly stratified, with the thermocline occurring at a depth of three to four meters. Within the hypolimnion, the waters would be considered hypoxic, with dissolved oxygen levels at 0.1 mg/L. The lakes had consistently low pH, with levels ranging from 4.23 to 4.88.

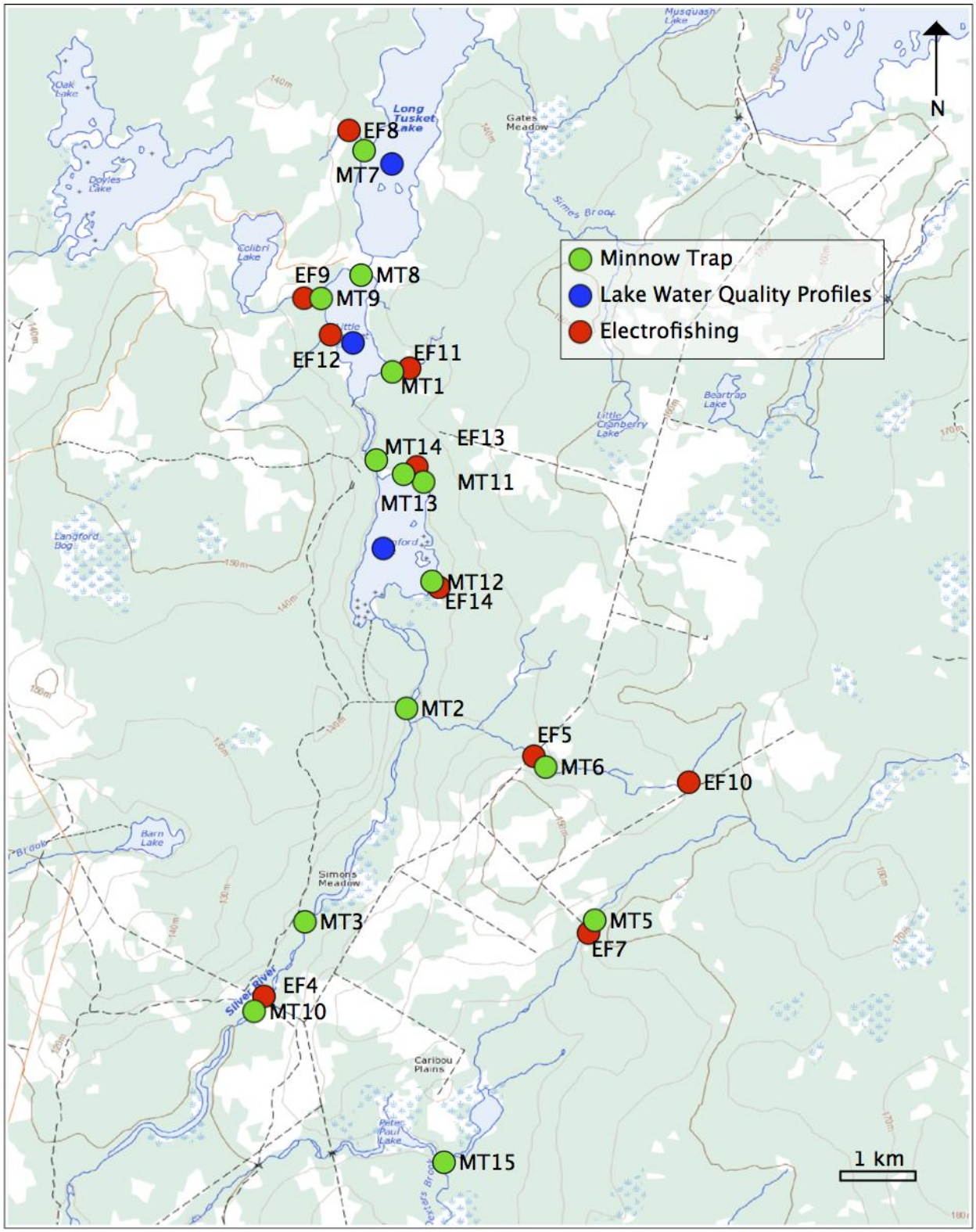


Figure 4. Minnow trap, Electrofishing and Lake Water Quality Profile station.

The Nova Scotia Lake Survey program, operated as a partnership between Nova Scotia Environment and Nova Scotia Fisheries and Aquaculture, has inventoried lakes throughout the province to provide baseline data for management purposes (NSE, 2013). The program undertook preliminary inventories of the Long Tusket, Little Tusket and Langford lakes in 1985 (Table 2). Similar temperature, dissolved oxygen and pH values were recorded by ECA in 2013 as found in the 1985 sruveys. The strong stratification observed in Langford Lake in 2013 was, however, not recorded in the historic data. This may have been due to the historic inventory being completed approximately one month earlier in the summer than the 2013 survey, before stratification of the lake fully developed.

Water quality results for selected riparian habitats are reported in Table 3, including several electrofishing and minnow trapping sites. Notable from this data is the low specific conductivity (average 43.08 µS/cm, all sites) and very low pH (average 4.00, excluding Colibri Lake and EF9). pH values as low as 3.82 and 3.86 were recorded on the Silver River and Caribou Rivers, respectively. Colibri Lake and its unnamed tributary into Little Tusket Lake (electrofishing site EF9) represent an anomaly within this data set, with higher pH values at 5.06 and 4.70, respectively. These pH values, while not high in absolute terms, were the highest values observed through the field survey. The water quality of Colibri Lake is believed to be influenced by a drumlin field occurring to the west of Long Tusket Lake, resulting in pH values being elevated above those in surrounding areas. The unnamed tributary to Long Tusket Lake (electrofishing site EF10) is also thought to be influenced by this drumlin field with a slightly higher pH value of 4.18. All the surface waters observed within the study area were highly coloured, due to the presence of naturally occurring tannic and humic acids.

In order to provide a regional context for this data, water quality in Halfpenny Brook (draining Doyle's Lake) where it crosses the access road to the site was also measured. This site also had low specific conductivity (41.5 µS/cm) and a very low pH of 4.01.

The Canadian Council of Ministers of the Environment (CCME) have established water quality guidelines for the protection of freshwater life. The CCME guideline for pH is 6.5 to 9.0. All of water quality observations made in the study area fell outside this guideline. Many of the lakes and rivers in Nova Scotia, particularly those within the southwestern region of the province, have low alkalinity. This, coupled with decades of acid precipitation originating from industrial activities in central Canada and northeastern United States, have resulted in very low pH values being observed.

Table 1. July 2013 Water Quality Profiles for Long Tusket, Little Tusket and Langford Lakes

Client	Nature Conservancy of Canada	**Instrument**	YSI ProPlus multiprobe	
Project	Digby County - Irving Donation	**Location**	Silver River catchment, Digby Co.	
		Operator	Andy Sharpe	

Profile			**Depths (m)**		**0.2**	**1**	**2**	**3**	**4**	**4.5**
1	**UTM**	0279277 4912070	**Dissolved Oxygen**	(mg/L)	6.6	6.4	6.4	5.9	5.0	4.3
	Max. Depth	8 m	**Dissolved Oxygen**	(%)	80.0	78.0	74.0	64.0	52.0	43.0
	Details	Little Tusket Lake	**Temperature**	(C)	24.0	23.9	21.4	18.5	16.1	15.2
	Date	9/7/2013	**pH**		4.50	4.60	4.36	4.32	4.23	4.30
	Time	18:30	**Specific Conductivity**	(µS/cm)	36.0	36.1	37.9	39.2	40.0	39.4
			Total Dissolved Solids	(mg/L)	23.4	23.4	24.7	25.3	26.0	25.3
2	**UTM**	0279712 4913759	**Dissolved Oxygen**	(mg/L)	6.7	6.5	7.1	6.1		
	Max. Depth	3.5 m	**Dissolved Oxygen**	(%)	79.0	77.0	80.0	67.0		
	Details	Long Tusket Lake	**Temperature**	(C)	23.2	23.7	22.5	19.3		
	Date	10/7/2013	**pH**		4.62	4.60	4.55	4.41		
	Time	13:00	**Specific Conductivity**	(µS/cm)	35.5	35.5	35.5	36.7		
			Total Dissolved Solids	(mg/L)	22.8	22.8	22.8	24.1		
3	**UTM**	0279505 4910102	**Dissolved Oxygen**	(mg/L)	7.4	6.8	6.4	5.4	2.7	0.1
	Max. Depth	6 m	**Dissolved Oxygen**	(%)	92.0	88.0	76.0	60.0	29.0	1.0
	Details	Langford Lake	**Temperature**	(C)	28.2	27.7	22.5	19.4	17.8	17.4
	Date	16/7/2013	**pH**		4.37	4.41	4.33	4.36	4.38	4.88
	Time	16:00	**Specific Conductivity**	(µS/cm)	35.7	35.6	36.6	36.4	36.9	40.7
			Total Dissolved Solids	(mg/L)	23.4	23.4	24.0	23.4	23.4	26.6

Table 2. Morphology and Historic Water Quality Data for Long Tusket, Little Tusket and Langford Lakes (Nova Scotia Lake Survey program, 1985)

Lake Name	Assessment Date	Lake Volume (m^3)	Max. Depth (m)	Mean Depth (m)	Surface Area (ha)	Secchi Disk (m)	Surface Temp. (°C)	Bottom Temp. (°C)	Surface DO (mg/L)	Bottom DO (mg/L)	pH
LITTLE TUSKET	27-Jun-85	1441520	8	3.6	40.5	1.3	18.5	12	8	4	4.46
LONG TUSKET	7-Jul-85	3580120	7	2.4	152.3	1.2	22.5	17.5	6	6	4.68
LANGFORD	9-Jul-85	1747904	6	2.8	62	1.3	24.2	18.8	8	7	4.69

Table 3. Selected July 2013 Water Quality Observations, by Catchment

Station	Date	UTM	System	DO (mg/L)	DO (%)	pH	Sp. Cond. (µS/cm)	Temp. (°C)	Thermal Category*
EF4	10/7/2013	0278175 4905841	Silver River	8.5	90	4.09	39.2	17.8	Intermediate
EF5	4/7/2013	0280872 4908072	Silver River	5.1	23	3.82	47.1	16.8	Intermediate
EF10	4/7/2013	0282347 4907777	Silver River	7.1	72	4.08	42.0	14.4	Cool
EF8	9/7/2013	0279386 4914053	Long Tusket Lake	6.8	67	4.18	48.2	14.3	Cool
Colibri Lake	9/7/2013	278464 4913283	Little Tusket Lake	7.2	87	5.06	31.9	24.8	Warm
EF9 (Trib. From Colibri L.)	9/7/2013	0278961 4912508	Little Tusket Lake	7.3	85	4.70	32.6	22.2	Warm
EF11	4/7/2013	0279830 4911754	Little Tusket Lake	6.4	65	3.91	49.4	15.8	Cool
EF12	10/7/2013	0279073 4912148	Little Tusket Lake	8.1	82	3.90	48.3	15.9	Cool
EF13	16/7/2013	279856 4910767	Langford Lake	1.7	18	4.15	46.4	16.8	Intermediate
EF14	16/7/2013	280003 4909755	Langford Lake	1.0	12	4.09	48.4	16.3	Cool
EF7	10/7/2013	0281359 4906401	Caribou River	9.1	96	3.86	43.7	17.5	Intermediate
Dexter Brook	16/7/2013	0279896 4904189	Caribou River	5.5	65	4.00	42.4	21.7	Warm
MT15	16/7/2013	0279909 4904263	Caribou River	6.0	71	3.93	42.0	23.2	Warm
Access Road	9/7/2013	0274225 4911365	Halfpenny Brook	7.4	82	4.01	41.5	20.5	Warm

Note: * Thermal category based on MacMillan *et al.* (2008)

Given the fish survey methodology employed, the following results are not intended to provide absolute abundance data, but rather an inventory of fish diversity and distribution likely to occur within the study area. Electrofishing was conducted at ten sites, with a total duration of 3677 seconds (Figure 5). A total of 33 individual fish, comprising five species were retained by electrofishing. Minnow traps were deployed at 14 locations, with a total soak-time of 305.25 hours (Figure 6). A total of 48 individual fish, comprising four species were retained through minnow trapping. Directed angling was conducted at 11 locations over five field days. A total of 8.5 rod-hours were expended, with the catch of one fish. The electrofishing, minnow trapping and angling locations are shown in Figure 4. The overall catch information for these three methodologies have been brought together and summarized in Table 4. Photographs of the fish species inventoried are shown in Figure 7. The detailed effort and catch information for electrofishing is contained in Appendix 1, minnow trapping in Appendix 2 and angling in Appendix 3.

