

Appendix D:
McCallum Environmental Ltd. Field Report

Biophysical Review Report

Name of Project:

Richibucto Wind Power Project

Location: Rexton, Kent County, New Brunswick

Proponent: Natural Forces NB Inc.

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EXECUTIVE SUMMARY

Natural Forces NB Inc, are proposing the development of a wind power project (the Project) on undeveloped land near the community of Richibucto, southeastern New Brunswick. The Project will consist of one, Enercon E-126 wind turbine, with a maximum hub height of 135m, rotor diameter of 127m and installed capacity of 3.5 MW. The proposed Project is being submitted as part of the Embedded Generation Program.

In support of registering a provincial Environmental Impact Assessment (EIA) with New Brunswick Department of Environment and Local Government (DELG), this Study has been completed to review the biophysical conditions existing within, and in close proximity to the proposed site. This was achieved by completing a review of background desktop resources in combination with field studies to identify potential environmental constraints and sensitivities.

Two wetlands and one watercourse were observed within the Study Area. One wetland (a mixed-wood treed swamp) will be impacted by access road construction, however the second wetland (a graminoid fen) will be avoided by project infrastructure. A 30m setback buffer will be applied between turbine infrastructure and the wetlands and watercourse present.

Species at risk surveys completed within the Study Area revealed the presence of no flora or fauna species at risk.

Six avian priority species (five Species At Risk [SAR] and one Species of Conservation Interest [SOCI]) were observed within, and surrounding the Study Area during bird surveys completed in 2017. The following species were identified;

- Bald Eagle
- Peregrine Falcon
- Rusty Blackbird
- Olive-sided Flycatcher
- Killdeer
- Eastern Wood Pewee

Bird usage within the Study Area was determined to be low, exhibiting generally consistent bird activity throughout all seasons. The spring season was more active than the breeding and fall migration periods, and low bird activity was recorded during focussed waterfowl watch counts completed adjacent to the Study Area alongside areas of open water in an abandoned quarry. Minimal avian fly-overs were observed throughout all seasons including the watch counts during Fall. Therefore, passage migration and diurnal movement of birds in this area is not expected to interfere with the proposed turbine rotor swept arc, and precipitate impacts to the avian population as a result. The Kouchibouguac National Park (NP) Important Bird Area lies approximately 5km northeast of the Study Area. It supports important coastal island habitat for a variety of nesting shorebirds and other waterbirds, such as the Piping Plover and Common Tern. However, suitable habitat for these species is not present within the Study Area, nor were these species identified during field surveys. Suitable habitat for many birds is present throughout the Study Area, and bird habitat directly within the footprint of the proposed access road and turbine

infrastructure will be removed. However, construction of the access road and entire turbine infrastructure footprint is not likely to affect how birds use the local or regional area, especially as similar habitat is present throughout the local region.

Migratory bat monitoring results obtained as part of the Study indicate that bat activity is higher in the open area adjacent to the ponds in the abandoned quarry (bat monitor BM1, outside of the Study Area), than in the forested habitat within the Study Area (bat monitor BM2). Migratory bat passes per night at BM1 during the active period were calculated to be 1.96 migratory bat passes per detector night, compared to BM2 which experienced 0.62 migratory bat passes per detector night. Based on the Bat Mitigation Framework for Wind Power Development (Alberta Environment & Sustainable Resource Development, 2013), data at BM1 falls within a *potentially moderate risk category* compared to at BM2 which falls into the *potentially acceptable risk category*. BM2 lies within forested habitat consistent with the proposed turbine location. Therefore, bat activity levels at the proposed turbine are expected to resemble those at BM2 (i.e. *potentially acceptable risk category*).

Habitat (mixed-wood forest with evidence of small scale disturbance and fragmentation), and wildlife species observed within, and adjacent to the Study Area are consistent with conditions present in the adjacent regional landscape. The Study Area is located adjacent to commercial development, abandoned quarries and areas of disturbance. No unique habitats required to support species life cycle were identified during the Study. As such, the proposed project infrastructure (i.e. access road, turbine and associated components), are expected to impact localized habitat (i.e. 1.83 ha based on Project footprint), but an insignificant impact in the regional context is expected.

As a result of the studies completed, the following biophysical conditions were identified within, and adjacent to the Study Area:

- The Study Area is comprised of undeveloped forested land with evidence of small scale disturbance (skidder trails, selective tree harvesting);
- The Study Area is abutted by commercial development (east) an abandoned quarry (north) and forested land (west). A commercial peat facility is located approximately 500m west;
- The Study Area does not abut, or exist in close proximity to protected natural areas, national or provincial parks. The nearest Important Bird Area (IBA) is the Kouchibouguac NP Sand Islands, located approximately 5km northeast of the Study Area;
- The Study Area comprises mixed-wood forest and a small portion of a graminoid fen. Habitat is neither unique nor rare in the local or regional landscape context;
- Two wetlands were identified within the Study Area; the proposed turbine will be setback from the wetland a minimum of 30m;
- One watercourse was observed within the western extent of the Study Area. The proposed turbine will be setback from the watercourse a minimum of 30m;
- Fish habitat quality is considered low within the watercourse and associated fen habitat;
- Six avian priority species (five SAR and one SOCI) were observed within and surrounding the Study Area during bird surveys completed in 2017. No other SAR or SOCI, or evidence of raptor nests were identified during field surveys;
- No known bat hibernacula exist within 5km of the Study Area. Bat monitoring was completed at three locations within, and adjacent to the Study Area during 2017;

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1.0 INTRODUCTION

Natural Forces NB Inc, are proposing the development of a wind power project (the Project) on undeveloped land near the community of Richibucto, southeastern New Brunswick. The Project will consist of one, Enercon E-126 wind turbine, with a maximum hub height of 135m, rotor diameter of 127m and installed capacity of 3.5 MW. The proposed Project is being submitted as part of the Embedded Generation Program.

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1.1 Biophysical Assessments

The field components of the Study were initiated in April 2017 and extended through until November 2017 complying with the requirements of *A Guide to Environmental Impact Assessment in New Brunswick* (April 2012) and its associated additional information document: *Additional Information Requirements For Wind Turbines* (Environment and Local Government). These studies were focused on highlighting the ecological linkages within the Study Area, as well as with the habitats surrounding the Study Area. This work included:

1. Avian: Spring migration surveys 2017; Breeding bird surveys (Summer 2017); Fall bird migration surveys 2017; Waterfowl surveys (Fall 2017);
2. Vegetation surveys for priority species across the Study Area (June and August 2017);
3. Opportunistic herpetofauna, mammal and other taxonomic group surveys for priority species across the Study Area (Spring 2017 to October 2017);
4. Wetland and watercourse identification and evaluation (Summer 2017) across the Study Area;
5. Habitat and raptor nest surveys (Spring 2017 to October 2017): and,
6. Bat Monitoring (June to October 2017)

Field surveys were completed by McCallum Environmental biologists and expert birder Roland Chiasson. CV's are provided in Appendix B.

1.2 Study Area

The Study Area extends from the Richibucto-Rexton Industrial Park, which is located approximately 1km northwest of Rexton, NB (Figure 1, Appendix A). The Study Area encompasses approximately 11.86ha of undeveloped land and comprises the proposed turbine location, and associated turbine pad, lay-down area and access road footprint (Figure 2, Appendix A). The Study Area is entirely undeveloped, forested land with multiple woods access roads and smaller ATV/skidder trails within it. Some selective historical tree harvesting has occurred within the Study Area, however the majority of tree harvesting activities have occurred in lands to the south of the Study Area. The Study Area abuts a wetland and watercourse system to the west which drains water into a historical (and now abandoned) former quarry. The abandoned quarry has formed areas of open water, however water flow and quality are impacted by a

commercial peat facility located 500 meters from the Study Area. The Study Area is very flat with only minor, and intermittent topographical undulations present.

1.3 Priority Species

In support of the assessment of wildlife, vegetation and habitat, a priority species list was created. The priority species list was built using sub-national (provincial) conservation rank (SRanks, S1, S2, S3) rather than the formerly used general status ranks (GS Ranks Red and Yellow). The desktop priority list was based on general species habitat requirements and the broad geographic area that individual species are known to occur. The purposes of the priority species list is to identify a broad list of species which have the potential to be present within the Study Area, and to inform the field programs.

The priority list of species was first narrowed by broad geographic area. The priority list of species was then further narrowed by identifying specific habitat requirements for each species. For example, if a listed species on the New Brunswick Species At Risk Act (NBSARA) required open water lake habitat, and no open water lake habitat is present inside the Study Area footprint, this species was not carried forward to the final list of priority species for field assessments within the Richibucto Wind Project Study Area.

Development of a priority list of species for each taxonomic group was completed based on a compilation of listed species from the following sources:

- 1) Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Federal Species-at Risk Act (SARA 2003). All species listed as Endangered, Threatened, or of Special Concern;
- 2) New Brunswick Species At Risk Act (NBSARA, 2012). All species listed as Endangered, Threatened, or Vulnerable; and,
- 3) Conservation Rank: All species designated as S1, S2 or S3 as defined by the Atlantic Canadian Conservation Data Centre (ACCDC).

Note: All species rankings are current as of October 18th, 2017.

Collectively, this group of species is known as Priority Species. This umbrella grouping includes species of conservation interest (SOI) that are not listed species under provincial or federal legislation (COSEWIC species and ACCDC S1, S2 and S3 species), and Species at Risk (SAR) which are listed on SARA or NBSARA.

Data was requested from the ACCDC to obtain records of rare species existing or historically found within the general location of the Study Area. The results of the database search were also reviewed to identify priority species that could be potentially located within the Study Area (based on recorded sightings within or in close proximity to the Study Area, and general geographic and habitat requirements).

An in-text short list was created to outline those SAR with the highest potential of occurring within the Study Area, based on distribution and documentation by the ACCDC. The in-text priority species shortlist

provided herein was developed by identifying SAR that have been documented within 20km of the Study Area by the ACCDC. The in-text list is provided in Section 8.

The final broad priority list of species used for field assessments is attached in Appendix C. The ACCDC report is also included as Appendix C.

2.0 HABITAT

2.1 Methodology

In May 2017, a desktop habitat assessment was completed within the Study Area. Using available forestry and wetlands databases, habitat survey routes were created with the goal of assessing all of the major habitat types and landscape features throughout the Study Area, and to inform necessary targeted surveys for the remaining baseline environmental field program. Forestry cover data was obtained from the Department of Energy and Resource and Development (ERD) Forest Inventory database accessed through GeoNB (GeoNB, 2016). Forest cover polygons included in the database are interpreted from aerial imagery on a 10-year cycle. In addition, the Crown Lands Conservation Areas database was reviewed to determine potential significant habitat within the vicinity of the Study Area.

The survey team completed the habitat assessment within the Study Area encompassing the proposed access road and turbine in June 2017. The survey followed a meandering transect that reached all major habitat types expected within the Study Area. The habitat survey focused on assessing upland habitats, as detailed evaluation of all wetland habitat is completed as part of the surface water evaluation.

Habitat survey points were established along the survey route, based on anticipated and observed habitat types. The distance between habitat survey points was dependent upon the complexity of major habitat types across the landscape. Vegetation type was determined by classifying each stand by overall forest groups (tolerant hardwood, mixed-wood for example). Within each forest group, vegetation types were identified; vegetation types are recurring and identifiable plant communities which reflect differences in site conditions, natural disturbance regimes and successional stage. Therefore, the dominant vegetation type was established as part of the description (i.e. hardwood forest group dominated by Sugar Maple and White Ash vegetation type). Stand age classification (Over-mature, Mature, Immature and Regenerating) was determined through qualitative observations of multiple factors such as total basal area, level of canopy coverage, and species composition of the understory herb and shrub layers. The level of anthropogenic disturbance was described, particularly the presence of logging roads and harvested trees (clear-cut or selective harvest, and approximate time since harvest). Photos of representative habitats were taken.

2.2 Results

The Study Area lies in the Eastern Lowlands Ecoregion in the Kouchibouguac Ecodistrict. Topography in this ecodistrict is flat and low (less than 60m above sea level near the coast) rising gently westward (Department of Natural Resources, 2007). The Study Area typifies these conditions as it encompasses very flat land with only minor (i.e. 1-2m) elevation changes where small upland habitats are present and a range of 7-12m above sea level in elevation across the extent of the Study Area. The Study Area and surrounding lands do not contain major islands, peninsulas, or ridgelines. A wetland complex which is

located west of the Study Area comprises an extensive area currently utilized for commercial peat farming (Image 2, Page 4).

The Kouchibouguac Ecodistrict is mostly natural, with approximately 75% forest cover. The forest cover consists primarily of coniferous stands and mixed forests. Black spruce (*Picea mariana*) stands dominate poorly drained areas whereas mixed wood stands incorporating tolerant hardwoods such as red maple (*Acer rubrum*) together with balsam fir (*Abies balsamea*) dominate the better drained sites (Department of Natural Resources, 2007).

On review of the ERD Forest Cover database, it is evident that habitat type varies across the Study Area. The database indicates that the proposed turbine location exists within a mapped area of hardwood cover type with balsam fir mixed-wood (BFMX). The proposed access road extends through softwood cover type (red spruce balsam fir) (RSBF), mixed-wood cover type with spruce as a dominant species (SPMX) and soft wood cover type with spruce balsam fir (BFSP). These habitats, as determined by the ERD Forestry layer are provided on Figure 3 (Appendix A).

The Crown Lands Conservation Areas database indicated that no significant habitat for priority species was identified in the database, although some areas of Conservation Forest (Old Forest Target [Spruce/Fir]) exists adjacent to the Study Area (Askanas, Pers. Communication, 2017).

The field habitat assessment was completed within the Study Area in June 2017 by Tessa Giroux and Ryan Gardiner. The Study Area contains a mosaic of natural and anthropogenic disturbed habitat.

