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Appendix E VEC Aquatic Environment

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1.0 RATIONALE FOR THE VALUED ENVIRONMENTAL COMPONENT (VEC)

The Northwest Miramichi River is a central feature within the Project Area. Oxford Brook, a tributary to the Northwest Miramichi River, is also situated within the Project Area. Project related activities (*i.e.*, riverbank disturbance, in-water work) will interact with physical and ecological components of these waterbodies.

In order to assess any influence of the Project on the aquatic environment, five components have been identified for the VEC:

- *Surface Water Quality* - describes the chemical characteristics of a waterbody. Surface water quality can be impacted by concentrations of various natural and anthropogenic sourced contaminants including naturally occurring mineral deposits in the banks or bed of the waterbody or accidental release of pollutants;
- *Fish Habitat* - Fisheries and Oceans Canada (DFO) defines fish habitat as the spawning grounds and any other areas including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life process;
- *Fish Survey* - work that investigates the known and potential presence of fish species to frequent the Project Area during any life stage (*i.e.*, eggs, sperm, spawn, larvae, spat and juvenile, adult, and spawning);
- *Fish Species at Risk and Fish Species of Conservation Concern* - for purposes of this assessment, Fish Species at Risk (SAR) are any fish species that have protective status under Schedule 1 of the federal *Species at Risk Act* (SARA), or the provincial *New Brunswick Species at Risk Act* (NBSAR); and
- *Commercial, Recreational and Aboriginal (CRA) Fisheries* - as defined under the *Fisheries Act* and the functions of these fisheries that may be impacted by the Project activities.

2.0 BOUNDARIES FOR THE ENVIRONMENTAL EFFECTS ASSESSMENT

2.1 Spatial Boundaries

The assessment of the aquatic environment has been completed for three spatial boundaries:

- The Project Area is defined as footprint of ground disturbance required for the Project activities (PIDs 40381345, 40381337, 40437121, 40445330, 40495780, 40164808, portion of 40163826, portion of 40143083, portion of 40336240, and portion of 40437139). The Project Area also encompasses the area of disturbance within the Miramichi River (*i.e.*, streambed, water column and water surface) that will be impacted by the construction of the new bridge and the demolition and removal of the null bridge structure) (Figure E-1);
- The Assessment Area encompasses a 5 kilometre (km) radius of the Project Area where aquatic fauna SAR and Species of Conservation Concern (SOCC) have been recorded; and
- The local CRA Fisheries Assessment Area encompasses a 2 km radius of the Project Area and extends an additional 3 km (5 km total) upstream of the Project Area within the Northwest Miramichi River. This distance was determined appropriate by DFO to predict and assess any impact to local CRA fisheries (Ms. Sandra Comeau, personal communication, March 21, 2018).

2.2 Temporal Boundaries

The assessment of the aquatic environment has been completed for the following temporal boundaries:

- The construction phase of the Project; and
- The operational and maintenance phase of the Project.



Legend

- "WS" WATER SAMPLE
- APPROXIMATE VIDEO MONITORING POINT
- PROJECT AREA

Key Map

1:150000

Note
 1. THIS DRAWING IS A SCHEMATIC REPRESENTATION. SIZES, LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

Drawn By	CHG	Checked By	JH
Calculations By	---	Checked By	---

Date
 JUNE 2018

Project
 EIA - NORTHWEST MIRAMICHI RIVER
 NO.1 ANDERSON BRIDGE REPLACEMENT

Drawing
 AQUATIC ENVIRONMENT
 SPATIAL BOUNDARIES, WATER SAMPLE
 LOCATIONS AND UNDERWATER
 PHOTOGRAPHY LOCATIONS

Scale
 1:7500

File No.	Drawing	Revision No.
69214403	FIGURE E-1	0



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3.0 METHODOLOGY

There are two New Brunswick Hydrological Network (NBHN) mapped watercourses present within the Project Area; the Northwest Miramichi River and Oxford Brook. Both watercourses contain a year-round flow of surface water and both are tidally influenced, resulting in diurnal fluctuations in water depth and water chemistry. Both watercourses are considered estuarine. No unmapped watercourses are present within the Project Area.

A two-pronged approach was used to determine the existing aquatic conditions and any potential interaction with the Project, including:

- A desktop study of all existing information for fish SAR, SOCC and CRA fisheries; and
- Field investigations that were completed to determine the existing surface water quality and physical waterbody characteristics. A fish survey was also completed to investigate fish presence in the waterbodies.

With respect to the Environmental Impact Assessment (EIA) process, interactions or effects of the Project on the aquatic environment have been identified and are discussed. Where residual effects are anticipated, the proposed mitigation methods for mitigating the potential effects have been presented.

3.1 Surface Water Quality

Surface water grab samples were collected from both waterbodies on September 29, 2017. The water sample from Oxford Brook (WS1) was collected at approximately 12:20 and the water sample from the Northwest Miramichi River (WS2) was collected at approximately 13:30. The sampling locations are presented on Figure E-1. High tide in Newcastle, New Brunswick was 1.2 metres at 00:19 and 0.7 metres at 13:55 and low tides were 0.2 metres at 08:34 and 0.3 metres at 18:40 on September 29, 2017 (DFO, 2017).

Grab water samples were collected from flowing water reachable from the bank of the channel at WS1 and from a boat at WS2. The water sample at WS2 was collected from the surface strata of the water column. Laboratory supplied bottles were used for sample collection. All samples were collected while facing upstream to ensure that any potential contaminants on the sampling personnel or equipment did not flow into the sample container, and care was taken to ensure the inside of the sampling bottles and caps were not touched. The sampling personnel wore nitrile gloves during the sampling activities.

All samples were stored in coolers with ice to maintain temperatures to within +/- 5 degrees Celsius (°C). Samples were submitted to the Research and Productivity Council (RPC) laboratories in Fredericton, New Brunswick on September 29, 2017. Water samples were analysed for general chemistry, total metals, petroleum hydrocarbons (benzene, toluene, ethylbenzene, xylenes (BTEX) and modified total petroleum hydrocarbons (TPH)). The results

were compared to the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) and the Water Quality Guidelines for the Protection of Marine Aquatic Life (MWAL), as the watercourses are both considered estuarine.

Temperature (°C), conductivity (microSiemens per centimetre (µS/cm)), dissolved oxygen (milligrams per litre (mg/L)), and pH (unitless) were measured using a calibrated YSI-556 multi-meter. Water quality readings were taken while the probe was suspended within the water column at the same depth in which the grab samples were collected. Salinity was calculated using the field measured conductivity. Salinity was 0.14 parts per thousand (ppt) and 4.93 ppt at WS1 and WS2, respectively.

3.2 Fish Habitat

A GEMTEC biologist determined if the watercourses located within the Project Area contained fish habitat and/or had the potential to be fish-bearing. Fish habitat was determined by assessing the waterbody to determine the presence, or seasonal possibility of:

- Sufficient water depths to accommodate fish;
- Adequate water quality (e.g., field measurements of temperature, dissolved oxygen, conductivity, pH, and salinity);
- Nutrient inputs for feeding (e.g., overhanging vegetation, surface water influx, woody debris, etc.); and/or
- Fish passage from the Northwest Miramichi River or any other known fish bearing waterbodies.

Due to the depth of the watercourse, the substrate and vegetation conditions in the centre of the channel were observed using underwater videography equipment on September 29, 2017 and September 30, 2017. Figure E-1 shows the video monitoring point locations. The underwater videography was conducted in a linear transect along the proposed bridge alignment with five monitoring point locations. Due to the turbid nature and depth of the watercourse, a continuous transect of the underwater conditions within the Project Area could not be captured.

3.3 Fish Survey

A fish survey was completed along the length of Oxford Brook within the Project Area on September 28, 2017. An LR-24 Smith-Root backpack electrofisher powered by a 24-volt battery was used to live capture fish and all captured fish were species identified, visually measured using a ruler, and then released back into Oxford Brook.

The fish survey did not include quantifying fish populations, removing the fish from the Project Area, nor did it include obtaining specimen samples for laboratory analysis (e.g., tissue sampling).

3.4 Fish Species at Risk and Species of Conservation Concern

The Atlantic Canada Conservation Data Centre (ACCDC) report provides the location of fauna SOCC and any location sensitive species within a 5 km radius of the Project Area. The ACCDC report was reviewed prior to completing any field investigations to determine the potential for any aquatic fauna SAR and/or SOCC within the Project Area. Upon completion of field investigations, habitat comparisons were completed for any SAR or SOCC that were recorded within the 5 km radius to the observed conditions within the Project Area. The ACCDC report is included in Attachment E-1.

Any incidental sightings of fish SAR or SOCC were recorded and critical habitat, if any, was identified. For the purposes of this assessment, critical habitat is defined as per the federal *SARA*.

Information from the New Brunswick Department of Energy Resources Development (NBDERD) and DFO was reviewed to determine the extent of aquatic SAR and SOCC not identified in the ACCDC report that may frequent the Project Area.

3.5 Commercial, Recreational and Aboriginal (CRA) Fisheries

CRA fisheries are regulated under the federal *Fisheries Act* which is administered by DFO. CRA fisheries are defined by the *Fisheries Act* as follows:

- Commercial fisheries refer to fish harvested under the authority of a license for the purpose of sale, trade, or barter;
- Recreational fisheries refers to fish harvested under the authority of a license for personal use of the fish or for sport; and
- Aboriginal fisheries refers to fish harvested by an Aboriginal organization or any of its members for the purpose of using the fish as food, for social or ceremonial purposes or for purposes set out in an agreement entered into between DFO and the Aboriginal organization.

The *Fisheries Act* restricts work, undertakings or activities that result in “serious harm” to fish that are part of a CRA fishery, or to fish that support such a fishery. Serious harm is defined under section 2(2) of the *Fisheries Act* as “the death of fish or the permanent alteration to, or destruction of, fish habitat”.

Information from the NBDERD and DFO was reviewed to determine the extent of CRA fisheries within the Assessment Area, in addition to testimonial information from DFO officers, Mr. Frédéric Butruille and Ms. Sandra Comeau on March 16, 2018 and March 21, 2018, respectively.

4.0 DESCRIPTION OF EXISTING ENVIRONMENT

4.1 Surface Water Quality

General chemistry analytical results are presented in Table E1 (Attachment E-2), trace metals analytical results are presented in Table E2 (Attachment E-2), petroleum hydrocarbon analytical results are presented in Table E3 (Attachment E-2), and field parameters are presented in Table E4 (Attachment E-2). Laboratory reports are also included in Attachment E-3.

With respect to the CCME FWAL and MWAL guidelines, the following exceedances were noted:

- The reporting limit for arsenic (10 µg/L) in the water sample WS2 is greater than the CCME FWAL guideline; therefore, it cannot be determined if this sample exceeds the guideline. The arsenic concentration in WS1 (2 µg/L) was below both the FWAL and MWAL guidelines (5 µg/L and 12.5 µg/L, respectively). The variance in reporting limits was a result of required sample dilution, prior to analysis, to protect laboratory instruments from high levels of salinity;
- The reporting limit for copper (10 µg/L) for WS2 is greater than the CCME FWAL guideline; therefore, it cannot be determined if this sample exceeds the guideline. The copper concentration in WS1 (< 1 µg/L) was below the FWAL guideline (2.15 µg/L) and there is no MWAL guideline for copper. The variance in reporting limits was a result of required sample dilution, prior to analysis, to protect laboratory instruments from high levels of salinity;
- The concentration of iron (1450 µg/L) exceeded the FWAL guideline (300 µg/L) in WS1; and
- The concentration of aluminium (130 µg/L) slightly exceeded the FWAL guideline (100 µg/L) in WS1.

Petroleum hydrocarbons were not detected in either of the surface water samples.

The measured dissolved oxygen concentrations at WS1 and WS2 are inexplicably high for estuarine waterbodies. The shallow depth of the YSI probe may have influenced the dissolved oxygen concentration; however, this was not confirmed.

4.2 Fish Habitat

It was determined that both the Northwest Miramichi River and Oxford Brook are fish-bearing.

Both watercourses are tidally influenced, which results in diurnal changes to water depth, wet-channel width and water chemistry. Shallow waters in Oxford Brook during low tide allowed for the visual observation of streambed characteristics in-situ. Underwater videography was used to evaluate the streambed characteristics within the Northwest Miramichi River in the area of the

new bridge alignment. Site photos are included in Attachment E-4 and files of the underwater videography are included in the electronic submission of this document.

4.2.1 Northwest Miramichi River

The Northwest Miramichi River flows west to east under the existing bridge and has a channel width of approximately 450 metres within the Project Area (Figure E-1). Due to tidal influences, the water depth in the Northwest Miramichi River varies throughout the day. It was estimated during the field investigations that the maximum water depth is approximately 8 - 10 metres during normal seasonal conditions. Increased water depths will be observed during the spring snow and ice melt.

The bank and shoreline substrate varies between the true left (north) and the true right (south) side of the watercourse:

- The true left bank of the watercourse is vegetated and undisturbed (Photo 1, Attachment E-4). The shoreline substrate contains mostly sand (0.06 millimeters (mm) - 2.5 mm), gravel (2.6 mm - 53 mm) and rubble (54 mm - 179 mm) (Photo 2 and Photo 3, Attachment E-4); however, larger sized rocks (180 mm - 460 mm) and boulders (> 460 mm) are present near the bridge abutment. The true left bank ranged in height from 0.9 metres to 1.1 metres and some instability was observed (Photo 4, Attachment E-4). Drift wood, wrack and other debris were observed at low-tide (Photo 2, Attachment E-4).
- The true right bank is also vegetated and mostly undisturbed, with the exception of a snowmobile trail access area (Photo 5 and Photo 6, Attachment E-4). The shoreline is mixed with mostly gravel, rubble and rock sized substrate (Photo 7, Attachment E-4). Much of the bank has visible undercutting beneath vegetation. The bank height ranges from 1.5 metres to 3 metres based on the height of a rock outcrop along the bank (Photo 8, Attachment E-4).

A brief summary of the findings of the videography (Figure E-1) is presented below:

- Point 1: Captured off the true left bank, west of the first existing bridge pier. A fine (0.0005 mm – 0.05 mm) substrate was observed with some macrophyte vegetation (Photo 9, Attachment E-4). The video is bright and the water is relatively clear;
- Point 2: Captured west of the third existing bridge pier; the depth and turbidity of the water limited the light availability. Some vegetation and algae growth was observed along the riverbed and the substrate is very fine, creating clouds of sediment when disturbed (Photo 10, Attachment E-4);
- Point 3: Captured west of the third and fourth existing bridge pier; the depth and turbidity of the water limited the light availability. No macrophyte vegetation was observed. The

substrate appears to be fines, sand and some gravel (Photo 11, Attachment E-4). Sparse, unidentifiable debris is present on the riverbed;

- Point 4: Captured west of the fourth existing bridge pier. The substrate appears to be fines, sand and some gravel (Photo 12, Attachment E-4). Sunken logs, that appear to have been cut, are visible on the riverbed. No macrophyte vegetation was observed; and
- Point 5: Captured off the true right bank, west of the fourth existing bridge pier. The substrate is mixed with mostly rubble and rock, with sand and fines in the interstitial spaces (Photo 13, Attachment E-4). No macrophyte vegetation was observed.

4.2.2 Oxford Brook

The headwaters of Oxford Brook flow north to south through a rural residential area. The watercourse crosses managed transmission line right of ways (ROWs) four times and two roadways prior to reaching the Project Area. Approximately 270 metres upstream of the Project Area, Oxford Brook converges with an unnamed tributary and flows through the managed Route 8 ROW. Oxford Brook outlets from an aluminum culvert with concrete headwalls (Photo 15, Attachment E-4). In this location, the watercourse has been altered into a straight channel using riprap and geo-textile along the streambed and banks (Photo 16, Attachment E-4); sparse bank and overhanging vegetation was observed in this area (Photo 14, Attachment E-4). Approximately 50 metres downstream of the culvert, the riprap channelization ceases. The channel generally widens and deepens as it extends downstream. Emergent and bank vegetation of predominately Wild Rice (*Zizania palustris*) was observed along the length of the true left bank (east) (Photo 17, Attachment E-4). An undercut bank with shrub vegetation was observed along the true right bank (west). The watercourse substrate was observed as sand and fines. Within the Project Area, the following was measured at Oxford Brook:

- Average wet width ranged from 9 metres to 21.1 metres;
- Average bank channel width ranged from 8.5 metres to 47 metres;
- Average wet depth ranged from 0.6 metres to 1.8 metres; and
- Average channel depth ranged from 1.6 metres to 2.8 metres.

Detailed stream habitat inventory forms for Oxford Brook are presented in Attachment E-5. The stream assessment at Oxford Brook was conducted on September 28, 2017 between 11:00 and 13:00. High tide in Newcastle, New Brunswick was 0.7 metres at 12:58 and low tides were 0.3 metres at 07:57 and 17:39 on September 28, 2017 (DFO, 2017).

4.3 Fish Survey

The fish survey in Oxford Brook was conducted on September 28, 2017 between 08:30 and 10:30.

A total of 29 fish were captured within the Project Area including: White Sucker (*Catostomus commersonii*), Mummichog (*Fundulus heteroclitus*) and Nine-Spine Stickleback (*Pungitius*

pungitius). All captured White Sucker fish had Black Spot disease (Photo 18, Attachment E-4). Table E-1 summarizes the findings of the fish survey in Oxford Brook.

Table E-1 Summary of Fish Survey in Oxford Brook

Common Name	Scientific Name	Number Captured	Size Range (cm)
Mummichog	<i>Fundulus heteroclitus</i>	12	4 - 7
Nine-Spine Stickleback	<i>Pungitius pungitius</i>	13	3 - 5
White Sucker	<i>Catostomus commersonii</i>	4	5 - 9
Total		29	-

Fish survey efforts were not undertaken in the Northwest Miramichi River as it is a known fish bearing watercourse. The Northwest Miramichi River is frequented by many fish species; Table E-2 provides a summary of fish species and the likelihood of each species to frequent the Project Area based on the professional opinion of a GEMTEC environmental biologist.

Additionally, Eel Ground First Nation indicated that there are monitoring data available for this section of the river, and NBDTI is planning to meet with this First Nation to discuss these data.

Table E-2 Fish Species within Northwest Miramichi River and Oxford Brook and the Likelihood of Each Species to Frequent the Project Area.

Fish Species	Northwest Miramichi River	Oxford Brook
Alewife (<i>Alosa pseudoharengus</i>)	High	Low
American eel (<i>Anguilla rostrata</i>)	High	High
American Smooth Flounder (<i>Pleuronectes putnami</i>)	Moderate	Low
American Shad (<i>Alosa sapidissima</i>)	High	Low
Arctic Char (<i>Salvelinus alpinus</i>)	Low	Low
Atlantic Herring (<i>Clupea harengus harengus</i>)	High	Low
Atlantic Salmon (<i>Salmo salar</i>)	High	Moderate
Atlantic Sturgeon (<i>Acipenser oxyrinchus</i>)	Moderate	Low
Atlantic Tomcod (<i>Microgadus tomcod</i>)	High	High
Banded Killifish (<i>Fundulus diaphanus</i>)	High	High
Blacknose Dace (<i>Rhinichthys atratulus</i>)	High	High
Blueback Herring (<i>Alosa aestivalis</i>)	Moderate	Low
Brook Trout (<i>Salvelinus fontinalis</i>)	High	High
Brown Bullhead (<i>Ameiurus nebulosus</i>);	Low	Low
Burbot (<i>Lota lota</i>)	High	Low
Common Shiner (<i>Notropis cornutus</i>)	High	High
Creek Chub (<i>Semotilus atromaculatus</i>)	High	High
Fallfish (<i>Semotilus corporalis</i>)	High	High
Fourspine Stickleback (<i>Apeltes quadracus</i>)	High	High
Golden Shiner (<i>Notemigonus crysoleucas</i>)	Moderate	Low
Lake Chub (<i>Couesius plumbeus</i>)	High	High
Lake Whitefish (<i>Coregonus clupeaformis</i>)	Low	Low
Mummichog (<i>Fundulus heteroclitus</i>)	High	High
Ninespine Stickleback (<i>Pungitius pungitius</i>)	High	High
Northern Redbelly Dace (<i>Chrosomus eos</i>)	Low	Low
Pearl Dace (<i>Semotilus margarita</i>)	Low	Low
Rainbow Smelt (<i>Osmerus mordax</i>);	Moderate	Low
Sea Lamprey (<i>Petromyzon marinus</i>)	High	High
Slimy Sculpin (<i>Cottus cognatus</i>)	High	High
Striped Bass (<i>Morone saxatilis</i>)	High	Low
Threespine Stickleback (<i>Gasterosteus aculeatus</i>)	High	High
White Perch (<i>Morone americana</i>)	High	High
White Sucker (<i>Catostomus commersonii</i>)	High	High
Yellow Perch (<i>Perca flavescens</i>)	Moderate	Low

4.4 Species at Risk

DFO maintains aquatic SAR maps to provide a general overview of SAR and their critical habitat. The Project Area is located within two maps: the Scotian Shelf, Gulf of St. Lawrence and Grand Bank (Map 1 of 1) and the New Brunswick and Prince Edward Island (Map 2 of 26). Twenty-six (26) aquatic SAR are listed as occurring within these areas; however, none of the SAR have a high or moderate potential for occurring within the Project Area or the Assessment Area. Table E-3 summarizes SAR fish and the probability of their presence within the Project Area based on known habitats.

Table E-3 Aquatic Species at Risk + Potential Use of Project Area

Common Name	Population	Scientific Name	SARA Status	Habitat ¹	Probability of Frequenting the Project Area
Atlantic Mud-Piddock	-	<i>Barnea truncata</i>	Threatened	Restricted for red-mudstone facies within the Minas Basin, Nova Scotia	Low
Atlantic Salmon	Inner Bay of Fundy	<i>Salmo salar</i>	Endangered	Freshwater habitat includes clean, cool and flowing water with rapids and pools. The marine habitat includes the Bay of Fundy.	Low
Atlantic Whitefish	-	<i>Coregonus huntsmani</i>	Endangered	Only in the Tusket and Petite Riviere watersheds in southern Nova Scotia.	Low
Beluga Whale	St. Lawrence Estuary	<i>Delphinapterus leucas</i>	Endangered	Ice-covered parts of the Arctic and sub-Arctic seas.	Low
Blue Whale	Atlantic	<i>Balaenoptera musculus</i>	Endangered	Coastal waters, open oceans, and estuaries.	Low
Channel Darter	-	<i>Percina copelandi</i>	Threatened	Typically live in small to large rivers with moderate current and coarse bed material. Limited to Ontario and Quebec.	Low
Eastern Sand Darter	-	<i>Ammocrypta pellucida</i>	Threatened	Restricted to Quebec.	Low

Common Name	Population	Scientific Name	SARA Status	Habitat ¹	Probability of Frequenting the Project Area
Leatherback Sea Turtle	-	<i>Dermochelys coriacea</i>	Endangered	Found in coastal, shelf and offshore waters with the majority of their time spent within the photic zone.	Low
Loggerhead Sea Turtle	-	<i>Caretta caretta</i>	Endangered	Typically found in the thermally dynamic waters along the shelf break and further offshore.	Low
North Atlantic Right Whale	-	<i>Eubalaena glacialis</i>	Endangered	Coastal waters.	Low
Northern Bottlenose Whale	Scotian Shelf	<i>Hyperoodon ampullatus</i>	Endangered	Inhabits deep waters (>500 metres) along the continental slope off of Nova Scotia and southeastern Newfoundland.	Low
Northern Wolffish	-	<i>Anarhichas denticulatus</i>	Threatened	Found offshore in cold (>5°C), continental shelf waters at depths greater than 100 metres.	Low
Rainbow Smelt	Lake Utopia Small-Bodied	<i>Osmerus mordax</i>	Threatened	Found only in Lake Utopia in New Brunswick.	Low

Common Name	Population	Scientific Name	SARA Status	Habitat ¹	Probability of Frequenting the Project Area
Spotted Wolffish	-	<i>Anarhichas minor</i>	Threatened	Found offshore in cold (>5°C), continental shelf waters at depths greater than 50 metres.	Low
Striped Bass	St. Lawrence River	<i>Morone saxatilis</i>	Extirpated	Limited to the species found in the St. Lawrence River.	Low
White Shark	Atlantic	<i>Carcharodon carcharias</i>	Endangered	Occurs in both inshore and offshore waters. Beaches, rocky shores, enclosed bays, lagoons, harbours, and estuaries, but does not penetrate mixed fresh and salt waters (brackish) or fresh waters to any extent.	Low

1. Aquatic Species at Risk, DFO.

4.5 Fish Species of Conservation Concern

The DFO aquatic SAR maps also list several aquatic species considered to be SOCC under this assessment (*i.e.*, not protected federally or provincially). Table E-4 summarizes the aquatic SOCC fish and the probability of presence within the Project Area based on known habitats.