Figure 5. Electrofishing a tributary of the Silver River (site EF5)

Figure 6. Minnow trap placement (site MT9) where the unnamed tributary from Colibri Lake enters Little Tusket Lake

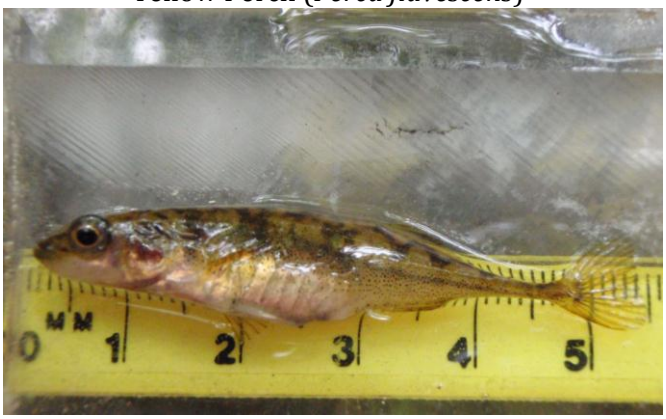
MacMillan *et al*. (2008), following an electrofishing and habitat survey of 100 Nova Scotia streams, established thermal categories based on mean summer water temperature. The authors found these categories to be highly predictive of the fish community within the stream and its respective productivity, particularly for Brook trout (Table 5). When these categories are applied to the water quality results in Table 3, 36% of the NCC project sites fall within the cool category, 29% the intermediate category and 36% the warm category. It is important to recognize that this categorization is based on a single sample event only. The electrofishing site with the greatest number of Brook trout, EF8 – western tributary to Long Tusket Lake, was in the cool category, with an estimated 10.0 fish per 100 m^2 of surveyed habitat. This productivity is lower than would be predicted by MacMillan *et al.* (2008).

Table 4. Summary of Fish Survey Results

Species	Name	Total Length (mm)				Survey	Number Caught At Each	Species
		Median	Mean	Min	Max	Location	Location	Total
American eel	*Anguilla rostrata*	35	68	20	150	EF7	4	
						MT14	1	**5**
Banded Killifish	*Fundulus diaphanus*	79	75	60	82	EF9	4	**4**
Brook trout	*Salvelinus fontinalis*	103.5	97	47	135	EF8	10	
						EF9	5	
						EF13	1	**16**
Golden Shiner	*Notemigonus crysoleucas*	102	103	82	120	MT9	11	**11**
Nine Spine Stickle-back	*Pungitius pungitius*	52	52	52	52	EF8	1	
						MT15	1	**2**
Yellow perch	*Perca flavescens*	83	84	28	192	EF4	5	
						EF9	2	
						MT9	4	
						MT10	9	
						MT11	1	
						MT12	1	
						MT14	21	**43**
							Total	**81**

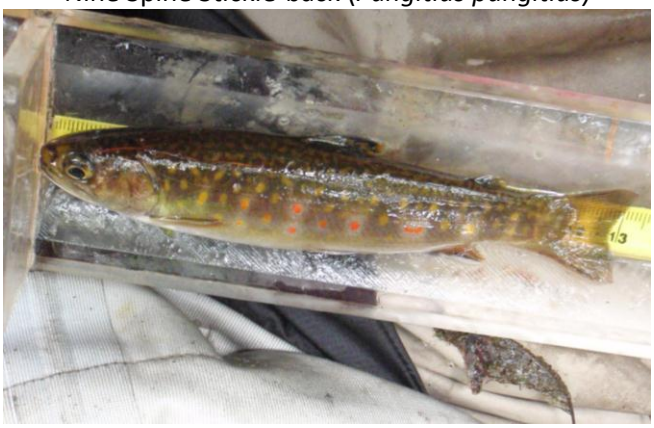
Yellow Perch (*Perca flavescens*)

Golden Shiner (*Notemigonus crysoleucas)*



Nine Spine Stickle-back (*Pungitius pungitius)*

Banded Killifish (*Fundulus diaphanus)*



Brook trout (*Salvelinus fontinalis)*

American eel (*Anguilla rostrata)*

Figure 7. Fish species documented through the July 2013 aquatic surveys.

Table 5. Stream thermal categories and fish productivity, from MacMillan *et al.* (2008)

		Thermal Category °C		
		Cool	Intermediate	Warm
Fish per 100 m^2		<16.5	16.5-18.9	>18.9
Brook Trout	(grams)	1126	214	16
Brook Trout	(number)	58	14	1.7
Atlantic salmon		9.1	4.6	4.3
American eel		2	0.8	10.9
Yellow perch		0	0.4	0.2
Stickleback		0.2	0.2	0.1
Killifish		0	0.03	1.1
Cyprinids		2.7	4.7	6.2

Discussion

Overall, the abundance and diversity of fish species recorded during the sampling program was lower than anticipated. There are at least two factors that may have contributed to this. The field surveys occurred during the month of July, with daytime air temperatures reaching 30 °C and water temperatures approaching 25 °C in lacustrine settings. Salmonids, in particular Brook trout, actively avoid habitats where water temperatures exceed 20 °C (Corbett *et al.*, 2008). As was discussed above, water quality monitoring documented very low pH values in surface waters throughout the study area. The viability of salmonids, particularly in the larval and juvenile life stages, is greatly reduced when water pH falls below 5 (Mike McNeil, Nova Scotia Fisheries pers. com., 2013). MacMillan *et al*. (2008) found very low Brook trout productivity at water pH below 5.5.

The recorded abundance of Brook trout was notably higher at two small tributaries that had higher pH. A total of 10 Brook trout were recorded at site EF8 (small tributary entering Long Tusket Lake from the west) with water temperature of 14.3 °C and pH of 4.2. A total of 5 Brook trout were recorded at site EF9 (inflow to Little Tusket Lake from Colibri Lake) with water temperature of 22.2 °C and pH of 4.7.

Numerous All-Terrain Vehicle (ATV) access points and footpaths to watercourses were observed through the field survey. ECA interviewed two individuals who had personal recent recreational angling experience within the study area. It was reported that the Silver and Caribou River systems, including the lakes, support a popular recreational fishery for Brook trout. The best fishing is reported to occur in the spring during high water (Rick Adams, pers. com.), (Bill Curry, pers. com.).

Corbett *et al*. (2008), in a recent radio-tagging study of Brook trout in the upper Mersey River watershed, found that trout moved extensively throughout the watershed over the course of the year to access feeding, spawning, summer and winter refuges. Daily movement patterns ranged from 100 m to 13 km over a 24 hr period. The authors found that when water temperatures approached 20 °C, trout quickly moved to deeper lakes and

groundwater springs in river. Trout spent the bulk of their time during the summer months in these cold-water refuges. Given that the Mersey River study occurred only 40 km from the Tusket site, in similar geological and landscape conditions, it is very likely that the conclusions are applicable to the study.

Based on field surveys, interviews and literature review, it is concluded that Brook trout occur widely through the study area, using the riverine habitat of Silver and Caribou during select periods of the year (e.g. early spring high flow). Trout likely move to cold water refugia during summer months, including cooler tributary streams and deeper pockets within the main rivers with groundwater seeps. Given the scope of the field survey, the locations of these cold-water refuges were not located.

An important implication of the Corbett *et al.* (2008) research is that of aquatic connectivity, with Brook trout and other species requiring barrier-free access to all parts of the catchment through their life cycle. The presence of a just a single barrier has the potential to prevent fish species from accessing critical habitat. Based on a qualitative assessment, no barriers to fish passage were observed during the field survey.

Alexander *et al.* (1986) reports on the survey of fish populations in 781 Nova Scotia lakes, carried out between 1964 and 1981. While the study did not include the three lakes within the study area, it did include three other lakes within the Tusket River catchment in Digby County: Hourglass, Napier and Snare Lakes. The survey identified a total of six fish species in these lakes: White sucker (*Catostomus commersoni*), Brook trout (*Salvelinus fontinalis*), White perch (*Morone americana*), Yellow perch (*Perca flavescens*), Banded killifish (*Fundulus diaphanus*) and Brown bullhead (*Ictalurus nebulosus*). As part of this study, ECA made an enquiry to Nova Scotia Department of Fisheries and Aquaculture (NSDFA) concerning records of fish species within the study area. In addition to the above six species, NSDFA reported that Gaspereau (*Alosa pseudoharengus*) occur within the Long Tusket, Little Tusket and Langford lakes (S. Sutherland, NSDFA pers. com. 2013).

Two invasive fish species of interest, within the scope of this study, were Chain pickerel (*Esox niger*) and Smallmouth bass (*Micropterus dolomieu*). Directed angling was undertaken in a range potentially suitable habitats for these species. Adams (pers. com.) reported that these species did not occur within the study area, although Smallmouth bass was know to occur in the lower Tusket River system. Curry (pers. com.) reported that Smallmouth bass was know to occur as far up the Tusket River as Pearl Lake at Kemptville, approximately 30 km downstream (river distance) of the study area. It has also been reported that Smallmouth bass are established in Sissiboo Grand Lake, only 1.5km (overland) from Long Tusket Lake (Barteaux, pers. com.), within the Sissiboo River catchment. Nova Scotia Department of Fisheries and Aquaculture had no records of Smallmouth Bass or Chain pickerel occurring within the study area (Sutherland, pers. com.). Based on the fish surveys and interrviews, within the scope of this study, ECA can find no evidence that Smallmouth bass and Chain pickerel occur within the study area at this time.

Smallmouth bass are known to occur within at least 188 lakes and rivers in Nova Scotia, resulting from deliberate introductions as well as accidental and illegal transfers (LeBlanc,

2010). Within the province, the species exhibits a preference for lacustrine over riverine systems, in particular lake habitats where water depths are less than 6 m. There is an indication that Smallmouth bass may have low tolerance for acidic water, although the actual pH threshold value and widespread applicability of this criteria remains unclear (LeBlanc, 2010).