Observations recorded during the survey indicated that habitat was generally classified into two main upland components and one treed wetland component. Although not within the infrastructure Study Area, a second wetland component (a graminoid fen) was also identified to the west of the proposed turbine and was also evaluated. This wetland is discussed in Section 7.

The upland components consisted of;

- i) Mixed-Wood, Red Maple Balsam Fir Forest (MW-RM/BF) and
- ii) Mixed-Wood Red Maple Red Spruce White Pine Forest (MW-RM/RS/WP)

The MW-RM/BF upland habitat type, exists in eastern portions of the Study Area within the upland habitats identified on Figure 3 (Appendix A). This area is identified by the ERD Forest Database as mixed-wood cover type. Vegetation is mapped as being dominated by soft wood cover type with spruce and balsam fir (BFSP). Field observations confirmed vegetation to be dominated by red maple (*Acer rubrum*) and balsam fir (*Abies balsamea*) trees, red maple, wild raisin (*Viburnum nudum*) and mountain holly (*Ilex mucronatus*) shrubs, and wild sarsaparilla (*Aralia nudicaulis*) and Canada mayflower (*Maianthemum canadense*) herbs (Photo 1). For the most part this upland habitat comprises a closed canopy and is mature in its stand age. Some anthropogenic disturbances in the form of skidder trails and an electrical transmission line has occurred in this upland habitat in close proximity to the western extent of Enterprise Street (Figure 3, Appendix A). However, tree harvesting activities are relatively absent throughout the Study Area, although some historical selective tree harvesting appears to have occurred within the wetland habitat. The majority of local tree harvesting has occurred south of the Study Area.



Photo 1: Canopy of RM/BFMW Habitat



Photo 2: RM/RSMW Habitat

The second upland habitat component identified throughout the remainder of the Study Area during field evaluations (MW-RM/RS/WP) was observed in forested upland habitat where the turbine is proposed (in western extent of the Study Area as identified on Figure 3 (Appendix A). This area is identified by the ERD Forest Database as hardwood cover type, with balsam fir mixed (BFMX). The field survey confirmed that this area was dominated by equal amounts of red maple, red spruce (*Picea rubens*) and white pine (*Pinus strobus*). An understory of shrubs dominated by balsam fir and red maple, and an herb layer of wild sarsaparilla, velvet-leaf blueberry (*Vaccinium myrtilloides*) and starflower (*Trientalis borealis*). This upland habitat comprises a closed canopy and is mature in its stand age. Apart from a surface drainage ditch, no other anthropogenic disturbances exist within the habitat.

Remaining portions of the Study Area, in-between the upland habitats discussed above (and as identified in Figure 5B, Appendix A), exist as mixed-wood treed swamp wetland habitat. The wetland is dominated by gray birch (*Betula populifolia*), eastern larch (*Larix laricina*) and balsam fir trees, with a shrub stratum comprised of red maple, eastern larch, speckled alder (*Alnus incana*) and red spruce. The wetland has been subject to anthropogenic disturbances including ditching, skidder trails, and tree harvesting. The wetland, as well as the area of fen habitat located to the west of the proposed turbine is described in Section 7.

3.0 VEGETATION

3.1 Methodology

For the purpose of this Study, vascular plant surveys focused on identifying general vegetative communities, with particular focus on identifying priority species (See section 1.3). Early and late botany surveys were completed concurrently with wetland and habitat surveys throughout the Study Area in June and August 2017 by Ryan Gardiner and Tessa Giroux. The priority list and associated ACCDC report created for the Richibucto Wind Project were consulted before completing botany surveys.

The Study Team searched for species which are indicators of nutrient rich, fertile soils, and species which are likely to frequent wetland habitat. These habitats have higher potential for rare species presence.

3.2 Results

Vegetative composition was evaluated during the habitat surveys completed within the Study Area in June and August 2017, the results of which are discussed in Section 2. In general, vegetative diversity is relatively limited across the Study Area. The few upland areas present across the Study Area share very similar vegetative characteristics (i.e. mixed-wood forest dominated by coniferous species intermixed with red maple). The eastern upland areas tend to comprise a denser shrub understory than the western upland community, however neither possess diverse nor extensive shrub congregations at either location. Herbaceous species are limited in both upland communities identified. In general, limited ground cover is present in uplands, likely as a result of the closed canopy conditions present across the Study Area (Photo 3).



Photo 3: Typical Upland Ground Cover

Conversely, the areas of wetland across the Study Area comprise a dense ground cover of herbs including bluejoint (*Calamagrostis canadensis*) in the fen west of the proposed turbine location, and tussock sedge (*Carex stricta*), rhodora, and sheep laurel throughout the mixed wood treed swamp elsewhere throughout the Study Area. Wetland characteristics (including vegetative composition) are discussed further in Section 7.

A total of 71 species were identified within the Richibucto Wind Project Study Area. No priority species were observed. A list of all species identified within the Study Area is provided in Table 1.

Table 1: Observed Vegetation

Latin Name	Common Name	Srank
<i>Abies balsamea</i>	Balsam Fir	S5
<i>Acer rubrum</i>	Red Maple	S5
<i>Alnus incana</i>	Speckled Alder	S5
<i>Amelandchier bartramiana</i>	Bartram's Serviceberry	S5
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	S5
<i>Betula alleghaniensis</i>	Yellow Birch	S5
<i>Betula papyrifera</i>	Paper Birch	S5
<i>Betula populifolia</i>	Gray Birch	S5
<i>Calamagrostis canadensis</i>	Bluejoint Reed Grass	S5

Latin Name	Common Name	Srank
<i>Carex cumulata</i>	Dense Sedge	S4S5
<i>Carex debilis</i>	White-edged Sledge	S5
<i>Carex folliculata</i>	Northern Long Sedge	S4
<i>Carex intumescens</i>	Bladder Sedge	S5
<i>Carex lurida</i>	Sallow Sedge	S5
<i>Carex projecta</i>	Necklace Sedge	S5
<i>Carex stricta</i>	Tussock Sedge	S5
<i>Carex trisperma</i>	Three-seeded Sedge	S5
<i>Clintonia borealis</i>	Yellow Bluebead Lily	S5
<i>Comptonia peregrina</i>	Sweet-fern	S5
<i>Coptis trifolia</i>	Goldthread	S5
<i>Cornus canadensis</i>	Bunchberry	S5
<i>Cypripedium acaule</i>	Pink Lady's-Slippers	S5
<i>Drosera rotundifolia</i>	Round-leaved Sundew	S5
<i>Dryopteris cristata</i>	Crested Wood Fern	S5
<i>Equisetum arvense</i>	Field Horse Tail	S5
<i>Equisetum sylvaticum</i>	Woodland Horsetail	S5
<i>Fragxinus nigra</i>	Northern Beech Fern	S5
<i>Galium palustre</i>	Common Marsh Bedstraw	S5
<i>Glyceria canadensis</i>	Canada Manna Grass	S5
<i>Glyceria grandis</i>	Common Tall Manna Grass	S5
<i>Ilex mucronatus</i>	Mountain Holly	S5
<i>Iris versicolor</i>	Harlequin Blue Flag	S5
<i>Juncus effusus</i>	Soft Rush	S5
<i>Kalmia angustifolia</i>	Sheep Laurel	S5
<i>Larix laricina</i>	Larch	S5
<i>Lonicera canadensis</i>	Canada Fly Honeysuckle	S5
<i>Lycopodium complanatum</i>	Northern Clubmoss	S4S5
<i>Maianthemum canadense</i>	False Lily-of-the-valley	S5
<i>Maianthemum trifolium</i>	Three-leaved False Solomon's Seal	S5
<i>Oclemena nemoralis</i>	Bog Aster	S5
<i>Onoclea sensibilis</i>	Sensitive Fern	S5

Latin Name	Common Name	Srank
<i>Osmunda cinnamomea</i>	Cinnamon Fern	S5
<i>Osmunda regalis</i>	Royal Fern	S5
<i>Phegopteris connectilis</i>	Northern Beech Fern	S5
<i>Picea mariana</i>	Black Spruce	S5
<i>Picea rubens</i>	Red Spruce	S5
<i>Pinus strobus</i>	Eastern White Pine	S5
<i>Pteridium aquilinum</i>	Bracken Fern	S5
<i>Quercus rubra</i>	Northern Red Oak	S5
<i>Rhododendron canadensis</i>	Rhodora	S5
<i>Rhododendron groenlandicum</i>	Common Labrador Tea	S5
<i>Rosa nitida</i>	Shining Rose	S5
<i>Rubus allegheniensis</i>	Alleghaney Blackberry	S5
<i>Rubus hispidus</i>	Bristly Dewberry	S5
<i>Rubus pubescens</i>	Dwarf Red Raspberry	S5
<i>Salix discolor</i>	Pussy Willow	S5
<i>Solidago canadensis</i>	Canada Goldenrod	S5
<i>Sorbus americana</i>	American Mountain Ash	S5
<i>Spiraea alba</i>	White Meadowsweet	S5
<i>Spiraea tomentosa</i>	Steeplebush	S5
<i>Thalictrum pubescens</i>	Tall Meadow Rue	S5
<i>Thelypteris noveboracensis</i>	New York Fer	S5
<i>Triadenum fraseri</i>	Fraser's Marsh St. John's-wort	S5
<i>Trientalis borealis</i>	Northern Starflower	S5
<i>Trillium undulatum</i>	Painted Trillium	S5
<i>Typha latifolia</i>	Broad-leaved Cat-tail	S5
<i>Vaccinium myrtilloides</i>	Velvet-leaved Blueberry	S5
<i>Vaccinium oxycoccus</i>	Small Cranberry	S5
<i>Viburnum lantanoides</i>	Hobblebush	S5
<i>Viburnum nudum</i>	Northern Wild Raisin	S5
<i>Viola macloskeyi</i>	Small White Violet	S5

No SAR and SOCI flora species were identified during field surveys. Further details relating to potential SAR and SOCI flora species are provided in Section 8.2.1.

4.0 WILDLIFE

4.1 Wildlife Habitat

Habitat across the Study Area is described in detail in Section 2.2. The majority of the Study Area is forested with some areas that have been historically harvested (i.e. selective harvesting within the mixed-wood treed swamp), but which is now in latter stages of regeneration. Land to the south of the Study Area has been subject to more recent tree harvesting activities. This area is mostly concentrated in the Hardwood Cover White or Grey Birch (BIHW) forest cover as identified by the ERD Forestry Database (GeoNB, 2016). This area comprises regenerating birch at a young/immature stage and can be identified visually on aerial imagery (Image 3, Page 60).

Habitat within the Study Area is relatively intact, albeit with some selective tree harvesting present within the mixed wood treed swamps. Therefore, the extent of habitat fragmentation within the Study Area is limited to small scale skidder tracks and a woods access road. Wildlife access to the site from natural adjacent lands is predominantly provided from the north/northwest where large tracts of undisturbed land exist. Land surrounding the Study Area however comprises larger scale fragmentation in the form of commercial industrial development adjacent east, a large commercial peat facility approximately 530m west. In addition, an abandoned quarry exists approximately 100m northeast of the Study Area and comprises steep sided banks, areas of open water and a limited vegetative component. Habitat within the Study Area is suitable for those wild species that thrive in fragmented, diverse landscapes, such as Moose, White-tailed Deer, Coyote, and Snowshoe Hare. This fragmented, diverse landscape provides edge habitat for foraging, and patches of full canopy coverage for refuge and cover through all seasons. Wildlife habitat observed was neither unique nor rare in the local or regional landscape context.

4.2 Herpetofaunal Species

4.2.1 Methodology

Incidental herpetofauna surveys were completed throughout the Study Area. According to the ACCDC, wood turtle and snapping turtle are not documented within 5km of the Study Area, however, due to suitable habitat present, targeted snapping turtle habitat was completed within the fen wetland habitat to the west of the proposed turbine. Broadly, incidental observations of herpetofauna across the Study Area were documented during all field surveys completed through 2017, especially during the wetland delineation and evaluation, and watercourse evaluation (turtles). Specific focus was given to identifying priority species, especially those identified as having appropriate habitat within the Study Area through the desktop evaluation for priority species.

4.2.2 Results

The only herpetofaunal species identified during field surveys was a Spring peeper (*Pseudacris crucifer*) which is not a SOCI or a SAR.

The limitation for many turtle and amphibian species is the lack of open water habitats, particularly associated with wetlands. A large area of mixed-wood treed swamp habitat exists within the Study Area

which is hydrologically connected at surface to the fen habitat to the west of the proposed turbine during periods of high flow (see Section 7.0). However, the Study Area only provides access for herpetofaunal species into the mixed-wood treed swamp during spring melt and/or during other high flow events, at which point standing water is present within the treed swamp wetland (see Section 7.0). The mixed-wood treed swamp does not comprise vernal pool habitat and no open channels are present. Conditions during the summer months are saturated but standing water within the mixed-wood treed swamp is absent.

Herpetofaunal habitat is present in the fen wetland due to its contiguity with the main watercourse channel, and its vegetative and hydrological characteristics (i.e. floodplain landform and graminoid dominated vegetation). Turtles and amphibians are more likely to find adequate habitat within this wetland; however, none were identified during all biophysical field evaluations.

No SAR and SOCI herpetofaunal species were identified during field surveys.

4.3 Mammals

4.3.1 Methodology

Incidental observations of mammals were documented during field surveys across the Study Area. Specific focus was given to searching for signs of priority species identified as having appropriate habitat within the Study Area. No bat hibernacula are documented within 50km of the Study Area by Environment Canada (2015), or within 5km of the Study Area by ACCDC. Additional information related to bats are provided in Section 6.0. Observations included such features as dens and nests, scat, tracks, and forage evidence. Mammal observations were collected throughout the field surveys in 2017.