The ACCDC report (Attachment E-1), which provides locations of known records of SAR and SOCC within the Assessment Area, identified one fish SOCC; the Striped Bass (*Morone saxatilis*). The Southern Gulf of St. Lawrence population of Striped Bass has a Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status of Special Concern and a provincial rarity rank of S3 (uncommon in the province). The Atlantic Salmon, Gaspé/Southern Gulf of St. Lawrence Population (*Salmo salar pop.12*), also has a COSEWIC status of Special Concern and has a provincial rarity rank of S2 (rare in the province).

4.5.1 Striped Bass - Southern Gulf of St. Lawrence Population

The Striped Bass is widely distributed throughout estuaries and coastal waters of the Gulf of St. Lawrence, particularly along the east coast of New Brunswick (SARA, 2018). The southern Gulf of St. Lawrence is the single confirmed spawning location for this species and the Northwest Miramichi River is a known migration corridor to spawning grounds. Mature Striped Bass spawn in late May or early June (SARA, 2018).

The Southern Gulf of St. Lawrence Striped Bass population was historically exploited by commercial and sport fishing. Due to declines in abundance, the commercial fishery for Striped Bass was closed in 1996 and the recreational and Aboriginal fisheries were closed in 2000. Since 2011, this Striped bass population has achieved both its recovery limit and recovery target populations. The re-opening of a recreational and Aboriginal fishery in this region occurred in 2013. Striped bass is highly-prized by anglers and Aboriginal groups.

4.5.2 Atlantic Salmon - Gaspé/Southern Gulf of St. Lawrence Population

The Atlantic Salmon, Gaspé/Southern Gulf of St. Lawrence Population (*Salmo salar pop.12*) reproduces in the tributaries of the Gulf of St. Lawrence, and more specifically between the Sud-Ouest River in Quebec and the rivers in the northern portion of Cape Breton, Nova Scotia (SARA, 2018). Atlantic Salmon (*Salmo salar pop.12*) are known to be present within the Northwest Miramichi River and frequent the Project Area when migrating. The migration from the marine environment into estuaries begins in spring, summer or early fall. Spawning will occur in freshwater areas in October and/or November (MSA, 2018).

The decline of Atlantic Salmon populations is primarily the result of a low rate of survival at sea. However, climatic changes, Aboriginal, recreational and illegal fishing, agriculture, urbanization, and invasive species have also been cited as causes for the decline of abundance (MSA, 2018).

Table E-4 Aquatic Species of Conservation Concern + Potential Use of the Project Area

Common Name	Population	Scientific Name	SARA Status	Habitat	Probability of Frequenting the Project Area
Atlantic Wolffish	-	<i>Anarhichas lupus</i>	Special Concern	Cold, deep waters of the continental shelf.	Low
Banded Killifish	Newfoundland	<i>Fundulus diaphanus</i>	Special Concern	Tend to frequent quiet areas of clear lakes and ponds with a muddy or sandy bottom. Protection is restricted to Newfoundland population.	Low
Bridle Shiner	-	<i>Notropis bifrenatus</i>	Special Concern	It is found in lowland areas and does not occur far inland from the St. Lawrence River or Rivière Richelieu. Tolerant to brackish water but is not acid tolerant.	Low
Brook Floater	-	<i>Alasmidonta varicosa</i>	Special Concern	A freshwater mussel found in rivers, streams, and lakes.	Low
Fin Whale	-	<i>Balaenoptera physalus</i>	Special Concern	Pelagic and coastal waters of the Atlantic Ocean.	Low

Common Name	Population	Scientific Name	SARA Status	Habitat	Probability of Frequenting the Project Area
Northern Brook Lamprey	Great Lakes - Upper St. Lawrence	<i>Ichthyomyzon fossor</i>	Special Concern	The Northern Brook Lamprey is a freshwater fish that is found in clear streams of varying sizes. Restricted to Quebec and Ontario.	Low
Shortnose Sturgeon	-	<i>Acipenser brevirostrum</i>	Special Concern	Occurs in only one river system in Canada - the Saint John River in New Brunswick.	Low
Sowerby`s Beaked Whale	-	<i>Mesoplodon bidens</i>	Special Concern	Often sighted in deep water, along the continental shelf edge and slope.	Low
Yellow Lampmussel	-	<i>Lampsilis cariosa</i>	Special Concern	Populations occur in the Sydney River watershed and Pottle River, Nova Scotia, and in the Saint John River watershed, New Brunswick.	Low

4.6 Commercial, Recreational and Aboriginal (CRA) Fisheries

4.6.1 Commercial Fisheries

One licensed commercial fishery is currently located within close proximity to the Project Area. This license holder has fishery locations immediately upstream and downstream of the Project Area and fishes primarily for Gaspereau using trap nets. Three additional commercial Gaspereau fishing license holders are located upstream of the Project Area. The approximate locations of active commercial fisheries within the CRA Fisheries Assessment Area are presented on Figure E-2.

4.6.2 Recreational Fisheries

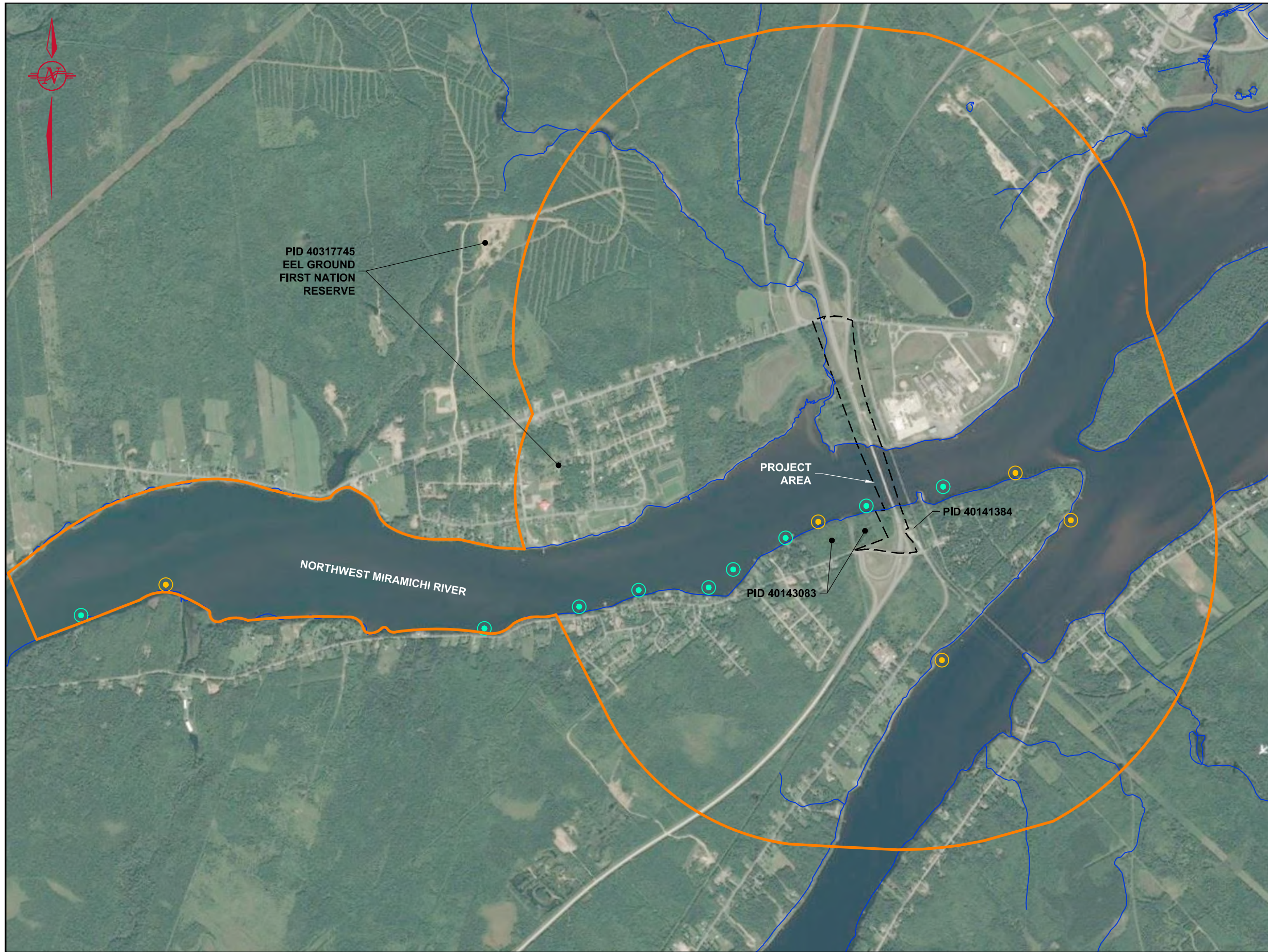
The Project Area is contained within the NBDERD Recreational Fishery Area (RFA) 3 (Miramichi). The portion of the Northwest Miramichi River that is contained within the Project Area and Oxford Brook are considered as tidal waters. Under current provincial legislation, recreational fishing licenses are not required in tidal waters. NBDERD issues an annual report (Fish, 2018) that details the recreational fishing seasons for each region of New Brunswick. During the field investigations completed in late September, 2017, fishermen were observed within the Project Area along the bank of the Northwest Miramichi River.

DFO officials indicate that ice fishing activities (primarily for smelt) take place during the winter months, and that the prevalent period for fishing within the CRA Assessment Area is May 1 to September 31.

4.6.3 Aboriginal Fisheries

Two First Nations communities are within close proximity to the Project Area; the Eel Ground First Nations and Metepenagiag Mi'kmaq Nation. These communities may fish within the Northwest Miramichi River under a Food, Social or Ceremonial (FSC) permit. The FSC permit allows for the retention of fish but not for the commercial sale of fish. The approximate locations of the FSC fisheries within the CRA Fisheries Assessment Area are presented in Figure E-2.

Two additional First Nations communities had access in 2017 to various species found in the Northwest Miramichi River. Those two communities are the Elsipogtog First Nation and Buctouche Band, as well as the New Brunswick Aboriginal Peoples Council (NBAPC); however, their FSC permits are not located within the CRA Fisheries Assessment Area for this Project. Table E-5 summarizes the FSC access within the Northwest Miramichi River.



Legend

	ABORIGINAL FSC FISHERIES
	COMMERCIAL FISHERIES
	CRA FISHERIES ASSESSMENT AREA
	PROJECT AREA



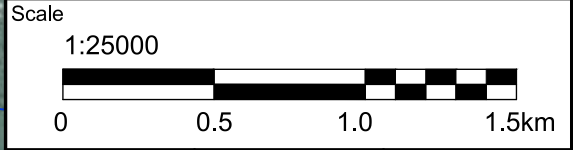
Note
 1. THIS DRAWING IS A SCHEMATIC REPRESENTATION. SIZES, LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

Drawn By	CHG	Checked By	JH
Calculations By	---	Checked By	---

Date
 JUNE 2018

Project
 EIA - NORTHWEST MIRAMICHI RIVER
 NO.1 ANDERSON BRIDGE REPLACEMENT

Drawing
 AQUATIC ENVIRONMENT
 SPATIAL BOUNDARIES AND CRA
 FISHERIES



File No. 69214403	Drawing FIGURE E-2	Revision No. 0
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Table E-5 Summary of FSC Access within the Northwest Miramichi River in 2017

First Nations Community	Fish Species	Fishing Season¹
Eel Ground	Brook Trout	January to March, April to October
	American Eel	April to March
	Gaspereau	May
	Atlantic Salmon	June to October
	American Shad	April to March
	Rainbow Smelt	May
	Striped Bass	May to September, November
Metepenagiag Mi'kmaq Nation	Atlantic Salmon	May to October
	American Shad	May to October
	Striped Bass	May to September
	Brook Trout	January to March, April to October
Elsipogtog First Nation	Atlantic Salmon	April to October
	Brook Trout	April to December
Buctouche Band	Atlantic Salmon	May to October
	Striped Bass	May to October
	Brook Trout	April to October
NBAPC	Atlantic Salmon	April to October
	American Shad	April to March
	Rainbow Smelt	April to May
	Striped Bass	May to September
	White Perch	April to October
	Yellow Perch	April to October

1. Based on information provided by DFO.

It is important to note that access allocated to First Nations communities for FSC purposes are subject to change based on needs and agreements reached with each community. Therefore, the access reflected in Table E-5 is based on the 2017 season. Access for the 2018 season has yet to be finalized and is subject to further discussions that will occur between DFO and leadership of these communities.

5.0 SUMMARY OF POTENTIAL EFFECTS

5.1 Construction Phase Potential Effects

Potential effects to surface water quality, fish and fish habitat and CRA fisheries during the construction phase of the Project are detailed in the following sub-sections for the aquatic environment VEC.

5.1.1 Surface Water Quality Potential Effects

Potential effects to surface water as a result of Project activities include:

- The potential for contaminants to be released into water and/or soil through spills of fuels and lubricants from construction equipment;
- Riverbed substrate may contain contaminants from historic land use (e.g., pulp and paper mill effluent). Dredging and disturbance of the riverbed material may release contaminants into the water column;
- Vegetation clearing and ground disturbance may increase the potential for erosion and sediment release into the aquatic environment; and
- In-water work may increase the potential for sediment release into the water column.

5.1.2 Fish and Fish Habitat Potential Effects

Potential effects to fish and fish habitat as a result of the construction phase of the Project include the following:

- Vibration and noise from bridge pier construction (e.g., pile driving, tremie concrete pouring, dredging, etc.) may disrupt and/or cause physical harm to fish SOCC and other fish species within the Project Area. The in-channel work will be completed in a sequential process (i.e., not all piers will be built at the same time); therefore, the effects to fish and fish habitat may be localized to the active work area. Effects near the source will dissipate to produce lesser impacts (e.g., vibrations, noise) at distances away from the active work site, and as such, the effects of vibration and noise will likely be limited to the Project Area;
- The noise and vibration of the construction work may deter fish SOCC and other fish species from migrating through the Project Area to spawning grounds. Depending on the level of effect, fish may completely avoid entering the Project Area during main migration windows, resulting in a loss or a reduction of spawning opportunity. Additionally, Project related activities may result in injury or death of fish migrating through the Project Area. DFO will be consulted to determine appropriate in-channel work windows with regards to fish migration through the Project Area;
- Accidental contaminant spills may result in aquatic life injury and death to fish species and/or destruction to habitat or foraging areas;

- Any in-channel footprints will result in the loss of fish habitat within the Project Area. However, this loss is expected to be offset, at least in part, by the removal of the existing bridge piers;
- During the in-channel work, increased sedimentation may be observed in the surrounding waters; and
- The above effects may interfere with aquatic studies carried out by Eel Ground First Nation.

DFO will be consulted to determine if a *Fisheries Act Authorization* and compensation activities will be required for the Project.

5.1.3 Commercial, Recreational and Aboriginal (CRA) Fisheries Potential Effects

Potential effects to CRA fisheries as a result of the construction phase of the Project include:

- Limited access to recreational fishing locations within the Project Area due to the presence of Project components and construction zones. It is expected that approximately 150 metres of shoreline will be inaccessible for land based recreational fisheries and up to 250 m² of the river channel will be inaccessible for vessel-based fisheries. The impact to recreational fisheries is temporary and localized to on-going construction zones;
- One licensed commercial fishing site may be directly impacted during the construction of the new bridge as the license holder's trap nets are located within the Project Area. NBDTI is currently working with DFO and this fisherman to find a solution to this issue;
- Three additional commercial license holders have a total of seven fishing sites located within 5 km upstream of the Project Area. Construction activities may result in a reduction of the migration of fish through the Project Area; and
- The Eel Ground First Nations community has five FSC licensed fishing sites in proximity to the Project Area. Construction activities may result in a reduction of the migration of fish through the Project Area; however, DFO will be consulted to determine appropriate in-channel work windows with regards to fish migration, to minimize the potential impacts to CRA fisheries.

5.2 Operational and Maintenance Phase Potential Effects

Potential effects to surface water quality, fish and fish habitat and CRA fisheries during the operational and maintenance phase of the Project are detailed in the following sub-sections for the aquatic environment VEC.

5.2.1 Surface Water Quality Potential Effects

Potential effects to surface water as a result of Project activities include the potential for contaminants to be released into water and/or soil through spills of fuels and lubricants from

maintenance equipment or by the release of a contaminant from a vehicular accident. Additionally, summer maintenance activities (e.g., patching, vegetation control, ditch maintenance, etc.) and winter maintenance activities (e.g., snow removal sanding and road salt application, etc.) may impact surface water quality through erosion and sedimentation, improper storage and handling of hazardous materials and salt runoff in the Project Area.

5.2.2 Fish and Fish Habitat Potential Effects

Potential effects to fish and fish habitat as a result of the operational and maintenance phases of the Project include the following:

- Significant noise generating activities (e.g., pile driving, dredging) may periodically be required during the maintenance and operational phase of the Project which may disrupt or deter fish SOCC and other fish species within, or migrating through the Project Area; however, any potential impacts will be assessed as a part of the regulatory consultation at that time; and
- Accidental contaminant spills may result in aquatic life injury or death to fish species and/or destruction to habitat or foraging areas.

5.2.3 Commercial, Recreational and Aboriginal (CRA) Fisheries Potential Effects

Potential effects to CRA fisheries as a result of the maintenance and operational phases of the Project include:

- Limited access to recreational fishing locations within the Project Area due to the presence of maintenance equipment and work zones. Potential impacts to recreational fisheries are likely to be temporary and localized to on-going maintenance zones and any potential impacts will be assessed as a part of the regulatory consultation at that time. Therefore, the potential impacts to recreational fisheries during the operational and maintenance phase of the Project are not discussed further in this VEC assessment;
- Four commercial license holders have a total of eight fishing sites located within 5 km of the Project Area. Maintenance activities (e.g., trestles, barges, patch-work) may result in a reduction of the migration of fish through the Project Area; however, DFO will be consulted to determine appropriate in-channel maintenance work windows with regards to fish migration to minimize potential impacts to CRA fisheries. Potential impacts to commercial fisheries are likely to be temporary and localized to on-going maintenance zones and any potential impacts will be assessed as a part of the regulatory consultation at that time. Therefore, the potential impacts to commercial fisheries during the operational and maintenance phase of the Project are not discussed further in this VEC assessment; and
- The Eel Ground First Nations community has five FSC licensed fishing sites in proximity to the Project Area. Maintenance activities may result in a reduction of the migration of

fish through the Project Area; however, DFO will be consulted to determine appropriate in-channel work windows with regards to fish migration to minimize the potential impacts to CRA fisheries. Potential impacts to Aboriginal fisheries are likely to be temporary and localized to on-going maintenance zones and any potential impacts will be assessed as a part of the regulatory consultation at that time. Therefore, the potential impacts to Aboriginal fisheries during the operational and maintenance phase of the Project are not discussed further.

5.3 Accidents, Malfunctions and Unplanned Events

There is a potential for accidents to occur during all phases of the Project. Accidents that may impact the aquatic environment within the Project Area include:

- Failure of sedimentation and erosion controls structures; and
- Accidental release of chemicals or petroleum products into the aquatic environment.

6.0 PROPOSED MITIGATION MEASURES

The potential effects, standard NBDTI Environmental Management Manual (EMM) mitigation measures and any additional mitigation measures, recommended by GEMTEC in order to minimize the potential adverse effects to the aquatic environment during the construction and operational and maintenance phases of the Project are summarized in Table E-6.

Table E-6 Summary of Mitigation Measures for Aquatic Environment

Project Component	Summary of Potential Interaction	Standard NBDTI EMM Mitigation Measures	Additional Recommended Mitigation Measures
Construction Phase			
Surface Water Quality	<p>Increased potential for contaminants to be released into water and/or soils through spills of fuels and lubricants from construction equipment or re-suspension of already contaminated riverbed material due to activities such as dredging.</p>	<ul style="list-style-type: none"> • 5.1 Asphalt Concrete; • 5.10 Fire Prevention and Contingency; • 5.12 Spill Management; • 5.13 Storage and Handling of Petroleum Products; • 5.14 Storage and Handling of Other Hazardous Materials; • 5.17 Temporary Ancillary Facility Management; • 5.19 Vehicle and Equipment Management; • 5.20 Waste Management, and • 5.23 Working Near Environmentally Sensitive Areas. 	<p>All dredged riverbed material should be sampled for contaminants. Should contamination exist, all removed material should be disposed of at an approval facility and should not be used as backfill on-site. A sampling plan will be developed in consultation with NBDELG.</p>
	<p>Construction, including:</p> <ul style="list-style-type: none"> • Clearing, grubbing; • Site preparation; • Road bed construction; • Bridge construction; • Surfacing and finishing; and • Temporary ancillary facilities, may increase the potential for erosion and the release of sediment into the aquatic environment. 	<ul style="list-style-type: none"> • 5.3 Clearing; • 5.4 Culverts; • 5.5 Detouring; • 5.6 Dust Control; • 5.7 Erosion and Sediment Management; • 5.8 Excavation, Blasting and Aggregate Production; • 5.11 Grubbing; • 5.15.1 Structures Construction; • 5.15.4 Construction of Embankments; • 5.17 Temporary Ancillary Facility Management; • 5.18 Topsoil; • 5.22 Work Progression; • 5.23 Working Near Environmentally Sensitive Areas; • 5.24 Working Near Pipelines and Other Underground Services; and • 5.25 Sulphide Bearing Rick & Acid Rock Drainage. 	<p>Excavated sediment from the riverbed should be stored in a manner such that it cannot re-enter the waterbody.</p>

Project Component	Summary of Potential Interaction	Standard NBDTI EMM Mitigation Measures	Additional Recommended Mitigation Measures
Fish and Fish Habitat	<ul style="list-style-type: none"> • Vibration and noise from bridge pier construction (<i>i.e.</i>, pile driving, tremie, dredging) may disrupt and/or cause physical harm to fish SOCC and other fish species within the Project Area; and • The noise and vibration of the construction work may deter fish SOCC and other fish species from migrating through the Project Area to spawning grounds. 	<ul style="list-style-type: none"> • 5.8 Excavation, Blasting and Aggregate Production; • 5.15 Structures; and • 5.23 Working Near Environmentally Sensitive Areas. 	<p>DFO will be consulted to determine appropriate in-channel work windows with regards to fish migration through the Project Area.</p>
	<p>During the in-channel work, increased sedimentation may be observed in the surrounding waters.</p>	<ul style="list-style-type: none"> • 5.6 Dust Control; • 5.7 Erosion and Sediment Management; • 5.8 Excavation, Blasting and Aggregate Production; • 5.11 Grubbing; • 5.15 Structures; • 5.18 Topsoil; • 5.22 Work Progression; and • 5.23 Working Near Environmentally Sensitive Areas. 	<p>No additional mitigation measures are recommended by GEMTEC.</p>

Project Component	Summary of Potential Interaction	Standard NBDTI EMM Mitigation Measures	Additional Recommended Mitigation Measures
Fish and Fish Habitat	Interference with studies carried out by Eel Ground First Nation.	<ul style="list-style-type: none"> • 5.23 Working Near Environmentally Sensitive Areas. 	NBDTI Design Branch to meet with Eel Ground First Nation to discuss any required mitigation.
	Any in-channel footprints will result in the loss of fish habitat within the Project Area. However, this loss is expected to be offset, at least in part, by the removal of the existing bridge piers.	<ul style="list-style-type: none"> • 5.15 Structures; and • 5.23 Working Near Environmentally Sensitive Areas. 	DFO will be consulted to determine if a Fisheries Act Authorization and/or offsetting is required.
CRA Fisheries	<ul style="list-style-type: none"> • Limited access to recreational fishing locations within the Project Area; one licensed fishing site may be directly impacted during the construction of the new bridge; and • Construction activities may result in a reduction of the migration of fish through the Project Area to commercial and Aboriginal fishing sites. 	<ul style="list-style-type: none"> • 5.8 Excavation, Blasting and Aggregate Production; • 5.15 Structures; • 5.22 Work Progression; and • 5.23 Working Near Environmentally Sensitive Areas 	NBDTI is currently working with DFO to mitigate the issue of the commercial fisherman to be directly impacted by the Project.