Given the abundant shallow-water habitat within Long Tusket, Little Tusket and Langford Lakes, it is conceivable that these lakes could support Smallmouth bass, although pH may be a limiting factor. With the proximity of established populations (e.g. Sissiboo Grand Lake) and the widespread practice of illegal transfers, there is a moderate to high risk that Smallmouth bass may occur in the study area at some point in the future.

Rick Adams (pers. com.) reported that a commercial fishery for American eel (*Anguilla rostrata*) has occurred at Langford Lake in the past. On July 16, while conducting field surveys at the site, ECA staff met a group of commercial eel fisherman at Langford Lake. The group, consisting of two fishers and two helpers, lived in the Tusket area and principal occupation was in the lobster fishery. The group had been coming to study area for approximately six years, making typically one to two trips per year, depending on catch. The group had approximately 50 eel traps to set, with herring as bait. Traps were reportedly set in Long Tusket, Little Tusket and Langford Lakes, with traps left in the water overnight. On the evening of July 16, the group camped at the southern end of Little Tusket Lake. The largest eel caught within the lakes the previous season reportedly weighed five pounds.

Herptofauna

Methodology

ECA staff recorded opportunistic observations of herptofauna while carrying out other inventories at the site. This included a visual and auditory inventory for frogs, observations of herptofaunal sign such as turtle nesting and egg masses and visual sightings of species. A dedicated nighttime survey for herptofauna was carried out in suitable habitats, for a duration of 3 person-hours. The beaches and exposed gravel areas along Long Tusket, Little Tusket and Langford Lakes within the study area, were examined to record evidence of turtle nesting.

Results

Given the survey methodology employed, the following results are not intended to provide absolute abundance data, but rather an inventory of herptofaunal taxa likely to occur within the study area. The field survey identified a total of 12 herptofauna taxa, comprising 83 individuals, at multiple locations (Figure 8). The most abundant species recorded where Bull frog (*Rana catesbeiana*) (23 individuals), Green frog (*Rana clamitans*) (18 individuals) and American toad (*Bufo americanus*) (16 individuals). One Snapping turtle (*Chelydra serpentine*) was observed crossing the Irving access road outside the study area near Langford Bog. At least eight Snapping turtle nests were documented (three on the south beach of Long Tusket Lake, one on edge of gravel road and four at confluence of Dexter Brook and Caribou River), all of which appeared to have been predated. These locations are shown in Figure 9. A summary of the herptofaunal taxa identified is shown at Table 6.

American Toad (*Bufo americanus*)

Bull frog (*Rana catesbeiana*)

Wood frog (*Rana sylvatica*)

Green frog (*Rana clamitans*)

Painted turtle (*Chrysemys picta picta*)

Snapping turtle (*Chelydra serpentina*)

Redbacked salamander (*Plethodon cinereus*)

Red-spotted newt (*Triturus viridescens*)

Figure 8. Herptofauna documented during the 2013 field surveys.

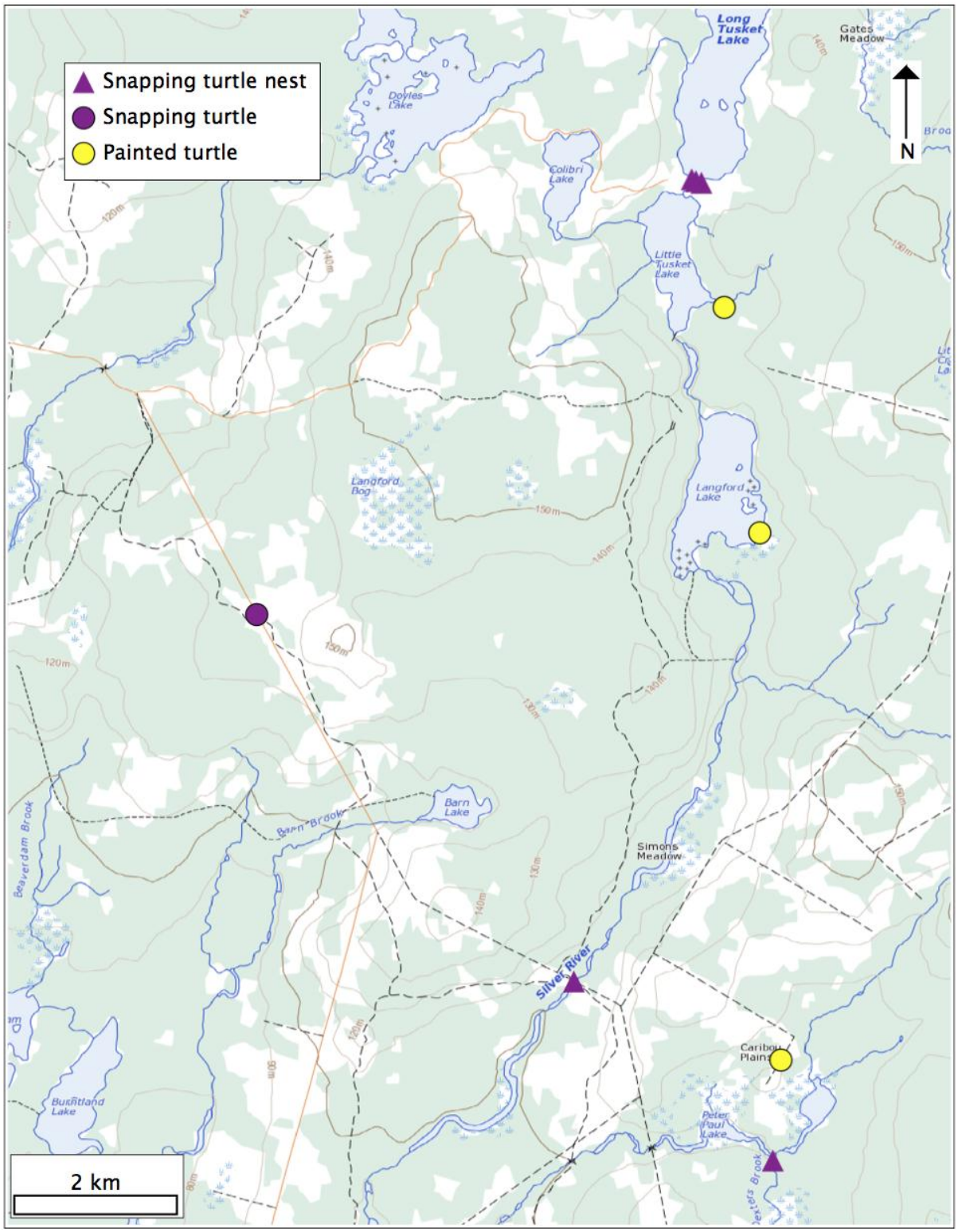


Figure 9. Locations of Snapping turtles (adults and nests) and Painted turtles identified during the July 2013 field surveys.

Table 6. Summary of herptofauna taxa identified

Species	Name	Individuals Observed	Days Observed	Locations Observed	Notes
American Toad	*Bufo americanus*	16	4	8	
Bull Frog	*Rana catesbeiana*	23	4	4	
Green Frog	*Rana clamitans*	18	5	9	
Leopard Frog	*Rana pipiens*	2	1	1	
Pickeral Frog	*Rana palustris*	8	3	5	
Wood Frog	*Rana sylvatica*	2	2	2	
Garter Snake	*Thamnophis sirtalis sirtalis*	3	1	2	
Painted Turtle	*Chrysemys picta picta*	5	2	5	
Snapping Turtle	*Chelydra serpentina*	1	1	1	8 predated nests found
Redbacked Salamander	*Plethodon cinereus*	4	1	2	
Red-spotted Newt	*Triturus viridescens*	1	1	1	
Yellow-spotted Salamander	*Ambystoma maculatum*				spawn located
	Total Individuals	**83**			

Discussion

As was noted above, herptofauna were documented through opportunistic observations during the course of other field surveys. As these surveys focused on specific habitats (riverine and lacustrine settings, riparian wetlands), this may have skewed the diversity and abundance of herptofauna documented. One very small road-side bog (wetland 5 below) was examined and found to contain two frog species and three salamander species. Numerous similar road-side bogs were observed but not investigated. These habitats and other wetlands, such as treed swamps, may harbor significant herptofauna, but were not addressed in this study.

Wetlands

Methodology

ECA staff undertook preliminary assessments of wetlands within the study site, with an emphasis on riparian wetlands encountered during the fisheries assessments. The wetlands were classified using the Canadian Wetlands Classification system (Warner and Rubec, 1997). Where practical, the wetland boundaries were delineated and recorded with a handheld GPS to determine the area; otherwise, the up and downstream points of the wetland were recorded. A preliminary inventory of species within the wetland at the herbaceous, shrub, sapling and tree strata was documented, with the dominant species (qualitatively determined) within each stratum documented. A basic soil profile was conducted to determine the presence and depth of organic or mineral layers. Given the location of the study site, attention was given to identifying the presence of Atlantic Coastal Plain Flora.

Results

A total of nine wetlands were examined through the course of the field survey. Although these wetlands represent the most prominent riparian areas encountered, it is important to note that they represents a small fraction of the total number wetlands encountered and likely to occur within the study area. These results document the types of wetland habitats and species present, with an emphasis on riparian wetlands. The locations of these wetlands are shown on Figure 10 and summarized in Table 7. These wetlands are discussed individually in greater detail on the following pages.

Discussion

In total, nine Atlantic Coastal Plain Flora (ACPF) species were identified, two of which are species of conservation concern: Lakeshore Yellow-eyed grass (*Xyris diformis)* and Beaked spikerush (*Eleocharis rostellata)*, both listed as Sensitive. The greatest density of ACPF species occurred at Wetlands 6 and 8, located on the eastern and southern shore of Long Tusket Lake, respectively. Numerous sites along Long Tusket, Little Tusket and Langford Lakes were observed to have gently grading shorelines with gravel and rock substrate. While a detailed examination of these sites was beyond the scope of this study, these sites may warrant further investigation as they may provide suitable habitat for a range of ACPF species.