4.3.2 Results

Table 2 lists those species that were confirmed within the Study Area either visually or by sign (scat, footprints, etc.). A discussion of bat usage within the Study Area is provided in Section 6.0.

Table 2. Confirmed mammalian species during 2017 field surveys.

Scientific Name	Common Name	ACCDC Prov. Rank
<i>Ursus americanus</i>	Black Bear	S5
<i>Tamiasciurus hudsonicus</i>	American Red Squirrel	S5
<i>Alces americanus</i>	Moose	S5
<i>Castor canadensis</i>	Beaver	S5
<i>Lepus americanus</i>	Snowshoe Hare	S5
<i>Microtus pennsylvanicus</i>	Meadow Vole	S5
<i>Erethizon dorsatum</i>	North American Porcupine	S5

Ungulate species expected to inhabit the vicinity of the Study Area were established by examination of distribution maps, comparison of preferred habitat with that in the vicinity of the proposed location and field assessments. Mammal species observed within the Study Area include the white-tailed deer (*Odocoileus virginianus*) and Moose (*Alces americanus*). Optimal habitat for deer species occurs within young forest stands and riparian and shoreline areas within drainage systems within the Study Area.

White-tailed deer forage on grasses, forbs and shrubby browse, and require large amounts of easily digested food.

Common carnivore/omnivore species such as Raccoon (*Procyon lotor*), Coyote (*Canis latrans*), American Porcupine (*Erethizon dorsatum*), Red Fox (*Vulpes vulpes*), Bobcat (*Lynx rufus*), American Mink (*Mustela vison*), Striped Skunk (*Mephitis mephitis*), Short-tailed Weasel (*Mustela erminea*) may inhabit the Study Area or surrounding areas, at least periodically.

Further details relating to potential SAR and SOCI mammal species are provided in Section 8.0. No SAR and SOCI mammals were identified during field surveys.

5.0 AVIAN

5.1 Desktop Review

A review of the Canada Important Bird Areas database was completed and the breeding birds square (20LS56) was reviewed from the Maritime Breeding Bird Atlas (MBBA) to support bird survey design and methodology. The MBBA square results are included in Appendix C and discussed further in Section 8.0.

The Study Area features predominantly mature mixed wood forest, a treed swamp and a portion of a fen wetland complex. Some portions of the Study Area comprise a relatively dense shrubby understory, and other areas lack shrubs and contain sparse herbaceous vegetation and in some cases dense herbaceous graminoids (i.e. the treed swamp and fen). Section 2.0 provides a detailed overview of habitat present. The Study Area therefore provides nesting, foraging and roosting habitats for a diversity of species, particularly passerines or other land birds. With the exception of the open fen to the west of the proposed turbine, and open bodies of water in the abandoned quarry to the north of the Study Area, the Study Area itself provides very limited habitat for waterbirds and waterfowl.

The nearest Important Bird Area (IBA) is the Kouchibouguac NP Sand Islands, located approximately 5km northeast of the Study Area (IBA NB003, Bird Studies Canada, 2012). The Kouchibouguac National Park Sand Spits and Barrier Islands are located on the east coast of New Brunswick adjacent to the Northumberland Strait. The site includes the entire barrier beach and sand island area. Locally, these islands and dunes are known as: North Island, North Kouchibouguac dune, North Richibucto dune, Pointe Sapin dune, Portage River dune, South Kouchibouguac dune, and Tern Islands. Much of the area is low and flat with the dominant vegetation being beach grass and strand wheat. Every few years, storms wash over the islands and beaches, removing all debris and vegetation. This is an important natural process in that it sets back succession and favours the long-term use of the islands, beaches, and dunes by terns and plovers.

The sand spits and barrier islands of Kouchibouguac National Park are especially important as breeding sites for Common Terns and Piping Plovers. Piping Plovers have been identified as both globally vulnerable and nationally endangered. Other nesting species include Red-breasted Mergansers and Herring, Ring-billed and Great Black-backed Gulls.

The habitats provided within this IBA are not consistent with habitat available within the Study Area. The IBA is mainly associated with coastal colonial nesting species and shorebirds dependant on exposed mudflats or sandy beaches.

The Project will not disrupt large contiguous wetland or forest habitat that may be of importance to birds. The closest significant migration staging area for waterfowl and shorebirds is also the Kouchibouguac National Park Sand Islands, which is the location of the nearest known tern and gull colony. The Kouchibouguac River (a tidal inlet) is the nearest waterbody to the Study Area, approximately 1.5km to the east. There are no migratory bird sanctuaries within 50km of the Study Area.

5.2 Site Sensitivity

The overall level of concern category associated with the Project was determined using the matrix provided in the following documents:

- *Wind Turbines and Birds. A Guidance Document for Environmental Assessment.* (Environment Canada, 2007),
- *Guide to Environmental Impact Assessment in New Brunswick* (Environment and Local Government, 2012); and its associated additional information document,
- *Additional Information Requirements For Wind Turbines*

The matrix matches the sensitivity of the site and the size of the proposed facility to rank projects into one of four possible categories (Tables 3 and 4).

Table 3. Facility Size

Size	Definition
Very Large	Contain more than 100 turbines
Large	Contain 41-100 turbines
Medium	Contain 11-40 turbines
<u>Small</u>	<u>Contain 1-10 turbines</u>

Table 4: Project Category

Facility Size	Site Sensitivity			
	Very High	High	Medium	Low
Very Large	Category 4	Category 4	Category 3	Category 2
Large	Category 4	Category 3	Category 2	Category 2
Medium	Category 4	Category 3	Category 2	Category 1
<u>Small</u>	Category 4	<u>Category 2</u>	Category 1	Category 1

Generic guidance is then provided on the nature and extent of baseline information and follow-up requirements for each category. The “level of concern” is therefore relative to other wind energy projects and does not reflect the threat to birds/bats posed by wind energy in comparison to other types of projects.

The characteristics of the region/area resulted in a potential sensitivity of “High” (Environment Canada, 2007). The criteria for a potential sensitivity of “High” are as follows:

- having landform factors that concentrate species (e.g., shoreline, ridge, peninsula or other landform that may funnel bird movement) or significantly increase the relative height of the turbines;
- a coastal island, or less than 5 km inland from coastal waters;
- an area of large local bird movements (between habitats) or is close to significant migration staging or wintering area for waterfowl or shorebirds;
- an area recognized as provincially or nationally significant for habitat conservation and/or protection;
- Having increased bird activity from the presence of an area recognized as nationally and/or provincially important habitat for birds (e.g., a National Wildlife Area, Migratory Bird Sanctuary, Important Bird Area, National Park, or similar area protected provincially or territorially because of its importance to birds); and
- Containing species of high conservation concern (SAR or SOCI).

Based on the parameters identified above the Project should be classified as high (Environment Canada, 2007). The primary reasoning behind defining this Project as highly sensitive is the proximity to coastal waters and an Important Bird Area. It should be noted, however, that the habitat within the Study Area is not suitable for those species which depend on the IBA (for instance, colonial nesting species such as the Common Tern, or coastal nesting species such as the Piping Plover), and the IBA is 5km from the Study Area.

With a high site sensitivity and small size (1 turbine), the Level of Concern Category for this Project is Category 2. Projects in this category present a theoretical moderate level of potential risk to wild species and/or their habitat(s), and require basic surveys, usually spread over a one-year period, to obtain quantitative information on wild species and habitats on the site and to identify any potential mitigation measures to minimize environmental impacts during construction.

5.3 Field Survey Methodology

Avian field monitoring programs were completed by expert Birder Roland Chiasson to meet the expectations of a Category 2 Project. The following surveys were completed:

- Spring migration monitoring (April 19, April 28, May 13, May 22, 2017);
- Breeding bird and Common Nighthawk (June 13 and 30, 2017);
- Fall migration monitoring (August 29, September 12 and 25, 2017); and,
- Waterfowl Surveys (October 17, 25 and November 1)

Seven point count locations were selected within, and surrounding the Study Area for all standard seasonal surveys (Spring, Breeding and Fall). Point count locations are provided on Figure 4 (Appendix A). CWS guidance recommends that point counts be completed along established transects. Due to the shape and size of the Study Area, it was determined that Point Count surveys would be more effective at determining avian usage of the Study Area and surrounding landscape. Spacing requirements between point counts did not allow for all point counts to fit within the Study Area boundaries. Habitat is relatively consistent throughout the entire Study Area, so establishment of point counts outside of the Study Area allowed for completion of surveys in a greater diversity of habitats. Surveys began at, or within, half an hour of sunrise and were completed within four-and-a-half hours or by 10:00 a.m., whichever came first.

Ten-minute point counts were completed at each survey location, during all seasonal surveys except where noted otherwise (i.e. Common Nighthawk Surveys, Waterfowl Surveys).

During each survey, weather conditions (i.e., precipitation and visibility) were monitored and confirmed to be within the parameters required by monitoring programs such as Environment Canada's (EC) Breeding Bird Survey. Bird observations were recorded at four distance regimes, within a 50m radius, 50 to 100 m radius, outside the 100m radius, and flyovers. For each point count, a record was made of the start time, and a hand held GPS unit was used to geo-reference its location. General observations including the temperature, visibility, wind speed, date, start and end time and point count were also recorded. Bearings were taken for priority species observed both during dedicated survey periods and incidentally.

Bird species were identified based on functional bird groups to understand how each group of birds is using the Study Area. These functional groups include:

1. **Waterfowl:** Ducks, geese, or other large aquatic birds, especially when regarded as game;
2. **Shorebirds:** Waders, from the Order Charadriiformes;
3. **Other waterbirds:** Includes seabirds (i.e. marine birds), grebes (Order Podicipediformes), loons (Order Gaviiformes), Ciconiiformes (i.e. storks, herons, egrets, ibises, spoonbills, etc.), pelicans (Order Pelicaniformes), flamingos (Order Phoenicopteriformes), Gruiformes (i.e. cranes and rails), kingfishers, gulls and dippers (the only family of passerines considered waterbirds);
4. **Diurnal Raptors:** Birds within the families Accipitridae (i.e. hawks, eagles, buzzards, harriers, kites and old-world vultures), Pandionidae (i.e. Osprey), Sagittariidae (i.e. Secretary bird), Falconidae (i.e. falcons, caracaras, and forest falcons), Cathartidae (i.e. new world vultures), and one species from the Order Strigiformes (i.e. Hawk Owl);
5. **Nocturnal Raptors:** Birds of the Order Strigiformes (i.e. owls; with exception of the Hawk Owl, which is a diurnal species of owl);
6. **Passerines:** Any bird of the Order Passeriformes, which includes more than half of all bird species. This is with exception of the dippers, which are a passerine considered a waterbird; and,
7. **Other Landbirds:** Birds within the Orders Galliformes (i.e. quail, pheasant, and grouse), Columbiformes (i.e. pigeons and doves), Cuculiformes (i.e. cuckoos), Caprimulgiformes (i.e. nighthawks and whip-poor-wills), Apodiformes (i.e. swifts and hummingbirds), and Piciformes (i.e. woodpeckers, flickers and sapsuckers).

5.3.1 Common Nighthawk

The Common Nighthawk prefers to nest in gravelly substrates and is best detected while foraging for insects shortly after sunset. Suitable habitat is available for this species within lands adjacent to the Study Area (existing quarry area, cutblocks, and roadside clearings), therefore dedicated surveys for the Common Nighthawk were conducted from mid- to end of June at either dawn (1 hour before sunrise to 30 minutes after sunrise) or dusk (30 minutes before sunset to an hour after sunset), as described in the Common Nighthawk Survey Protocol (Saskatchewan Ministry of Environment, 2015).

Two survey point locations (CONI1 and CONI2) were surveyed on June 13, and repeated on June 30, 2017, in conjunction with the regular breeding season surveys. CONI1 is located in a cleared area adjacent to the abandoned quarry approximately 620m east of the proposed turbine location. This area

comprises a gravelly disturbed substrate, and no tree cover. CONI2 is located in a regenerating cut block approximately 600m southeast of the proposed turbine and comprises regenerating saplings and a disturbed herbaceous groundcover. A call playback was used to detect the presence of Common Nighthawk, within a radius of 800m from the survey location. A three-minute passive point count was conducted at the point count location, followed by a call playback which included 30-seconds of the conspecific Common Nighthawk call followed by 30-seconds of silence (or passive surveying), repeated for three-minutes (i.e. three times). The total time spent at the survey point was a minimum of six-minutes during each breeding season survey.

5.3.2 Waterfowl

Given the Project's location in close proximity to wetlands, and in a peninsula between Mill Creek, the Richibucto River, Richibucto Harbour, the Northwest Branch, and the Saint Charles River, specific watch count surveys to target potential waterfowl were completed during the fall of 2017. Watch counts were conducted in accordance with guidance detailed in the Recommended Protocols for Monitoring Impacts of Wind Turbines and Birds (Environment Canada, 2007).

Two locations were selected, based on the vantage point they provide over the Study Area and proximity to waterbodies which may be used by passing waterfowl (Figure 4, Appendix A). Survey timing was based on tide events (2 completed during high tide, 1 completed during low tide). During each watch count survey, 2 hours were spent at each of the two locations. Surveys were completed on October 17th, October 25th, and November 01, 2017.

Weather conditions (i.e., precipitation and visibility) were monitored and confirmed to be within the parameters required by monitoring programs such as Environment Canada's (EC) Breeding Bird Survey. Bird observations were recorded at four distance regimes, within a 50m radius, 50 to 100 m radius, outside the 100m radius, and flyovers. For each watch count, a record was made of the start time, and a hand held GPS unit was used to geo-reference its location. General observations including the temperature, visibility, wind speed, date, start and end time and watch count were also recorded. Bearings were taken for priority species observed both during dedicated survey periods and incidentally. Bird groups were recorded as described above during this specific monitoring program.