Project Component	Summary of Potential Interaction	Standard NBDTI EMM Mitigation Measures	Additional Recommended Mitigation Measures
Operational / Maintenance Phase			
Surface Water Quality	Summer and winter maintenance activities may impact surface water quality by erosion and sedimentation, improper storage/handling of a hazardous material and salt runoff in the Project Area.	<ul style="list-style-type: none"> • 5.1 Asphalt Concrete; • 5.3 Clearing; • 5.4 Culverts; • 5.5 Detouring; • 5.6 Dust Control; • 5.7 Erosion and Sediment Management; • 5.8.3 Crushing, Screening and Washing; • 5.10 Fire Prevention and Contingency; • 5.11 Grubbing; • 5.12 Spill Management; • 5.13 Storage and Handling of Petroleum Products; • 5.14 Storage and Handling of Other Hazard Materials; • 5.15.2 Structures Maintenance; • 5.16 Summer Highway Maintenance; • 5.17 Temporary Ancillary Facility Management; • 5.18 Topsoil; • 5.19 Vehicle and Equipment Management; • 5.20 Waste Management; • 5.21 Winter Highway Maintenance; • 5.22 Work Progression; • 5.23 Working Near Environmentally Sensitive Areas; • 5.24 Working Near Pipelines and Underground Services; and • 5.25 Sulphide Bearing Rock & Acid Rock Drainage Management. 	No additional mitigation measures are recommended by GEMTEC.

Project Component	Summary of Potential Interaction	Standard NBDTI EMM Mitigation Measures	Additional Recommended Mitigation Measures
Fish and Fish Habitat	Noise from maintenance activities may disrupt aquatic life and migration through the Project Area.	<ul style="list-style-type: none"> • 5.15 Structures; and • 5.23 Working Near Environmentally Sensitive Areas. 	DFO will be consulted to determine appropriate in-channel work windows with regards to fish migration through the Project Area.
Accidents, Malfunctions and Unplanned Events			
Accidental Release of Contaminants	<ul style="list-style-type: none"> • Increased potential for contaminants to be released into surface water through the accidental release of fuels and lubricants from maintenance equipment or vehicle collisions; and • Accidental contaminant spills may result in aquatic life injury, death and/or destruction to habitat or foraging areas. 	<ul style="list-style-type: none"> • 5.1 Asphalt Concrete; • 5.12 Spill Management; • 5.13 Storage and Handling of Petroleum Products; • 5.14 Storage and Handling of Other Hazard Materials; • 5.17 Temporary Ancillary Facility Management; • 5.19 Vehicle and Equipment Management; • 5.20 Waste Management; • 5.22 Work Progression; and • 5.23 Working Near Environmentally Sensitive Areas. 	No additional mitigation measures are recommended by GEMTEC.
Failure of Erosion Control Structures	Increased potential for the degradation of surface water via the failure of erosion and sediment control structures.	<ul style="list-style-type: none"> • 5.3 Clearing; • 5.7 Erosion and Sediment Management; • 5.18 Topsoil; • 5.22 Work Progression; and • 5.23 Working Near Environmentally Sensitive Areas. 	

7.0 SUMMARY OF POTENTIAL SIGNIFICANT RESIDUAL EFFECTS

A significant residual effect to the aquatic environment VEC is considered to be an unauthorized or unmitigated loss of fish or habitat productivity which results in:

- Persistent or permanent degradation of surface water quality that exceeds regulatory limits beyond the background conditions outlined in Section 4.1; and/or
- The alteration of fish and or fish habitat to the extent that the ecological function of the habitat is adversely impacted or a change in the distribution or abundance of a species or community to the extent that the population is unable to re-establish within one generation.

The construction phase of the Project is expected to temporarily affect the aquatic environment within the Project Area. The disruption of the riverbed material risks elevating the level of sedimentation and/or releasing hazardous substances into the aquatic environment; however, the implementation of the proposed mitigation measures are intended to minimize any adverse environmental effects.

The construction of the proposed bridge piers will result in a direct loss of fish habitat; however, this will be partially off-set by the removal of the null bridge piers. The temporary loss of habitat is not expected to impact any fish species at a population level. DFO will be consulted to determine whether serious harm to fish will occur as a result of the Project activities. Since any required offsetting activities will be completed, interactions occurring during the construction phase are not considered to be significant.

The operational and maintenance phase of the Project will not significantly alter environmental conditions that are currently observed on-site. The implementation of the proposed mitigation measures will minimize risks of adverse effects to the aquatic environment; therefore, interactions during the operational and maintenance phase are considered to be non-significant.

8.0 REFERENCES

ACCDC (Atlantic Canada Conservation Data Centre), 2017. Ranking Data. Internet Publication: <http://www.accdc.com/products/ranking.html> Updated Sept 19, 2017.

Atlantic Canada Conservation Data Centre (ACCDC). 2017. Data Report 5928 Northwest Miramichi, NB.

Canadian Rivers Institute (CRI). 2018. Inland Fish Species of New Brunswick. Accessed March 19, 2018. Website: <http://www.unb.ca/research/institutes/cri/links/inlandfishesnb/Species/index.html>

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2017. Accessed November, 2017. Website: http://www.cosewic.gc.ca/eng/sct5/index_e.cfm

Environment Canada Protected Areas Network (ECPAN). 2017. Accessed October, 2017. Website: <http://www.ec.gc.ca/ap-pa/default.asp?lang=En&n=7FC45404-1#a3>

Fisheries and Oceans Canada (DFO). 2018. Aquatic Species at Risk. Accessed March 29, 2018. Website: <http://www.dfo-mpo.gc.ca/species-especies/index-eng.htm>

Fisheries and Oceans Canada (DFO). 2018. Aquatic Species at Risk Mapping. Accessed March 29, 2018. Website: <http://www.dfo-mpo.gc.ca/species-especies/index-eng.htm>

Fisheries and Oceans Canada (DFO). 2017. Tides, Currents, and Water Levels. Accessed November 3, 2017. Website: <http://www.waterlevels.gc.ca/eng/find/region/5>

GeoNB Wetland Mapping. Accessed October, 2017. Website: <http://geonb.snb.ca/geonb/>

Government of Canada. Species at Risk Public Registry. 2011. Accessed October, 2017. Website: <https://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1>

Guidelines for Canadian Drinking Water Quality. 2017. Health Canada. Accessed October, 2017. Website: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/sum_guide-res_recom/index-eng.php

Miramichi Salmon Association (MSA). 2018. Life Cycle of the Atlantic Salmon. Accessed March 19, 2018. Website: <https://miramichisalmon.ca/education/atlantic-salmon/>

Miramichi Salmon Association (MSA). 2017. History of the Miramichi River. Accessed October 27, 2017. Website: <http://www.miramichisalmon.ca/education/history-of-the-miramichi-river/>

Natural Resources Canada (NRCAN). 2017. Toporama Mapping. Accessed October, 2017. Website: <http://atlas.nrcan.gc.ca/site/english/toporama/index.html>

New Brunswick Department of Environment and Local Government (NBDELG). 2012a. A Guide to Environmental Impact Assessment in New Brunswick. April 2012.

New Brunswick Department of Energy and Resource Development (NBDERD). 2017. Protected Natural Areas. Accessed October, 2017. Website: <http://nbdnr.maps.arcgis.com/apps/webappviewer/index.html?id=ceb3caf9aba34466bbb0bfa0bb0c3ed5&locale=en>

New Brunswick Department of Energy and Resource Development (NBDERD). 2018. Fish 2018. Accessed June 25, 2018. Website: <http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Fish/Fish.pdf>

Species At Risk Public Registry. 2013. Accessed October, 2017. Website: http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=286



ATTACHMENTS

E-1 - ACCDC Report

DATA REPORT 5928: Northwest Miramichi, NB

Prepared 19 September 2017
by J. Churchill, Data Manager

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1.0 Preface

- 1.1 Data List
- 1.2 Restrictions
- 1.3 Additional Information
- Map 1: Buffered Study Area

2.0 Rare and Endangered Species

- 2.1 Flora
- 2.2 Fauna
- Map 2: Flora and Fauna

3.0 Special Areas

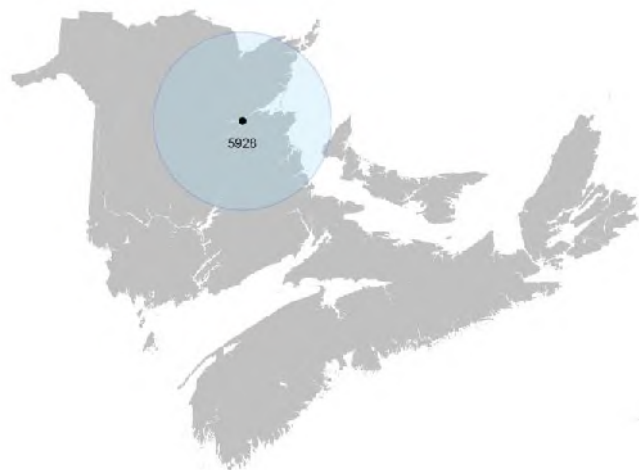
- 3.1 Managed Areas
- 3.2 Significant Areas
- Map 3: Special Areas

4.0 Rare Species Lists

- 4.1 Fauna
- 4.2 Flora
- 4.3 Location Sensitive Species
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5.0 Rare Species within 100 km

- 5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The ACCDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees. URL: www.ACCDC.com.

Upon request and for a fee, the ACCDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the ACCDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
NorthwestMirNB_5928ob.xls	All Rare and legally protected <i>Flora and Fauna</i> in your study area
NorthwestMirNB_5928ob100km.xls	A list of Rare and legally protected <i>Flora and Fauna</i> within 100 km of your study area
NorthwestMirNB_5928ma.xls	All <i>Managed Areas</i> in your study area
NorthwestMirNB_5928sa.xls	All <i>Significant Natural Areas</i> in your study area
NorthwestMirNB_5928ff.xls	Rare and common <i>Freshwater Fish</i> in your study area (DFO database)

1.2 RESTRICTIONS

The ACCDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting ACCDC data, recipients assent to the following limits of use:

- a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
- b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
- c) The ACCDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
- d) ACCDC data responses are restricted to the data in our Data System at the time of the data request.
- e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
- f) ACCDC data responses are not to be construed as exhaustive inventories of taxa in an area.
- g) The absence of a taxon cannot be inferred by its absence in an ACCDC data response.

1.3 ADDITIONAL INFORMATION

The attached file DataDictionary 2.1.pdf provides metadata for the data provided.

Please direct any additional questions about ACCDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries

Sean Blaney, Senior Scientist, Executive Director

Tel: (506) 364-2658

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Animals (Fauna)

John Klymko, Zoologist

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Plant Communities

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Data Management, GIS

James Churchill, Data Manager

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Billing

Jean Breau

Tel: (506) 364-2657

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Questions on the biology of Federal Species at Risk can be directed to ACCDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Stewart Lusk, Natural Resources: (506) 453-7110.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Sherman Boates, NSDNR: (902) 679-6146. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NSDNR Regional Biologist:

Western: Duncan Bayne

(902) 648-3536

Duncan.Bayne@novascotia.ca

Western: Donald Sam

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For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

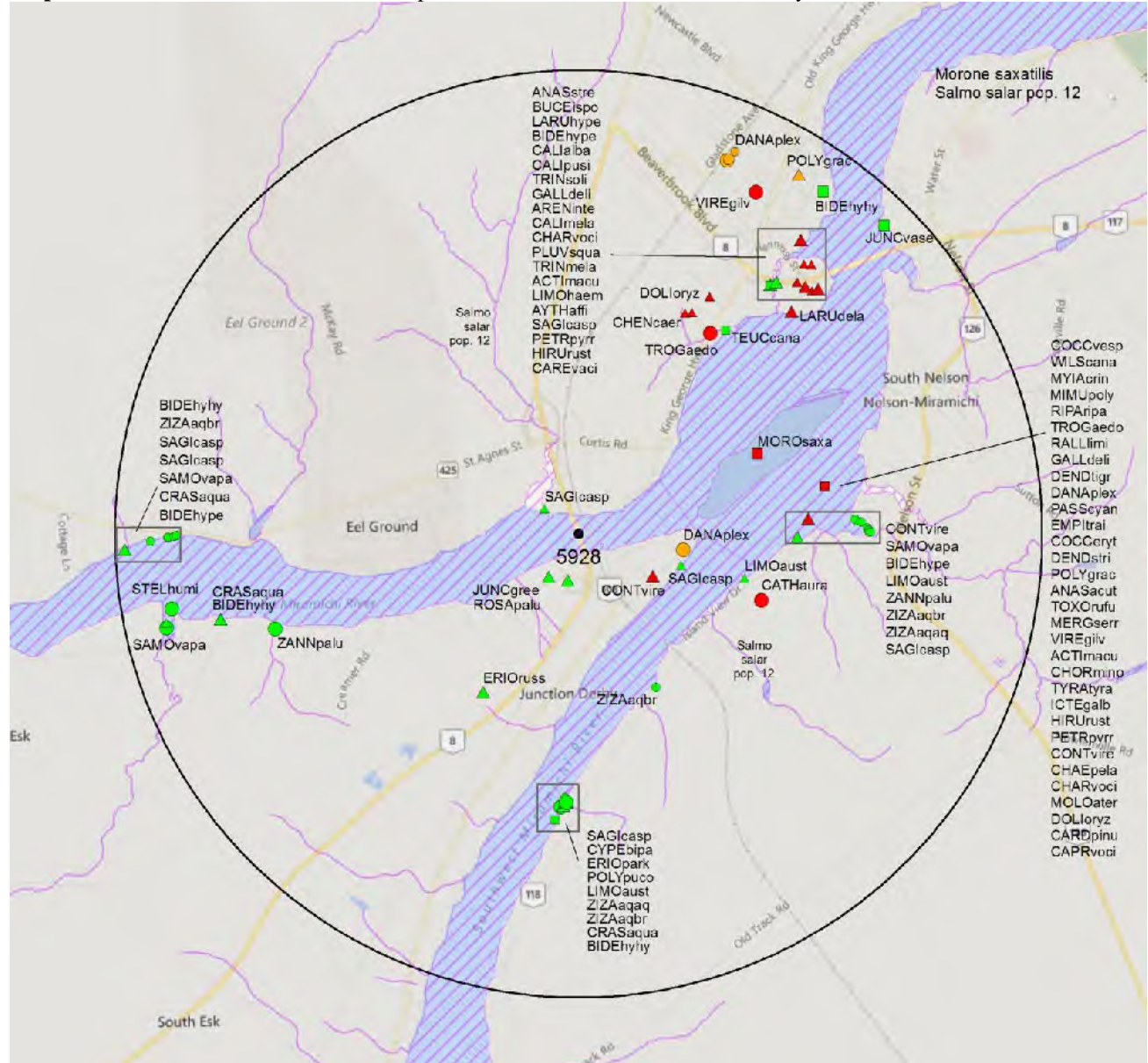
2.1 FLORA

The study area contains 59 records of 19 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 516 records of 46 vertebrate, 10 records of 2 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



RESOLUTION

- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- △ 3.0 within kilometers
- △ 2.7 within 500s of meters
- 2.0 within 100s of meters
- ◇ 1.7 within 10s of meters

HIGHER TAXON

- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

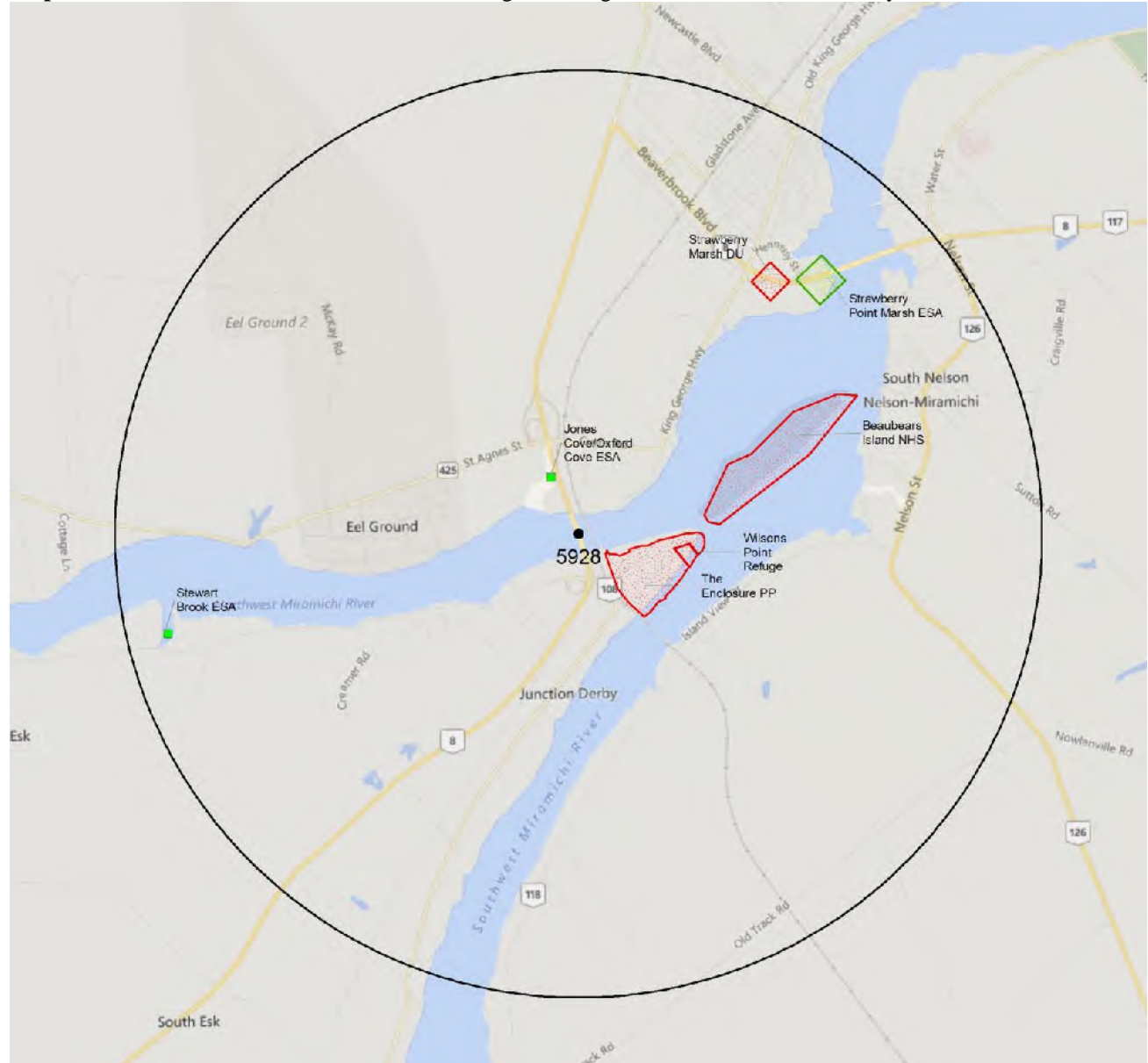
3.1 MANAGED AREAS

The GIS scan identified 4 managed areas in the vicinity of the study area (Map 3 and attached file: *ma*.xls).

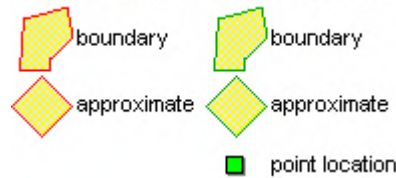
3.2 SIGNIFICANT AREAS

The GIS scan identified 3 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *sa*.xls).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



MANAGED AREAS SIGNIFICANT AREAS



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (\pm the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	<i>Eriocaulon parkeri</i>	Parker's Pipewort	Not At Risk		Endangered	S2	1 At Risk	1	2.9 \pm 1.0
P	<i>Cyperus bipartitus</i>	Shining Flatsedge				S1	2 May Be At Risk	1	2.9 \pm 0.0
P	<i>Juncus greenii</i>	Greene's Rush				S1	2 May Be At Risk	1	0.6 \pm 1.0
P	<i>Zizania aquatica</i> var. <i>brevis</i>	Indian Wild Rice				S1	2 May Be At Risk	4	1.9 \pm 0.0
P	<i>Sagittaria calycina</i> var. <i>spongiosa</i>	Long-lobed Arrowhead				S2	4 Secure	15	0.5 \pm 0.0
P	<i>Juncus vaseyi</i>	Vasey Rush				S2	3 Sensitive	2	4.7 \pm 10.0
P	<i>Zizania aquatica</i> var. <i>aquatica</i>	Indian Wild Rice				S2	5 Undetermined	2	2.4 \pm 1.0
P	<i>Carex vacillans</i>	Estuarine Sedge				S2?	3 Sensitive	2	3.4 \pm 1.0
P	<i>Bidens hyperborea</i>	Estuary Beggarticks				S3	4 Secure	3	3.1 \pm 0.0
P	<i>Bidens hyperborea</i> var. <i>hyperborea</i>	Estuary Beggarticks				S3	4 Secure	6	3.1 \pm 5.0
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S3	4 Secure	1	4.5 \pm 0.0
P	<i>Crassula aquatica</i>	Water Pygmyweed				S3	4 Secure	3	2.9 \pm 1.0
P	<i>Teucrium canadense</i>	Canada Germander				S3	3 Sensitive	1	2.7 \pm 5.0
P	<i>Polygonum punctatum</i> var. <i>confertiflorum</i>	Dotted Smartweed				S3	4 Secure	1	2.9 \pm 1.0
P	<i>Samolus valerandi</i> ssp. <i>parviflorus</i>	Seaside Brookweed				S3	4 Secure	9	3.0 \pm 0.0
P	<i>Rosa palustris</i>	Swamp Rose				S3	4 Secure	1	0.5 \pm 1.0
P	<i>Limosella australis</i>	Southern Mudwort				S3	4 Secure	3	1.9 \pm 0.0
P	<i>Zannichellia palustris</i>	Horned Pondweed				S3	4 Secure	2	3.1 \pm 0.0
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	4 Secure	1	2.0 \pm 1.0

4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	<i>Caprimulgus vociferus</i>	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	2	2.7 \pm 7.0
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened		Threatened	S2B,S2M	3 Sensitive	6	2.7 \pm 7.0
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	4	2.7 \pm 7.0
A	<i>Riparia riparia</i>	Bank Swallow	Threatened			S2S3B,S2S3M	3 Sensitive	2	2.7 \pm 7.0
A	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	1	2.7 \pm 7.0
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened		Threatened	S3B,S3M	3 Sensitive	7	2.7 \pm 7.0
A	<i>Chordeiles minor</i>	Common Nighthawk	Threatened	Threatened	Threatened	S3B,S4M	1 At Risk	4	2.7 \pm 7.0
A	<i>Bucephala islandica</i> (Eastern pop.)	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	3	3.8 \pm 0.0
A	<i>Coccythraustes vespertinus</i>	Evening Grosbeak	Special Concern			S3B,S3S4N,SUM	3 Sensitive	1	2.7 \pm 7.0
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	4 Secure	6	0.9 \pm 1.0
A	<i>Morone saxatilis</i>	Striped Bass	E,E,SC			S3	2 May Be At Risk	1	2.1 \pm 10.0
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S1?B,S5M	4 Secure	85	3.6 \pm 0.0
A	<i>Aythya affinis</i>	Lesser Scaup				S1B,S4M	4 Secure	2	3.6 \pm 1.0
A	<i>Empidonax traillii</i>	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	2	2.7 \pm 7.0
A	<i>Troglodytes aedon</i>	House Wren				S1S2B,S1S2M	5 Undetermined	2	2.6 \pm 0.0
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S2B,S2M	3 Sensitive	1	2.7 \pm 7.0
A	<i>Toxostoma rufum</i>	Brown Thrasher				S2B,S2M	3 Sensitive	1	2.7 \pm 7.0
A	<i>Anas strepera</i>	Gadwall				S2B,S3M	4 Secure	1	3.8 \pm 0.0
A	<i>Tringa solitaria</i>	Solitary Sandpiper				S2B,S5M	4 Secure	9	3.6 \pm 0.0
A	<i>Chen caerulescens</i>	Snow Goose				S2M	4 Secure	2	2.6 \pm 0.0
A	<i>Larus hyperboreus</i>	Glaucous Gull				S2N,S2M	4 Secure	1	3.8 \pm 0.0
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	2	2.7 \pm 7.0

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	5	2.7 ± 7.0
A	<i>Carduelis pinus</i>	Pine Siskin				S3	4 Secure	3	2.7 ± 7.0
A	<i>Cathartes aura</i>	Turkey Vulture				S3B,S3M	4 Secure	1	2.1 ± 0.0
A	<i>Rallus limicola</i>	Virginia Rail				S3B,S3M	3 Sensitive	2	2.7 ± 7.0
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	3 Sensitive	74	2.7 ± 7.0
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B,S3M	4 Secure	1	2.7 ± 7.0
A	<i>Vireo gilvus</i>	Warbling Vireo				S3B,S3M	4 Secure	6	2.7 ± 7.0
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B,S3M	4 Secure	1	2.7 ± 7.0
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	2	2.7 ± 7.0
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B,S3M	4 Secure	6	2.7 ± 7.0
A	<i>Dendroica tigrina</i>	Cape May Warbler				S3B,S4S5M	4 Secure	1	2.7 ± 7.0
A	<i>Anas acuta</i>	Northern Pintail				S3B,S5M	3 Sensitive	1	2.7 ± 7.0
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	2	2.7 ± 7.0
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	4 Secure	4	3.6 ± 0.0
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	4	2.7 ± 7.0
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B,S5M	4 Secure	123	2.7 ± 7.0
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B,S5M	4 Secure	27	2.7 ± 7.0
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B,S5M	4 Secure	4	2.9 ± 0.0
A	<i>Dendroica striata</i>	Blackpoll Warbler				S3S4B,S5M	4 Secure	2	2.7 ± 7.0
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3S4M	4 Secure	11	3.6 ± 0.0
A	<i>Limosa haemastica</i>	Hudsonian Godwit				S3S4M	4 Secure	1	3.6 ± 0.0
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3S4M	4 Secure	51	3.6 ± 0.0
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S3S4M	4 Secure	33	3.6 ± 0.0
A	<i>Calidris alba</i>	Sanderling				S3S4M,S1N	3 Sensitive	6	3.6 ± 0.0
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	3 Sensitive	8	1.1 ± 0.0
I	<i>Polygonia gracilis</i>	Hoary Comma				S3	4 Secure	2	2.7 ± 7.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species “location sensitive”. Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with “YES”.