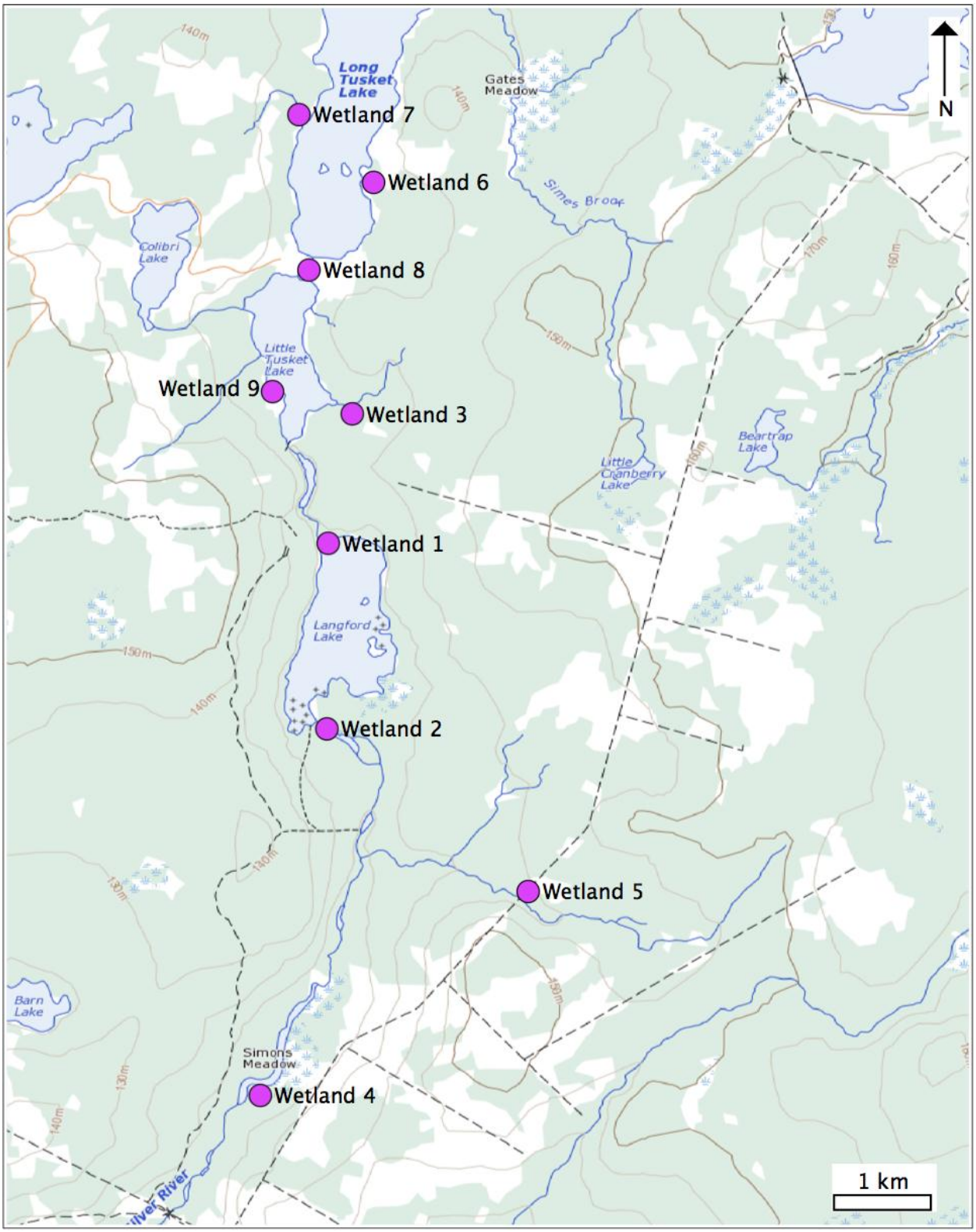


Figure 10. Location of wetlands examined during 2013 field surveys

Table 7. Summary of wetlands examined

Wetland Number	Location	Classification	Atlantic Coastal Plain Flora documented	Species Status
1	Northwest corner of Langford Lake, at Silver River inflow	Lacustrine shore marsh	Bayonet rush (*Juncus militaris)*	Secure
2	South of Langford Lake at Silver River outflow	Riverine swamp (part of larger complex)	Poison ivy (*Toxicodendron radicans)* Virginia Marsh St. John's Wort (*Triadenum virginicum)*	Secure Secure
3	Unnamed tributary inflow from east to Little Tusket Lake	Riverine swamp	None	N/A
4	Stillwater on Silver River at Simons Meadow	Riverine swamp (part of larger complex)	None	N/A
5	Very small roadside bog	Basin bog	None	N/A
6	Maple swamp on eastern shore of Long Tusket Lake	Lacustrine swamp	Button sedge (*Carex bullata)* Virginia Marsh St. John's Wort *(Triadenum virginicum* Eaton's panic grass (*Panicum spretum)* Lakeshore Yellow-eyed grass (*Xyris diformis)* Beaked spikerush (*Eleocharis rostellata)*	Secure Secure Secure Sensitive Sensitive
7	Unnamed tributary inflow from west to Long Tusket Lake	Lacustrine swamp	Virginia Marsh St. John's Wort (*Triadenum virginicum)*	Secure
8	Wetland situated between Long Tusket and Little Tusket Lakes	Lacustrine lagoon marsh	Virginia Marsh St. John's Wort (*Triadenum virginicum)* Lakeshore yellow-eyed grass (*Xyris diformis)* Bayonet rush (*Juncus militaris)* Mild water-pepper (*Polygonum hydropiperoides)* Carolina fragrant goldenrod (*Euthamia caroliniana)*	Secure Sensitive Secure Secure Secure
9	Small wetland at southwest corner of Little Tusket Lake	Lacustrine lagoon marsh	Eaton's panic grass (*Dichanthelium spretum)*	Secure

Wetland Number	1			
Description and Setting	Lakeshore wetland at the north end of Langford Lake, adjacent to the inflow of Silver River.			
Classification	Lacustrine Shore Marsh			
UTM	20T 279523 4910761			
Area	0.37 ha (boundary delineated with GPS)			
Vegetation	Dom*.	ACPF	Species	
Herbs	Yes	Yes	Bayonet rush	*Juncus militaris*
	Yes		American bur-reed	*Sparganium americanum*
			Swamp candle	*Lysimachia terrestris*
			Floating heart	*Nymphoides cordata*
Shrubs			None	
Saplings			None	
Trees			None	
Substrate	Compact gravel, with patches of organic sediments anchored by emergent vegetation.			
Comments	Lakeshore fringe, with water depths of 0.3 to 0.5m.			
Photographs	Recorded July 16, 2013			

View to the east towards inflow of Silver River.

View to the west, along northern beach of Langford Lake.

Notes:
* Dominant species within strata, determined qualitatively
ACPF – Atlantic Coastal Plain Flora

Wetland Number	2			
Description and Setting	Riparian wetland to the south of Langford Lake, at Silver River outflow.			
Classification	Riparian Swamp			
UTM	20T 279445 4909401			
Area	Part of a larger wetland complex at the southern end of Langford Lake, map estimated at over 9ha in size.			
Vegetation	Dom*.	ACPF	Species	
Herbs	Yes		Royal fern	*Osmunda regalis*
			Carex spp (no seed head)	*Carex spp*
	Yes		Swamp dewberry	*Rubus hispidus*
		Yes	Poison ivy	*Toxicodendron radicans*
		Yes	Virginia Marsh St. John's Wort	*Triadenum virginicum*
			Bladder sedge	*Carex intumescens*
Shrubs	Yes		Sweet gale	*Myrica gale*
	Yes		Sheep laurel	*Kalmia angustifolia*
Saplings	Yes		Speckled Alder	*Alnus incana*
Trees	Yes		Red maple	*Acer rubrum*
Substrate	Decomposed organic, to a depth of at least 40cm			
Comments	Sphagnum substrate, adjacent to Silver River			
Photographs	Recorded July 16, 2013			

Silver River at outflow from Langford Lake.

Riparian wetland south of Langford Lake, adjacent to Silver River.

Notes:
* Dominant species within strata, determined qualitatively
ACPF – Atlantic Coastal Plain Flora

Wetland Number	3			
Description and Setting	Unnamed tributary from the east to Little Tusket Lake.			
Classification	Riparian Swamp			
UTM	20T 279678 4911767			
Area	0.39ha (boundary delineated with GPS).			
Vegetation	Dom*.	ACPF	Species	
Herbs	Yes		Fowl managrass	*Glyceria striata*
			Fowl bluegrass	*Poa palustris*
			Swamp dewberry	*Rubus hispidus*
			Swamp candle	*Lysimachia terrestris*
			Marsh St. John's Work	*Triadenum fraseri*
			Wool grass	*Scirpus cyperinus*
			Large cranberry	*Vaccinium macrocarpon*
	Yes		Royal fern	*Osmunda regalis*
Shrubs	Yes		Sweet gale	*Myrica gale*
	Yes		Sheep laurel	*Kalmia angustifolia*
			Common winterberry	*Ilex verticillata*
			Rhodora	*Rhododendron canadense*
	Yes		Leatherleaf	*Chamaedaphne calyculata*
	Yes		Narrow-leaved meadowsweet	*Spiraea alba*
Saplings	Yes		Downy alder	*Alnus viridis*
Trees	Yes		Red maple	*Acer rubrum*
Substrate	Decomposed organic, to a depth of at least 30cm			
Comments	Sphagnum substrate. Wetland occurs in an embayment of the lake.			
Photographs	Recorded July 16, 2013			

View from Little Tusket Lake when unnamed tributary enters the lake from the east.

Dominant ericaceous shrubs at wetland.

Notes:
* Dominant species within strata, determined qualitatively
ACPF – Atlantic Coastal Plain Flora

Wetland Number	4			
Description and Setting	Large wetland complex along Silver River at Simons Meadow.			
Classification	Riparian Swamp			
UTM	20T 279170 4906834			
Area	Part of a larger wetland complex within the floodplain of the Silver River, including the area known as Simons Meadow, map estimated at over 22ha in size.			
Vegetation	Dom*.	ACPF	Species	
Herbs			Bluejoint	*Calamagrostis canadensis*
	Yes		Sedge (no seed head)	*Carex spp*
			Rough-stemmed goldenrod	*Solidago rugosa*
			Flat-topped white aster	*Doellingeria umbellate*
			Dwarf raspberry	*Rubus pubescens*
	Yes		Swamp dewberry	*Rubus hispidus*
			Bog fern	*Thelypteris simulata*
			Marsh St. John's Work	*Triadenum fraseri*
			Bog rosemary	*Andromeda glaucophylla*
			Blue iris	*Iris versicolor*
			Spinulose woodfern	*Dryopteris carthusiana*
			Grasses (no seed)	*Glyceria spp*
	Yes		Royal fern	*Osmunda regalis*
Shrubs	Yes		Sweet gale	*Myrica gale*
	Yes		Sheep laurel	*Kalmia angustifolia*
			Common winterberry	*Ilex verticillata*
			Rhodora	*Rhododendron canadense*
	Yes		Leatherleaf	*Chamaedaphne calyculata*
	Yes		Broad-leaved meadowsweet	*Spiraea latifolia*
Saplings	Yes		Downy alder	*Alnus viridis*
			Serviceberry	*Amelanchier spp*
Trees	Yes		Red maple	*Acer rubrum*
Substrate	Decomposed organic, to a depth of at least 30cm			
Comments	Sphagnum substrate. Wetland occurs in an embayment of the lake.			
Photographs	Recorded July 17, 2013			

	
View to the north along long axis of wetland, with Silver River on the left..	View across Silver River, to similar wetland composition on the western floodplain.
	
Graminoid community within tree swamp.	Mixed graminoid community within treed swamp.

Notes:
* Dominant species within strata, determined qualitatively
ACPF – Atlantic Coastal Plain Flora

Wetland Number	5			
Description and Setting	Very small roadside wetland			
Classification	Basin bog (Note: wetland is believed to be the result of anthropogenic influence (borrow pit for road construction) and as such has not yet developed the peat accumulation typically associated with basin bogs.)			
UTM	20T 280934 4908137			
Area	0.04ha (boundary delineated with GPS).			
Vegetation	Dom*.	ACPF	Species	
Herbs			Round-leaved sundew	*Drosera rotundifolia*
			Rose pogonia	*Pogonia ophioglossoides*
	Yes		Water horsetail	*Equisetum fluviatile*
	Yes		Marsh horsetail	*Equisetum palustre*
			Osmunda sensibilis	*Sensitive Fern*
Shrubs			None	
Saplings			None	
Trees			None	
Substrate	Dense sphagnum substrate with *Lycopodium annotinum*. Very little (<10cm) organic accumulation, with course mineral soil under moss layer			
Comments	Ephemeral wetland formed within a borrow pit for road construction. Yellow-spotted salamander egg mass found within shallow standing water. Red backed salamander and Red-spotted newt found in adjacent forest, approximately 5m from wetland.			
Photographs	Recorded July 9, 2013			

Moist sphagnum substrate within wetland.