5.4 Avian Survey Results

Baseline assessments for birds were completed from April through November 2017. A total of 1304 minutes (21 hours, 44 minutes) of surveys were completed over three seasons. These surveys resulted in the observation of 846 individuals, representing 72 species within the Study Area and lands adjacent to the Study Area. Across all survey seasons, a total of six priority species were observed during dedicated survey periods. These species include the Peregrine Falcon (*Falco peregrinus*), Bald Eagle (*Haliaeetus leucocephalus*), Rusty Blackbird (*Euphagus carolinianus*), Olive-sided Flycatcher (*Contopus cooperi*), Eastern Wood Pewee (*Contopus virens*) and Killdeer (*Charadrius vociferous*). A summary of all combined seasonal surveys is provided in Table 5. Detailed results of each seasonal survey are provided in the following sections.

Table 5: 2017 Bird Results Summary

Code	Common Name	Srank	Bird Group	Abundance ¹	Frequency ²	Surveys Observed*
ABDU	American Black Duck	S5B, S4N, S5M	1	6	4	Sp, Br
ALFL	Alder Flycatcher	S5B, S5M	6	1	1	CONI
AMCR	American Crow	S5	6	64	13	Sp, Br, Fa, WF
AMGO	American Goldfinch	S5	6	14	14	Sp, Br, Fa
AMRE	American Redstart	S5B, S5M	6	6	6	Sp, Br, Fa
AMRO	American Robin	S5B, S5M	6	70	23	Sp, Br, Fa, CONI, WF
AMWO	American Woodcock	S5B, S5M	2	1	1	CONI
BADO	Barred Owl	S5	5	1	1	Sp
BAEA	Bald Eagle	S4, NBSARA Endangered	4	3	1	WF
BAWW	Black and White Warbler	S5B, S5M	6	22	22	Sp, Br, Fa
BBWA	Bay-breasted Warbler	S4B, S4S5M	6	1	1	Br
BCCH	Black-capped Chickadee	S5	6	68	50	Sp, Br, Fa, CONI, WF
BEVI	Blue-headed Vireo	S5B, S5M	6	15	15	Sp, Br, Fa
BLBW	Blackburnian Warbler	S5B, S5M	6	1	1	Br
BLJA	Blue Jay	S5	6	43	35	Sp, Br, Fa, WF
BRCR	Brown Creeper	S5	6	4	4	Sp, Fa
BTBW	Black-throated Blue Warbler	S5B, S5M	6	1	1	Sp
BTNW	Black-throated Green Warbler	S5B, S5M	6	2	2	Sp, Fa
BWHA	Broad-winged Hawk	S5B, S5M	4	4	1	Fa
CAGO	Canada Goose	SNAB, S5M	1	33	16	Sp, Fa, WF
CEDW	Cedar Waxwing	S5B, S5M	6	2	1	Br
COGR	Common Grackle	S5B, S5M	6	11	8	Sp, Br
COLO	Common Loon	S4B, S4M, S4N	3	15	11	Sp, Br, Fa
CORA	Common Raven	S5	6	6	5	Sp, Br, Fa
CORE	Common Redpoll	S5B, S5M	6	7	2	Sp
COYE	Common Yellowthroat	S5B, S5M	6	34	29	Sp, Br, Fa, CONI
CSWA	Chestnut-sided Warbler	S5B, S5M	6	4	3	Sp, Br
DEJU	Dark-eyed Junco	S5	6	3	3	Sp, Br
DOWO	Downy Woodpecker	S5	7	3	3	Sp, Fa
EAPH	Eastern Phoebe	S4B, S4M	6	1	1	Sp
EWPE	Eastern Wood Pewee	S4B, S4M, NBSARA and SARA SC	6	1	1	Br
FOSP	Fox Sparrow	S4B, S5M	6	1	1	Sp
GCKI	Golden-crowned Kinglet	S5	6	26	24	Sp, Br, Fa
GRJA	Gray Jay	S4	6	4	2	Sp, WF
HAWO	Hairy Woodpecker	S5	7	9	9	Sp, Fa, WF

Code	Common Name	Srank	Bird Group	Abundance ¹	Frequency ²	Surveys Observed*
HETH	Hermit Thrush	S5B, S5M	6	28	26	Sp, Br, Fa
HOME	Hooded Merganser	S4B, S5M	1	1	1	WF
KILL	Killdeer	S3B, S3M	6	2	2	Sp, Fa
LEFL	Least Flycatcher	S5B, S5M	6	1	1	Sp
LEYE	Lesser Yellowlegs	S4M	2	8	2	WF
MALL	Mallard	S5B, S4N, S5M	1	1	1	Fa
MAWA	Magnolia Warbler	S5B, S5M	6	9	8	Sp, Br, CONI
MERL	Merlin	S5B, S5M	4	1	1	Sp
MODO	Mourning Dove	S5B, S5M, S4N	7	3	3	Sp, Br
NAWA	Nashville Warbler	S5B, S5M	6	18	16	Sp, Br, CONI
NOFL	Northern Flicker	S5B, S5M	6	14	14	Sp, Br, Fa, WF
NOPA	Northern Parula	S5B, S5M	6	17	17	Sp, Br, Fa
OSFL	Olive-sided Flycatcher	S3B, S3M, NBSARA and SARA Threatened	6	1	1	Br
OSPR	Osprey	S4S5B, S5M	4	2	2	Fa
OVEN	Ovenbird	S5B, S5M	6	4	4	Sp, Br
PAWA	Palm Warbler	S5B, S5M	6	1	1	Fa
PEFA	Peregrine Falcon	S1B, S3M, NBSARA Endangered, SARA SC	4	1	1	WF
PUFI	Purple Finch	S4S5B, SUN, S5M	6	33	27	Sp, Br, Fa, WF
RBNU	Red-breasted Nuthatch	S5	6	45	31	Sp, Br, Fa, WF
RCKI	Ruby-crowned Kinglet	S4B, S5M	6	5	5	Sp, Fa
REVI	Red-eyed Vireo	S5B, S5M	6	14	14	Br, Fa, CONI
RTHU	Ruby-throated Hummingbird	S5B, S5M	6	1	1	Br
RUBL	Rusty Blackbird	S3B, S3M, NBSARA & SARA SC.	6	1	1	WF
RUGR	Ruffed Grouse	S5	7	13	13	Sp, Br, Fa, WF
RWBL	Red-winged Blackbird	S4B, S4M	6	4	3	Sp
SNBU	Snow Bunting	S5B, S5M	6	2	1	WF
SOSP	Song Sparrow	S5B, S5M	6	5	2	WF
SWSP	Swamp Sparrow	S5B, S5M	6	11	11	Sp, Br, CONI
SWTH	Swainson's Thrush	S5B, S5M	6	2	2	Br
TRES	Tree Swallow	S4B, S4M	6	1	1	Sp
UNWO	Woodpecker	n/a	7	10	8	Sp, Fa
WISN	Wilson's Snipe	S3S4B, S5M	7	1	1	WF
WODU	Wood Duck	S4B, S4M	1	2	2	Br
WTSP	White-throated Sparrow	S5B, S5M	6	31	23	Sp, Br, Fa, CONI, WF
WWCR	White-winged Crossbill	S5	6	19	2	WF
YBSA	Yellow-bellied Sapsucker	S5B, S5M	7	17	16	Sp, Br, Fa

Code	Common Name	Srank	Bird Group	Abundance ¹	Frequency ²	Surveys Observed*
YRWA	Yellow-rumped Warbler	S5B, S5M	6	30	27	Sp, Br, Fa
Total:	72 Species			846		

*Sp: Spring Migration, Br: Breeding Season, Fa: Fall Migration, CONI: Common Nighthawk Surveys, WF: Waterfowl Surveys.

¹ Number of individuals observed

² Number of times each species observed

5.4.1 Spring Migration

Seven point count locations were surveyed during the spring bird migration period. The spring migration surveys were conducted during three visits on April 19, May 13 and May 22, 2017. During spring migration, 318 individuals, representing 48 species, were observed during the dedicated survey periods. One priority species, a Killdeer (*Charadrius vociferous*, ranked S3M, S3M) was observed at PC7 on May 13th. No SAR were observed during spring migration surveys. Table 6, below provides a summary of results from Spring 2017 point count surveys. In the table below, abundance indicates the number of individuals observed, while frequency indicates the number of times each species was observed.

Table 6. Species and abundance of birds observed during Spring Migration

Code	Common Name	S-Rank	Group	Abundance ¹	Frequency ²
ABDU	American Black Duck	S5B, S4N, S5M	1	4	2
AMCR	American Crow	S5	6	7	5
AMGO	American Goldfinch	S5	6	7	7
AMRE	American Redstart	S5B, S5M	6	2	2
AMRO	American Robin	S5B, S5M	6	10	10
BADO	Barred Owl	S5	5	1	1
BAWW	Black and White Warbler	S5B, S5M	6	10	10
BCCH	Black-capped Chickadee	S5	6	29	22
BEVI	Blue-headed Vireo	S5B, S5M	6	7	7
BLJA	Blue Jay	S5	6	15	13
BRCR	Brown Creeper	S5	6	2	2
BTBW	Black-throated Blue Warbler	S5B, S5M	6	1	1
BTNW	Black-throated Green Warbler	S5B, S5M	6	1	1
CAGO	Canada Goose	SNAB, S5M	1	23	10
COGR	Common Grackle	S5B, S5M	6	8	5
COLO	Common Loon	S4B, S4M, S4N	3	2	2
CORA	Common Raven	S5	6	1	1
CORE	Common Redpoll	S5B, S5M	6	7	2
COYE	Common Yellowthroat	S5B, S5M	6	10	10
CSWA	Chestnut-sided Warbler	S5B, S5M	6	3	2
DEJU	Dark-eyed Junco	S5	6	2	2
DOWO	Downy Woodpecker	S5	7	1	1

Code	Common Name	S-Rank	Group	Abundance ¹	Frequency ²
EAPH	Eastern Phoebe	S4B, S4M	6	1	1
FOSP	Fox Sparrow	S4B, S5M	6	1	1
GCKI	Golden-crowned Kinglet	S5	6	15	13
GRJA	Gray Jay	S4	6	2	1
HAWO	Hairy Woodpecker	S5	7	6	6
HETH	Hermit Thrush	S5B, S5M	6	18	17
KILL	Killdeer	S3B, S3M	6	1	1
LEFL	Least Flycatcher	S5B, S5M	6	1	1
MAWA	Magnolia Warbler	S5B, S5M	6	2	2
MERL	Merlin	S5B, S5M	4	1	1
MODO	Mourning Dove	S5B, S5M, S4N	7	1	1
NAWA	Nashville Warbler	S5B, S5M	6	8	8
NOFL	Northern Flicker	S5B, S5M	6	6	6
NOPA	Northern Parula	S5B, S5M	6	7	7
OVEN	Ovenbird	S5B, S5M	6	3	3
PUFI	Purple Finch	S4S5B, SUN, S5M	6	18	18
RBNU	Red-breasted Nuthatch	S5	6	7	6
RCKI	Ruby-crowned Kinglet	S4B, S5M	6	4	4
RUGR	Ruffed Grouse	S5	7	10	10
RWBL	Red-winged Blackbird	S4B, S4M	6	4	3
SWSP	Swamp Sparrow	S5B, S5M	6	7	7
TRES	Tree Swallow	S4B, S4M	6	1	1
UNWO	Unknown Woodpecker	n/a	7	9	7
WTSP	White-throated Sparrow	S5B, S5M	6	12	12
YBSA	Yellow-bellied Sapsucker	S5B, S5M	7	9	8
YRWA	Yellow-rumped Warbler	S5B, S5M	6	11	11
Total:	48 species			318	

Notes: Bird species codes are defined under the Maritime Breeding Bird Atlas species codes (<http://www.mba-aom.ca/jsp/codes.jsp?lang=en&pg=species>). SRanks are rarity ranks as identified by the ACCDC (<http://www.accdc.com/webranks/NBall.htm>). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds.

¹ Number of individuals observed

² Number of times each species observed

During spring migration, abundance and diversity of species increased steadily throughout the season. An abundance of warbler species moving into the Study Area was documented by the middle of May. Passerines comprised 79% of all individuals observed, which is expected based on the forested habitat present within and adjacent to the Study Area. Other landbirds (such as Woodpeckers, grouse, etc) were the next most abundance bird group representing 11% of individuals observed, followed by waterfowl

(9% of individuals). Black-capped Chickadees (*Poecile atricapillus*) was the most abundant species observed (n=29), followed by Canada Goose (*Branta canadensis*, n=23), Hermit Thrush (*Catharus guttatus*, n=18) and Purple Finch (*Carpodacus purpureus*, n=18).

All of the species identified are native species in this region of New Brunswick and the province in general. Typical and common habitat required to support these species is present with the Study Area and surrounding landscape. The majority of observations (97%) were of one or two individuals, and the largest group of birds observed was five Canada Geese, and five Common Redpoll, both observed at PC1 on April 19th, 2017. No obvious concentration of ducks or shorebirds was observed.

Frequency and abundance of species identified during 2017 Spring surveys are provided in Chart 1 (below).