New Brunswick

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Chrysemys picta picta</i>	Eastern Painted Turtle			No
<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	No
<i>Haliaeetus leucocephalus</i>	Bald Eagle		Endangered	YES
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	No
<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	Endangered	Endangered	No
<i>Coenonympha nipisiquit</i>	Maritime Ringlet	Endangered	Endangered	No
<i>Bat Hibernaculum</i>		[Endangered] ¹	[Endangered] ¹	No

¹ *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
410	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
48	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
37	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
21	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.
19	eBird. 2014. eBird Basic Dataset. Version: EBD_relNov-2014. Ithaca, New York. Nov 2014. Cornell Lab of Ornithology, 25036 recs.
17	Coursol, F. 2005. Dataset from New Brunswick fieldwork for <i>Eriocaulon parkeri</i> COSEWIC report. Coursol, Pers. comm. to C.S. Blaney, Aug 26. 110 recs.
7	Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs.
4	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
4	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
4	Dept of Fisheries & Oceans. 2001. Atlantic Salmon Maritime provinces overview for 2000. DFO.
4	Klymko, J.J.D. 2014. Maritimes Butterfly Atlas, 2012 submissions. Atlantic Canada Conservation Data Centre, 8552 records.
3	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
3	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs.
3	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc.
2	Dept of Fisheries & Oceans. 2001. Atlantic Salmon Maritime provinces overview for 2000. DFO.
2	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
2	Thomas, A.W. 1996. A preliminary atlas of the butterflies of New Brunswick. New Brunswick Museum.
1	Atlantic Canada Conservation Area Database (ARCAD)
1	Benedict, B. Connell Herbarium Specimen Database Download 2004. Connell Memorial Herbarium, University of New Brunswick. 2004.
1	Bradford, R.G. et al. 1999. Update on the Status of Striped bass (<i>Morone saxatilis</i>) in eastern Canada in 1998.
1	Cdn Gazeteer
1	Dept of Fisheries & Oceans. 1999. Status of Wild Striped Bass, & Interaction between Wild & Cultured Striped Bass in the Maritime Provinces. , Science Stock Status Report D3-22. 13 recs.
1	EMR Place Names
1	Federal Lands db
1	Speers, L. 2008. Butterflies of Canada database: New Brunswick 1897-1999. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 2048 recs.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 20110 records of 126 vertebrate and 633 records of 63 invertebrate fauna; 4997 records of 261 vascular, 103 records of 56 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs. All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (\pm the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	1	52.7 \pm 1.0	NB
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	1932	25.0 \pm 0.0	NB
A	<i>Dermochelys coriacea</i> (Atlantic pop.)	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	4	50.1 \pm 1.0	NB
A	<i>Salmo salar</i> pop. 1	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	2 May Be At Risk	425	84.5 \pm 0.0	NB
A	<i>Calidris canutus rufa</i>	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	1 At Risk	197	32.2 \pm 0.0	NB
A	<i>Rangifer tarandus</i> pop. 2	Woodland Caribou (Atlantic-Gasp [r-sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	6	17.1 \pm 5.0	NB
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	2 May Be At Risk	6	5.1 \pm 7.0	NB
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	2 May Be At Risk	57	10.3 \pm 7.0	NB
A	<i>Caprimulgus vociferus</i>	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	49	2.7 \pm 7.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened		Threatened	S2B,S2M	3 Sensitive	641	2.7 ± 7.0	NB
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2B,S2M	1 At Risk	435	40.3 ± 7.0	NB
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	541	11.2 ± 0.0	NB
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	232	2.7 ± 7.0	NB
A	<i>Riparia riparia</i>	Bank Swallow	Threatened		Threatened	S2S3B,S2S3M	3 Sensitive	372	2.7 ± 7.0	NB
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	534	7.3 ± 7.0	NB
A	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	418	2.7 ± 7.0	NB
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened		Threatened	S3B,S3M	3 Sensitive	524	2.7 ± 7.0	NB
A	<i>Chordeiles minor</i>	Common Nighthawk	Threatened	Threatened	Threatened	S3B,S4M	1 At Risk	360	2.7 ± 7.0	NB
A	<i>Anguilla rostrata</i>	American Eel	Threatened		Threatened	S4	4 Secure	13	19.9 ± 1.0	NB
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	1 At Risk	4	64.5 ± 0.0	NB
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B,S3M	1 At Risk	11	7.0 ± 20.0	NB
A	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	9	47.9 ± 0.0	NB
A	<i>Bucephala islandica (Eastern pop.)</i>	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	49	3.8 ± 0.0	NB
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	188	7.3 ± 7.0	NB
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern			S3B,S3S4N,SUM	3 Sensitive	384	2.7 ± 7.0	NB
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	3	80.9 ± 1.0	NB
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	4 Secure	380	0.9 ± 1.0	NB
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern		Special Concern	S4N,S4M	4 Secure	1	73.3 ± 3.0	NB
A	<i>Odobenus rosmarus rosmarus</i>	Atlantic Walrus	Special Concern		Extirpated	SX		3	48.2 ± 1.0	NB
A	<i>Bubo scandiacus</i>	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	12	61.9 ± 29.0	NB
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	2 May Be At Risk	1	80.9 ± 1.0	NB
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1S2B,S1S2M	3 Sensitive	3	12.7 ± 1.0	NB
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	13	19.7 ± 0.0	NB
A	<i>Sorex dispar</i>	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	16	70.6 ± 1.0	NB
A	<i>Buteo lineatus</i>	Red-shouldered Hawk	Not At Risk	Special Concern		S2B,S2M	2 May Be At Risk	10	10.7 ± 0.0	NB
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S2B,S2M	3 Sensitive	6	49.8 ± 7.0	NB
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk			S2S3		1	42.9 ± 1.0	NB
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	41	23.0 ± 0.0	NB
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	549	30.5 ± 1.0	NB
A	<i>Podiceps grisegena</i>	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	7	12.1 ± 0.0	NB
A	<i>Haliaeetus leucocephalus</i>	Bald Eagle	Not At Risk		Endangered	S4	1 At Risk	350	0.6 ± 0.0	NB
A	<i>Canis lupus</i>	Gray Wolf	Not At Risk		Extirpated	SX	0.1 Extirpated	1	44.2 ± 100.0	NB
A	<i>Puma concolor pop. 1</i>	Eastern Cougar	Data Deficient		Endangered	SU	5 Undetermined	48	5.1 ± 1.0	NB
A	<i>Morone saxatilis</i>	Striped Bass	E,E,SC			S3	2 May Be At Risk	14	2.1 ± 10.0	NB
A	<i>Salvelinus alpinus</i>	Arctic Char				S1	3 Sensitive	10	69.0 ± 1.0	NB
A	<i>Synaptomys borealis</i>	Northern Bog Lemming				S1	5 Undetermined	3	51.7 ± 1.0	NB
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S1?B,S5M	4 Secure	583	3.6 ± 0.0	NB
A	<i>Aythya americana</i>	Redhead				S1B,S1M	8 Accidental	1	80.9 ± 1.0	NB
A	<i>Grus canadensis</i>	Sandhill Crane				S1B,S1M	8 Accidental	6	24.8 ± 1.0	NB
A	<i>Bartramia longicauda</i>	Upland Sandpiper				S1B,S1M	3 Sensitive	14	58.7 ± 7.0	NB
A	<i>Phalaropus tricolor</i>	Wilson's Phalarope				S1B,S1M	3 Sensitive	10	80.1 ± 7.0	NB
A	<i>Leucophaeus atricilla</i>	Laughing Gull				S1B,S1M	3 Sensitive	1	52.7 ± 0.0	NB
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	2 May Be At Risk	18	22.6 ± 7.0	NB
A	<i>Thryothorus ludovicianus</i>	Carolina Wren				S1B,S1M	8 Accidental	1	9.7 ± 0.0	NB
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B,S2S3M	4 Secure	11	49.2 ± 0.0	NB
A	<i>Uria aalge</i>	Common Murre				S1B,S3N,S3M	4 Secure	3	95.4 ± 0.0	NB
A	<i>Aythya affinis</i>	Lesser Scaup				S1B,S4M	4 Secure	63	3.6 ± 1.0	NB
A	<i>Aythya marila</i>	Greater Scaup				S1B,S4M,S2N	4 Secure	11	49.2 ± 1.0	NB
A	<i>Eremophila alpestris</i>	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	106	10.3 ± 7.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Sterna paradisaea</i>	Arctic Tern				S1B,SUM	2 May Be At Risk	33	30.5 ± 0.0	NB
A	<i>Branta bernicla</i>	Brant				S1N, S2S3M	4 Secure	54	48.4 ± 10.0	NB
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S1N,S2M	3 Sensitive	6	80.7 ± 0.0	NB
A	<i>Butorides virescens</i>	Green Heron				S1S2B,S1S2M	3 Sensitive	2	80.1 ± 7.0	NB
A	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	79	20.3 ± 1.0	NB
A	<i>Empidonax traillii</i>	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	19	2.7 ± 7.0	NB
A	<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	5	53.5 ± 1.0	NB
A	<i>Troglodytes aedon</i>	House Wren				S1S2B,S1S2M	5 Undetermined	4	2.6 ± 0.0	NB
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S1S2B,S4N,S5M	4 Secure	20	89.6 ± 0.0	NB
A	<i>Calidris bairdii</i>	Baird's Sandpiper				S1S2M	3 Sensitive	10	48.8 ± 0.0	NB
A	<i>Microtus chrotorrhinus</i>	Rock Vole				S2?	5 Undetermined	29	85.6 ± 1.0	NB
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S2B,S2M	3 Sensitive	50	2.7 ± 7.0	NB
A	<i>Toxostoma rufum</i>	Brown Thrasher				S2B,S2M	3 Sensitive	37	2.7 ± 7.0	NB
A	<i>Poocetes gramineus</i>	Vesper Sparrow				S2B,S2M	2 May Be At Risk	74	16.4 ± 7.0	NB
A	<i>Anas strepera</i>	Gadwall				S2B,S3M	4 Secure	47	3.8 ± 0.0	NB
A	<i>Alca torda</i>	Razorbill				S2B,S3N,S3M	4 Secure	7	94.6 ± 14.0	NB
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	72	22.6 ± 7.0	NB
A	<i>Tringa solitaria</i>	Solitary Sandpiper				S2B,S5M	4 Secure	90	3.6 ± 0.0	NB
A	<i>Chen caerulescens</i>	Snow Goose				S2M	4 Secure	19	2.6 ± 0.0	NB
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2N,S2M	4 Secure	9	53.8 ± 1.0	NB
A	<i>Somateria spectabilis</i>	King Eider				S2N,S2M	4 Secure	2	73.3 ± 1.0	NB
A	<i>Larus hyperboreus</i>	Glaucous Gull				S2N,S2M	4 Secure	17	3.8 ± 0.0	NB
A	<i>Asio otus</i>	Long-eared Owl				S2S3	5 Undetermined	9	20.1 ± 1.0	NB
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S2S3	3 Sensitive	69	24.5 ± 0.0	NB
A	<i>Salmo salar</i>	Atlantic Salmon				S2S3	2 May Be At Risk	2106	19.9 ± 1.0	NB
A	<i>Anas clypeata</i>	Northern Shoveler				S2S3B,S2S3M	4 Secure	55	5.9 ± 0.0	NB
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	28	2.7 ± 7.0	NB
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	299	2.7 ± 7.0	NB
A	<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	3 Sensitive	45	20.8 ± 2.0	NB
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S2S3N,SUM	3 Sensitive	9	11.3 ± 0.0	NB
A	<i>Cephus grylle</i>	Black Guillemot				S3	4 Secure	34	71.8 ± 3.0	NB
A	<i>Loxia curvirostra</i>	Red Crossbill				S3	4 Secure	102	5.4 ± 0.0	NB
A	<i>Carduelis pinus</i>	Pine Siskin				S3	4 Secure	288	2.7 ± 7.0	NB
A	<i>Prosopium cylindraceum</i>	Round Whitefish				S3	4 Secure	2	98.2 ± 0.0	NB
A	<i>Salvelinus namaycush</i>	Lake Trout				S3	3 Sensitive	4	83.6 ± 0.0	NB
A	<i>Sorex maritimensis</i>	Maritime Shrew				S3	4 Secure	39	32.6 ± 0.0	NB
A	<i>Cathartes aura</i>	Turkey Vulture				S3B,S3M	4 Secure	14	2.1 ± 0.0	NB
A	<i>Rallus limicola</i>	Virginia Rail				S3B,S3M	3 Sensitive	10	2.7 ± 7.0	NB
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	3 Sensitive	574	2.7 ± 7.0	NB
A	<i>Tringa semipalmata</i>	Willet				S3B,S3M	3 Sensitive	215	23.8 ± 0.0	NB
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B,S3M	4 Secure	70	2.7 ± 7.0	NB
A	<i>Vireo gilvus</i>	Warbling Vireo				S3B,S3M	4 Secure	54	2.7 ± 7.0	NB
A	<i>Piranga olivacea</i>	Scarlet Tanager				S3B,S3M	4 Secure	89	12.7 ± 7.0	NB
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B,S3M	4 Secure	22	2.7 ± 7.0	NB
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	161	2.7 ± 7.0	NB
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B,S3M	4 Secure	63	2.7 ± 7.0	NB
A	<i>Somateria mollissima</i>	Common Eider				S3B,S4M,S3N	4 Secure	107	47.5 ± 14.0	NB
A	<i>Dendroica tigrina</i>	Cape May Warbler				S3B,S4S5M	4 Secure	215	2.7 ± 7.0	NB
A	<i>Anas acuta</i>	Northern Pintail				S3B,S5M	3 Sensitive	124	2.7 ± 7.0	NB
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	250	2.7 ± 7.0	NB
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	4 Secure	535	3.6 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S3M	3 Sensitive	5	32.2 ± 0.0	NB
A	<i>Melanitta nigra</i>	Black Scoter				S3M,S1S2N	3 Sensitive	124	30.5 ± 0.0	NB
A	<i>Bucephala albeola</i>	Bufflehead				S3M,S2N	3 Sensitive	40	5.8 ± 0.0	NB
A	<i>Calidris maritima</i>	Purple Sandpiper				S3M,S3N	4 Secure	3	76.6 ± 0.0	NB
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3S4	4 Secure	12	32.6 ± 0.0	NB
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	234	2.7 ± 7.0	NB
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B,S5M	4 Secure	975	2.7 ± 7.0	NB
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B,S5M	4 Secure	365	2.7 ± 7.0	NB
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B,S5M	4 Secure	341	2.9 ± 0.0	NB
A	<i>Dendroica striata</i>	Blackpoll Warbler				S3S4B,S5M	4 Secure	164	2.7 ± 7.0	NB
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3S4M	4 Secure	382	3.6 ± 0.0	NB
A	<i>Limosa haemastica</i>	Hudsonian Godwit				S3S4M	4 Secure	147	3.6 ± 0.0	NB
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3S4M	4 Secure	711	3.6 ± 0.0	NB
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S3S4M	4 Secure	93	3.6 ± 0.0	NB
A	<i>Calidris alba</i>	Sanderling				S3S4M,S1N	3 Sensitive	372	3.6 ± 0.0	NB
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	4 Secure	173	6.9 ± 0.0	NB
I	<i>Coenonympha nipisiquit</i>	Maritime Ringlet	Endangered	Endangered	Endangered	S1	1 At Risk	38	70.4 ± 7.0	NB
I	<i>Gomphus ventricosus</i>	Skillet Clubtail	Endangered		Endangered	S1S2	2 May Be At Risk	1	84.0 ± 0.0	NB
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	3 Sensitive	19	1.1 ± 0.0	NB
I	<i>Ophiogomphus howei</i>	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	2 May Be At Risk	26	30.2 ± 0.0	NB
I	<i>Alasmidonta varicosa</i>	Brook Floater	Special Concern		Special Concern	S2	3 Sensitive	16	41.1 ± 0.0	NB
I	<i>Lampsilis cariosa</i>	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	4	83.9 ± 0.0	NB
I	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern			S3?	3 Sensitive	11	45.2 ± 0.0	NB
I	<i>Appalachina sayana</i>	Spike-lip Crater	Not At Risk			S3?		1	91.5 ± 1.0	NB
I	<i>Erora laeta</i>	Early Hairstreak				S1	2 May Be At Risk	2	76.3 ± 7.0	NB
I	<i>Somatochlora septentrionalis</i>	Muskeg Emerald				S1	2 May Be At Risk	3	80.0 ± 0.0	NB
I	<i>Leucorrhinia patricia</i>	Canada Whiteface				S1	2 May Be At Risk	8	52.7 ± 1.0	NB
I	<i>Plebejus saepiolus</i>	Greenish Blue				S1S2	4 Secure	17	24.0 ± 7.0	NB
I	<i>Cicindela ancociscenensis</i>	Appalachian Tiger Beetle				S2	5 Undetermined	1	50.3 ± 0.0	NB
I	<i>Satyrrium calanus</i>	Banded Hairstreak				S2	3 Sensitive	1	48.1 ± 7.0	NB
I	<i>Strymon melinus</i>	Grey Hairstreak				S2	4 Secure	8	37.0 ± 1.0	NB
I	<i>Aeshna juncea</i>	Rush Darner				S2	3 Sensitive	1	80.0 ± 0.0	NB
I	<i>Somatochlora brevicincta</i>	Quebec Emerald				S2	5 Undetermined	7	80.4 ± 0.0	NB
I	<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald				S2	5 Undetermined	5	30.6 ± 0.0	NB
I	<i>Ladona exusta</i>	White Corporal				S2	5 Undetermined	1	63.6 ± 0.0	NB
I	<i>Coenagrion interrogatum</i>	Subarctic Bluet				S2	3 Sensitive	12	20.1 ± 0.0	NB
I	<i>Callophrys henrici</i>	Henry's Elfin				S2S3	4 Secure	11	21.5 ± 0.0	NB
I	<i>Desmocerus palliatus</i>	Elderberry Borer				S3		2	38.7 ± 0.0	NB
I	<i>Hippodamia parenthesis</i>	Parenthesis Lady Beetle				S3	4 Secure	1	53.8 ± 1.0	NB
I	<i>Xylotrechus quadrimaculatus</i>	a Longhorned Beetle				S3		1	80.4 ± 1.0	NB
I	<i>Xylotrechus undulatus</i>	a Longhorned Beetle				S3		1	88.2 ± 1.0	NB
I	<i>Calathus gregarius</i>	a Ground Beetle				S3	4 Secure	1	83.3 ± 1.0	NB
I	<i>Hyperaspis disconotata</i>	a Ladybird Beetle				S3	5 Undetermined	1	99.6 ± 5.0	NB
I	<i>Hesperia sassacus</i>	Indian Skipper				S3	4 Secure	4	31.4 ± 1.0	NB
I	<i>Euphyes bimacula</i>	Two-spotted Skipper				S3	4 Secure	9	42.0 ± 0.0	NB
I	<i>Papilio brevicauda</i>	Short-tailed Swallowtail				S3	4 Secure	45	47.8 ± 0.0	NB
I	<i>Papilio brevicauda bretonensis</i>	Short-tailed Swallowtail				S3	4 Secure	16	48.1 ± 0.0	NB