P. ophioglossoides and *Equisetum* spp within wetland.

	
Ephemerally ponded area of wetland, where Yellow-spotted salamander eggs were found.	Photo indicates the narrowness of the wetland, with road to the left and upland forest to the right.

Notes:
* Dominant species within strata, determined qualitatively
ACPF – Atlantic Coastal Plain Flora

Wetland Number	6			
Description and Setting	Red maple swamp on eastern shore of Long Tusket Lake, encompassing a number of small embayments.			
Classification	Lacustrine swamp			
UTM	20T 279953 4913265			
Area	3.5 ha, including at three small upland headlands along lakeshore (delineated by handheld GPS).			
Vegetation	Dom*.	ACPF	Species	
Herbs	Yes		Sedge (no seed head)	*Carex spp*
			Swamp candle	*Lysimachia terrestris*
			Swamp dewberry	*Rubus hispidus*
		Yes	Button sedge	*Carex bullata*
		Yes	Virginia Marsh St. John's Wort	*Triadenum virginicum*
			Cinnamon fern	*Osmunda cinnamomea*
			Marsh fern	*Thelypteris palustris*
			Northern St. John wort	*Hypericum boreale*
			Northern panic grass	*Panicum boreale*
		Yes	Eaton's panic grass	*Panicum spretum*
			Grass-leaved goldenrod	Euthamia graminifolia
		Yes	Lakeshore Yellow-eyed grass	*Xyris diformis*
		Yes	Beaked spikerush	*Eleocharis rostellata*
			Round-leaved sundew	*Drosera rotundifolia*
			Water lobelia	*Lobelia dortmanna*
			Royal fern	*Osmunda regalis*
Shrubs			Common winterberry	*Ilex verticillata*
			Rhodora	*Rhododendron canadense*
	Yes		Leatherleaf	*Chamaedaphne calyculata*
	Yes		Narrow-leaved meadowsweet	*Spiraea alba*
Saplings	Yes		Common witch hazel	*Hamamelis virgiania*
Trees	Yes		Red maple	*Acer rubrum*
Substrate	Highly decomposed organic, to a depth of at least 60cm			
Comments	Sphagnum substrate. High plant diversity in small shallow embayments along lakeshore.			
Photographs	Recorded July 29, 2013			

	
Small embayment of Long Tusket Lake and wetland margin	Wetland back from lakeshore, with *Carex* spp in herb stratum and *Acer rubrum* canopy
	
Dense clump of *Drosera rotundifolia* along lakeshore	Highly decomposed organic matter substrate

Notes:
* Dominant species within strata, determined qualitatively
ACPF – Atlantic Coastal Plain Flora

Wetland Number	7			
Description and Setting	Narrow bay off Long Tusket Lake, at the inflow of an unnamed tributary			
Classification	Lacustrine swamp			
UTM	20T 279447 4913895			
Area	0.86 ha			
Vegetation	Dom*.	ACPF	Species	
Herbs			American bur-reed	*Sparganium americanum*
			Swamp candle	*Lysimachia terrestris*
	Yes		Sedge (no seed head)	*Carex spp*
			Pickerel weed	*Pontederia cordata*
		Yes	Virginia Marsh St. John's Work	*Triadenum virginicum*
			Boneset	*Eupatorium perfoliatum*
			Cinnamon fern	*Osmunda cinnamomea*
			New York aster	*Symphyotrichum novi-belgii*
			Lance-leaved American aster	*Symphyotrichum lanceolatum*
			Northern panic grass	*Panicum boreale*
			Royal fern	*Osmunda regalis*
Shrubs			Common winterberry	*Ilex verticillata*
			Sweet gale	*Myrica gale*
	Yes		Leatherleaf	*Chamaedaphne calyculata*
			Steeple bush	*Spiraea tomentosa*
			Wide-leaved meadowsweet	*Spiraea latifolia*
	Yes		Narrow-leaved meadowsweet	*Spiraea alba*
Saplings	Yes		Speckled alder	*Alnus incana*
Trees	Yes		Red maple	*Acer rubrum*
Substrate	Highly decomposed organic, to a depth of at least 1.0 m near the centre.			
Comments	Sphagnum substrate. Inflow stream water temperature 15°C			
Photographs	Recorded July 29, 2013			

View to the east along wetland towards Long Tusket Lake

View to the west along long axis of wetland

Notes:
* Dominant species within strata, determined qualitatively; ACPF – Atlantic Coastal Plain Flora

Wetland Number	8			
Description and Setting	Wetland situated between the southern boundary of Long Tusket Lake and northern edge of Little Tusket Lake. Silver river flows through the centre of the wetland, between the two lakes.			
Classification	Lacustrine lagoon marsh			
UTM	20T 279449 4912851			
Area	4.4 ha (delineated by handheld GPS)			
Vegetation	Dom*.	ACPF	Species	
Herbs		Yes	Mild water-pepper	*Polygonum hydropiperoides*
			Bog aster	*Oclemena nemoralis*
		Yes	Carolina fragrant goldenrod	*Euthamia caroliniana*
			American bur-reed	*Sparganium americanum*
			Cranberry	*Vaccinium macrocarpon*
			Pitcher-plant	*Sarracenia purpurea*
	Yes		Swamp dewberry	*Rubus hispidus*
	Yes		Bluejoint	*Calamagrostis canadensis*
			Pickerel weed	*Pontederia cordata*
			Northern panic grass	*Panicum boreale*
		Yes	Virginia Marsh St. John's Wort	*Triadenum virginicum*
		Yes	Lakeshore yellow-eyed grass	*Xyris diformis*
		Yes	Bayonet rush	*Juncus militaris*
			Club spur orchid	*Platanthera clavellata*
			Tawny cottongrass	*Eriphorum virginicum*
			White beaked sedge	*Rhyncospora alba*
Shrubs	Yes		Common winterberry	*Ilex verticillata*
			Steeple bush	*Spiraea tomentosa*
			Wide-leaved meadowsweet	*Spiraea latifolia*
			Hobblebush	*Viburnum lantanoides*
			Labrador tea	*Ledum groenlandicum*
	Yes		Sweet gale	*Myrica gale*
			Leatherleaf	*Chamaedaphne calyculata*
Saplings			None	
Trees	Yes		Red maple	*Acer rubrum*
Substrate	20 cm of highly decomposed organic material over gravel, thinning to 5 cm or less along northern and southern margins			
Comments	Sphagnum substrate.			
Photographs	Recorded July 29, 2013			

	
View to the south along Silver River where it passes through the wetland	View to the east where Silver River enters Little Tusket Lake
	
View to the north towards Long Tusket Lake across ericaceous shrub wetland	Substrate composed of 13 cm of highly decomposed organics over gravel

Notes:
* Dominant species within strata, determined qualitatively
ACPF – Atlantic Coastal Plain Flora

Wetland Number	9			
Description and Setting	Small wetland on the southwestern edge of Little Tusket Lake, formed behind a low beach shelf			
Classification	Lacustrine lagoon marsh			
UTM	20T 279165 4911829			
Area	0.28 ha (delineated by handheld GPS)			
Vegetation	Dom*.	ACPF	Species	
Herbs			Club spur orchid	*Platanthera clavellata*
			White beak sedge	*Rhyncospora alba*
		Yes	Eaton's panic grass	*Dichanthelium spretum*
	Yes		Cranberry	*Vaccinium macrocarpon*
			Goldthread	*Coptis trifolia*
			Royal fern	*Osmunda regalis*
			Cinnamon fern	*Osmunda cinnamomea*
			Swamp dewberry	*Rubus hispidus*
			Spreading wood fern	*Dryopteris expansa*
			Bog fern	*Thelypteris simulata*
			Blue flag	*Iris versicolor*
Shrubs			Common winterberry	*Ilex verticillata*
			Steeple bush	*Spiraea tomentosa*
	Yes		Mountain holly	*Ilex mucronata*
			Rhodora	*Rhododendron canadense*
	Yes		Sweet gale	*Myrica gale*
Saplings			None	
Trees			White pine	*Pinus strobus*
	Yes		Red maple	*Acer rubrum*
Substrate	13 cm of highly decomposed organic material over gravel. Water at wetland surface, likely tied to lake water level.			
Comments	Sphagnum substrate.			
Photographs	Recorded July 29, 2013			

View to the north and Long Tusket Lake

View across dense shrub cover of wetland

Notes:
* Dominant species within strata, determined qualitatively
ACPF – Atlantic Coastal Plain Flora

Anthropogenic Activities Observed

While outside the project terms of reference, during the course of the field survey ECA staff made a number of observations concerning local resource usage within the study area which may be of interest to NCC as it moves forward with the development of management plans for these properties. These observations should not be viewed as a comprehensive examination for local resource usage patterns, as they were made opportunistically through the course of the field surveys

Vehicle Use on Beaches, Eskers and In Wetlands

ECA visited multiple locations were the recent tracks All Terrain Vehicle (ATV) and four-wheel drive vehicles were evident on beaches, eskers and, to a less extent, in wetlands. The edge of a large esker, located to the east of Little Tusket Lake, was extensively tracked. At this location, two Painted turtles were located during the field survey. The possibility exists that they may have recently nested (Figure 11) in the area. The large beach at the south end of Long Tusket Lake was also extensively tracked; with at least three Snapping Turtle nests located on this beach (Figure 12).

Figure 11: ATV tracks on edge of esker, east of Little Tusket Lake, where two female Painted Turtles were located.

Figure 12: ATV tracks on south beach of Long Tusket Lake, with predated Snapping turtle nest at centre of image.

Camping Sites

As well as the defined camping sites at the former location of New France (Silver City), ECA staff observed multiple tenting sites throughout the Irving properties, clustered around Long Tusket Lake, Little Tusket Lake and Langford Lake. There was evidence of frequent and regular usage at many of these sites. These sites typically had one or more fire rings, an abundance of garbage and some form of pit toilet. In some cases, the makeshift toilets were

within 5m of the lakeshore (Figure 13). A very recently burned area, covering approximately 15m x 15m, was found surrounding a campsite at the south end of Long Tusket Lake (Figure 14). It is suspected that the fire escaped from the campfire or was the result of hot ashes being deposited in an area of dense shrubs.

Figure 13: Makeshift toilet at the edge of Little Tusket Lake.

Figure 14: Very recent groundfire adjacent to a campsite at south end of Long Tusket Lake.

Extractive Resource Use

There is good evidence to suggest that the Irving properties are subject to a range of extractive resource uses, including recreational and commercial fishing, hunting and trapping. Recently used footpaths and ATV trails were observed accessing watercourses, suggesting regular recreational fishing. This is supported by the interviews with Adams and Curry (pers. com.). There is an on-going commercial eel fishery in the three lakes, which is discussed in greater detail above.