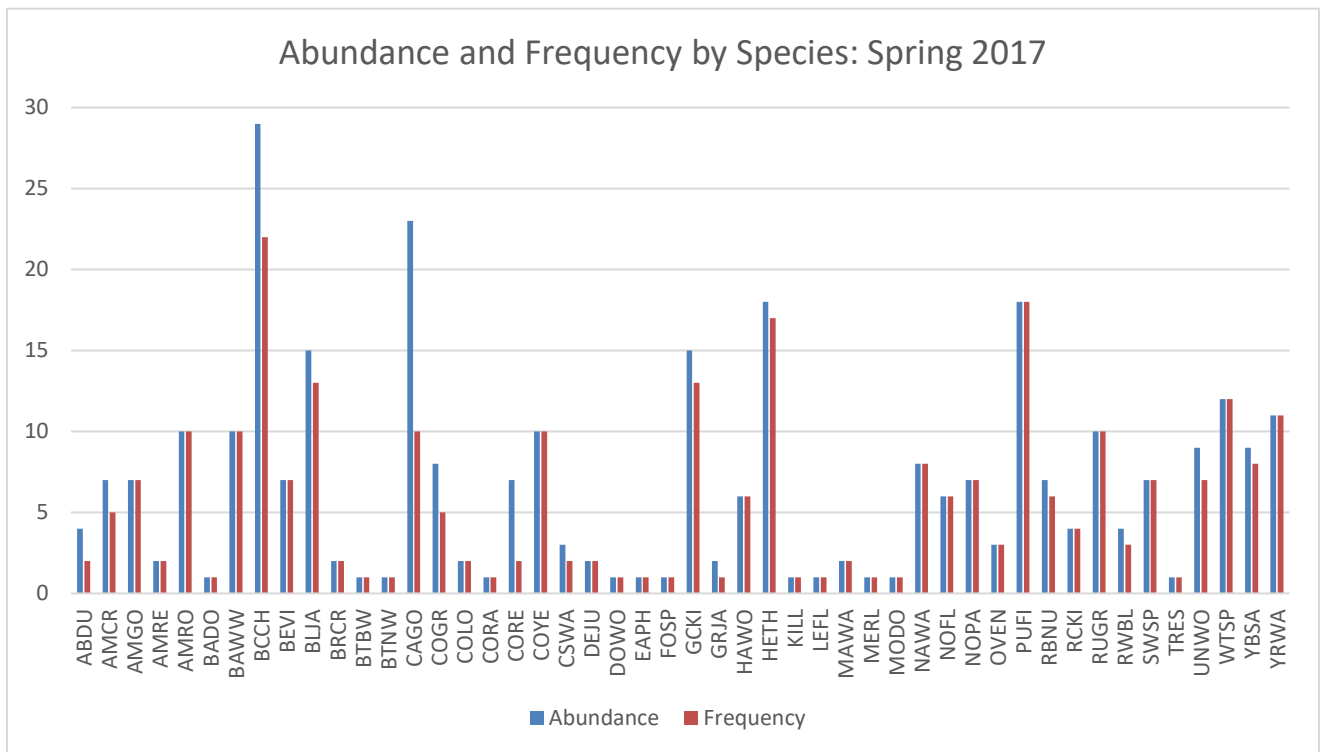


Chart 1: Frequency and Abundance of Species identified during 2017 Spring Surveys

5.4.2. Breeding Season

The same seven point count locations surveyed in the spring migration surveys were surveyed during the breeding season. These surveys were completed on June 13th and June 30th, 2017. During the breeding point count surveys, 120 individuals representing 39 species were observed. Two SAR bird species were observed: one Olive-sided Flycatcher (*Contopus cooperi*, ranked S3B, S3M, SARA and NBSARA Threatened) was observed at PC6 on June 30th, and one Eastern Wood Pewee (*Contopus virens*, ranked S4B, S4M, SARA and NBSARA Threatened) was observed at PC4 on June 13th, 2017. While the Eastern Wood Pewee was detected from PC4, the call was coming from approximately 90-100m south. Both of

these species were documented as possible breeders, using guidance from the Maritime Breeding Bird Atlas. A summary of results of point count surveys conducted in the breeding season of 2017 is included below. No other priority species were observed. Table 7 provides abundance (i.e. the number of individuals observed), while frequency indicates the number of times each species was observed.

Table 7: Species and abundance of birds observed during Breeding Season Surveys

Code	Common name	S-Rank	Group	Abundance ¹	Frequency ²	Breeding Status
ABDU	American Black Duck	S5B, S4N, S5M	1	2	2	Probable
AMCR	American Crow	S5	6	1	1	Possible
AMGO	American Goldfinch	S5	6	1	1	Possible
AMRE	American Redstart	S5B, S5M	6	3	3	Probable
AMRO	American Robin	S5B, S5M	6	1	1	Possible
BAWW	Black and White Warbler	S5B, S5M	6	9	9	Probable
BBWA	Bay-breasted Warbler	S4B, S4S5M	6	1	1	Possible
BCCH	Black-capped Chickadee	S5	6	4	4	Possible
BHVI	Blue-headed Vireo	S5B, S5M	6	1	1	Possible
BLBW	Blackburian Warbler	S5B, S5M	6	1	1	Possible
BLJA	Blue Jay	S5	6	3	3	Probable
CEDW	Cedar Waxwing	S5B, S5M	6	2	1	Possible
CSWA	Chestnut-sided Warbler	S5B, S5M	6	1	1	Possible
COGR	Common Grackle	S5B, S5M	6	3	3	Possible
COLO	Common Loon	S4B, S4M, S4N	3	2	2	Possible
CORA	Common Raven	S5	6	2	1	Possible
COYE	Common Yellowthroat	S5B, S5M	6	9	9	Possible
DEJU	Dark-eyed Junco	S5	6	1	1	Possible
EWPE	Eastern Wood Pewee	S4B, S4M, SARA & NBSARA Special Concern	6	1	1	Possible
GCKI	Golden-crowned Kinglet	S5	6	4	4	Possible
HETH	Hermit Thrush	S5B, S5M	6	6	6	Confirmed
MAWA	Magnolia Warbler	S5B, S5M	6	5	5	Possible
MODO	Mourning Dove	S5B, S5M, S4N	7	2	2	Possible
NAWA	Nashville Warbler	S5B, S5M	6	4	4	Possible
NOFL	Northern Flicker	S5B, S5M	7	2	2	Possible
NOPA	Northern Parula	S5B, S5M	6	9	9	Probable
OSFL	Olive-sided Flycatcher	S3B, S3M, SARA & NBSARA Threatened	6	1	1	Possible
OVEN	Ovenbird	S5B, S5M	6	1	1	Possible
PUFI	Purple Finch	S4S5B, SUN, S5M	6	1	1	Possible
RBNU	Red-breasted Nuthatch	S5	6	4	4	Probable
REVI	Red-eyed Vireo	S5B, S5M	6	8	8	Probable

Code	Common name	S-Rank	Group	Abundance ¹	Frequency ²	Breeding Status
RTHU	Ruby-throated Hummingbird	S5B, S5M	6	1	1	Possible
RUGR	Ruffed Grouse	S5	6	1	1	Confirmed
SWSP	Swamp Sparrow	S5B, S5M	6	3	3	Probable
SWTH	Swainson's Thrush	S5B, S5M	6	2	2	Possible
WODU	Wood Duck	S4B, S4M	1	2	2	Possible
WTSP	White-throated Sparrow	S5B, S5M	6	7	6	Probable
YBSA	Yellow-bellied Sapsucker	S5B, S5M	7	7	7	Probable
YRWA	Yellow-rumped Warbler	S5B, S5M	6	2	2	Possible
Total:	39 species			120		

Notes: Bird species codes are defined under the Maritime Breeding Bird Atlas species codes (<http://www.mba-aom.ca/jsp/codes.jsp?lang=en&pg=species>). SRanks are rarity ranks as identified by the ACCDC (<http://www.accdc.com/webranks/NBall.htm>). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds. Breeding status qualifiers are defined in the Maritime Breeding Bird Atlas (<http://www.mba-aom.ca/jsp/codes.jsp?lang=en&pg=breeding>). Where multiple observations of breeding evidence were observed, the highest breeding evidence is presented in the table.

¹ Number of individuals observed

² Number of times each species observed

Passerines comprised 86% of all individuals observed, which is expected based on the forested habitat present within the Study Area and adjacent lands. Other landbirds (such as Woodpeckers, grouse, etc) were the next most abundant bird group representing 9% of individuals observed, followed by waterfowl (3% of individuals). The most abundant species observed were Black-and-white Warbler (*Mniotilta varia*), Common Yellowthroat (*Geothlypis trichas*) and Northern Parula (*Parula Americana*), with 9 individuals observed each.

Similar to the species identified during the spring surveys, all of the species identified are native species in this region of New Brunswick and the province in general. Typical and common habitat to support these species are present within the Study Area and surrounding landscape.

All observations were of single birds or groups of two. No obvious concentration of ducks or shorebirds was observed. Of the 39 species observed, 70% were identified as possible breeders based on the species being observed in suitable habitat during breeding season, or the observation of singing males or breeding calls heard. Evidence of probable breeding was observed in 25% of species. Agitated behavior and establishment of a territory (observing the same species in the same location on two consecutive surveys) were documented as evidence of probable breeding. Breeding was confirmed in two species (5% of species). A Ruffed Grouse (*Bonasa umbellus*) was observed performing a distraction display (broken wing routine) near PC5 on June 30th. A Hermit Thrush was observed on a nest in the same location on the same date. No other breeding evidence was observed during the breeding surveys.

Frequency and abundance of species identified during 2017 Breeding surveys are provided in Chart 2 (below).

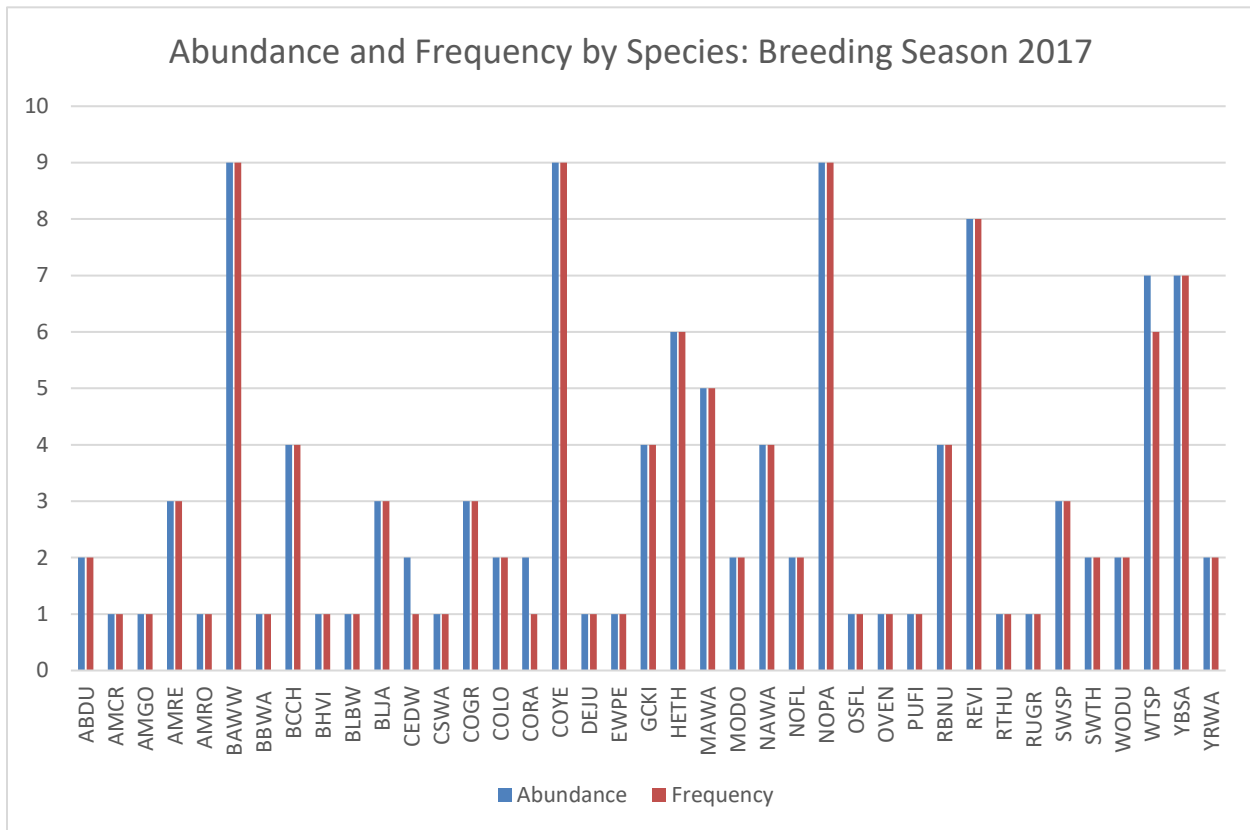


Chart 2: Frequency and Abundance of Species identified during 2017 Breeding Surveys

5.4.3 Common Nighthawk

During breeding season surveys, an additional 2 locations were established for the purpose of specialized Common Nighthawk Surveys (Saskatchewan Ministry of Environment, 2015). No Common Nighthawk were observed during either specialized survey. A summary of incidental observations of other species documented during the Nighthawk surveys is provided in Table 8, below. No Priority species were observed during Common Nighthawk surveys.

Table 8: Species incidentally observed during Common Nighthawk Surveys.

Code	Species	S-Rank	Group	Abundance ¹	Frequency ²	Breeding Evidence
ALFL	Alder Flycatcher	S5B, S5M	6	1	1	Possible
AMRO	American Robin	S5B, S5M	6	2	2	Probable
AMWO	American Woodcock	S5B, S5M	2	1	1	Confirmed
BCCH	Black-capped Chickadee	S5	6	2	1	Possible
COYE	Common Yellowthroat	S5B,	6	4	2	Probable

Code	Species	S-Rank	Group	Abundance ¹	Frequency ²	Breeding Evidence
		S5M				
MAWA	Magnolia Warbler	S5B, S5M	6	2	1	Possible
NAWA	Nashville Warbler	S5B, S5M	6	6	4	Probable
REVI	Red-eyed Vireo	S5B, S5M	6	1	1	Possible
SWSP	Swamp Sparrow	S5B, S5M	6	1	1	Possible
WTSP	White-throated Sparrow	S5B, S5M	6	6	3	Probable
Total	10 Species			26		

Notes: Bird species codes are defined under the Maritime Breeding Bird Atlas species codes (<http://www.mba-aom.ca/jsp/codes.jsp?lang=en&pg=species>). SRanks are rarity ranks as identified by the ACCDC (<http://www.accdc.com/webranks/NBall.htm>). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds.