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I	<i>Lycaena hyllus</i>	Bronze Copper				S3	3 Sensitive	5	12.8 ± 0.0	NB
I	<i>Lycaena dospassosi</i>	Salt Marsh Copper				S3	4 Secure	96	23.2 ± 0.0	NB
I	<i>Satyrrium acadica</i>	Acadian Hairstreak				S3	4 Secure	3	70.4 ± 7.0	NB
I	<i>Callophrys polios</i>	Hoary Elfin				S3	4 Secure	13	17.1 ± 0.0	NB
I	<i>Callophrys eryphon</i>	Western Pine Elfin				S3	4 Secure	10	40.8 ± 10.0	NB
I	<i>Plebejus idas</i>	Northern Blue				S3	4 Secure	21	52.2 ± 0.0	NB
I	<i>Plebejus idas empetri</i>	Crowberry Blue				S3	4 Secure	3	59.6 ± 0.0	NB
I	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	4 Secure	5	22.6 ± 1.0	NB
I	<i>Boloria eunomia</i>	Bog Fritillary				S3	5 Undetermined	5	51.4 ± 0.0	NB
I	<i>Boloria bellona</i>	Meadow Fritillary				S3	4 Secure	1	82.2 ± 7.0	NB
I	<i>Boloria chariclea</i>	Arctic Fritillary				S3	4 Secure	17	24.0 ± 7.0	NB
I	<i>Boloria chariclea grandis</i>	Purple Lesser Fritillary				S3	4 Secure	4	40.8 ± 10.0	NB
I	<i>Polygonia satyrus</i>	Satyr Comma				S3	4 Secure	17	25.8 ± 1.0	NB
I	<i>Polygonia gracilis</i>	Hoary Comma				S3	4 Secure	30	2.7 ± 7.0	NB
I	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S3	4 Secure	5	18.1 ± 10.0	NB
I	<i>Gomphus abbreviatus</i>	Spine-crowned Clubtail				S3	4 Secure	14	17.6 ± 0.0	NB
I	<i>Dorocordulia lepida</i>	Petite Emerald				S3	4 Secure	3	83.7 ± 0.0	NB
I	<i>Somatochlora albicincta</i>	Ringed Emerald				S3	4 Secure	8	56.8 ± 1.0	NB
I	<i>Somatochlora cingulata</i>	Lake Emerald				S3	4 Secure	13	47.5 ± 0.0	NB
I	<i>Somatochlora forcipata</i>	Forcipate Emerald				S3	4 Secure	12	20.1 ± 0.0	NB
I	<i>Williamsonia fletcheri</i>	Ebony Boghaunter				S3	4 Secure	8	21.4 ± 0.0	NB
I	<i>Lestes eurinus</i>	Amber-Winged Spreadwing				S3	4 Secure	17	38.4 ± 1.0	NB
I	<i>Enallagma geminatum</i>	Skimming Bluet				S3	5 Undetermined	4	88.4 ± 0.0	NB
I	<i>Enallagma signatum</i>	Orange Bluet				S3	4 Secure	1	88.4 ± 0.0	NB
I	<i>Stylurus scudleri</i>	Zebra Clubtail				S3	4 Secure	3	31.4 ± 0.0	NB
I	<i>Alasmidonta undulata</i>	Triangle Floater				S3	3 Sensitive	3	45.9 ± 1.0	NB
I	<i>Leptodea ochracea</i>	Tidewater Mucket				S3	4 Secure	1	90.3 ± 0.0	NB
I	<i>Pantala hymenaea</i>	Spot-Winged Glider				S3B,S3M	4 Secure	1	99.2 ± 0.0	NB
I	<i>Satyrrium liparops</i>	Striped Hairstreak				S3S4	4 Secure	18	20.1 ± 0.0	NB
I	<i>Satyrrium liparops strigosum</i>	Striped Hairstreak				S3S4	4 Secure	8	41.7 ± 1.0	NB
I	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	4 Secure	1	45.9 ± 1.0	NB
I	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle				SH	2 May Be At Risk	9	53.8 ± 1.0	NB
N	<i>Aulacomnium heterostichum</i>	One-sided Groove Moss				S1	2 May Be At Risk	1	49.0 ± 0.0	NB
N	<i>Campylostelium saxicola</i>	a Moss				S1	2 May Be At Risk	1	48.2 ± 0.0	NB
N	<i>Zygodon viridissimus</i> var. <i>viridissimus</i>	a Moss				S1	2 May Be At Risk	1	47.0 ± 0.0	NB
N	<i>Cinclidium stygium</i>	Sooty Cupola Moss				S1?	2 May Be At Risk	1	91.6 ± 0.0	NB
N	<i>Dicranum bonjeanii</i>	Bonjean's Broom Moss				S1?	2 May Be At Risk	1	61.2 ± 1.0	NB
N	<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss				S1?	2 May Be At Risk	1	47.1 ± 0.0	NB
N	<i>Paludella squarrosa</i>	Tufted Fen Moss				S1?	2 May Be At Risk	1	91.6 ± 0.0	NB
N	<i>Seligeria recurvata</i>	a Moss				S1?	2 May Be At Risk	1	96.8 ± 15.0	NB
N	<i>Rhizomnium pseudopunctatum</i>	Felted Leafy Moss				S1?	2 May Be At Risk	1	52.1 ± 0.0	NB
N	<i>Cephaloziella spinigera</i>	Spiny Threadwort				S1S2	6 Not Assessed	2	80.0 ± 0.0	NB
N	<i>Odontoschisma sphagni</i>	Bog-Moss Flapwort				S1S2	6 Not Assessed	1	52.1 ± 0.0	NB
N	<i>Pallavicinia lyellii</i>	Lyell's Ribbonwort				S1S2	6 Not Assessed	1	43.8 ± 1.0	NB
N	<i>Drummondia prorepens</i>	a Moss				S1S2	2 May Be At Risk	1	48.7 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	<i>Seligeria brevifolia</i>	a Moss				S1S2	3 Sensitive	4	47.1 ± 0.0	NB
N	<i>Calypogeia neesiana</i>	Nees' Pouchwort				S1S3	6 Not Assessed	1	71.9 ± 1.0	NB
N	<i>Meesia triquetra</i>	Three-ranked Cold Moss				S2	2 May Be At Risk	1	86.9 ± 10.0	NB
N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2	3 Sensitive	1	96.8 ± 15.0	NB
N	<i>Pohlia elongata</i>	Long-necked Nodding Moss				S2	3 Sensitive	4	48.1 ± 0.0	NB
N	<i>Pohlia sphagnicola</i>	a moss				S2	3 Sensitive	1	52.3 ± 0.0	NB
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S2	3 Sensitive	1	52.1 ± 0.0	NB
N	<i>Sphagnum flexuosum</i>	Flexuous Peatmoss				S2	3 Sensitive	2	43.8 ± 0.0	NB
N	<i>Tetradontium brownianum</i>	Little Georgia				S2	3 Sensitive	5	48.1 ± 0.0	NB
N	<i>Nephroma laevigatum</i>	Mustard Kidney Lichen				S2	2 May Be At Risk	1	55.0 ± 0.0	NB
N	<i>Barbilophozia lycopodioides</i>	Greater Pawwort				S2?	6 Not Assessed	1	77.5 ± 1.0	NB
N	<i>Anacamptodon splachnoides</i>	a Moss				S2?	3 Sensitive	1	61.8 ± 1.0	NB
N	<i>Bryum pallescens</i>	Pale Bryum Moss				S2?	5 Undetermined	1	47.0 ± 100.0	NB
N	<i>Sphagnum angermanicum</i>	a Peatmoss				S2?	3 Sensitive	2	50.0 ± 0.0	NB
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss				S2?	3 Sensitive	1	96.8 ± 15.0	NB
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2?	5 Undetermined	1	48.6 ± 0.0	NB
N	<i>Orthotrichum speciosum</i>	Showy Bristle Moss				S2S3	5 Undetermined	4	47.1 ± 0.0	NB
N	<i>Pohlia prolifera</i>	Cottony Nodding Moss				S2S3	3 Sensitive	9	48.1 ± 0.0	NB
N	<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss				S2S3	3 Sensitive	2	70.0 ± 1.0	NB
N	<i>Sphagnum subfulvum</i>	a Peatmoss				S2S3	2 May Be At Risk	2	52.3 ± 0.0	NB
N	<i>Zygodon viridissimus</i>	a Moss				S2S3	2 May Be At Risk	1	47.1 ± 0.0	NB
N	<i>Dendriscoaulon umhausense</i>	a lichen				S2S3	3 Sensitive	1	48.1 ± 0.0	NB
N	<i>Schistidium maritimum</i>	a Moss				S3	4 Secure	1	52.1 ± 0.0	NB
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	3 Sensitive	1	48.1 ± 0.0	NB
N	<i>Ahtiana aurescens</i>	Eastern Candlewax Lichen				S3	5 Undetermined	1	51.2 ± 0.0	NB
N	<i>Aulacomnium androgynum</i>	Little Groove Moss				S3?	4 Secure	5	49.1 ± 0.0	NB
N	<i>Dicranella rufescens</i>	Red Forklet Moss				S3?	5 Undetermined	1	72.2 ± 7.0	NB
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss				S3S4	4 Secure	1	71.2 ± 15.0	NB
N	<i>Dicranum majus</i>	Greater Broom Moss				S3S4	4 Secure	4	49.3 ± 0.0	NB
N	<i>Dicranum leioneuron</i>	a Dicranum Moss				S3S4	4 Secure	1	57.1 ± 10.0	NB
N	<i>Fissidens bryoides</i>	Lesser Pocket Moss				S3S4	4 Secure	1	58.1 ± 5.0	NB
N	<i>Heterocladium dimorphum</i>	Dimorphous Tangle Moss				S3S4	4 Secure	2	47.1 ± 0.0	NB
N	<i>Pogonatum dentatum</i>	Mountain Hair Moss				S3S4	4 Secure	1	48.7 ± 0.0	NB
N	<i>Sphagnum compactum</i>	Compact Peat Moss				S3S4	4 Secure	1	48.2 ± 1.0	NB
N	<i>Sphagnum torreyanum</i>	a Peatmoss				S3S4	4 Secure	1	72.3 ± 0.0	NB
N	<i>Sphagnum contortum</i>	Twisted Peat Moss				S3S4	4 Secure	1	72.3 ± 0.0	NB
N	<i>Tetraphis geniculata</i>	Geniculate Four-tooth Moss				S3S4	4 Secure	3	55.5 ± 0.0	NB
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	1	49.1 ± 0.0	NB
N	<i>Rauvella scita</i>	Smaller Fern Moss				S3S4	3 Sensitive	1	49.2 ± 0.0	NB
N	<i>Pseudocyphellaria perpetua</i>	Gilded Specklebelly Lichen				S3S4	3 Sensitive	4	48.6 ± 0.0	NB
N	<i>Stereocaulon paschale</i>	Easter Foam Lichen				S3S4	5 Undetermined	1	74.5 ± 1.0	NB
N	<i>Leucodon brachypus</i>	a Moss				SH	2 May Be At Risk	9	47.0 ± 0.0	NB
N	<i>Splachnum luteum</i>	Yellow Collar Moss				SH	5 Undetermined	1	47.0 ± 100.0	NB
P	<i>Juglans cinerea</i>	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	23	41.8 ± 0.0	NB
P	<i>Symphyotrichum laurentianum</i>	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	1 At Risk	27	53.7 ± 0.0	NB

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P	<i>Symphytotrichum subulatum</i> (Bathurst pop)	Bathurst Aster - Bathurst pop.	Special Concern	Special Concern	Endangered	S2	1 At Risk	201	17.8 ± 0.0	NB
P	<i>Isoetes prototypus</i>	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	1 At Risk	1	87.5 ± 0.0	NB
P	<i>Lechea maritima</i> var. <i>subcylindrica</i>	Beach Pinweed	Special Concern			S2	3 Sensitive	443	47.2 ± 0.0	NB
P	<i>Eriocaulon parkeri</i>	Parker's Pipewort	Not At Risk		Endangered	S2	1 At Risk	82	2.9 ± 1.0	NB
P	<i>Pterospora andromedea</i>	Woodland Pinedrops			Endangered	S1	1 At Risk	1	98.9 ± 0.0	NB
P	<i>Cryptotaenia canadensis</i>	Canada Honewort				S1	2 May Be At Risk	1	50.2 ± 1.0	NB
P	<i>Bidens eatonii</i>	Eaton's Beggarticks				S1	2 May Be At Risk	7	7.1 ± 0.0	NB
P	<i>Pseudognaphalium obtusifolium</i>	Eastern Cudweed				S1	2 May Be At Risk	4	47.2 ± 0.0	NB
P	<i>Betula glandulosa</i>	Glandular Birch				S1	2 May Be At Risk	8	67.6 ± 0.0	NB
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch				S1	2 May Be At Risk	3	51.1 ± 0.0	NB
P	<i>Cynoglossum virginianum</i> var. <i>boreale</i>	Wild Comfrey				S1	2 May Be At Risk	3	58.1 ± 0.0	NB
P	<i>Cardamine parviflora</i> var. <i>arenicola</i>	Small-flowered Bittercress				S1	2 May Be At Risk	1	48.0 ± 0.0	NB
P	<i>Stellaria crassifolia</i>	Fleshy Stitchwort				S1	2 May Be At Risk	1	31.9 ± 10.0	NB
P	<i>Stellaria longipes</i>	Long-stalked Starwort				S1	2 May Be At Risk	1	97.2 ± 1.0	NB
P	<i>Triadenum virginicum</i>	Virginia St John's-wort				S1	2 May Be At Risk	1	16.3 ± 0.0	NB
P	<i>Vaccinium boreale</i>	Northern Blueberry				S1	2 May Be At Risk	12	67.6 ± 0.0	NB
P	<i>Vaccinium uliginosum</i>	Alpine Bilberry				S1	2 May Be At Risk	4	71.6 ± 0.0	NB
P	<i>Chamaesyce polygonifolia</i>	Seaside Spurge				S1	2 May Be At Risk	5	55.5 ± 5.0	NB
P	<i>Desmodium glutinosum</i>	Large Tick-Trefoil				S1	2 May Be At Risk	1	85.5 ± 0.0	NB
P	<i>Bartonia virginica</i>	Yellow Bartonia				S1	2 May Be At Risk	3	62.1 ± 0.0	NB
P	<i>Ranunculus lapponicus</i>	Lapland Buttercup				S1	2 May Be At Risk	1	96.0 ± 0.0	NB
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1	2 May Be At Risk	1	83.7 ± 100.0	NB
P	<i>Crataegus jonesiae</i>	Jones' Hawthorn				S1	2 May Be At Risk	1	74.1 ± 1.0	NB
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S1	5 Undetermined	1	91.4 ± 0.0	NB
P	<i>Salix serissima</i>	Autumn Willow				S1	2 May Be At Risk	4	90.9 ± 0.0	NB
P	<i>Agalinis paupercula</i> var. <i>borealis</i>	Small-flowered Agalinis				S1	2 May Be At Risk	9	18.4 ± 0.0	NB
P	<i>Carex bigelowii</i>	Bigelow's Sedge				S1	2 May Be At Risk	1	67.7 ± 0.0	NB
P	<i>Carex glareosa</i> var. <i>amphigena</i>	Gravel Sedge				S1	2 May Be At Risk	2	95.5 ± 1.0	NB
P	<i>Carex saxatilis</i>	Russet Sedge				S1	2 May Be At Risk	6	89.2 ± 0.0	NB
P	<i>Carex viridula</i> var. <i>elatior</i>	Greenish Sedge				S1	2 May Be At Risk	11	90.8 ± 0.0	NB
P	<i>Cyperus diandrus</i>	Low Flatsedge				S1	2 May Be At Risk	2	9.6 ± 0.0	NB
P	<i>Cyperus bipartitus</i>	Shining Flatsedge				S1	2 May Be At Risk	13	2.9 ± 0.0	NB
P	<i>Scirpus pendulus</i>	Hanging Bulrush				S1	2 May Be At Risk	1	99.4 ± 0.0	PE
P	<i>Schoenoplectus smithii</i>	Smith's Bulrush				S1	2 May Be At Risk	18	7.0 ± 0.0	NB
P	<i>Juncus greenei</i>	Greene's Rush				S1	2 May Be At Risk	2	0.6 ± 1.0	NB
P	<i>Juncus stygius</i>	Moor Rush				S1	2 May Be At Risk	1	33.6 ± 0.0	NB
P	<i>Juncus stygius</i> ssp. <i>americanus</i>	Moor Rush				S1	2 May Be At Risk	3	59.5 ± 10.0	NB
P	<i>Juncus subtilis</i>	Creeping Rush				S1	2 May Be At Risk	3	57.3 ± 0.0	NB
P	<i>Juncus trifidus</i>	Highland Rush				S1	2 May Be At Risk	5	67.6 ± 0.0	NB
P	<i>Allium canadense</i>	Canada Garlic				S1	2 May Be At Risk	1	20.3 ± 1.0	NB
P	<i>Malaxis brachypoda</i>	White Adder's-Mouth				S1	2 May Be At Risk	2	90.8 ± 0.0	NB

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P	<i>Calamagrostis stricta</i> <i>ssp. inexpansa</i>	Slim-stemmed Reed Grass				S1	2 May Be At Risk	1	54.6 ± 0.0	NB
P	<i>Dichanthelium</i> <i>xanthophysum</i>	Slender Panic Grass				S1	2 May Be At Risk	9	60.7 ± 0.0	NB
P	<i>Zizania aquatica</i> var. <i>brevis</i>	Indian Wild Rice				S1	2 May Be At Risk	16	1.9 ± 0.0	NB
P	<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	2 May Be At Risk	2	18.5 ± 0.0	NB
P	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern				S1	2 May Be At Risk	1	74.5 ± 0.0	NB
P	<i>Huperzia selago</i>	Northern Firmoss				S1	2 May Be At Risk	3	67.7 ± 0.0	NB
P	<i>Bidens heterodoxa</i>	Connecticut Beggar-Ticks				S1?	2 May Be At Risk	2	53.8 ± 0.0	NB
P	<i>Cuscuta campestris</i>	Field Dodder				S1?	2 May Be At Risk	3	20.8 ± 0.0	NB
P	<i>Carex laxiflora</i>	Loose-Flowered Sedge				S1?	5 Undetermined	1	82.7 ± 2.0	NB
P	<i>Rumex aquaticus</i> var. <i>fenestratus</i>	Western Dock				S1S2	2 May Be At Risk	2	58.4 ± 0.0	NB
P	<i>Carex crawei</i>	Crawe's Sedge				S1S2	2 May Be At Risk	1	67.9 ± 0.0	NB
P	<i>Thelypteris simulata</i>	Bog Fern				S1S2	2 May Be At Risk	1	14.2 ± 1.0	NB
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S1S3	2 May Be At Risk	22	20.7 ± 0.0	NB
P	<i>Listera australis</i>	Southern Twayblade			Endangered	S2	1 At Risk	23	33.0 ± 0.0	NB
P	<i>Osmorhiza</i> <i>depauperata</i>	Blunt Sweet Cicely				S2	3 Sensitive	3	26.6 ± 1.0	NB
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	3 Sensitive	4	33.6 ± 0.0	NB
P	<i>Pseudognaphalium</i> <i>macounii</i>	Macoun's Cudweed				S2	3 Sensitive	30	49.8 ± 5.0	NB
P	<i>Ionactis linariifolius</i>	Stiff Aster				S2	3 Sensitive	67	8.0 ± 1.0	NB
P	<i>Symphotrichum</i> <i>subulatum</i>	Annual Saltmarsh Aster				S2	1 At Risk	152	18.1 ± 0.0	NB
P	<i>Betula minor</i>	Dwarf White Birch				S2	3 Sensitive	5	67.6 ± 0.0	NB
P	<i>Arabis drummondii</i>	Drummond's Rockcress				S2	3 Sensitive	5	7.3 ± 1.0	NB
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S2	3 Sensitive	1	78.0 ± 1.0	NB
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	3 Sensitive	3	50.3 ± 0.0	NB
P	<i>Atriplex franktonii</i>	Frankton's Saltbush				S2	4 Secure	2	48.4 ± 5.0	NB
P	<i>Chenopodium rubrum</i>	Red Pigweed				S2	3 Sensitive	12	47.4 ± 0.0	NB
P	<i>Hypericum</i> <i>dissimulatum</i>	Disguised St John's-wort				S2	3 Sensitive	1	70.5 ± 1.0	NB
P	<i>Astragalus eucosmus</i>	Elegant Milk-vetch				S2	2 May Be At Risk	1	18.5 ± 0.0	NB
P	<i>Oxytropis campestris</i> var. <i>johannensis</i>	Field Locoweed				S2	3 Sensitive	1	54.8 ± 10.0	NB
P	<i>Gentiana linearis</i>	Narrow-Leaved Gentian				S2	3 Sensitive	20	48.4 ± 5.0	NB
P	<i>Myriophyllum humile</i>	Low Water Milfoil				S2	3 Sensitive	1	57.3 ± 1.0	NB
P	<i>Nuphar lutea</i> ssp. <i>rubrodisca</i>	Red-disked Yellow Pond-lily				S2	3 Sensitive	5	51.1 ± 0.0	NB
P	<i>Orobanche uniflora</i>	One-Flowered Broomrape				S2	3 Sensitive	3	31.1 ± 10.0	NB
P	<i>Polygonum amphibium</i> var. <i>emersum</i>	Water Smartweed				S2	3 Sensitive	1	18.5 ± 0.0	NB
P	<i>Podostemum</i> <i>ceratophyllum</i>	Horn-leaved Riverweed				S2	3 Sensitive	8	20.1 ± 1.0	NB
P	<i>Hepatica nobilis</i> var. <i>obtusa</i>	Round-lobed Hepatica				S2	3 Sensitive	3	24.8 ± 0.0	NB
P	<i>Ranunculus</i> <i>longirostris</i>	Eastern White Water-Crowfoot				S2	5 Undetermined	1	88.3 ± 1.0	NB
P	<i>Crataegus scabrada</i>	Rough Hawthorn				S2	3 Sensitive	3	60.7 ± 1.0	NB
P	<i>Rosa acicularis</i> ssp. <i>sayi</i>	Prickly Rose				S2	2 May Be At Risk	133	47.5 ± 0.0	NB
P	<i>Galium kamtschaticum</i>	Northern Wild Licorice				S2	3 Sensitive	6	86.8 ± 5.0	NB
P	<i>Salix candida</i>	Sage Willow				S2	3 Sensitive	21	76.1 ± 0.0	NB
P	<i>Castilleja</i> <i>septentrionalis</i>	Northeastern Paintbrush				S2	3 Sensitive	2	89.6 ± 0.0	NB

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P	<i>Viola novae-angliae</i>	New England Violet				S2	3 Sensitive	2	85.0 ± 1.0	NB
P	<i>Sagittaria calycina</i> var. <i>spongiosa</i>	Long-lobed Arrowhead				S2	4 Secure	144	0.5 ± 0.0	NB
P	<i>Carex granularis</i>	Limestone Meadow Sedge				S2	3 Sensitive	7	57.2 ± 5.0	NB
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S2	3 Sensitive	9	90.8 ± 0.0	NB
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2	3 Sensitive	16	18.1 ± 0.0	NB
P	<i>Carex rostrata</i>	Narrow-leaved Beaked Sedge				S2	3 Sensitive	6	61.8 ± 5.0	NB
P	<i>Carex salina</i>	Saltmarsh Sedge				S2	3 Sensitive	7	62.8 ± 0.0	NB
P	<i>Carex sprengelii</i>	Longbeak Sedge				S2	3 Sensitive	1	54.1 ± 0.0	NB
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S2	2 May Be At Risk	2	52.8 ± 0.0	NB
P	<i>Carex albicans</i> var. <i>emmonsii</i>	White-tinged Sedge				S2	3 Sensitive	9	42.5 ± 0.0	NB
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S2	2 May Be At Risk	2	59.1 ± 10.0	NB
P	<i>Blysmus rufus</i>	Red Bulrush				S2	3 Sensitive	55	56.3 ± 0.0	NB
P	<i>Juncus vaseyi</i>	Vasey Rush				S2	3 Sensitive	37	4.7 ± 10.0	NB
P	<i>Amerorchis rotundifolia</i>	Small Round-leaved Orchis				S2	2 May Be At Risk	8	85.1 ± 1.0	NB
P	<i>Calypso bulbosa</i> var. <i>americana</i>	Calypso				S2	2 May Be At Risk	7	24.8 ± 0.0	NB
P	<i>Coeloglossum viride</i> var. <i>virescens</i>	Long-bracted Frog Orchid				S2	2 May Be At Risk	4	93.0 ± 5.0	NB
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	1	14.1 ± 5.0	NB
P	<i>Goodyera oblongifolia</i>	Menzies' Rattlesnake-plantain				S2	3 Sensitive	22	27.4 ± 1.0	NB
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	3 Sensitive	8	20.2 ± 1.0	NB
P	<i>Agrostis mertensii</i>	Northern Bent Grass				S2	2 May Be At Risk	57	47.7 ± 0.0	NB
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S2	3 Sensitive	5	21.3 ± 0.0	NB
P	<i>Piptatherum canadense</i>	Canada Rice Grass				S2	3 Sensitive	5	60.5 ± 0.0	NB
P	<i>Poa glauca</i>	Glaucous Blue Grass				S2	4 Secure	3	74.5 ± 0.0	NB
P	<i>Puccinellia laurentiana</i>	Nootka Alkali Grass				S2	3 Sensitive	2	46.5 ± 0.0	NB
P	<i>Zizania aquatica</i> var. <i>aquatica</i>	Indian Wild Rice				S2	5 Undetermined	7	2.4 ± 1.0	NB
P	<i>Piptatherum pungens</i>	Slender Rice Grass				S2	2 May Be At Risk	12	60.4 ± 1.0	NB
P	<i>Woodwardia virginica</i>	Virginia Chain Fern				S2	3 Sensitive	11	49.9 ± 0.0	NB
P	<i>Woodsia alpina</i>	Alpine Cliff Fern				S2	3 Sensitive	1	55.6 ± 0.0	NB
P	<i>Lycopodium sitchense</i>	Sitka Clubmoss				S2	3 Sensitive	2	67.5 ± 0.0	NB
P	<i>Selaginella selaginoides</i>	Low Spikemoss				S2	3 Sensitive	14	90.8 ± 0.0	NB
P	<i>Toxicodendron radicans</i>	Poison Ivy				S2?	3 Sensitive	4	42.0 ± 0.0	NB
P	<i>Symphotrichum novibelgii</i> var. <i>crenifolium</i>	New York Aster				S2?	5 Undetermined	1	56.4 ± 0.0	NB
P	<i>Humulus lupulus</i> var. <i>lupuloides</i>	Common Hop				S2?	3 Sensitive	3	18.0 ± 0.0	NB
P	<i>Crataegus macrosperma</i>	Big-Fruit Hawthorn				S2?	5 Undetermined	1	60.7 ± 0.0	NB
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw				S2?	4 Secure	9	36.1 ± 1.0	NB
P	<i>Salix myricoides</i>	Bayberry Willow				S2?	3 Sensitive	4	33.5 ± 5.0	NB
P	<i>Carex vacillans</i>	Estuarine Sedge				S2?	3 Sensitive	3	3.4 ± 1.0	NB
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S2?	5 Undetermined	1	56.6 ± 0.0	NB
P	<i>Barbarea orthoceras</i>	American Yellow Rocket				S2S3	3 Sensitive	1	42.5 ± 0.0	NB
P	<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S2S3	3 Sensitive	1	7.7 ± 0.0	NB
P	<i>Callitriche hermaphroditica</i>	Northern Water-starwort				S2S3	4 Secure	4	41.5 ± 0.0	NB