During the course of the field surveys, at two locations, ECA staff located blue plastic barrels with a large cutout, affixed to a tree. In each case, the barrels were within 20 to 40m of a tree stand (Figure 15). It is suspected that the barrels were used to contain some form of bait for hunting. The target species is unknown, but could be black bear or deer.

While departing from the property, ECA staff noted a wooden enclosure on the side of the access road, approximately seven kilometers to the east of the Irving properties. Given the unique shape of the enclosure, it is believed the box was built to hold a Conibear trap, possibly for Coyote or Bobcat (Figure 16). The enclosure contained a partial animal carcass (beaver?) suspected to serve as bait. It could not be determined if a trap had recently been placed in the enclosure, or whether the box was in the process of being moved to a new location in anticipation of the next trapping season. As the enclosure was not present on the road earlier in the day, this suggests that trapping is occurring within general area of the Irving properties on an active basis.

Figure 15: Suspected bait barrel for hunting purposes, near EF7 at Caribou River.

Figure 16: Enclose for holding Conibear trap, located on access road to Irving properties.

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Appendix 1 – Electrofishing Catch Data

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Silver River	**Site Description:**	Silver River at Irving Road crossing. Survey included both side channel and main river, above and below road crossings. Abundant deep pool habitat. Mature forest with stable banks. Boulder substrate. Dimensions refer to side channel.
Site:	EF4		
UTM: 20T	0278175 4905841		
Date: dd / mm / yy	10/07/2013	**Water Temp °C:**	17.8
Survey Length (m):	80	**Air Temp °C:**	21
pH:	4.09	**Sp. Cond. µS/cm:**	39.2
DO (mg/L):	8.5	**DO (%):**	90

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual $Dw_{avg.\ (m)}$
Dbf (+m):	#DIV/0!				**A:**	0.4	0.8	0.4	0.533333333
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	3.50	3.5			**C:**				
Dw Avg:	0.53								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J5 500v	2765	3235	1	PY	124	120		
2					PY	83	79		
3					PY	120	115		
4					PY	79	76		
5					PY	100			lost during capture
6									
7									
8									
9									
10									
11									
12									
13									

Effort (sec)	
1st Pass Effort (sec):	470
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	470

Surveyed Area (m^2): length	280
Total Fish / 100m^2: (100 / su	1.8
CPUE 1st Pass (fish/100sec)	0.2
Total CPUE (fish/100sec): to	1.1

Species	**Total No: Caught:**	**Fish / 100m2**	**Total Weight Caught**	**Biomass / 100m^2**
Brook Trout	0	0.0	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	0	0.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	5	1.8	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	0	0.0	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	0	0.0	0	0
Totals :	**5**	**1.8**	**0**	**0**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Silver River	**Site Description:**	Small tributary to Silver River, downstream of EF10 and large stillwater. Mature forest with stable banks. Boulder and cobble substrate. Site accessed off Irving logging road. No fish observed or caught.
Site:	EF5		
UTM: 20T	0280872 4908072		
Date: dd / mm / yy	4/07/2013	**Water Temp °C:**	16.8
Survey Length (m):	70	**Air Temp °C:**	26
pH:	3.82	**Sp. Cond. µS/cm:**	47.1
DO (mg/L):	5.1	**DO (%):**	23

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual Dw avg. (m)
Dbf (+m):	#DIV/0!				**A:**	0.3	0.5	0.3	0.366666667
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	3.00	3			**C:**				
Dw Avg:	0.37								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J5 400v	233	578	1					No fish observed or caught
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

Effort (sec)	
1st Pass Effort (sec):	345
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	345

Surveyed Area (m²): length	210
Total Fish / 100m²: (100 / su	0.0
CPUE 1st Pass (fish/100sec)	0.3
Total CPUE (fish/100sec): to	0.0

Species	Total No: Caught:	Fish / 100m2	Total Weight Caught	Biomass / 100m²
Brook Trout	0	0.0	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	0	0.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	0	0.0	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	0	0.0	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	0	0.0	0	0
Totals :	**0**	**0.0**	**0**	**0**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Caribou River	**Site Description:**	Caribou River. Survey included riffle and pool habitat, with numerous embedded pools. Mature forest with stable banks. Boulder substrate. Large pool within sample reach, 8m x 8m. Site accessed off end of Irving logging road.
Site:	EF7		
UTM: **20T**	0281359 4906401		
Date: dd / mm / yy	10/07/2013	**Water Temp ^{0}C:**	17.5
Survey Length (m):	50	**Air Temp ^{0}C:**	21
pH:	3.86	**Sp. Cond. µS/cm:**	43.7
DO (mg/L):	9.1	**DO (%):**	96

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual Dw$_{avg.\ (m)}$
Dbf (+m):	#DIV/0!				**A:**	0.8	0.8	0.8	0.8
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	4.00	4			**C:**				
Dw Avg:	0.80								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J6 500v	2348	2765	1	AE	150			lost during capture
2					AE	100			lost during capture
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

Effort (sec)	
1st Pass Effort (sec):	417
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	417

Surveyed Area (m^2): length	200
Total Fish / 100m^2: (100 / su	1.0
CPUE 1st Pass (fish/100sec)	0.2
Total CPUE (fish/100sec): to	0.5

Species	**Total No: Caught:**	**Fish / 100m2**	**Total Weight Caught**	**Biomass / 100m^2**
Brook Trout	0	0.0	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	0	0.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	0	0.0	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	0	0.0	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	2	1.0	0	0
Totals :	**2**	**1.0**	**0**	**0**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Long Tusket Lake	**Site Description:**	Western tributary to Long Tusket Lake, upstream from head of lake influence. Mature forest with stable banks. Gravel road crossing 40m upstream. Cobble to boulder substrate. Pool and riffle habitat.
Site:	EF8		
UTM: 20T	0279386 4914053		
Date: dd / mm / yy	09/07/2013	**Water Temp °C:**	14.3
Survey Length (m):	50	**Air Temp °C:**	21
pH:	4.18	**Sp. Cond. µS/cm:**	48.2
DO (mg/L):	6.8	**DO (%):**	67

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual $Dw_{avg.\ (m)}$
Dbf (+m):	#DIV/0!				**A:**	0.3	0.3	0.3	0.3
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	2.00	2			**C:**				
Dw Avg:	0.30								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J5 500v	778	1362	1	NS	52			
2					BT	110	105		
3					BT	120	115		
4					BT	133	127		
5					BT	135	130		
6					BT	67	65		
7					BT	102	97		
8					BT	65	62		
9					BT	95	90		
10					BT	125	120		
11					BT	110	105		
12									
13									

Effort (sec)	
1st Pass Effort (sec):	584
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	584

Surveyed Area (m^2): length	100
Total Fish / 100m^2: (100 / su	11.0
CPUE 1st Pass (fish/100sec)	0.2
Total CPUE (fish/100sec): tot	1.9

Species	Total No: Caught:	Fish / 100m2	Total Weight Caught	Biomass / 100m^2
Brook Trout	10	10.0	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	1	1.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	0	0.0	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	0	0.0	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	0	0.0	0	0
Totals :	**11**	**11.0**	**0**	**0**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Long Tusket Lake	**Site Description:**	Outflow stream from Colibri Lake into Little Tusket Lake. Survey also included lake shallows (10m). Mature forest with stable banks. Cobble to boulder substrate. Pool and riffle habitat with abundant course woody debris.
Site:	EF9		
UTM: 20T	0278961 4912508		
Date: dd / mm / yy	09/07/2013	**Water Temp °C:**	22.2
Survey Length (m):	60	**Air Temp °C:**	21
pH:	4.7	**Sp. Cond. µS/cm:**	32.6
DO (mg/L):	7.3	**DO (%):**	85

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual Dw avg. (m)
Dbf (+m):	#DIV/0!				**A:**	0.3	0.4	0.3	0.333333333
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	1.80	1.8			**C:**				
Dw Avg:	0.33								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J5 600v	1362	1999	1	BK	82			
2					BT	100	95		
3					BT	53	50		
4					BT	47	45		
5					BK	78			
6					BK	60			
7					BT	125	120		
8					BK	80			
9					BT	105	100		
10					PY	54			
11					PY	38			
12					AE	20			
13					AE	35			

Effort (sec)	
1st Pass Effort (sec):	637
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	637

Surveyed Area (m^2): length	108
Total Fish / 100m^2: (100 / su	12.0
CPUE 1st Pass (fish/100sec)	0.2
Total CPUE (fish/100sec): to	2.0

Species	Total No: Caught:	Fish / 100m2	Total Weight Caught	Biomass / 100m^2
Brook Trout	5	4.6	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	0	0.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	2	1.9	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	4	3.7	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	2	1.9	0	0
Totals :	**13**	**12.0**	**0**	**0**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Silver River	**Site Description:**	Small tributary to Silver River at head of wetland. Mature forest with stable banks. Boulder and organic muck substrate. Site accessed off end of Irving logging road. No fish observed or caught. Few benthic inverts observed.
Site:	EF10		
UTM: 20T	0282347 4907777		
Date: dd / mm / yy	4/07/2013	**Water Temp °C:**	14.4
Survey Length (m):	25	**Air Temp °C:**	26
pH:	4.08	**Sp. Cond. µS/cm:**	42
DO (mg/L):	7.1	**DO (%):**	72

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual $Dw_{avg.\ (m)}$
Dbf (+m):	#DIV/0!				**A:**	0.8	0.8	0.8	0.8
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	2.00	2			**C:**				
Dw Avg:	0.80								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J4 300	0	205	1					No fish observed or caught
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

Effort (sec)	
1st Pass Effort (sec):	205
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	205

Surveyed Area (m^2): length	50
Total Fish / 100m^2: (100 / su	0.0
CPUE 1st Pass (fish/100sec)	0.5
Total CPUE (fish/100sec): to	0.0

Species	Total No: Caught:	Fish / 100m2	Total Weight Caught	Biomass / 100m^2
Brook Trout	0	0.0	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	0	0.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	0	0.0	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	0	0.0	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	0	0.0	0	0
Totals :	**0**	**0.0**	**0**	**0**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Little Tusket Lake	**Site Description:**	Eastern Tributary to Little Tusket Lake, draining to the north of esker. Mature forest and stable banks. Boulder and cobble substrate. Sample reach upstream from bridge. No fish caught or observed.
Site:	EF11		
UTM: 20T	0279830 4911754		
Date: dd / mm / yy	04/07/2013	**Water Temp ^{0}C:**	15.8
Survey Length (m):	50	**Air Temp ^{0}C:**	26
pH:	3.91	**Sp. Cond. µS/cm:**	49.4
DO (mg/L):	6.4	**DO (%):**	65

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual Dw$_{avg.\ (m)}$
Dbf (+m):	#DIV/0!				**A:**	0.7	0.8	0.7	0.733333333
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	2.00	2			**C:**				
Dw Avg:	0.73								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J5 400v	578	778	1					No fish caught or observed.
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

Effort (sec)	
1st Pass Effort (sec):	200
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	200

Surveyed Area (m^2): length	100
Total Fish / 100m^2: (100 / su	0.0
CPUE 1st Pass (fish/100sec)	0.5
Total CPUE (fish/100sec): to	0.0