¹ Number of individuals observed

² Number of times each species observed

5.4.4 Fall Migration

The seven spring migration and breeding season point count locations were also surveyed during fall migration. Fall migration surveys occurred on August 28th, September 12th, and September 25th, 2017. During the fall point count surveys, 201 individuals representing 34 species were observed. One priority species, a Killdeer (S3M, S3M) was observed at PC6 on August 29th, 2017. No other priority species were observed. A summary of results of point count surveys conducted in the fall migration season of 2017 is included in Table 9. Abundance indicates the number of individuals observed, while frequency indicates the number of times each species was observed.

Table 9: Species and Abundance of Birds Observed During Fall Migration

Code	Common Name	S-Rank	Group	Abundance ¹	Frequency ²
AMCR	American Crow	S5	6	5	3
AMGO	American Goldfinch	S5	6	6	6
AMRE	American Redstart	S5B, S5M	6	1	1
AMRO	American Robin	S5B, S5M	6	4	2
BAWW	Black and white Warbler	S5B, S5M	6	3	3
BCCH	Black-capped Chickadee	S5	6	29	14
BHVI	Blue-headed Vireo	S5B, S5M	6	7	7
BLJA	Blue Jay	S5	6	17	14
BRCR	Brown Creeper	S5	6	2	2
BTNW	Black-throated Green Warbler	S5B, S5M	6	1	1
BWHA	Broad-winged Hawk	S5B, S5M	4	4	1
CAGO	Canada Goose	SNAB, S5M	1	9	5
COLO	Common Loon	S4B, S4M, S4N	2	11	7
CORA	Common Raven	S5	6	3	3

Code	Common Name	S-Rank	Group	Abundance ¹	Frequency ²
COYE	Common Yellowthroat	S5B, S5M	6	11	8
DOWO	Downy Woodpecker	S5	6	2	2
GCKI	Golden-crowned Kinglet	S5	6	7	7
HAWO	Hairy Woodpecker	S5	7	2	2
HETH	Hermit Thrush	S5B, S5M	6	4	3
KILL	Killdeer	S3B, S3M	2	1	1
MALL	Mallard	S5B, S4N, S5M	1	1	1
NOFL	Northern Flicker	S5B, S5M	7	5	5
NOPA	Northern Parula	S5B, S5M	6	1	1
OSPR	Osprey	S4S5B, S5M	4	2	2
PAWA	Palm Warbler	S5B, S5M	6	1	1
PUFI	Purple Finch	S4S5B, SUN, S5M	6	3	3
RBNU	Red-breasted Nuthatch	S5	6	31	18
RCKI	Ruby-crowned Kinglet	S4B, S5M	6	1	1
REVI	Red-eyed Vireo	S5B, S5M	6	5	5
RUGR	Ruffed Grouse	S5	7	1	1
UNWO	Woodpecker spp	n/a	7	1	1
WTSP	White-throated Sparrow	S5B, S5M	6	2	2
YBSA	Yellow-bellied Sapsucker	S5B, S5M	7	1	1
YRWA	Yellow-rumped Warbler	S5B, S5M	6	17	14
Total:	34 Species			201	

Notes: Bird species codes are defined under the Maritime Breeding Bird Atlas species codes (<http://www.mba-aom.ca/jsp/codes.jsp?lang=en&pg=species>). SRanks are rarity ranks as identified by the ACCDC (<http://www.accdc.com/webranks/NBall.htm>). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds.

¹ Number of individuals observed

² Number of times each species observed

Throughout the fall migration, overall abundance and diversity of species observed decreased as the season progressed. Consistent with spring and breeding survey results, passerines comprised 81% of all individuals observed, which is expected based on the forested habitat present within the Study Area and adjacent lands. All other bird groups comprised less than 6% each of individuals observed. The Red-breasted Nuthatch (*Sitta canadensis*) was the most abundant species observed (n=31), followed by Black-capped Chickadee (n=29), Yellow-rumped Warbler (*Dendroica coronata*, n=17) and Blue Jay (*Cyanocitta cristata*, n=17).

All of the species identified are native to the province and region in general. Suitable habitat for all species identified is present in the Study Area and surrounding landscape. The majority of observations (92%) were of one or two individuals, and the largest group of birds observed was five Canada Geese observed at PC5 on August 29th.

No obvious concentration of ducks or shorebirds was observed.

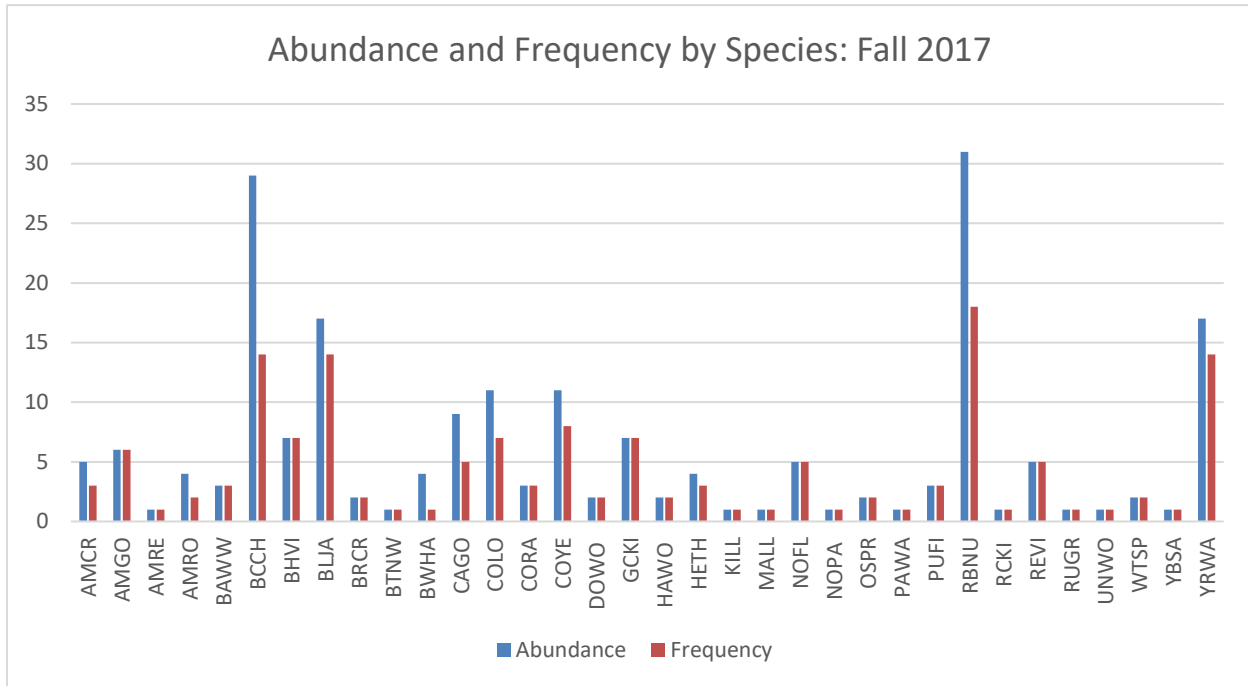


Chart 3: Frequency and Abundance of Species identified during 2017 Fall Migration Surveys

5.4.5 Waterfowl Surveys

Waterfowl surveys were completed at rising and falling tide at two watch count locations between mid-October and early November, 2017. During these surveys, 181 individuals representing 21 species were observed. Three priority species were observed. One Peregrine Falcon was observed 40m east of the “Lake S” survey location on November 1st. Two immature Bald Eagles were observed 200m west of the “Lake N” survey location on October 17th, and one Rusty Blackbird was observed 70m north of the same location on the same date. No other priority species were observed. A summary of results of point count surveys conducted in the fall waterfowl surveys are included in Table 10. Abundance indicates the number of individuals observed, while frequency indicates the number of times each species was observed.

Table 10. Species and abundance of birds observed during Waterfowl Season Surveys

Code	Common Name	Rarity	Bird Group	Abundance ¹	Frequency ²
AMGO	American Goldfinch	S5	6	51	4
AMRO	American Robin	S5B, S5M	6	53	8
BAEA	Bald Eagle	S4, NBSARA Endangered	4	3	1
BCCH	Black-capped Chickadee	S5B, S5M	6	4	2
BLJA	Blue Jay	S5	6	8	5
CAGO	Canada Goose	SNAB, S5M	1	1	1
WISN	Wilson's Snipe	S3S4B, S5M	7	1	1
GRAJ	Gray Jay	S4	6	2	1

Code	Common Name	Rarity	Bird Group	Abundance ¹	Frequency ²
HAWO	Hairy Woodpecker	S5	7	1	1
HOME	Hooded Merganser	S4B, S5M	1	1	1
LEYE	Lesser Yellowlegs	S4M	2	8	2
NOFL	Northern Flicker	S5B, S5M	7	1	1
PEFA	Peregrine Falcon	S1B, S3M, NBSARA Endangered, SARA Special Concern	4	1	1
PUFI	Purple Finch	S4S5B, SUN, S5M	6	11	5
RBNU	Red-breasted Nuthatch	S5	6	3	3
RUBL	Rusty Blackbird	S3B, S3M, NBSARA and SARA Special Concern	6	1	1
RUGR	Ruffed Grouse	S5	6	1	1
SNBU	Snow Bunting	S5B, S5M	6	2	1
SOSP	Song Sparrow	S5B, S5M	6	5	2
WTSP	White-throated Sparrow	S5B, S5M	6	4	1
WWCR	White-winged Crossbill	S5	6	19	2
Total	21 Species			181	

Notes: Bird species codes are defined under the Maritime Breeding Bird Atlas species codes (<http://www.mba-aom.ca/jsp/codes.jsp?lang=en&pg=species>). SRanks are rarity ranks as identified by the ACCDC (<http://www.accdc.com/webranks/NBall.htm>). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds.

¹ Number of individuals observed

² Number of times each species observed

Despite selecting the location and survey methods specifically to identify waterfowl and other waterbirds, passerines still accounted for the vast majority of all individuals observed (90%). Waterbirds and waterfowl together accounted for 5% of individuals, while diurnal raptors and other landbirds accounted for 2% each of individuals observed. The raptors (bald eagles and peregrine falcon) appeared to be flying through, whereas small groups of passerines were generally exhibiting small, short movements, likely as part of their migration sequence. American Robins and American Goldfinch were the most abundant species, with 53 and 51 individuals observed, respectively. The abundance of these species is the result of small migrating flocks of 25-30 individuals. A small flock (n=15) of White-winged Crossbills was observed on November 1st. Seventy-two percent of observations were single individuals or groups of two. All of the species identified are native to the province and region in general. Suitable habitat for all species identified is present in the Study Area and surrounding landscape. No obvious concentration of ducks or shorebirds was observed.

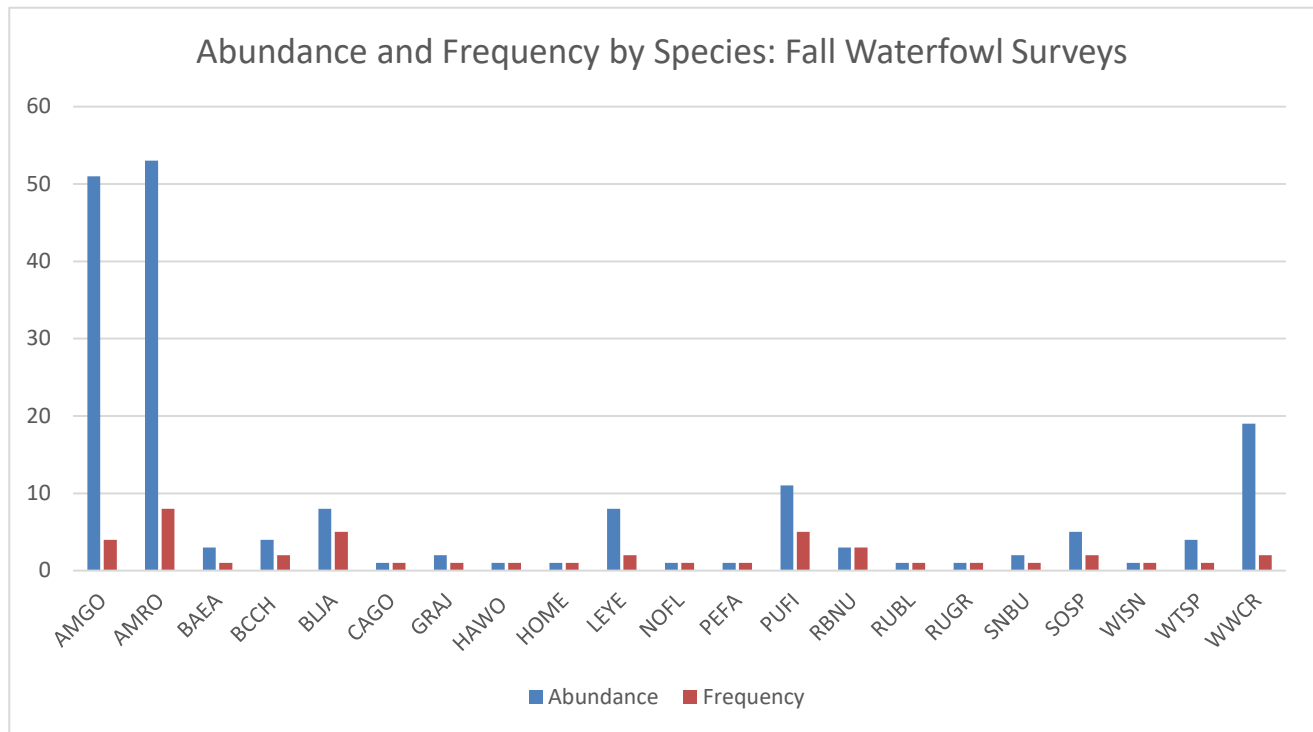


Chart 4: Frequency and Abundance of Species identified during 2017 Waterfowl Surveys

5.5 Summary of Avian Use

Overall, species abundance and diversity were consistent with expectations, based on regional context and habitat available within the Study Area. On average, 79 individuals were observed per survey in the spring migration season, compared with 60 individuals/survey in the breeding season, and 67 individuals/survey in the fall migration (excluding focused surveys for CONI and waterfowl). This suggests that bird usage of the Study Area is slightly higher in the Spring. None of the species observed experience an elevated risk of turbine strikes based on behaviour (i.e. aerial flight displays).