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P	<i>Elatine americana</i>	American Waterwort				S2S3	3 Sensitive	19	7.2 ± 0.0	NB
P	<i>Bartonia paniculata</i> <i>ssp. iodandra</i>	Branched Bartonia				S2S3	3 Sensitive	2	51.4 ± 0.0	NB
P	<i>Geranium robertianum</i>	Herb Robert				S2S3	4 Secure	45	96.2 ± 0.0	PE
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2S3	3 Sensitive	3	46.0 ± 10.0	NB
P	<i>Rumex maritimus</i> var. <i>persicarioides</i>	Peach-leaved Dock				S2S3	5 Undetermined	2	56.8 ± 0.0	NB
P	<i>Rumex pallidus</i>	Seabeach Dock				S2S3	3 Sensitive	6	54.5 ± 0.0	NB
P	<i>Rubus pensilvanicus</i>	Pennsylvania Blackberry				S2S3	4 Secure	2	83.7 ± 100.0	NB
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2S3	3 Sensitive	15	85.2 ± 0.0	NB
P	<i>Valeriana uliginosa</i>	Swamp Valerian				S2S3	3 Sensitive	8	90.8 ± 0.0	NB
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	4 Secure	9	50.5 ± 0.0	NB
P	<i>Juncus brachycephalus</i>	Small-Head Rush				S2S3	3 Sensitive	2	90.8 ± 0.0	NB
P	<i>Corallorhiza maculata</i> var. <i>occidentalis</i>	Spotted Coralroot				S2S3	3 Sensitive	2	33.7 ± 1.0	NB
P	<i>Listera auriculata</i>	Auricled Twayblade				S2S3	3 Sensitive	17	53.6 ± 0.0	NB
P	<i>Spiranthes cernua</i>	Nodding Ladies'-Tresses				S2S3	3 Sensitive	1	61.7 ± 0.0	NB
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	3 Sensitive	1	95.1 ± 1.0	NB
P	<i>Stuckenia pectinata</i>	Sago Pondweed				S2S3	3 Sensitive	18	27.1 ± 1.0	NB
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S2S3	4 Secure	1	87.5 ± 0.0	NB
P	<i>Isoetes acadensis</i>	Acadian Quillwort				S2S3	3 Sensitive	1	53.8 ± 0.0	NB
P	<i>Panax trifolius</i>	Dwarf Ginseng				S3	3 Sensitive	19	8.5 ± 5.0	NB
P	<i>Arnica lanceolata</i>	Lance-leaved Arnica				S3	4 Secure	41	23.7 ± 0.0	NB
P	<i>Artemisia campestris</i> <i>ssp. caudata</i>	Field Wormwood				S3	4 Secure	4	49.4 ± 0.0	NB
P	<i>Bidens hyperborea</i>	Estuary Beggarticks				S3	4 Secure	106	3.1 ± 0.0	NB
P	<i>Bidens hyperborea</i> var. <i>hyperborea</i>	Estuary Beggarticks				S3	4 Secure	13	3.1 ± 5.0	NB
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	4 Secure	5	43.0 ± 0.0	NB
P	<i>Symphotrichum boreale</i>	Boreal Aster				S3	3 Sensitive	5	61.9 ± 5.0	NB
P	<i>Betula pumila</i>	Bog Birch				S3	4 Secure	121	48.2 ± 0.0	NB
P	<i>Arabis glabra</i>	Tower Mustard				S3	5 Undetermined	13	43.5 ± 0.0	NB
P	<i>Cardamine maxima</i>	Large Toothwort				S3	4 Secure	3	59.4 ± 0.0	NB
P	<i>Subularia aquatica</i> var. <i>americana</i>	Water Awlwort				S3	4 Secure	1	70.3 ± 1.0	NB
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S3	4 Secure	8	4.5 ± 0.0	NB
P	<i>Hudsonia tomentosa</i>	Woolly Beach-heath				S3	4 Secure	186	36.2 ± 5.0	NB
P	<i>Crassula aquatica</i>	Water Pygmyweed				S3	4 Secure	49	2.9 ± 1.0	NB
P	<i>Elatine minima</i>	Small Waterwort				S3	4 Secure	6	7.0 ± 0.0	NB
P	<i>Hedysarum alpinum</i>	Alpine Sweet-vetch				S3	4 Secure	5	52.5 ± 0.0	NB
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill				S3	4 Secure	9	23.4 ± 0.0	NB
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil				S3	4 Secure	6	19.1 ± 0.0	NB
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil				S3	4 Secure	5	5.7 ± 1.0	NB
P	<i>Teucrium canadense</i>	Canada Germander				S3	3 Sensitive	59	2.7 ± 5.0	NB
P	<i>Nuphar lutea</i> ssp. <i>pumila</i>	Small Yellow Pond-lily				S3	4 Secure	7	24.1 ± 0.0	NB
P	<i>Epilobium hornemannii</i>	Hornemann's Willowherb				S3	4 Secure	23	21.1 ± 10.0	NB
P	<i>Epilobium strictum</i>	Downy Willowherb				S3	4 Secure	2	68.3 ± 0.0	NB
P	<i>Polygala sanguinea</i>	Blood Milkwort				S3	3 Sensitive	21	32.0 ± 0.0	NB
P	<i>Polygonum arifolium</i>	Halberd-leaved Tearthumb				S3	4 Secure	28	43.8 ± 5.0	NB
P	<i>Polygonum punctatum</i>	Dotted Smartweed				S3	4 Secure	1	54.8 ± 2.0	NB
P	<i>Polygonum punctatum</i> var. <i>confertiflorum</i>	Dotted Smartweed				S3	4 Secure	37	2.9 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Polygonum scandens</i>	Climbing False Buckwheat				S3	4 Secure	47	18.8 ± 0.0	NB
P	<i>Littorella uniflora</i>	American Shoreweed				S3	4 Secure	2	89.2 ± 1.0	NB
P	<i>Primula mistassinica</i>	Mistassini Primrose				S3	4 Secure	2	84.9 ± 0.0	NB
P	<i>Samolus valerandi</i> ssp. <i>parviflorus</i>	Seaside Brookweed				S3	4 Secure	194	3.0 ± 0.0	NB
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	4 Secure	14	41.2 ± 0.0	NB
P	<i>Clematis occidentalis</i>	Purple Clematis				S3	4 Secure	2	58.1 ± 1.0	NB
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup				S3	4 Secure	12	58.6 ± 5.0	NB
P	<i>Thalictrum venulosum</i>	Northern Meadow-rue				S3	4 Secure	1	42.5 ± 0.0	NB
P	<i>Amelanchier canadensis</i>	Canada Serviceberry				S3	4 Secure	5	56.7 ± 0.0	NB
P	<i>Rosa palustris</i>	Swamp Rose				S3	4 Secure	4	0.5 ± 1.0	NB
P	<i>Sanguisorba canadensis</i>	Canada Burnet				S3	4 Secure	46	72.8 ± 5.0	NB
P	<i>Galium boreale</i>	Northern Bedstraw				S3	4 Secure	2	65.2 ± 1.0	NB
P	<i>Salix interior</i>	Sandbar Willow				S3	4 Secure	1	65.2 ± 1.0	NB
P	<i>Salix pedicellaris</i>	Bog Willow				S3	4 Secure	28	16.2 ± 0.0	NB
P	<i>Comandra umbellata</i>	Bastard's Toadflax				S3	4 Secure	65	40.3 ± 1.0	NB
P	<i>Parnassia glauca</i>	Fen Grass-of-Parnassus				S3	4 Secure	18	19.2 ± 0.0	NB
P	<i>Limosella australis</i>	Southern Mudwort				S3	4 Secure	123	1.9 ± 0.0	NB
P	<i>Veronica serpyllifolia</i> ssp. <i>humifusa</i>	Thyme-Leaved Speedwell				S3	4 Secure	11	36.1 ± 1.0	NB
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle				S3	3 Sensitive	7	15.8 ± 0.0	NB
P	<i>Pilea pumila</i>	Dwarf Clearweed				S3	4 Secure	9	7.7 ± 0.0	NB
P	<i>Viola adunca</i>	Hooked Violet				S3	4 Secure	11	50.3 ± 0.0	NB
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S3	4 Secure	6	86.7 ± 1.0	NB
P	<i>Carex aquatilis</i>	Water Sedge				S3	4 Secure	10	37.4 ± 1.0	NB
P	<i>Carex arcta</i>	Northern Clustered Sedge				S3	4 Secure	3	54.8 ± 0.0	NB
P	<i>Carex atratiformis</i>	Scabrous Black Sedge				S3	4 Secure	6	43.5 ± 0.0	NB
P	<i>Carex capillaris</i>	Hairlike Sedge				S3	4 Secure	3	50.3 ± 0.0	NB
P	<i>Carex chordorrhiza</i>	Creeping Sedge				S3	4 Secure	1	48.1 ± 0.0	NB
P	<i>Carex conoidea</i>	Field Sedge				S3	4 Secure	2	63.8 ± 10.0	NB
P	<i>Carex garberi</i>	Garber's Sedge				S3	3 Sensitive	24	20.7 ± 0.0	NB
P	<i>Carex haydenii</i>	Hayden's Sedge				S3	4 Secure	6	52.9 ± 0.0	NB
P	<i>Carex lupulina</i>	Hop Sedge				S3	4 Secure	1	68.2 ± 1.0	NB
P	<i>Carex michauxiana</i>	Michaux's Sedge				S3	4 Secure	10	27.8 ± 0.0	NB
P	<i>Carex ormostachya</i>	Necklace Spike Sedge				S3	4 Secure	8	7.3 ± 1.0	NB
P	<i>Carex tenera</i>	Tender Sedge				S3	4 Secure	3	20.2 ± 1.0	NB
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S3	4 Secure	10	17.5 ± 0.0	NB
P	<i>Carex vaginata</i>	Sheathed Sedge				S3	3 Sensitive	6	90.8 ± 0.0	NB
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	4 Secure	29	31.7 ± 1.0	NB
P	<i>Carex recta</i>	Estuary Sedge				S3	4 Secure	15	37.8 ± 0.0	NB
P	<i>Cyperus dentatus</i>	Toothed Flatsedge				S3	4 Secure	2	33.0 ± 10.0	NB
P	<i>Cyperus esculentus</i>	Perennial Yellow Nutsedge				S3	4 Secure	3	21.5 ± 0.0	NB
P	<i>Eleocharis intermedia</i>	Matted Spikerush				S3	4 Secure	2	52.3 ± 0.0	NB
P	<i>Rhynchospora capitellata</i>	Small-headed Beakrush				S3	4 Secure	85	20.1 ± 0.0	NB
P	<i>Rhynchospora fusca</i>	Brown Beakrush				S3	4 Secure	7	39.6 ± 0.0	NB
P	<i>Trichophorum clintonii</i>	Clinton's Clubrush				S3	4 Secure	98	37.0 ± 0.0	NB
P	<i>Schoenoplectus torreyi</i>	Torrey's Bulrush				S3	4 Secure	9	16.0 ± 0.0	NB
P	<i>Lemna trisulca</i>	Star Duckweed				S3	4 Secure	1	92.7 ± 2.0	NB
P	<i>Triantha glutinosa</i>	Sticky False-Asphodel				S3	4 Secure	47	23.5 ± 0.0	NB
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S3	3 Sensitive	15	7.3 ± 1.0	NB
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3	4 Secure	3	51.0 ± 0.0	NB
P	<i>Platanthera blephariglottis</i>	White Fringed Orchid				S3	4 Secure	109	14.8 ± 0.0	NB
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	3 Sensitive	17	28.3 ± 100.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S3	3 Sensitive	6	42.5 ± 0.0	NB
P	<i>Calamagrostis pickeringii</i>	Pickering's Reed Grass				S3	4 Secure	5	60.7 ± 0.0	NB
P	<i>Dichanthelium depauperatum</i>	Starved Panic Grass				S3	4 Secure	29	18.9 ± 0.0	NB
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	4 Secure	11	41.4 ± 1.0	NB
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S3	3 Sensitive	5	45.4 ± 0.0	NB
P	<i>Xyris montana</i>	Northern Yellow-Eyed-Grass				S3	4 Secure	89	12.4 ± 5.0	NB
P	<i>Zannichellia palustris</i>	Horned Pondweed				S3	4 Secure	84	3.1 ± 0.0	NB
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S3	4 Secure	2	33.6 ± 0.0	NB
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S3	4 Secure	2	55.5 ± 0.0	NB
P	<i>Asplenium trichomanes-ramosum</i>	Green Spleenwort				S3	4 Secure	2	56.5 ± 0.0	NB
P	<i>Dryopteris fragrans var. remotiuscula</i>	Fragrant Wood Fern				S3	4 Secure	34	32.3 ± 0.0	NB
P	<i>Dryopteris goldiana</i>	Goldie's Woodfern				S3	3 Sensitive	4	85.9 ± 0.0	NB
P	<i>Isoetes tuckermanii</i>	Tuckerman's Quillwort				S3	4 Secure	5	7.1 ± 0.0	NB
P	<i>Lycopodium sabinifolium</i>	Ground-Fir				S3	4 Secure	14	48.1 ± 1.0	NB
P	<i>Huperzia appalachiana</i>	Appalachian Fir-Clubmoss				S3	3 Sensitive	8	7.3 ± 1.0	NB
P	<i>Botrychium lanceolatum var. angustisegmentum</i>	Lance-Leaf Grape-Fern				S3	3 Sensitive	4	55.5 ± 0.0	NB
P	<i>Botrychium simplex</i>	Least Moonwort				S3	4 Secure	8	50.9 ± 0.0	NB
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	4 Secure	1	86.1 ± 0.0	NB
P	<i>Lobelia kalmii</i>	Brook Lobelia				S3S4	4 Secure	11	23.5 ± 0.0	NB
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	4 Secure	32	40.5 ± 1.0	NB
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	4 Secure	8	52.9 ± 0.0	NB
P	<i>Stachys pilosa</i>	Hairy Hedge-Nettle				S3S4	5 Undetermined	3	42.7 ± 0.0	NB
P	<i>Utricularia gibba</i>	Humped Bladderwort				S3S4	4 Secure	1	51.6 ± 1.0	NB
P	<i>Rumex maritimus</i>	Sea-Side Dock				S3S4	4 Secure	31	39.4 ± 0.0	NB
P	<i>Rumex maritimus var. fueginus</i>	Tierra del Fuego Dock				S3S4	4 Secure	15	53.7 ± 0.0	NB
P	<i>Potentilla arguta</i>	Tall Cinquefoil				S3S4	4 Secure	3	33.6 ± 50.0	NB
P	<i>Rubus chamaemorus</i>	Cloudberry				S3S4	4 Secure	146	39.6 ± 0.0	NB
P	<i>Geocaulon lividum</i>	Northern Comandra				S3S4	4 Secure	76	12.4 ± 10.0	NB
P	<i>Juniperus horizontalis</i>	Creeping Juniper				S3S4	4 Secure	2	70.7 ± 1.0	NB
P	<i>Cladium mariscoides</i>	Smooth Twigrush				S3S4	4 Secure	7	52.8 ± 0.0	NB
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	4 Secure	71	2.0 ± 1.0	NB
P	<i>Triglochin gaspensis</i>	Gasp [- Arrowgrass				S3S4	4 Secure	86	19.0 ± 0.0	NB
P	<i>Corallorhiza maculata</i>	Spotted Coralroot				S3S4	3 Sensitive	11	42.5 ± 0.0	NB
P	<i>Calamagrostis stricta</i>	Slim-stemmed Reed Grass				S3S4	4 Secure	11	48.3 ± 0.0	NB
P	<i>Calamagrostis stricta var. stricta</i>	Slim-stemmed Reed Grass				S3S4	4 Secure	5	72.0 ± 0.0	NB
P	<i>Distichlis spicata</i>	Salt Grass				S3S4	4 Secure	75	6.9 ± 0.0	NB
P	<i>Potamogeton oakesianus</i>	Oakes' Pondweed				S3S4	4 Secure	2	75.9 ± 10.0	NB
P	<i>Polygonum raii</i>	Sharp-fruited Knotweed				SH	0.1 Extirpated	3	73.2 ± 1.0	NB
P	<i>Montia fontana</i>	Water Blinks				SH	2 May Be At Risk	1	20.0 ± 1.0	NB
P	<i>Agalinis maritima</i>	Saltmarsh Agalinis				SX	0.1 Extirpated	2	59.6 ± 50.0	NB

5.1 SOURCE BIBLIOGRAPHY (100 km)

The recipient of these data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
4819	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
3515	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys, 86171 recs.
2700	eBird. 2014. eBird Basic Dataset. Version: EBD_relNov-2014. Ithaca, New York. Nov 2014. Cornell Lab of Ornithology, 25036 recs.
2507	Cowie, F. 2007. Electrofishing Population Estimates 1979-98. Canadian Rivers Institute, 2698 recs.
2234	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
1064	Pardieck, K.L. & Ziolkowski Jr., D.J.; Hudson, M.-A.R. 2014. North American Breeding Bird Survey Dataset 1966 - 2013, version 2013.0. U.S. Geological Survey, Patuxent Wildlife Research Center <www.pwrc.usgs.gov/BBS/RawData/>.
744	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
697	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
503	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
441	Gravel, Mireille. 2010. Coordonnées GPS et suivi des tortues marquées, 2005-07. Kouchibouguac National Park, 480 recs.
435	Beaudet, A. 2007. Piping Plover Records in Kouchibouguac NP, 1982-2005. Kouchibouguac National Park, 435 recs.
402	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA), NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs.
394	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
394	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
304	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.
301	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
237	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
232	Campbell, G. 2017. Maritimes Bicknell's Thrush database 2002-2015. Bird Studies Canada, Sackville NB, 609 recs.
177	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
175	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
175	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
159	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
125	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
122	Speers, L. 2008. Butterflies of Canada database: New Brunswick 1897-1999. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 2048 recs.
120	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
120	Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs.
115	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
93	Tremblay, E. 2006. Kouchibouguac National Park Digital Database. Parks Canada, 105 recs.
92	Mazerolle, D.M. 2005. Bouctouche Irving Eco-Centre rare coastal plant fieldwork results 2004-05. Irving Eco-centre, la Dune du Bouctouche, 174 recs.
86	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
86	Coursol, F. 2005. Dataset from New Brunswick fieldwork for <i>Eriocaulon parkeri</i> COSEWIC report. Coursol, Pers. comm. to C.S. Blaney, Aug 26. 110 recs.
83	Blaney, C.S.; Mazerolle, D.M.; Klymko, J; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
77	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
76	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
71	Klymko, J.J.D. 2014. Maritimes Butterfly Atlas, 2012 submissions. Atlantic Canada Conservation Data Centre, 8552 records.
70	Thomas, A.W. 1996. A preliminary atlas of the butterflies of New Brunswick. New Brunswick Museum.
65	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
64	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 11311 recs.
63	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
56	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
56	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
53	Sollows, M.C., 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
49	Benedict, B. Connell Herbarium Specimen Database Download 2004. Connell Memorial Herbarium, University of New Brunswick. 2004.
45	Tranquilla, L. 2015. Maritimes Marsh Monitoring Project 2015 data. Bird Studies Canada, Sackville NB, 5062 recs.
42	Busby, D.G. 1999. 1997-1999 Bicknell's Thrush data, unpublished files. Canadian Wildlife Service, Sackville, 17 recs.
41	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
40	Scott, Fred W. 1998. Updated Status Report on the Cougar (<i>Puma concolor cougar</i>) [Eastern population]. Committee on the Status of Endangered Wildlife in Canada, 298 recs.
38	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
37	Allen, K. 2012. Rare plant spatial data from Pleasant Ridge cranberry farm. NB Department of Environment, Environmental Assessment Section, 39 recs.
37	Robinson, S.L. 2010. Fieldwork 2009 (dune ecology). Atlantic Canada Conservation Data Centre. Sackville NB, 408 recs.
36	Blaney, C.S. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 6719 recs.
36	Robinson, S.L. 2015. 2014 field data.