Species	Total No: Caught:	Fish / 100m2	Total Weight Caught	Biomass / 100m^2
Brook Trout	0	0.0	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	0	0.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	0	0.0	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	0	0.0	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	0	0.0	0	0
Totals :	**0**	**0.0**	**0**	**0**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Little Tusket Lake	**Site Description:**	Western Tributary to Little Tusket Lake. Excellent habitat with mature forest, stable banks and abundant large woody debris. Boulder and cobble substrate. Site accessed from Little Tusket Lake. No fish caught or observed.
Site:	EF12		
UTM: 20T	0279073 4912148		
Date: dd / mm / yy	10/07/2013	**Water Temp °C:**	15.9
Survey Length (m):	50	**Air Temp °C:**	21
pH:	3.9	**Sp. Cond. µS/cm:**	48.3
DO (mg/L):	8.1	**DO (%):**	82

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual Dw avg. (m)
Dbf (+m):	#DIV/0!				**A:**	0.3	0.6	0.4	0.433333333
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	3.00	3			**C:**				
Dw Avg:	0.43								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J6 500v	1999	2348	1					No fish caught or observed.
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

Effort (sec)	
1st Pass Effort (sec):	349
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	349

Surveyed Area (m²): length	150
Total Fish / 100m²: (100 / su	0.0
CPUE 1st Pass (fish/100sec)	0.3
Total CPUE (fish/100sec): to	0.0

Species	Total No: Caught:	Fish / 100m2	Total Weight Caught	Biomass / 100m²
Brook Trout	0	0.0	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	0	0.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	0	0.0	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	0	0.0	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	0	0.0	0	0
Totals :	**0**	**0.0**	**0**	**0**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Langford Lake	**Site Description:**	Small tributary to the northeast beach of Langford Lake. Substrate gravel and sand. Surveyed reach included portion of lakeshore shallows.
Site:	EF13		
UTM: 20T	279856 4910767		
Date: dd / mm / yy	16/7/2013	**Water Temp ^{0}C:**	16.8
Survey Length (m):	30	**Air Temp ^{0}C:**	29
pH:	4.15	**Sp. Cond. µS/cm:**	46.4
DO (mg/L):	1.7	**DO (%):**	18

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual Dw avg. (m)
Dbf (+m):	#DIV/0!				**A:**				
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	#DIV/0!				**C:**				
Dw Avg:	#DIV/0!								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J5 600v	3293	3445	1	BT	55	53		
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

Effort (sec)	
1st Pass Effort (sec):	152
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	152
Surveyed Area (m^2): length	#DIV/0!
Total Fish / 100m^2: (100 / su	#DIV/0!
CPUE 1st Pass (fish/100sec)	0.7
Total CPUE (fish/100sec): tot	0.7

Species	Total No: Caught:	Fish / 100m2	Total Weight Caught	Biomass / 100m^2
Brook Trout	1	#DIV/0!	0	#DIV/0!
Rainbow Trout	0	#DIV/0!	0	#DIV/0!
Brown Trout	0	#DIV/0!	0	#DIV/0!
Nine Spine Stickeback	0	#DIV/0!	0	#DIV/0!
Creek Chub	0	#DIV/0!	0	#DIV/0!
Yellow Perch	0	#DIV/0!	0	#DIV/0!
Smallmouth Bass	0	#DIV/0!	0	#DIV/0!
Banded Killifish	0	#DIV/0!	0	#DIV/0!
Brown Bullhead	0	#DIV/0!	0	#DIV/0!
White Sucker	0	#DIV/0!	0	#DIV/0!
Eel	0	#DIV/0!	0	#DIV/0!
Totals :	**1**	**#DIV/0!**	**0**	**#DIV/0!**

Electroseine Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project:	NCC Digby Co. Irving Property		
Watershed:	Langford Lake	**Site Description:**	Small southeast tributary to Langford Lake, arising from a wetland. Substrate gravel and sand.
Site:	EF14		
UTM: 20T	280003 4909755		
Date: dd / mm / yy	16/7/2013	**Water Temp °C:**	16.3
Survey Length (m):	30	**Air Temp °C:**	29
pH:	4.09	**Sp. Cond. µS/cm:**	48.4
DO (mg/L):	1	**DO (%):**	12

	Avg.'s	A:	B:	C:	Dw (m):	1/4	1/2	3/4	Individual $Dw_{avg.\ (m)}$
Dbf (+m):	#DIV/0!				**A:**	0.4	0.4	0.4	0.4
Wbf (m):	#DIV/0!				**B:**				
Ww (m):	1.00	1	1	1	**C:**				
Dw Avg:	0.40								
Dbf (m):	#DIV/0!								

	Electroseine setting	Start Time	End Time	Pass	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Comments
1	J4 600v	3445	3563	1					No fish observed or caught
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

Effort (sec)	
1st Pass Effort (sec):	118
2nd Pass Effort (sec):	0
3rd Pass Effort (sec):	0
4th Pass Effort (sec):	0
Total Effort (sec):	118

Surveyed Area (m^2): length	30
Total Fish / 100m^2: (100 / su	0.0
CPUE 1st Pass (fish/100sec)	0.8
Total CPUE (fish/100sec): to	0.0

Species	Total No: Caught:	Fish / 100m2	Total Weight Caught	Biomass / 100m^2
Brook Trout	0	0.0	0	0
Rainbow Trout	0	0.0	0	0
Brown Trout	0	0.0	0	0
Nine Spine Stickeback	0	0.0	0	0
Creek Chub	0	0.0	0	0
Yellow Perch	0	0.0	0	0
Smallmouth Bass	0	0.0	0	0
Banded Killifish	0	0.0	0	0
Brown Bullhead	0	0.0	0	0
White Sucker	0	0.0	0	0
Eel	0	0.0	0	0
Totals :	**0**	**0.0**	**0**	**0**

Appendix 2 – Minnow Trapping Catch Data

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Little Tusket Lake
Site: MT1
UTM: 20T 279678 4911767
Placement Date: 9/7/2013
Placement Time: 18:00
Placement Duration (hr): 17
Wetted Width (m): 4
Bait used: sardines in soya oil

Site Description: Trap placed where a small tributary enters Little Tusket Lake from the east. Trap placed immediately upstream of a small beaver dam. Organic muck substrate.
Retrieval Date: 10/7/2013
Retrieval Time: 11:00
Water Temp. °C: 16
Wetted Depth (m): 0.8

	Species	Total Length (mm)	Fork Length (mm)	Comments		Species	Total No. Caught	Comments
1				No fish caught		Brook Trout	0	
2						Rainbow Trout	0	
3						Golden Shiner	0	
4						Nine Spine Stickeback	0	
5						Creek Chub	0	
6						Yellow Perch	0	
7						Smallmouth Bass	0	
8						Banded Killifish	0	
9						Brown Bullhead	0	
10						White Sucker	0	
11						Eel	0	
12						**Totals :**	**0**	No fish caught
13								
14								
15								

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property

Watershed: Silver River

Site: MT2

UTM: 20T 279675 4908573

Placement Date: 16/7/2013

Placement Time: 12:00

Placement Duration (hr): 22.3

Wetted Width (m): 4

Bait used: sardines in canola oil with hotdogs

Site Description: Trap placed along main Silver River, near head of stillwater, upstream of Simon's Meadow.

Retrieval Date: 17/7/2013

Retrieval Time: 10:20

Water Temp. °C: 24

Wetted Depth (m): 0.8

	Species	Total Length (mm)	Fork Length (mm)	Comments
1				No fish caught
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Species	Total No. Caught	Comments
Brook Trout	0	
Rainbow Trout	0	
Golden Shiner	0	
Nine Spine Stickeback	0	
Creek Chub	0	
Yellow Perch	0	
Smallmouth Bass	0	
Banded Killifish	0	
Brown Bullhead	0	
White Sucker	0	
Eel	0	
Totals :	**0**	No fish caught, one tadpole

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Silver River
Site: MT3
UTM: 20T 278641 4906568
Placement Date: 9/7/2013
Placement Time: 13:00
Placement Duration (hr): 28
Wetted Width (m): 8
Bait used: sardines in soya oil

Site Description: Trap placed at edge of pool on main Silver River, at downstream end of Simon's Meadow wetland. Riffle and glide habitat up and downstream.
Retrieval Date: 10/7/2013
Retrieval Time: 17:00
Water Temp. °C: 18
Wetted Depth (m): 0.7

	Species	Total Length (mm)	Fork Length (mm)	Comments	
1				No fish caught	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Species	Total No. Caught	Comments
Brook Trout	0	
Rainbow Trout	0	
Golden Shiner	0	
Nine Spine Stickeback	0	
Creek Chub	0	
Yellow Perch	0	
Smallmouth Bass	0	
Banded Killifish	0	
Brown Bullhead	0	
White Sucker	0	
Eel	0	
Totals :	**0**	No fish caught

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Caribou River
Site: MT5
UTM: 20T 281390 4906460
Placement Date: 9/7/2013
Placement Time: 10:30
Placement Duration (hr): 29
Wetted Width (m): 4
Bait used: sardines in soya oil

Site Description: Trap placed at edge of 8m x 8m pool along Caribou River, with riffle and rapid habitat up and downstream. Site accessed off end of Irving logging road.
Retrieval Date: 10/7/2013
Retrieval Time: 15:30
Water Temp. °C: 21
Wetted Depth (m): 0.4

	Species	Total Length (mm)	Fork Length (mm)	Comments		Species	Total No. Caught	Comments
1				No fish caught		Brook Trout	0	
2						Rainbow Trout	0	
3						Golden Shiner	0	
4						Nine Spine Stickeback	0	
5						Creek Chub	0	
6						Yellow Perch	0	
7						Smallmouth Bass	0	
8						Banded Killifish	0	
9						Brown Bullhead	0	
10						White Sucker	0	
11						Eel	0	
12						**Totals :**	**0**	No fish caught
13								
14								
15								

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Silver River
Site: MT6
UTM: 20T 280925 4908004
Placement Date: 9/7/2013
Placement Time: 11:20
Placement Duration (hr): 29
Wetted Width (m): 10
Bait used: sardines in soya oil

Site Description: Trap placed at the downstream of stillwater on the eastern tributary to the Silver River. Site accessed off Irving logging road.
Retrieval Date: 10/7/2013
Retrieval Time: 16:30
Water Temp. °C: 18
Wetted Depth (m): 0.9

	Species	Total Length (mm)	Fork Length (mm)	Comments		Species	Total No. Caught	Comments
1				No fish caught		Brook Trout	0	
2						Rainbow Trout	0	
3						Golden Shiner	0	
4						Nine Spine Stickeback	0	
5						Creek Chub	0	
6						Yellow Perch	0	
7						Smallmouth Bass	0	
8						Banded Killifish	0	
9						Brown Bullhead	0	
10						White Sucker	0	
11						Eel	0	
12						**Totals :**	**0**	One bullfrog tadpole caught
13								
14								
15								

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Long Tusket Lake
Site: MT7
UTM: 20T 279447 4913895
Placement Date: 9/7/2013
Placement Time: 15:00
Placement Duration (hr): 22.7
Wetted Width (m): 2
Bait used: sardines in soya oil

Site Description: Trap placed where the small western tributary enters the lake. Lacustrine wetland setting, with graminoid herbaceaus vegetation along the defined stream channel.
Retrieval Date: 10/7/2013
Retrieval Time: 13:20
Water Temp. °C: 16
Wetted Depth (m): 0.8

	Species	Total Length (mm)	Fork Length (mm)	Comments		Species	Total No. Caught	Comments
1				No fish caught		Brook Trout	0	
2						Rainbow Trout	0	
3						Golden Shiner	0	
4						Nine Spine Stickeback	0	
5						Creek Chub	0	
6						Yellow Perch	0	
7						Smallmouth Bass	0	
8						Banded Killifish	0	
9						Brown Bullhead	0	
10						White Sucker	0	
11						Eel	0	
12						**Totals :**	**0**	No fish caught
13								
14								
15								

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property

Watershed: Little Tusket Lake

Site: MT8

UTM: 20T 279385 4912704

Placement Date: 9/7/2013

Placement Time: 16:45

Placement Duration (hr): 19

Wetted Width (m): 4

Bait used: sardines in soya oil

Site Description: Trap placed in the outflow from Long Tusket Lake enters Little Tusket Lake. Gravel substrate with riffle and glide habitat.