Diversity of species observed declined from spring through fall, and within standard seasonal surveys as well. During standard surveys (excluding CONI and waterfowl focused surveys), a total of 68 species were observed. Seventy percent of all species observed were recorded in the spring, while 55% were recorded in the breeding season, and only 50% were recorded in the fall migration. Of these 68 species, 20% were observed in all standard seasonal surveys. This common assemblage of species includes species such as American Robin, Blue Jay, Golden-crowned Kinglet, Common Loon, Common Raven, Hermit Thrush and Northern Parula. These species are expected to use the Study Area and surrounding landscape for migration, foraging, resting, breeding and potentially overwintering as well.

Species which rely on habitat provided in the nearby Important Bird Area were not frequently observed within the Study Area. Further details will be provided in the Species at Risk section. The Kouchibouguac National Park (NP) Important Bird Area list approximately 5km northeast of the Study Area. It supports important coastal island habitat for a variety of nesting shorebirds and other waterbirds, such as the Piping Plover and Common Tern. In the Spring, Waterfowl, Shorebirds and Other Waterbirds (Bird groups 1-3,

defined in Section 5.3) accounted for 9.1% of all individuals observed, and the majority of these were Canada Geese, observed in groups of 1-5 individuals. During fall migration surveys, these groups accounted for 10.9% of individuals observed. Similar to the spring migration, the majority of these observations were of Canada Geese and Common Loons. The Study Area does not appear to be a migratory flyway for shorebirds to move into, or out of the Kouchibouguac NP IBA.

Based on surveys completed in 2017, the Study Area supports very few avifauna Species at Risk (SAR) or Species of Conservation Interest (SOCI). A total of 8 individuals representing 6 priority species were documented. This accounts for less than 1% of all individual birds observed, and only 8% of species observed within the Study Area during all seasonal surveys. Additional information regarding use of habitat within the Study Area for these SAR and SOCI are provided in Section 8.2.4.

Bird habitat directly within the footprint of the proposed access road and turbine infrastructure will be removed. Clearing and grubbing for site preparation will remove vegetation, reducing the quantity and quality of terrestrial habitat for birds, and will affect the quality of an already marginal habitat. The Project will result in an increase in edge area, which may increase predation on birds, but also has potential benefits related to habitat creation (edge nesting birds) and food availability (near edge and standing water in wet periods). Avian assessments did not identify an abundance of species which rely on interior forest conditions which would be affected by increase in 'edge habitat' (such as Black-backed Woodpecker, Mourning Warbler, Blackburnian Warbler, Scarlet Tanager, Wood Thrush, etc). If these species were present, it would indicate that the Study Area has mature or intact forest which could be altered by construction of a road and turbine pad. Habitat within the Study Area is generally fragmented and immature, supporting birds which prefer this habitat type. As such the construction of a road and turbine pad is not likely to affect how birds use the local or regional area.

The risk of avian collisions with wind turbines is likely to be greater on or near areas regularly used by large numbers of feeding or roosting birds, or on migratory flyways or local flight paths (Drewitt & Langston, 2006). Furthermore, several factors have been shown to affect avian collisions with wind turbines, these include both species-specific and site-specific factors (Marques, et al., 2014). Factors such as frequency of passage, flight behaviour, weather, and topography around the wind farm, as well as the seasons (time of year) should be considered prior to wind farm development at a potential site (Marques, et al., 2014); collision mortality has been shown to not simply increase with abundance. Wind farm-specific factors can also affect the risk of collision, including turbine features, blade visibility, wind farm configuration, and wind farm lights (Marques, et al., 2014).

Based on targeted bird surveys, as well as all other field surveys completed as part of the Study, general qualitative observations indicate that bird activity within and directly adjacent to the Study Area was low (i.e. limited evidence of breeding activities as well as evidence of migration pathways). The point count methodology employed provides us with an accurate indication of bird use within the habitats surveyed. In addition, effort to record incidental fly overs during and in-between point counts, plus the completion of watch counts during Fall 2017 have enabled a quantitative determination of avian flyover activity to be made. Based on these surveys, it has been established that during spring 25 of the 318 individuals observed were identified to be fly-overs, during breeding 5 of the 120 individuals were fly-overs and during Fall, 19 of the 201 individuals were fly-overs. During waterfowl watch count surveys, some

migration activity was encountered, however this was limited to small flocks of passerines and three raptors (two Bald Eagles and one Peregrine Falcon).

In order to evaluate the potential for regional bird migration and subsequent risk to migrating birds as a result of the Project, regional landscape conditions have been evaluated. As can be noted in Image 1, the proposed Project lies within a peninsula of land in-between Mill Creek, the Richibucto River, the Northwest Branch and the Saint Charles River.

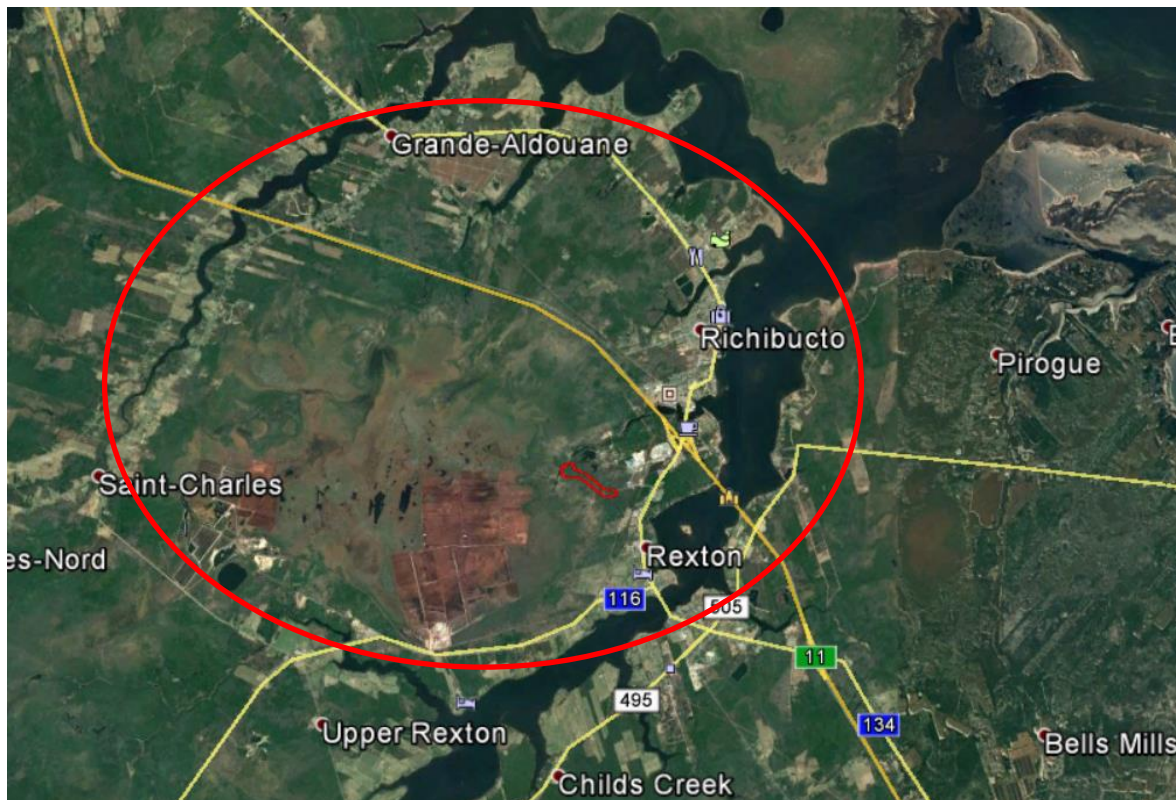


Image 1: Study Area and Associated Peninsular Location

Peninsulas can concentrate migrating birds as they follow the land and then pause before launching over water (Cornell Lab of Ornithology, 2007). As has been previously discussed, the topography of the land surrounding the Study Area, and extending inland (westward) is predominantly flat, with a gradual rise in topography to the west of the proposed Project. There is a lack of abrupt topography which promotes funneling of bird movement across this land area, including the location of the Study Area.

It is possible due to the Study Area's relative proximity to tidal waters present in the Richibucto Estuary, and the coastline barrier beaches to the north, that shorebirds utilize the inland habitats present in, and near the Study Area for feeding and diurnal activity. However, bird surveys completed in 2017 do not support this theory in the localized area surrounding the Study Area due to the low numbers of waterfowl and shorebirds identified. Comments provided by The Canadian Wildlife Service (CWS) to the proponent regarding the proposed Project, indicated that there is potential for bird passage migration from inland areas to the coast, and that this could lead to interaction with the proposed turbine. Although quantitative methods of predicting possible interaction between birds and the proposed turbine have not

been completed as part of this Study, it is relevant to recognize the physical obstruction the proposed turbine would pose to bird movement at this location compared to the region as a whole. In order to achieve this, a simple comparison of air space that the rotor swept arc (RSA) would account for at the turbine location, versus what the same air space value (also based on the RSA) throughout the inland peninsular noted above has been completed. The air space of the land mass of the peninsular identified in Image 1 is approximately 9.7 billion cubic meters (based on ~length of peninsular x ~width of peninsular x 127m turbine rotor diameter). In comparison, the approximate air space taken up by the proposed turbine as determined by the total rotor diameter (127m X 127m x 127m) is approximately 2.04 million cubic meters, which accounts for approximately 0.0002% of the air space across the entire peninsular that falls within the zone of the RSA. Based on this example, it is appropriate to suggest that the proposed turbine presents a very low potential to impact avian population on a regional scale. This does not pre-suppose that mortality will not occur, only that mortality would probably be expected to fall within regional norms for wind projects in New Brunswick.

6.0 BAT USE

Bat pass monitoring was designed based on the protocols described in *Bats and Wind Turbines: Pre-siting and Pre-construction Protocols* (Lausen, Baerwald, Gruver, & Barclay, 2010), and *Pre-construction Bat Survey Guidelines for Wind Farm development in NB*.

The goal of the bat survey was to provide a representative sampling of bat activity across the Project location. Preliminary evidence indicates that this will facilitate estimates of the relative risk to bats from wind turbines at proposed sites (E. Baerwald, unpubl. data), but at present it cannot guarantee that sites with low levels of activity will result in fewer deaths than sites with higher levels of activity. (Lausen, Baerwald, Gruver, & Barclay, 2010).

Specifically, the recommended surveys are designed to determine:

1. Species occurrence and diversity
2. Activity levels (e.g., relative abundance, seasonal timing, daily timing)

6.1 Desktop Review

6.1.1 Methodology

A desktop review for known bat hibernacula nearby and within the Study Area was completed. The New Brunswick Department of Energy and Resource Development (NB ERD) provided MEL with a database of known open adits (mine openings) in New Brunswick. This database was reviewed for all of Kent County, New Brunswick to identify any potential for bat hibernacula within the regional vicinity of the Study Area. The ACCDC report and the Government of Canada Species at Risk Act Recovery Strategy for bats were also consulted.

During habitat surveys within the Study Area, MEL ecologists were also looking for any signs of habitat that could support winter bat hibernation (aka – caves, abandoned mines/shafts or other sub-grade access features). In addition, during the same surveys, habitat observations were collected to support the development of the bat monitoring locations discussed in the following section.

6.1.2 Results

According to the ACCDC report, no known bat hibernacula are present within 5km of the Study Area. According to the NB Mine Openings database (2016), no open adits are identified within Kent County. According to the Recovery Strategy for Little brown myotis, Northern myotis, and Tri-coloured bats (Environment Canada 2015), there are no known critical bat habitats within 50km of the Study Area.

No observations of potential bat hibernacula were identified in the Study Area during field evaluations and surveys.

As discussed in Section 2.0, observations recorded during the habitat survey indicated that habitat was generally classified into two main upland components and one treed wetland component. The treed swamp community is further discussed in Section 7.0. Although not located within the infrastructure Study Area, a second wetland component (a graminoid fen) was also identified to the west of the proposed turbine. As a result of this review, it has been determined that a closed canopy, mixed-wood forest habitat dominates the landscape, including the habitat present at the proposed turbine location.

Table 10 outlines the dominant tree and shrub species identified within the two upland communities and the treed swamp observed during the survey.

Table 11: Dominant Species in Habitats Identified

Dominant Tree Species	MW-RM/BF Upland Community	MW-RM/RS/WP Upland Community	Mixed-Wood Treed Swamp
Red maple	X	X	
Balsam fir	X		X
Gray birch			X
White pine		X	
Eastern larch			X
Red spruce		X	
Dominant Shrub Species	MW-RM/BF Upland Community	MW-RM/RS/WP Upland Community	Mixed-Wood Treed Swamp
Red maple	X	X	X
Balsam fir		X	
Wild raisin	X		
Mountain holly	X		
Eastern larch			X
Speckled alder			X

In summary, habitat within the Study Area associated with the proposed Project infrastructure overwhelmingly comprises mixed-wood forest. A full canopy cover was observed throughout, and apart from small variances in dominant species, general vegetative composition was similar.