# recs	CITATION
35	Amirault, D.L. 2000. Piping Plover Surveys, 1983-2000. Canadian Wildlife Service, Sackville, unpublished data. 70 recs.
34	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
34	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
30	Campbell, G., Villamil, L. 2012. Heath Steele Mine Bird Surveys 2012. Wood Turtle (<i>Glyptemys insculpta</i>) Miramichi Watershed Synopsis 2013
29	Compiled by: Vladimir King Trajkovic, EPT Miramichi River Environmental Assessment Committee
26	Hilaire Chiasson Rare vascular plant specimens in the Hilaire Chiasson Herbarium. 2015.
26	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
24	Doucet, D.A. & Edsall, J.; Brunelle, P.-M. 2007. Miramichi Watershed Rare Odonata Survey. New Brunswick ETF & WTF Report, 1211 recs.
24	Spicer, C.D. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 211 recs.
23	Erskine, A.J. 1999. Maritime Nest Records Scheme (MNRS) 1937-1999. Canadian Wildlife Service, Sackville, 313 recs.
23	Keppie, D.M. 2005. Rare Small Mammal Records in NB, PE. Pers. comm. to K. Bredin; PE 1 rec., NB 24 recs, 23 recs.
23	McAlpine, D.F. 1998. NBM Science Collections: Wood Turtle records. New Brunswick Museum, Saint John NB, 329 recs.
22	Donell, R. 2008. Rare plant records from rare coastal plant project. Bouctouche Dune Irving Eco-centre. Pers. comm. to D.M. Mazerolle, 50 recs.
22	Klymko, J.J.D. 2016. 2014 field data. Atlantic Canada Conservation Data Centre.
21	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
21	Doucet, D.A. & Edsall, J. 2007. Ophiogomphus howei records. Atlantic Canada Conservation Data Centre, Sackville NB, 21 recs.
21	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
21	Kouchibouguac National Park, Natural Resource Conservation Sec. 1988. The Resources of Kouchibouguac National Park. Beach, H. (ed.) , 90 recs.
21	Mazerolle, M.J., Drolet, B., & Desrochers, A. 2001. Small Mammal Responses to Peat Mining of Southeastern Canadian Bogs. Can. J. Zool., 79:296-302. 21 recs.
20	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
20	Hinds, H.R. 1999. Connell Herbarium Database. University New Brunswick, Fredericton, 131 recs.
19	Tingley, S. (compiler). 2001. Butterflies of New Brunswick. , Web site: www.geocities.com/Yosemite/8425/butterfly. 142 recs.
18	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
16	Cowie, Faye. 2007. Surveyed Lakes in New Brunswick. Canadian Rivers Institute, 781 recs.
16	Mazerolle, D. 2003. Assessment of Seaside Pinweed (<i>Lechea maritima</i> var. <i>subcylindrica</i>) in Southeastern New Brunswick. Irving Eco-centre, la Dune du Bouctouche, 18 recs.
16	Webster, R.P. & Edsall, J. 2007. 2005 New Brunswick Rare Butterfly Survey. Environmental Trust Fund, unpublished report, 232 recs.
15	Belland, R.J. 1992. The Bryophytes of Kouchibouguac National Park. Parks Canada, Kouchibouguac NP, 101 pp. + map.
14	Boyne, A.W. 2000. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 168 recs.
14	Edsall, J. 2001. Lepidopteran records in New Brunswick, 1997-99. , Pers. comm. to K.A. Bredin. 91 recs.
14	Morton, L.D. & Savoie, M. 1983. The Mammals of Kouchibouguac National Park. Parks Canada Report prep. by Canadian Wildlife Service, Sackville, NB, Vols 1-4. 14 recs.
13	Majka, C. 2009. Université de Moncton Insect Collection: Carabidae, Cerambycidae, Coccinellidae. Université de Moncton, 540 recs.
13	Toner, M. 2005. Lynx Records 1996-2005. NB Dept of Natural Resources, 48 recs.
12	Doucet, D.A. 2008. Fieldwork 2008: Odonata. ACCDC Staff, 625 recs.
11	Canadian Wildlife Service, Atlantic Region. 2010. Piping Plover censuses 2006-09. , 35 recs.
11	Chiasson, R. & Dietz, S. 1998. Piper Project Report of Common Tern Observations. Corvus Consulting, Tabusintac NB, 20 recs.
11	David, M. 2000. CNPA website. Club de naturalistes de la Péninsule acadienne (CNPA), www.francohone.net/cnpa/rares. 16 recs.
11	Dept of Fisheries & Oceans. 1999. Status of Wild Striped Bass, & Interaction between Wild & Cultured Striped Bass in the Maritime Provinces. , Science Stock Status Report D3-22. 13 recs.
11	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
10	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
10	Sollows, M.C.. 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
10	Tremblay, E. 2001. Kouchibouguacis River Freshwater Mussel Data. Parks Canada, Kouchibouguac NP, 45 recs.
9	Mawhinney, K. & Seutin, G. 2001. Lepidoptera Survey of the Salt Marshes of of Kouchibouguac National Park. Parks Canada Unpublished Report, 5p. 9 recs.
9	Sollows, M.C. 2008. NBM Science Collections databases: herpetiles. New Brunswick Museum, Saint John NB, download Jan. 2008, 8636 recs.
9	Webster, R.P. 2001. R.P. Webster Collection. R. P. Webster, 39 recs.
8	Bateman, M.C. 2000. Waterfowl Brood Surveys Database, 1990-2000 . Canadian Wildlife Service, Sackville, unpublished data. 149 recs.
8	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
8	Pike, E., Tingley, S. & Christie, D.S. 2000. Nature NB Listserve. University of New Brunswick, listserv.unb.ca/archives/naturenb. 68 recs.
7	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
7	Doucet, D.A. 2008. Wood Turtle Records 2002-07. Pers. comm. to S. Gerriets, 7 recs, 7 recs.
7	Toner, M. 2005. NB DNR fieldwork on Parker's Pipewort. NB Dept of Natural Resources. Pers. comm to C.S. Blaney, Dec 12, 8 recs.
6	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2000.
6	Chaput, G. 1999. Atlantic Salmon: Miramichi & SFA 16 Rivers. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-05. 6 recs.
6	Cronin, P. & Ayer, C.; Dube, B.; Hooper, W.C.; LeBlanc, E.; Madden, A.; Pettigrew, T.; Seymour, P. 1998. Fish Species Management Plans (draft). NB DNRE Internal Report. Fredericton, 164pp.
6	Gowan, S. 1980. The Lichens of Kouchibouguac National Park, Parts I (Macrolichens) & II (Microlichens). National Museum of Natural Sciences. Ottawa, ON, 7 recs.
6	McLeod, D. & Merrithew, C. 2005. The Inventory of the Flora and Fauna of the French Fort Cove Nature Park. French Fort Cove Development Commission, 7 recs.

# recs	CITATION
6	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
6	Newell, R.E. 2008. Vascular Plants of Muzroll Lake. Pers. comm. to C.S. Blaney, 1 pg. 43 recs.
5	Blaney, C.S. 1999. Fieldwork 1999. Atlantic Canada Conservation Data Centre. Sackville NB, 292 recs.
5	Holder, M. & Kingsley, A.L. 2000. Peatland Insects in NB & NS: Results of surveys in 10 bogs during summer 2000. Atlantic Canada Conservation Data Centre, Sackville, 118 recs.
4	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
4	Dalton, M. & Saba, B.A. 1980. A preliminary report on the natural history of the Gaspé shrew. The Atlantic Center for the Environment, Ipswich, MA, 29 pp.
4	Gautreau-Daigle, H. 2007. Rare plant records from peatland surveys. Coastal Zones Research Institute, Shippagan NB. Pers. comm. to D.M. Mazerolle, 39 recs.
4	Godbout, V. 2000. Recherche de l'Aster du St-Laurent (<i>Aster laurentianus</i>) et du Satyre des Maritimes (<i>Coenonympha nepisiquit</i>) au Parc national Kouchibouguac et a Dune du Bouctouche, N-B. Irving Eco-centre, 23 pp.
4	Gravel, Mireille. 2010. Coordonnées des tortues des bois Salmon River Road, 2005. Kouchibouguac National Park, 4 recs.
4	Hoyt, J.S. 2001. Assessment and update status report on the Bathurst Aster (<i>Symphotrichum subulatum</i>) in Canada. Committee on the Status of Endangered Wildlife in Canada, 4 recs.
4	McLeod, D. & Saunders, J. 2004. <i>Cypripedium reginae</i> . Pers. comm. to C.S. Blaney. 4 recs, 4 recs.
4	Parks Canada. 2010. Specimens in or near National Parks in Atlantic Canada. Canadian National Museum, 3925 recs.
4	Spicer, C.D., Popma, T.M. 2003. UPM Kymmene site survey 2003
4	Webster, R.P. 1997. Status Report on Maritime Ringlet (<i>Coenonympha nipisiquit</i>) in Canada. Committee on the Status of Endangered Wildlife in Canada, 4 recs.
3	Amirault, D.L. 1997-2000. Unpublished files. Canadian Wildlife Service, Sackville, 470 recs.
3	Gautreau, R. 2005. <i>Betula michauxii</i> occurrence on Bog 324, near Baie-Ste-Anne, NB. Pers. comm. to C.S. Blaney, 3 recs.
3	Gauvin, J.M. 1979. Etude de la vegetation des marais sales du parc national Kouchibouguac, N-B. M.Sc. Thesis, Universite de Moncton, 248 pp.
3	Godbout, Valérie. 2010. Étude de l'Aster du Saint-Laurent dans le parc national Kouchibouguac, 2000-04. Parks Canada, 3 recs.
3	Grondin, P. & Blouin, J.-L., Bouchard, D.; et al. 1981. Description et cartographie de la vegetation du cordon littoral. Parc National de Kouchibouguac. Le Groupe Dryade, 57 pp.
3	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2003-11. Atlantic Canada Conservation Data Centre. Sackville NB, 1337 recs.
3	Mazerolle, D. 2003. Assessment and Rehabilitation of the Gulf of St Lawrence Aster (<i>Symphotrichum laurentianum</i>) in Southeastern New Brunswick. Irving Eco-centre, la Dune du Bouctouche, 13 recs.
3	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.
3	Nelson Poirier. 2009. Rare plant finds in the Exmoor & Lyttleton areas. Pers. comm. to S. Blaney. 4 recs, 4 recs.
3	Sollows, M.C., 2009. NBM Science Collections databases: Coccinellid & Cerambycid Beetles. New Brunswick Museum, Saint John NB, download Feb. 2009, 569 recs.
3	Speers, L. 2001. Butterflies of Canada database. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 190 recs.
3	Spicer, C.D. 2004. Specimens from CWS Herbarium, Mount Allison Herbarium Database. Mount Allison University, 5939 recs.
3	Toner, M. 2001. Lynx Records 1973-2000. NB Dept of Natural Resources, 29 recs.
2	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
2	Benedict, B. Connell Herbarium Specimens, Digital photos. University New Brunswick, Fredericton. 2005.
2	Blaney, C.S. Miscellaneous specimens received by ACCDC (botany). Various persons. 2001-08.
2	Bouchard, A. Herbar Marie-Victorin. Universite de Montreal, Montreal QC. 1999.
2	Bredin, K.A. 2001. WTF Project: Freshwater Mussel Fieldwork in Freshwater Species data. Atlantic Canada Conservation Data Centre, 101 recs.
2	Catling, P.M., Erskine, D.S. & MacLaren, R.B. 1985. The Plants of Prince Edward Island with new records, nomenclatural changes & corrections & deletions, 1st Ed. Research Branch, Agriculture Canada, Ottawa, Publication 1798. 22pp.
2	Donelle, R. 2007. Bouctouche Dune Rare Coastal Plant Data. Irving Eco-centre, la Dune du Bouctouche, 2 recs.
2	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
2	Godbout, V. 2001. Recherche de l'Aster du St-Laurent (<i>Symphotrichum laurentianum</i>) dans les marais sales du sud-est du Nouveau-Brunswick. Irving Eco-centre, la Dune du Bouctouche, 23 pp.
2	Goltz, J.P. 2002. Botany Ramblings: 1 July to 30 September, 2002. N.B. Naturalist, 29 (3):84-92. 7 recs.
2	Madden, A. 1998. Wood Turtle records in northern NB. New Brunswick Dept of Natural Resources & Energy, Campbellton, Pers. comm. to S.H. Gerriets. 16 recs.
2	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
1	Boyne, A.W. 2001. Portage Island National Wildlife Area inspection visit. Canadian Wildlife Service, Sackville, 1 rec.
1	Bredin, K.A. 2001. NB Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centre, 16 recs.
1	Bredin, K.A. 2002. NB Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centre, 30 recs.
1	Brunelle, P.-M. 2005. Wood Turtle observations. Pers. comm. to S.H. Gerriets, 21 Sep. 3 recs, 3 recs.
1	Curley, F.R. 2005. PEF&W Collection 2003-04. PEI Fish & Wildlife Div., 716 recs.
1	Dibblee, R.L. 1999. PEI Cormorant Survey. Prince Edward Island Fisheries, Aquaculture & Environment, 1p. 21 recs.
1	Doucet, D.A. 2007. Fieldwork 2007: Insects (minus Odonata). ACCDC Staff, 1 rec.
1	Douglas, S.G. & G.C. Chaput & R. Bradford. 2001. Status of Striped Bass (<i>Morone saxatilis</i>) in the southern Gulf of St. Lawrence in 1999 & 2000. DFO Canadian Science Advisory Secretariat Res. Doc. 2001/058, 2001/058. 1 rec.
1	Edsall, J. 1993. Summer 1993 Report. New Brunswick Bird Info Line, 2 recs.
1	Elderkin, M. 2001. Bog Lemming record for Popple Depot NB. , Pers. comm. to K.A. Bredin. 1 rec.
1	Erskine, D. 1960. The plants of Prince Edward Island, 1st Ed. Research Branch, Agriculture Canada, Ottawa., Publication 1088. 1238 recs.
1	Glen, W. 1991. 1991 Prince Edward Island Forest Biomass Inventory Data. PEI Dept of Energy and Forestry, 10059 recs.
1	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (<i>Isoetes prototypus</i>). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
1	Goltz, J.P. 2007. Field Notes: <i>Listera australis</i> at Kouchibouguac National Park. , 7 recs.
1	Hinds, H.R. 1997. Vascular Plants of Cocagne Island. , 14 recs.
1	Klymko, J.J.D. 2011. Insect fieldwork & submissions, 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 742 recs.
1	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.

# recs	CITATION
1	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
1	MacKinnon, C.M. 2000. Inspection visit to Inkerman MBS, June 5, 2000. Canadian Wildlife Service, Sackville, 1 rec.
1	Mills, E. Connell Herbarium Specimens, 1957-2009. University New Brunswick, Fredericton. 2012.
1	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
1	Nye, T. 2002. Wood Turtle observations in Westmorland, Queens Cos. , Pers. com. to S.H. Gerriets, Dec. 3. 3 recs.
1	Sabine, D.L. 2005. 2001 Freshwater Mussel Surveys. New Brunswick Dept of Natural Resources & Energy, 590 recs.
1	Sabine, D.L. 2013. Dwaine Sabine butterfly records, 2009 and earlier.
1	Saunders, J. 2009. White-Fringe Orchis photo and coordinates. Pers. comm. to S. Blaney, July 17. 1 rec, 1 rec.
1	Toner, M. 2009. Wood Turtle Sightings. NB Dept of Natural Resources. Pers. comm. to S. Gerriets, Jul 13 & Sep 2, 2 recs.
1	Tremblay, E., Craik, S.R., Titman, R.D., Rousseau, A. & Richardson, M.J. 2006. First Report of Black Terns Breeding on a Coastal Barrier Island. Wilson Journal of Ornithology, 118(1):104-106. 1 rec.
1	Young, A.D., Titman, R.D. 1986. Costs and benefits to Red-breasted Mergansers nesting in tern and gull colonies. Can. J. Zool., 64: 2339-2343.



Attachment E-2 - Surface Water Quality Data

Table E1. General Chemistry

Parameters	Units	CCME FWAL ¹	CCME MWAL ²	WS1	WS2
				29-Sep-17	29-Sep-17
Alkalinity	mg/L	-	-	69	37
Ammonia	mg/L	varies ³	-	< 0.05 (6.98)	< 0.05 (1.54)
Calcium	mg/L	-	-	24.2	94.4
Chloride	mg/L	120 ⁴	-	94	3760
Conductivity	µS/cm	-	-	467	14300
Copper	mg/L	varies ⁵	-	< 0.001 (0.00215)	< 0.01 (0.004)
Iron	mg/L	0.3	-	1.45	0.2
Magnesium	mg/L	-	-	7.06	277.
Manganese	mg/L	-	-	1.78	0.10
Nitrate + Nitrite	mg/L	-	-	< 0.05	< 0.05
o-Phosphate	mg/L	-	-	< 0.01	< 0.01
pH	unitless	6.5 - 9.0 ⁴	7.0 - 8.7 ⁴	7.3	7.6
Potassium	mg/L	-	-	3.12	89.7
r-Silica	mg/L	-	-	9.6	3.7
Sodium	mg/L	-	-	54.4	2250
Sulfate	mg/L	-	-	12	550
Total Organic Carbon	mg/L	-	-	4.0	1.0
Turbidity	NTU	-	-	9.1	1.6
Zinc	mg/L	0.03	-	0.002	< 0.01
Bicarbonate	mg/L	-	-	68.9	36.8
Carbonate	mg/L	-	-	0.129	0.138
Hydroxide	mg/L	-	-	0.010	0.020
Cation sum	meq/L	-	-	4.38	128.
Anion sum	meq/L	-	-	4.28	118.
% difference	%	-	-	1.13	3.83
Theoretical Conductivity	µS/cm	-	-	439	9170
Hardness	mg/L	-	-	89.5	1380
Ion Sum	mg/L	-	-	250	7050
Saturation pH (5°C)	units	-	-	8.4	8.4
Langelier Index (5°C)	-	-	-	-1.10	-0.78

Notes:

1. CCME FWAL = Canadian Council of Ministers of the Environment - Water Quality Guidelines for the Protection of Freshwater Aquatic Life (Accessed online, November, 2017).
 2. CCME MWAL = Canadian Council of Ministers of the Environment - Water Quality Guidelines for the Protection of Marine Aquatic Life (Accessed online, November, 2017).
 3. Guideline is pH and temperature-dependent. The calculated guideline is based on the field parameters and is presented in the brackets following the concentration.
 4. Long-Term Exposure.
 5. Guideline is hardness dependent. The calculated guideline is presented in the brackets following the concentration.
- "-" = No- established / not measured.

Results that exceed the CCME FWAL guideline are bold.

Results that exceed the CCME MWAL guideline are bold and shaded.

Table E2. Trace Metals

Parameters	Units	CCME FWAL ¹	CCME MWAL ²	WS1	WS2
				29-Sep-17	29-Sep-17
Aluminium	µg/L	varies ⁵	-	130 (100)	40 (100)
Antimony	µg/L	-	-	< 0.1	< 1
Arsenic	µg/L	5	12.5	2	< 10
Barium	µg/L	-	-	124	30
Beryllium	µg/L	-	-	< 0.1	< 1
Bismuth	µg/L	-	-	< 1	< 10
Boron	µg/L	1500 ⁴	-	26	1000
Cadmium	µg/L	0.09 ⁴	0.12 ⁴	0.02	< 0.1
Calcium	µg/L	-	-	24200	94400
Chromium	µg/L	-	-	< 1	< 10
Cobalt	µg/L	-	-	0.4	< 1
Copper	µg/L	varies ⁶	-	< 1 (2.15)	< 10 (4)
Iron	µg/L	300	-	1450	200
Lead	µg/L	varies ⁶	-	0.5 (2.76)	< 1 (7)
Lithium	µg/L	-	-	2.3	38
Magnesium	µg/L	-	-	7060	277000
Manganese	µg/L	-	-	1780	100
Molybdenum	µg/L	73	-	0.2	3
Nickel	µg/L	varies ⁶	-	< 1 (87.85)	< 10 (150)
Potassium	µg/L	-	-	3120	89700
Rubidium	µg/L	-	-	2.7	26
Selenium	µg/L	1	-	< 1	< 10
Silver	µg/L	0.25 ⁴	7.5	< 0.1	< 1
Sodium	µg/L	-	-	54400	2250000
Strontium	µg/L	-	-	125	1820
Tellurium	µg/L	-	-	< 0.1	< 1
Thallium	µg/L	0.8	-	< 0.1	< 1
Tin	µg/L	-	-	< 0.1	< 1
Uranium	µg/L	15 ⁴	-	0.1	< 1
Vanadium	µg/L	-	-	2	30
Zinc	µg/L	30	-	2	< 10

Notes:

1. CCME FWAL = Canadian Council of Ministers of the Environment - Water Quality Guidelines for the Protection of Freshwater Aquatic Life (Accessed online, November, 2017).
 2. CCME MWAL = Canadian Council of Ministers of the Environment - Water Quality Guidelines for the Protection of Marine Aquatic Life (Accessed online, November, 2017).
 3. Guideline is pH and temperature-dependent.
 4. Long-Term Exposure.
 5. Guideline is pH dependent. The calculated guideline is presented in brackets following the concentration.
 6. Guideline is hardness dependent. The calculated guideline is presented in the brackets following the concentration.
- "-" = No- established / not measured.

Results that exceed the CCME FWAL guideline are bold.
Results that exceed the CCME MWAL guideline are bold and shaded.

Table E3. Petroleum Hydrocarbons

Parameters	Units	CCME FWAL ¹	CCME MWAL ²	Atlantic RBCA Tier 1 Surface Water ESLs ³	WS1	WS2	WS2 - DUP
					29-Sep-17	29-Sep-17	29-Sep-17
Benzene	mg/L	0.37	0.11	2.1	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.002	0.215	0.77	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.09	0.025	0.32	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	-	-	0.33	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	-	-	-	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	-	-	-	< 0.05	< 0.05	< 0.05
EPH >C16 - C21	mg/L	-	-	-	< 0.05	< 0.05	< 0.05
EPH >C21-C32	mg/L	-	-	-	< 0.1	< 0.1	< 0.1
Modified TPH Tier 1	mg/L	-	-	0.1 ⁴	< 0.1	< 0.1	< 0.1
Resemblance					ND	ND	ND

Notes:

1. CCME FWAL = Canadian Council of Ministers of the Environment - Water Quality Guidelines for the Protection of Freshwater Aquatic Life (Accessed online, November, 2017).

2. CCME MWAL = Canadian Council of Ministers of the Environment - Water Quality Guidelines for the Protection of Marine Aquatic Life (Accessed online, November, 2017).

3. Atlantic Risk-based Corrective Action (RBCA) - Tier 1 Surface Water and Groundwater Ecological Screening Levels (ESLs) for the Protection of Freshwater and Marine Aquatic Life (Accessed online, November, 2017).

4. Most conservative guideline for Modified TPH.

ND = Not Detected

DUP= Laboratory Duplicate

ND = Not Detected

DUP= Laboratory Duplicate

Table E4. Field Parameters

Parameter	Units	WS1	WS2
		29-Sep-17	29-Sep-17
Temperature	°C	13.5	17.5
Dissolved Oxygen	mg/L	31.7	15.3
Conductivity	µS/cm	331.0	8744
pH	-	6.63	7.55
Salinity ¹	ppt	0.14	4.93

Notes:

Field parameters measured between 12:30 and 13:00 on Septmeber 29, 2017 by GEMTEC using a YSI 556 multi-meter.

¹ Calculated parameter



Attachment E-3 - Laboratory Certificates of Analysis

Report ID: 251051-IAS
 Report Date: 17-Oct-17
 Date Received: 29-Sep-17

CERTIFICATE OF ANALYSIS

for
 Gemtec Limited
 191 Doak Road
 Fredericton, NB E3C 2E6



921 College Hill Rd
 Fredericton NB
 Canada E3B 6Z9
 Tel: 506.452.1212
 Fax: 506.452.0594
 www.rpc.ca

Attention: Jenna McCoy

Project #: 6921.44

Location: Miramichi

Analysis of Water

RPC Sample ID:			251051-1	251051-2
Client Sample ID:			WS1	WS2
Date Sampled:			29-Sep-17	29-Sep-17
Analytes	Units	RL		
Sodium	mg/L	0.05	54.4	2250
Potassium	mg/L	0.02	3.12	89.7
Calcium	mg/L	0.05	24.2	94.4
Magnesium	mg/L	0.01	7.06	277.
Iron	mg/L	0.02	1.45	0.2
Manganese	mg/L	0.001	1.78	0.10
Copper	mg/L	0.001	< 0.001	< 0.01
Zinc	mg/L	0.001	0.002	< 0.01
Ammonia (as N)	mg/L	0.05	< 0.05	< 0.05
pH	units	-	7.3	7.6
Alkalinity (as CaCO ₃)	mg/L	2	69	37
Chloride	mg/L	0.5	94.0	3760
Sulfate	mg/L	1	12	550
Nitrate + Nitrite (as N)	mg/L	0.05	< 0.05	< 0.05
o-Phosphate (as P)	mg/L	0.01	< 0.01	< 0.01
r-Silica (as SiO ₂)	mg/L	0.1	9.6	3.7
Carbon - Total Organic	mg/L	0.5	4.0	1.0
Turbidity	NTU	0.1	9.1	1.6
Conductivity	µS/cm	1	467	14300
Calculated Parameters				
Bicarbonate (as CaCO ₃)	mg/L	-	68.9	36.8
Carbonate (as CaCO ₃)	mg/L	-	0.129	0.138
Hydroxide (as CaCO ₃)	mg/L	-	0.010	0.020
Cation Sum	meq/L	-	4.38	128.
Anion Sum	meq/L	-	4.28	118.
Percent Difference	%	-	1.13	3.83
Theoretical Conductivity	µS/cm	-	439	9170
Hardness (as CaCO ₃)	mg/L	0.2	89.5	1380
Ion Sum	mg/L	-	250	7050
Saturation pH (5°C)	units	-	8.4	8.4
Langelier Index (5°C)	-	-	-1.10	-0.78

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit; Organic Carbon and ion chemistries for turbid samples are determined on filtered aliquots.