Retrieval Date: 10/7/2013

Retrieval Time: 11:45

Water Temp. °C: 24

Wetted Depth (m): 1

	Species	Total Length (mm)	Fork Length (mm)	Comments		Species	Total No. Caught	Comments
1				No fish caught		Brook Trout	0	
2						Rainbow Trout	0	
3						Golden Shiner	0	
4						Nine Spine Stickeback	0	
5						Creek Chub	0	
6						Yellow Perch	0	
7						Smallmouth Bass	0	
8						Banded Killifish	0	
9						Brown Bullhead	0	
10						White Sucker	0	
11						Eel	0	
12						**Totals :**	**0**	No fish caught
13								
14								
15								

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Little Tusket Lake
Site: MT9
UTM: 20T 278961 4912508
Placement Date: 9/7/2013
Placement Time: 16:00
Placement Duration (hr): 16.75
Wetted Width (m): N/A - lake edge
Bait used: sardines in soya oil

Site Description: Edge of Little Tusket Lake where stream from Colibri Lake enters. Gravel substrate with emergent aquatic vegetation.
Retrieval Date: 10/7/2013
Retrieval Time: 8:45
Water Temp. °C: 16
Wetted Depth (m): 0.4

	Species	Total Length (mm)	Fork Length (mm)	Comments		Species	Total No. Caught	Comments
1	PY	84	82			Brook Trout	0	
2	PY	76	74			Rainbow Trout	0	
3	GS	115	105			Golden Shiner	11	
4	GS	110	100			Nine Spine Stickeback	0	
5	PY	28	18			Creek Chub	0	
6	GS	120	110			Yellow Perch	4	
7	GS	110	102			Smallmouth Bass	0	
8	GS	112	105			Banded Killifish	0	
9	GS	90	84			Brown Bullhead	0	
10	PY	75	72			White Sucker	0	
11	GS	91	85			Eel	0	
12	GS	82	76			**Totals :**	**15**	
13	GS	100	95					
14	GS	102	95					
15	GS	102	95					

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Silver River
Site: MT10
UTM: 20T 278105 4905770
Placement Date: 16/7/2013
Placement Time: 11:30
Placement Duration (hr): 25.5
Wetted Width (m): 5
Bait used: sardines in canola oil & hot dogs

Site Description: Trap placed along main Silver River at head of stillwater, approximately 200m south of main Irving Road bridge.
Retrieval Date: 17/7/2013
Retrieval Time: 13:00
Water Temp. °C: 24
Wetted Depth (m): 0.8

	Species	Total Length (mm)	Fork Length (mm)	Comments
1	PY	75	71	
2	PY	75	72	
3	PY	76	73	
4	PY	79	75	
5	Py	83	79	
6	PY	72	68	
7	PY	80	72	
8	PY	74	70	
9	PY	79	74	
10				
11				
12				
13				
14				
15				

Species	Total No. Caught	Comments
Brook Trout	0	
Rainbow Trout	0	
Golden Shiner	0	
Nine Spine Stickeback	0	
Creek Chub	0	
Yellow Perch	9	
Smallmouth Bass	0	
Banded Killifish	0	
Brown Bullhead	0	
White Sucker	0	
Eel	0	
Totals :	**9**	

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Langford Lake
Site: MT11
UTM: 20T 279853 4910752
Placement Date: 16/7/2013
Placement Time: 14:00
Placement Duration (hr): 18
Wetted Width (m): N/A lake shore
Bait used: sardines in canola oil

Site Description: Trap placed at the eastern end Langford Lake, north beach. Substrate consisted of sand and gravel with patches of emergent aquatic vegetation. Many small fish observed.

Retrieval Date: 17/7/2013
Retrieval Time: 8:00
Water Temp. °C: 26
Wetted Depth (m): 0.7

	Species	Total Length (mm)	Fork Length (mm)	Comments	
1	PY	45	43		
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Species	Total No. Caught	Comments
Brook Trout	0	
Rainbow Trout	0	
Golden Shiner	0	
Nine Spine Stickeback	0	
Creek Chub	0	
Yellow Perch	1	
Smallmouth Bass	0	
Banded Killifish	0	
Brown Bullhead	0	
White Sucker	0	
Eel	0	
Totals :	**1**	

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Langford Lake
Site: MT12
UTM: 20T 279991 4909756
Placement Date: 16/7/2013
Placement Time: 15:00
Placement Duration (hr): 17.5
Wetted Width (m): N/A - lake shore
Bait used: sardines in canola oil

Site Description: Trap placed where a small tributary enters Langford Lake from the southeast. Gravel substrate.
Retrieval Date: 17/7/2013
Retrieval Time: 8:30
Water Temp. °C: 26
Wetted Depth (m): 0.8

	Species	Total Length (mm)	Fork Length (mm)	Comments		Species	Total No. Caught	Comments
1	PY	85	80			Brook Trout	0	
2						Rainbow Trout	0	
3						Golden Shiner	0	
4						Nine Spine Stickeback	0	
5						Creek Chub	0	
6						Yellow Perch	1	
7						Smallmouth Bass	0	
8						Banded Killifish	0	
9						Brown Bullhead	0	
10						White Sucker	0	
11						Eel	0	
12						**Totals :**	**1**	
13								
14								
15								

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Langford Lake
Site: MT13
UTM: 20T 279770 4910784
Placement Date: 16/7/2013
Placement Time: 17:00
Placement Duration (hr): 15
Wetted Width (m): N/A - lake shore
Bait used: sardines in canola oil

Site Description: Trap placed where a small tributary enters Langford Lake from the southeast. Gravel substrate.
Retrieval Date: 17/7/2013
Retrieval Time: 8:00
Water Temp. °C: 24.5
Wetted Depth (m): 1

	Species	Total Length (mm)	Fork Length (mm)	Comments		Species	Total No. Caught	Comments
1				No fish caught		Brook Trout	0	
2						Rainbow Trout	0	
3						Golden Shiner	0	
4						Nine Spine Stickeback	0	
5						Creek Chub	0	
6						Yellow Perch	0	
7						Smallmouth Bass	0	
8						Banded Killifish	0	
9						Brown Bullhead	0	
10						White Sucker	0	
11						Eel	0	
12						**Totals :**	**0**	No fish caught
13								
14								
15								

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Silver River
Site: MT14
UTM: 20T 279464 4910934
Placement Date: 16/7/2013
Placement Time: 13:00
Placement Duration (hr): 20.5
Wetted Width (m): 5
Bait used: sardines in canola oil and hotdogs

Site Description: Trap placed at bridge crossing of Silver River near New France site, upstream of Langford Lake. Gravel substrate
Retrieval Date: 17/7/2013
Retrieval Time: 9:30
Water Temp. °C: 26
Wetted Depth (m): 1

	Species	Total Length (mm)	Fork Length (mm)	Comments
1	PY	83	80	
2	PY	103	98	
3	PY	93	90	
4	PY	78	75	
5	PY	85	82	
6	PY	80	76	
7	PY	89	85	
8	PY	95	91	
9	PY	84	80	
10	PY	96	93	
11	PY	72	69	
12	PY	85	81	
13	PY	104	100	
14	PY	63	60	no head-eel predation?
15	PY	83	80	
16	PY	100	95	
17	PY	84	80	
18	PY	88	84	
19	PY	71	68	
20	PY	106	102	
21	AE	33		

Species	Total No. Caught	Comments
Brook Trout	0	
Rainbow Trout	0	
Golden Shiner	0	
Nine Spine Stickeback	0	
Creek Chub	0	
Yellow Perch	20	
Smallmouth Bass	0	
Banded Killifish	0	
Brown Bullhead	0	
White Sucker	0	
Eel	1	
Totals :	**21**	

Minnow Trap Survey Data Form

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Project: NCC Digby Co. Irving Property
Watershed: Caribou River
Site: MT15
UTM: 20T 279890 4904234
Placement Date: 16/7/2013
Placement Time: 10:00
Placement Duration (hr): 25
Wetted Width (m): N/A - lake influence
Bait used: sardines in canola oil & hotdogs

Site Description: Trap placed where Caribou River enters Peter Paul Lake, adjacent to inflow of Dexters Brook. Organic muck substrate.
Retrieval Date: 17/7/2013
Retrieval Time: 11:00
Water Temp. °C: 22
Wetted Depth (m): 1.2

	Species	Total Length (mm)	Fork Length (mm)	Comments
1	NS	52		
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Species	Total No. Caught	Comments
Brook Trout	0	
Rainbow Trout	0	
Golden Shiner	0	
Nine Spine Stickeback	1	
Creek Chub	0	
Yellow Perch	0	
Smallmouth Bass	0	
Banded Killifish	0	
Brown Bullhead	0	
White Sucker	0	
Eel	0	
Totals :	**1**	

Appendix 3 – Directed Angling Catch Data

Directed Angling Survey Data Form **Project:** NCC Digby Co. Irving Property

East Coast Aquatics

P.O. Box 129 Bridgetown, NS B0S 1C0
(902)665-4682

Date	Station	Watercourse	Gear Used	Start Time	End Time	No. of Fishers	Effort (hr)	Fish caught	Catch per Unit Effort	Comments
4/7/2013	EF4	Silver	Spin x 2, Fly	10:00:00	10:40:00	3	2:00:00	0		one bite
4/7/2013	MT3	Silver	Spin x 3	15:40:00	15:50:00	3	0:30:00	0		one bite
4/7/2013	MT14a	Silver	Spin x 3	16:30:00	16:50:00	3	1:00:00	1		
4/7/2013	EF11	Silver	Spin x 3	17:00:00	17:15:00	3	0:45:00	0		Yellow perch
9/7/2013	MT5	Caribou	Spin x 2	10:30:00	10:45:00	2	0:30:00	0		
9/7/2013	MT6	Caribou	Spin x 1	11:45:00	11:55:00	1	0:10:00	0		
9/7/2013	Little Tusket Lake		Troll x 2	18:40:00	19:00:00	2	0:40:00	0		
10/7/2013	Little Tusket Lake		Troll x 2	10:40:00	11:00:00	2	0:40:00	0		
10/7/2013	Long Tusket Lake		Troll x 2	13:20:00	14:00:00	2	1:20:00	0		
16/7/2013	MT5	Caribou	Fly x 1	10:00:00	10:15:00	1	0:15:00			
17/7/2013	Langford Lake		Spin x 2	07:30:00	07:50:00	2	0:40:00			
							0:00:00			
							0:00:00			
							0:00:00			
						Total Effort	**8:30:00**			