A. Ross Kean, M.Sc.
 Department Head
 Inorganic Analytical Chemistry

WATER CHEMISTRY

Peter Crowhurst, B.Sc., C.Chem
 Analytical Chemist
 Inorganic Analytical Chemistry

Report ID: 251051-IAS
 Report Date: 17-Oct-17
 Date Received: 29-Sep-17

CERTIFICATE OF ANALYSIS

for
 Gemtec Limited
 191 Doak Road
 Fredericton, NB E3C 2E6



921 College Hill Rd
 Fredericton NB
 Canada E3B 6Z9
 Tel: 506.452.1212
 Fax: 506.452.0594
 www.rpc.ca

Attention: Jenna McCoy

Project #: 6921.44

Location: Miramichi

Analysis of Metals in Water

RPC Sample ID:			251051-1	251051-2
Client Sample ID:			WS1	WS2
Date Sampled:			29-Sep-17	29-Sep-17
Analytes	Units	RL		
Aluminum	µg/L	1	130	40
Antimony	µg/L	0.1	< 0.1	< 1
Arsenic	µg/L	1	2	< 10
Barium	µg/L	1	124	30
Beryllium	µg/L	0.1	< 0.1	< 1
Bismuth	µg/L	1	< 1	< 10
Boron	µg/L	1	26	1000
Cadmium	µg/L	0.01	0.02	< 0.1
Calcium	µg/L	50	24200	94400
Chromium	µg/L	1	< 1	< 10
Cobalt	µg/L	0.1	0.4	< 1
Copper	µg/L	1	< 1	< 10
Iron	µg/L	20	1450	200
Lead	µg/L	0.1	0.5	< 1
Lithium	µg/L	0.1	2.3	38
Magnesium	µg/L	10	7060	277000
Manganese	µg/L	1	1780	100
Molybdenum	µg/L	0.1	0.2	3
Nickel	µg/L	1	< 1	< 10
Potassium	µg/L	20	3120	89700
Rubidium	µg/L	0.1	2.7	26
Selenium	µg/L	1	< 1	< 10
Silver	µg/L	0.1	< 0.1	< 1
Sodium	µg/L	50	54400	2250000
Strontium	µg/L	1	125	1820
Tellurium	µg/L	0.1	< 0.1	< 1
Thallium	µg/L	0.1	< 0.1	< 1
Tin	µg/L	0.1	< 0.1	< 1
Uranium	µg/L	0.1	0.1	< 1
Vanadium	µg/L	1	2	30
Zinc	µg/L	1	2	< 10

Report ID: 251051-IAS
Report Date: 17-Oct-17
Date Received: 29-Sep-17

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for
Gemtec Limited
191 Doak Road
Fredericton, NB E3C 2E6



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Methods

<u>Analyte</u>	<u>RPC SOP #</u>	<u>Method Reference</u>	<u>Method Principle</u>
Ammonia	4.M47	APHA 4500-NH ₃ G	Phenate Colourimetry
pH	4.M03	APHA 4500-H ⁺ B	pH Electrode - Electrometric
Alkalinity (as CaCO ₃)	4.M43	EPA 310.2	Methyl Orange Colourimetry
Chloride	4.M44	APHA 4500-CL E	Ferricyanide Colourimetry
Sulfate	4.M45	APHA 4500-SO ₄ E	Turbidimetry
Nitrate + Nitrite (as N)	4.M48	APHA 4500-NO ₃ H	Hydrazine Red., Derivatization, Colourimetry
o-Phosphate (as P)	4.M50	APHA 4500-P F	Molybdate/Ascorbic Acid Colourimetry
r-Silica (as SiO ₂)	4.M46	APHA 4500-SI F	Heteropoly Blue Colourimetry
Carbon - Total Organic	4.M38	APHA 5310 C	UV-Persulfate Digestion, NDIR Detection
Turbidity	4.M06	APHA 2130 B	Nephelometry
Conductivity	4.M04	APHA 2510 B	Conductivity Meter, Pt Electrode
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES

Report ID: 251051-OAS
 Report Date: 06-Oct-17
 Date Received: 29-Sep-17

CERTIFICATE OF ANALYSIS

for
 Gemtec Limited
 191 Doak Road
 Fredericton, NB E3C 2E6



921 College Hill Rd
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 Canada E3B 6Z9
 Tel: 506.452.1212
 Fax: 506.452.0594
 www.rpc.ca

Attention: Jenna McCoy

Project #: 6921.44

Location: Miramichi

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			251051-1	251051-2	251051-2 Dup
Client Sample ID:			WS1	WS2	WS2
Date Sampled:			29-Sep-17	29-Sep-17	29-Sep-17
Matrix:			water	water	water
Analytes	Units	RL			
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.05	< 0.05	< 0.05	< 0.05
EPH >C16 - C21	mg/L	0.05	< 0.05	< 0.05	< 0.05
EPH >C21-C32	mg/L	0.1	< 0.1	< 0.1	< 0.1
Modified TPH Tier 1	mg/L	0.1	< 0.1	< 0.1	< 0.1
VPH Surrogate (IBB)	%		100	99	101
EPH Surrogate (IBB)	%		111	103	105
EPH Surrogate (C32)	%		112	104	104
Resemblance			ND	ND	ND
Return to Baseline at C32			Yes	Yes	Yes

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

Bruce Phillips
 Department Head
 Organic Analytical Services

ATLANTIC MUST WATER

Page 1 of 4

Angela Colford
 Lab Supervisor
 Organic Analytical Services

Report ID: 251051-OAS
Report Date: 06-Oct-17
Date Received: 29-Sep-17

CERTIFICATE OF ANALYSIS

for
Gemtec Limited
191 Doak Road
Fredericton, NB E3C 2E6



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Method Summary

OAS-HC04: The Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water(VPH)
OAS-HC04: Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water (EPH)

Resemblance Legend

<u>Resemblance Code</u>	<u>Resemblance</u>	<u>Resemblance Code</u>	<u>Resemblance</u>
AG	Aviation Gasoline	PAH	Possible PAHs Detected
COMMENT	See General Report Comments	PG	Possible Gasoline Fraction
FO	Fuel Oil Fraction	PLO	Possible Lube Oil Fraction
FO.LO	Fuel Oil and Lube Oil Fraction	PWFO	Possible Weathered Fuel Oil Fraction
G	Gasoline Fraction	PWG	Possible Weathered Gasoline Fraction
LO	Lube Oil Fraction	TO	Transformer Oil
ND	Not Detected	UP	Unknown Peaks
NR	No Resemblance (not-petrogenic in origin)	WFO	Weathered Fuel Oil Fraction
NRLR	No Resemblance in the lube oil range (>C21-C32).	WG	Weathered Gasoline Fraction
OP	One Product (unidentified)		

General Report Comments

Return to Baseline: Samples are considered to have returned to baseline if the area from C32-C36 is less than 10% of the area from C10-C32.

COMMENTS

Report ID: 251051-OAS
 Report Date: 06-Oct-17
 Date Received: 29-Sep-17

CERTIFICATE OF ANALYSIS

for
 Gemtec Limited
 191 Doak Road
 Fredericton, NB E3C 2E6



921 College Hill Rd
 Fredericton NB
 Canada E3B 6Z9
 Tel: 506.452.1212
 Fax: 506.452.0594
 www.rpc.ca

Project #: 6921.44

Location: Miramichi

QA/QC Report

RPC Sample ID:			BLANKC1392	BLANKC1396	SPIKEC1392	SPIKEC1396
Type:			EPH	VPH	EPH	VPH
Matrix:			water	water	water	water
Analytes	Units	RL			% Recovery	% Recovery
Benzene	mg/L	0.001	-	< 0.001	-	102%
Toluene	mg/L	0.001	-	< 0.001	-	102%
Ethylbenzene	mg/L	0.001	-	< 0.001	-	100%
Xylenes	mg/L	0.001	-	< 0.001	-	99%
VPH C6-C10 (Less BTEX)	mg/L	0.01	-	< 0.01	-	98%
EPH >C10 - C16	mg/L	0.05	< 0.05	-	-	-
EPH >C16 - C21	mg/L	0.05	< 0.05	-	-	-
EPH >C21-C32	mg/L	0.1	< 0.1	-	-	-
EPH >C10 - C32	mg/L		-	-	102%	-

RL = Reporting Limit

Report ID: 251051-OAS
Report Date: 06-Oct-17
Date Received: 29-Sep-17

CERTIFICATE OF ANALYSIS

for
Gemtec Limited
191 Doak Road
Fredericton, NB E3C 2E6




921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Project #: 6921.44

Summary of Date Analyzed

RPC Sample ID	VPH		EPH	
	Extracted	Analyzed	Extracted	Analyzed
251051-1	2-Oct-17	2-Oct-17	2-Oct-17	3-Oct-17
251051-2	2-Oct-17	2-Oct-17	2-Oct-17	3-Oct-17
251051-2 Dup	3-Oct-17	3-Oct-17	2-Oct-17	3-Oct-17



Attachment E-4 - Site Photos



Photo 1: View of the northern bank (true left bank) of the Northwest Miramichi River (September 30, 2017).



Photo 2: View of the northern bank (true left bank) of the Northwest Miramichi River, facing east (September 29, 2017).



Photo 3: View of substrate on the northern bank (true left bank) of the Northwest Miramichi River (September 29, 2017).



Photo 4: View of the northern bank (true left bank) of the Northwest Miramichi River (September 29, 2017).



Photo 5: View of the southern bank (true right bank) of the Northwest Miramichi River (September 30, 2017).



Photo 6: View of the southern bank (true right bank) of the Northwest Miramichi River facing east (September 30, 2017).



Photo 7: View of substrate on the southern bank (true right bank) of the Northwest Miramichi River (September 30, 2017).



Photo 8: View of the southern bank (true right bank) of the Northwest Miramichi River (September 30, 2017).



Photo 9: Underwater videography screen grab at Point 1 (September 29, 2017)

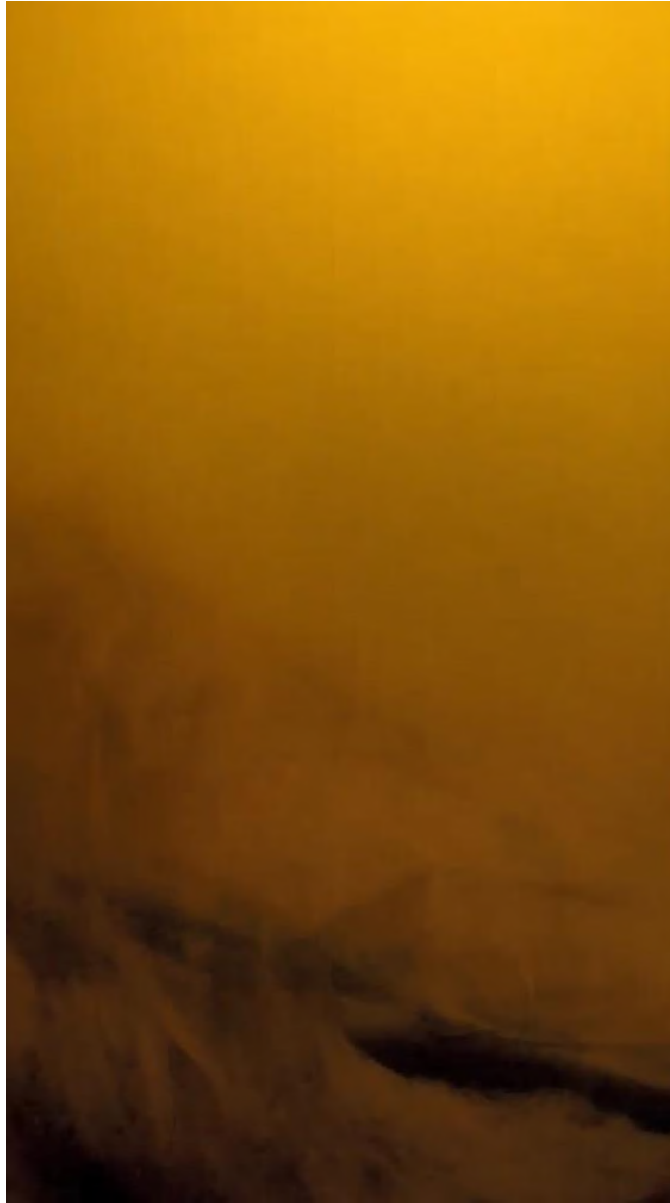


Photo 10: Underwater videography screen grab at Point 2 (September 29, 2017)

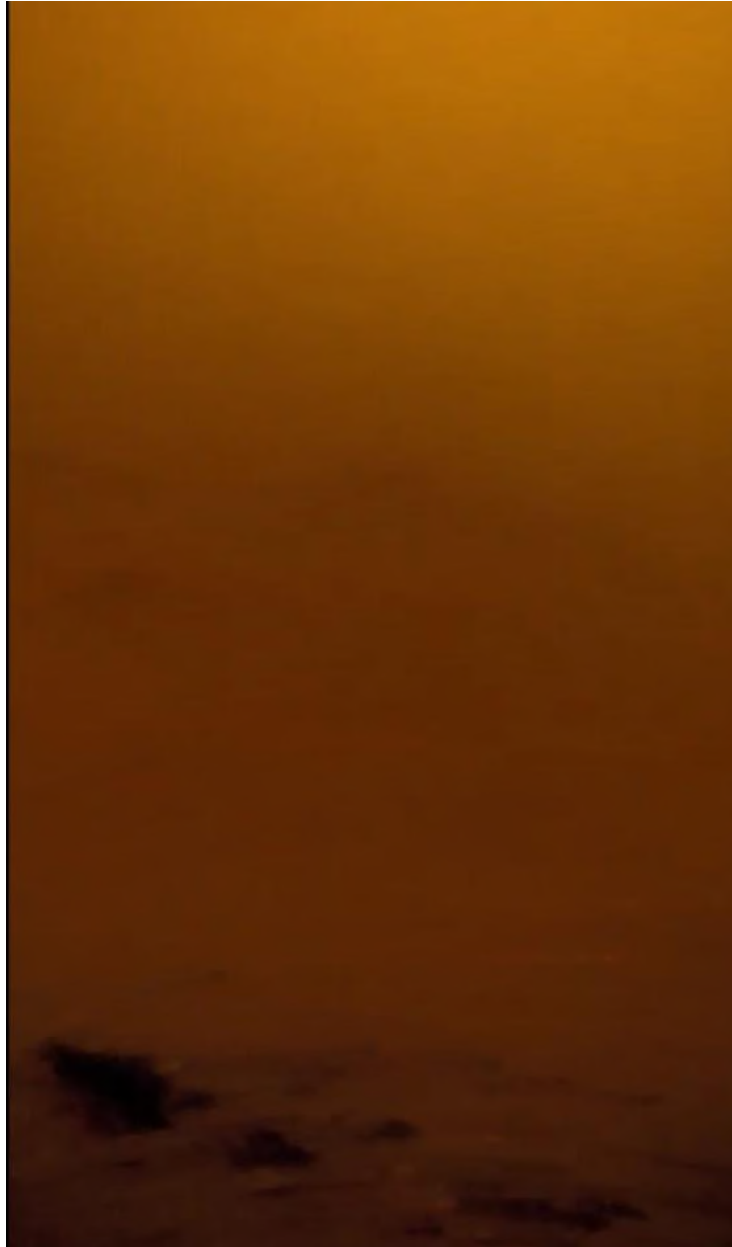


Photo 11: Underwater videography screen grab at Point 3 (September 30, 2017)



Photo 12: Underwater videography screen grab at Point 4 (September 30, 2017)



Photo 13: Underwater videography screen grab at Point 5 (September 29, 2017)



Photo 14: View of Oxford Brook on PID 40437139, facing south (September 27, 2017).



Photo 15: View of Oxford Brook under Saint Agnes Street, facing north (September 28, 2017).




Photo 16: View of eastern bank of Oxford Brook, facing south (September 28, 2017).



Photo 17: View of Oxford Brook, facing south (September 28, 2017).



Photo 18: View of captured White Sucker (*Catostomus commersonii*) (September 28, 2017).



Attachment E-5 - Stream Habitat Inventory Form

DNR&E / DFO - NEW BRUNSWICK
STREAM HABITAT INVENTORY

River: Oxford Brook Start Point: 46.974216°N -65.603194°W End Point: 46.971633°N -65.602866°W Drainage Code: -

Personnel: Jennifer Hachey & Jenna McCoy Date: 09/28/2017 GIS Map No.: N/A Drainage Name: -

****Right and Left are looking DOWNSTREAM****

REACH NO.	UNIT NO.	STREAM TYPE	CHANNEL TYPE	LENGTH (m)	AVG WIDTH (m)		SUBSTRATE (%)						AVG DEPTH WET WIDTH (cm)	0 - 50% UNDERCUT BANK		0 - 50% OVERHANGING VEGETATION		LARGE WOODY DEMRIS IN STREAM (m)	FLOWS			EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20%-35% 3: 35%-50% 4: >50%	COMMENTS	CHECKLIST OF LANDUSE ATTRIBUTES (COMMENTS)			
					WET	BANK CHANNEL	BED-ROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND		FINES	L	R	L		R	TYPE	FLOWS (cm/s)				TIME	TEMP (°C) W A	
1	1	4	1	0	8.5	8.5	0	80	20	0	0	0	0	90	0	0	0	0	0	-	-	-	-	-	1	40, 29	1. ACTIVE BEAVER DAM 2. INACTIVE BEAVER DAM 3. WOODY DEBRIS (OBSTRUCTION) 4. MAN-MADE DAM OBSTRUCTION 5. ROCK DAM (SWIMMING POOL) 6. BRAIDED STREAM CHANNELS 7. OBSTRUCTION IN STREAM 8. ROAD FORD POLLUTION CAUSED BY: 9. FOOD PROCESSING INDUSTRY 10. FOREST INDUSTRY 11. CAMPSITE OR RESIDENTIAL 12. MINING 13. LITTER 14. OIL
1	2	6	11	50	21.1	25.2	0	0	20	0	0	40	40	90	0	45	0	50	0	-	-	-	-	-	1	43, 29	15. AGRICULTURE WASTE 16. HEALTH HAZARD 17. CLEAR CUT TO STREAM EDGE 18. SELECTIVE CUT 19. BUFFER STRIP PRESENT 20. CATTLE CROSSING 21. EROSION FROM AGRICULTURE 22. SUSPENDED SILT NOTED 23. UNUSUAL STREAM SCOURING 24. LARGE BEDLOAD DEPOSIT 25. BANK EROSION - MODERATE 26. BANK EROSION - EXCESSIVE 27. STREAM DREDGING/BULLDOZING 28. GRAVEL REMOVAL 29. CHANNELIZATION (RIPRAP, ETC) 30. STREAM DIVERSION 31. WATER WITHDRAWAL
1	3	6	1	100	12	43.7	0	0	5	0	0	50	45	90	0	5	2	50	4	-	-	-	-	-	3	43	32. REGULATED STREAM FLOW 33. CAMP/COTTAGE PRESENT 34. RESIDENTIAL AREA 35. ACCESS - ATV'S 36. ACCESS - TRAILS 37. ACCESS - TRUCK/CAR 38. ACCESS - BOAT
1	4	6	1	150	19.8	40.5	0	0	0	0	0	50	50	-	0	50	0	50	1	-	-	-	-	-	4	43	39. ROAD CROSSING (BRIDGE) 40. ROAD CROSSING (CULVERT) 41. BOAT LANDING 42. ORGANIC LITTER 43. AQUATIC PLANTS ABUNDANT 44. GOOD SPAWNING 45. GOOD NURSERY 46. ATLANTIC SALMON OBSERVED 47. BROOK TROUT OBSERVED
1	5	6	1	200	17.5	45	0	0	0	0	0	50	50	-	0	50	0	50	5	-	-	-	-	-	4	43	
1	6	6	1	250	20	47	0	0	0	0	0	50	50	-	0	50	0	50	0	-	-	-	-	-	4	43	
1	7	6	1	300	9	45	0	0	0	0	0	50	50	-	0	50	0	50	10	-	-	-	-	-	4	43	
STREAM TYPE													CHANNEL TYPE					SUBSTRATE (representing at least 25% of habitat type)			FLOW TYPE		POOL RATING (reverse side)				
FASTWATER					POOLS																						
													1. Main (if measurement refers to main area of river) *2. Side Channel (water diverted by islands) *3. Split (if river is split into various different stream *4. Bogan (backwater/narrow stretch of water) *Specify Left (L), Right (R) or Middle (M)					1. Bedrock, Ledge = >461 mm 2. Boulder = 180 - 460 mm 3. Rock = 54 - 179 mm 4. Rubble = 2.6 - 53 mm 5. Gravel = 0.06 - 2.5 mm 6. Sand = 0.0005 - 0.05 mm			1. Survey 2. Spring 3. Brook / River Tributary 4. Spring Seep		POOL DEPTH ≥ 1.5m 1 - Instream Cover ≥ 30% 2 - Instream Cover < 30%		a - > 30% b - > 10 to c - < 10%		
1. Fall 2. Cascade 3. Riffle (GR/RB) 4. Riffle (R/B) 5. Riffle (Sand) 6. Sheet 7. Chute 8. Run 9. Rapid 10. Midchannel 11. Convergenc 12. Lateral 13. Beaver 14. Trench 15. Plunge 16 17. Bogan 18. Eddy 19. Gabion 20. Log Structure 21. Road Crossing 22. Wood Debris 23. Man-Made Dam 24. Natural Deadwater																							POOL DEPTH .5 - 1.5m 3 - Instream Cover 5-30% 4 - Instream Cover ≥ 30%		a - > 50% b - < 50%		

**DNR&E / DFO - NEW BRUNSWICK
STREAM HABITAT INVENTORY**

River: Oxford Brook Start Point: 46.974216°N -65.603194°W End Point: 46.971633°N -65.602866°W Drainage Code: -
 Personnel: Jennifer Hachey & Jenna McCoy Date: 09/28/2017 GIS Map No.: N/A Drainage Name: -

****Right and Left are looking DOWNSTREAM****

REACH NO.	SITE (50m - interval)	% SITE		SHADE (%)	STREAM BANKS											O ₂ (mg/l)	pH	DEPTH						POOL RATING (CRITERIA ON OTHER SIDE)		POOL TAIL			% TURBULENCE
		RIFFLE/RUN	POOLS		VEGETATION (%)				EROSION (%)									1/4 (m)		1/2 (m)		3/4 (m)		NO.	LETTER	EMBEDDEDNESS CRITERIA 1: ≤ 20% 2: 20% - 35% 3: 35% -50% 4: ≥ 50%	MEAN SUBSTRATE SIZE (cm)	% FINE	
					BARE GROUND	GRASSES	SHRUBS	TREES	LEFT BANK (0 - 50%)			RIGHT BANK (0 - 5-%)						Wet	CHANNEL	Wet	CHANNEL	Wet	CHANNEL						
									STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING															
1	1	Run	0	0	0	20	10	0	50	-	-	50	-	0	16.0	7.50	1	2	1.3	2.3	1	2	N/A	N/A	N/A	N/A	N/A	N/A	
1	2	Run	0	10	0	30	5	40	50	-	-	10	-	40	13.3	7.47	1	2	1.3	2.3	1	2	N/A	N/A	N/A	N/A	N/A	N/A	
1	3	Run	0	20	0	25	30	40	50	-	-	30	-	20	11.8	7.45	0.75	1.75	1	2	0.75	1.75	N/A	N/A	N/A	N/A	N/A	N/A	
1	4	Run	0	20	0	50	0	50	50	-	-	0	-	50	10.6	7.46	0.6	1.6	0.8	1.8	0.6	1.6	N/A	N/A	N/A	N/A	N/A	N/A	
1	5	Run	0	15	10	40	0	50	50	-	-	0	-	50	10.8	7.62	1.4	2.4	1.5	2.5	1.4	2.4	N/A	N/A	N/A	N/A	N/A	N/A	
1	6	Run	0	5	5	80	0	15	50	-	-	15	-	35	-	-	1.4	2.4	1.5	2.5	1.4	2.4	N/A	N/A	N/A	N/A	N/A	N/A	
1	7	Run	0	5	0	60	0	40	50	-	-	0	-	50	-	-	1.6	2.6	1.8	2.8	1.6	2.6	N/A	N/A	N/A	N/A	N/A	N/A	
REACH NO.	UNIT NO.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM/4		COEFFICIENT (0.9 - SMOOTH) (0.8 - ROUGH)	LENGTH (3m)	FLOAT TIME (sec)									COMMENTS (LOCATION)									
				1/4 WAY	1/2 WAY	3/4 WAY	CENTIMETERS	METERS (m)			1/4 WAY			1/2 WAY			3/4 WAY				AVERAGE								
											T1	T2	T3	T1	T2	T3	T1	T2	T3										
1	-	4	8.5	100	130	100	110	1.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	-	6	21.1	100	130	100	110	1.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	6	12	75	100	75	83	0.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4	-	6	19.8	60	80	60	67	0.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5	-	6	17.5	140	150	140	143	1.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6	-	6	20	140	150	140	143	1.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	-	6	9	160	180	160	167	1.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

FORMULA (CMS) = $\frac{W \times D \times A \times L}{T}$
 (m) x D (m) x A x L (m) / T (sec)

WHERE: W =width, D = depth, L = length, A is coefficient for the stream bottom

NOTE: Stream flow too slow to obtain accurate measurements.