6.2 Bat Monitoring

6.2.1 Methodology

Wildlife Acoustic SM4BAT FS Bioacoustic Recorders (SM4BAT) were installed, monitored, and data was collected by Ryan Gardiner, BSc, and Tessa Giroux. Acoustic bat monitoring was conducted to evaluate relative activity patterns by species or species groups over the monitoring period across the Study Area.

6.2.1.1 Bat Detector Placement

Two SM4BAT detectors (Bat Monitor 1 (BM1) and Bat Monitor 2 (BM2)) were set up on the dates indicated in Table 12. Bat monitor locations are provided on Figure 3 (Appendix A).

Table 12. Detector Information

Unit	BM 1	BM 2	BM 3
UTM NAD83	20T 355779.00, 5169512	20T 355678, 5169145	20T 355186, 5169442
Installed/Monitoring Start	13 June 2017	13 June 2017	24 September 2017
Monitoring Ended	13 October 2017	13 October 2017	13 October 2017
Height Installed Above Ground Level	13.4 meters	13.4 meters	4 meters
Detector nights	117	112	19

In the document *Pre-Construction Bat Survey Guidelines for Wind Farm development in NB* (New Brunswick Department of Natural Resources, 2009), it is stated that:

“Survey stations are stationary points that are positioned in such a way as to provide adequate coverage of the spatial distribution of the proposed wind turbine placements (e.g., if known, survey stations should be established at sites where wind turbines are proposed to be constructed, to the extent possible; if turbine locations are not known, survey stations should cover the full spatial extent of the site and all habitat types)”.

As previously discussed, the dominant habitat type across the landscape is a closed canopy mixed-wood forest. Table 10 indicates that there are subtle changes in dominant species present, although not abrupt enough to alter the relationship between presence or abundance levels of bats.

Forest gaps constitute an important microhabitat for the majority of bat species foraging on aerial insects: bats with high flight speed, low maneuverability known to forage in open space or in open forests, used forest gaps like some species known to be edge specialists (e.g., *Pipistrellus* sp.) (Froidevaux *et al*, 2014).

In their paper discussing the influence of habitat structure on the ability to detect ultrasound using bat detectors, Patriquin *et al.* (2003) state that there is a reduced probability of call identification in sites where the detection volume includes substantial amounts of vegetative structure, the structure itself may alter ultrasound propagation and, with it, call detection or quality.

Furthermore, at the time of bat monitor installation, the turbine location was unknown, therefore, based on the habitats observed within the infrastructure Study Area, one monitoring station was erected on the edge of habitat that was consistent across the landscape (i.e. mixed-wood forest), as well as in an open area to the northeast of the site located in close proximity to areas of open water which have formed in an old quarry. These positions were chosen in order to maximize the ability to capture bat activity based upon habitat characteristics and likelihood of bat use.

Photo 3 indicates the location of BM1. This monitor was erected adjacent to the edge of the mixed-wood forest, and in close proximity to adjacent areas of open water in a former quarry. These features are contiguous with the graminoid fen wetland located behind the proposed turbine location. The bat monitor location is elevated 13.4 meters above the ground, although likely in excess of 16 meters from the water level in the adjacent ponds. This presents favorable siting conditions as it extends the vertical and horizontal detection zone of the monitor from the open water/edge habitat, which bats typically frequent.



Photo 3: Bat Monitor 1 – Open Area

Photo 4 indicates the location of BM2 which is located in a clearing, on the edge of the mixed-wood forest in eastern portions of the Study Area. As is evident in the photo, the location of the monitor adequately represents the mixed-wood habitat across the Study Area, while also maximizing the ability to record bat activity in a cleared area.

Subsequently, once the proposed turbine placement had been determined, a third bat monitor (BM3) was installed within the area of graminoid fen habitat to the west of the proposed turbine location (Photo 5). Habitat within the graminoid fen is discussed further in Section 7.2.2. As such, this represents the closest location to the proposed turbine (~120m) of the three monitor locations.

The data collected at the bat monitoring locations discussed was anticipated to provide an accurate estimation of species and relative abundance in the landscape surrounding the proposed turbine.

6.2.1.2 Acoustic Detector Information

SM4BAT detectors record ultrasonic bat calls through a transducer (microphone) and record them on a compact flash card for later download and analysis.

The SM4BAT detectors are equipped with SMM-U1 microphones which operate omnidirectionally. The microphones were further equipped with a foam windscreen to reduce wind interference and exposure to precipitation. Each microphone was pointed just below the horizontal to protect from precipitation while maximizing the volume of detection. The distance of microphone sensitivity to ultrasonic calls is subject



Photo 4: Bat Monitor 2 – Mixed-wood Forest Edge



Photo 5: Bat Monitor 3 – Graminoid Fen

to multiple design and environmental factors, however, with the dominant factor being atmospheric absorption of frequencies. Manufacture estimates state that the SMM-U1 microphone has a spherical detection volume with a 22.1m radius for 40 kHz frequencies, which increases (38.8 m) for lower (20 kHz) and decreases (6.5 m) for higher (100 kHz) frequencies. Prior to SM4BAT detector deployment the SMM-U1 microphones were calibrated to the manufacture's specifications.

All SM4BAT detectors operate in waterproof casements and are powered by 4 D-Cell batteries. Data was downloaded and the function of all SM4BAT detectors was checked at approximately two-week intervals during the study period.

6.2.1.3 Bat Detector Software

Two specialized software systems (Kaleidoscope Pro and Analoook) were used by a qualified biologist in to identify recorded bat files to species or species group. Kaleidoscope Pro (KSPro) uses sophisticated modelling to match recorded calls to an internal reference library, similar to voice recognition techniques. Analoook was used to construct frequency/time graphs from the bat calls recorded by the SM4BAT detectors. For each call, the slope, maximum frequency (i.e., the highest frequency), minimum frequency (i.e., the lowest frequency), and duration were determined, as those variables are believed to be species-specific, and can hence be used in comparison to recorded calls. Each variable was then compared with a library of reference calls collected from individual bats that had been identified to species. Subsequently, the data was reviewed by the qualified biologist in order to define the species producing the bat call¹.

Bat calls (call) were defined as a single, recognizable vocalization from one bat, and a bat pass (pass) as one or more sequential calls, representing calls from a single bat, recorded in one SM4BAT digital file.

Where echolocation recordings could be identified to species, we classified them as:

- EPFU - *Eptesicus fuscus* (Big brown bat)
- LABO - *Lasionycteris borealis* (Eastern red bat).
- LACI - *Lasiurus cinereus* (hoary bat);
- LANO - *Lasionycteris noctivagans* (silver-haired bat);
- MYLU - *Myotis lucifugus* (little brown bat)
- MYSE - *Myotis. Septentrionalis* (Northern long-eared myotis)
- PESU – *Perimyotis subflavus* (Tricolored bat)

Due to insufficient calls/pass or overlap in identifying call characteristics passes that could not be identified to species were grouped into the following categories:

- EPFU/LANO - *Eptesicus fuscus Lasionycteris noctivagans* (silver-haired bat/big brown bat);
- LABO/PESU - *Lasionycteris borealis/Perimyotis subflavus* (Eastern red bat / Tricolored bat),
- Myotis – *Myotis lucifugus/Myotis. Septentrionalis* (little brown bat/Northern long-eared myotis),
- LowF – Low frequency bats include (LACI/LANO/EPFU)
- HighF – High frequency bats include (LABO/MYLU/MYSE/PESU)

6.2.1.4 Monitoring Period

Bat Monitors 1 and 2 were installed on June 13, 2017 and ran continuously through to the Fall migratory season with collection on October 13, 2017. Data collection ceased due to a malfunction in BM1 on Sept. 29, 2017, and BM2 on Sept. 24, 2017. Data collection was re-established during the following equipment check on Oct. 4, 2017. Bat Monitor 3 was installed on September 24, 2017 and no malfunctions occurred during its monitoring period. All bat monitors were collected from the field on October 13, 2017 (Chart 5).

The detectors were programmed to record bat passes from a half an hour before sunset, to a half an hour after sunrise to determine relative activity patterns by species or species groups over the monitoring period.

¹Ryan Gardiner received Bat Acoustic training held by Cori Lausen of the Wildlife Conservation Society of Canada in June 2017. Training included site selection, data collection techniques, use of available software and species identification processes.

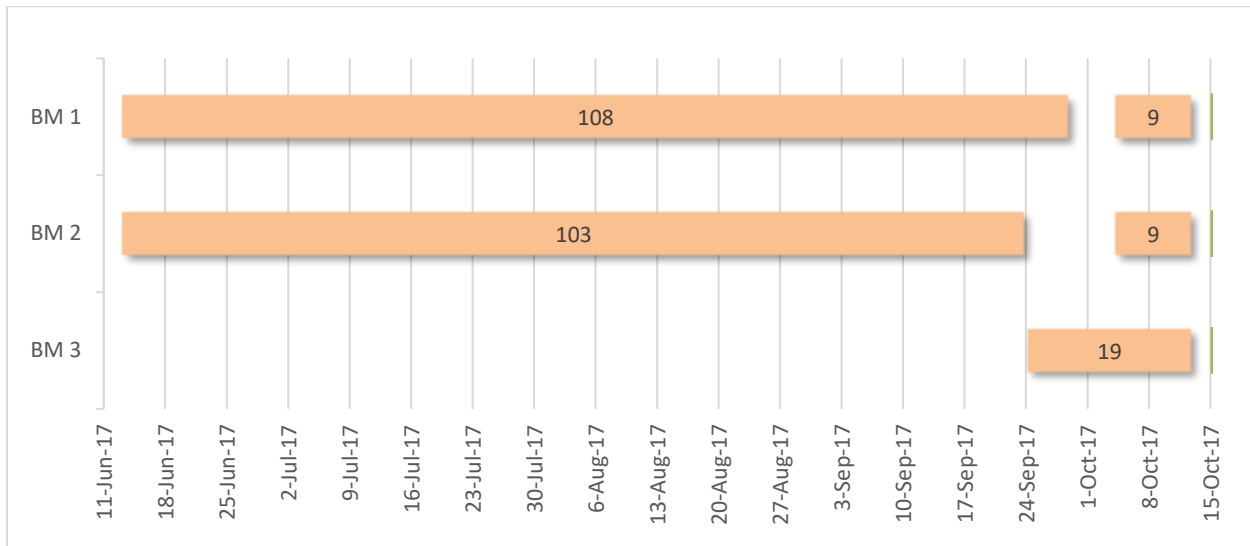


Chart 5: Bat Monitor Operation Schedule

6.2.2 Results

Data was analysed from all three bat monitors over the monitoring periods discussed above, the results of which are provided in

Table 13. Summaries of bat passes per detector night; average bat passes per detector night and total presence for each species across the three monitoring locations is provided. A bat pass is a sequence of 2 or more echolocation calls recorded as a bat flies within range of a bat detector (Thomas and West 1989; Vonhof 2006). A detector-night is the activity recorded by 1 detector from sunset to sunrise and was used to standardize measures of activity.

Where distinction between two species was not possible, the two undistinguishable species groups are grouped together as indicated Table 12 (i.e. Eastern red bat / Tricolored bat – (LABO/PESU) refers to either of these species).

Table 13: Summary of Bat Passes Per Detector Night

Species	Bat Detector			Total all sites
	BM1	BM2	BM3	
High Frequency	12	5	0	17
Little brown bat – (MYLU)	1	0	0	1
Little brown bat/Northern long-eared myotis – (Myotis)	3	8	0	11
Eastern red bat – (LABO)	42	3	0	45
Tricolored bat – (PESU)	15	1	0	16
Eastern red bat / Tricolored bat – (LABO/PESU)	60	3	0	63
Low Frequency	22	7	0	29
Hoary bat - (LACI)	135	30	0	165
Big brown bat - (EPFU)	2	1	0	3
Silver-haired bat - LANO	8	2	0	10

Species	Bat Detector			Total all sites
	BM1	BM2	BM3	
Silver-haired bat/Big brown bat - (EPFU/LANO)	3	4	0	7
Total passes all species	303	64	0	367
Detector Nights	117	112	19	248
Average passes per detector night	2.59	0.57	0	1.48

During the 2017 sampling period (Table 13) there were a total of 367 bat passes recorded by three detectors. Activity at the detectors sites was variable, ranging from zero total passes at BM3 (albeit only over 19 nights during late September – mid October), to 303 total passes at BM1. The highest bat activity was at the BM1, with 2.59 passes per night. The average passes per detector night for all detectors over the entire season was 1.48.

The most common species recorded during all detector surveys was the *Lasiurus cinereus* (Hoary bat) at 44.96%, followed by the *Lasiurus borealis* (Eastern Red) / *Perimyotis subflavus* (Tricolored) group (33.79%), Eastern red bat (12.26%), *Eptesicus fuscus* (Big brown) and *Lasionyceteris noctivagans* (Silver-haired) group (5.45%) and Myotis group (3.27%). The remaining consisted of unidentified high and low frequency bats.

6.2.2.1 Seasonal and Nightly Activity

During the 2017 monitoring season (June 13th to October 13th), bat activity was first recorded on June 16th during an isolated peak event. As is shown on Chart 6 (below), activity levels increased throughout July and again peaked in August prior to decreasing sharply in early September. Only a single bat pass was recorded across the Study Area between September 14th and October 13th, 2017. No activity was recorded at BM2 and BM3 during late September and early October.

Activity was relatively even throughout the night, beginning near twilight (8pm) and increasing sharply through the first few hours after sunset, with highest levels of activity occurring at 10pm. A smaller peak in activity was observed at 1am, after which activity tapered off and ceased just before sunrise (6am) (Chart 7).

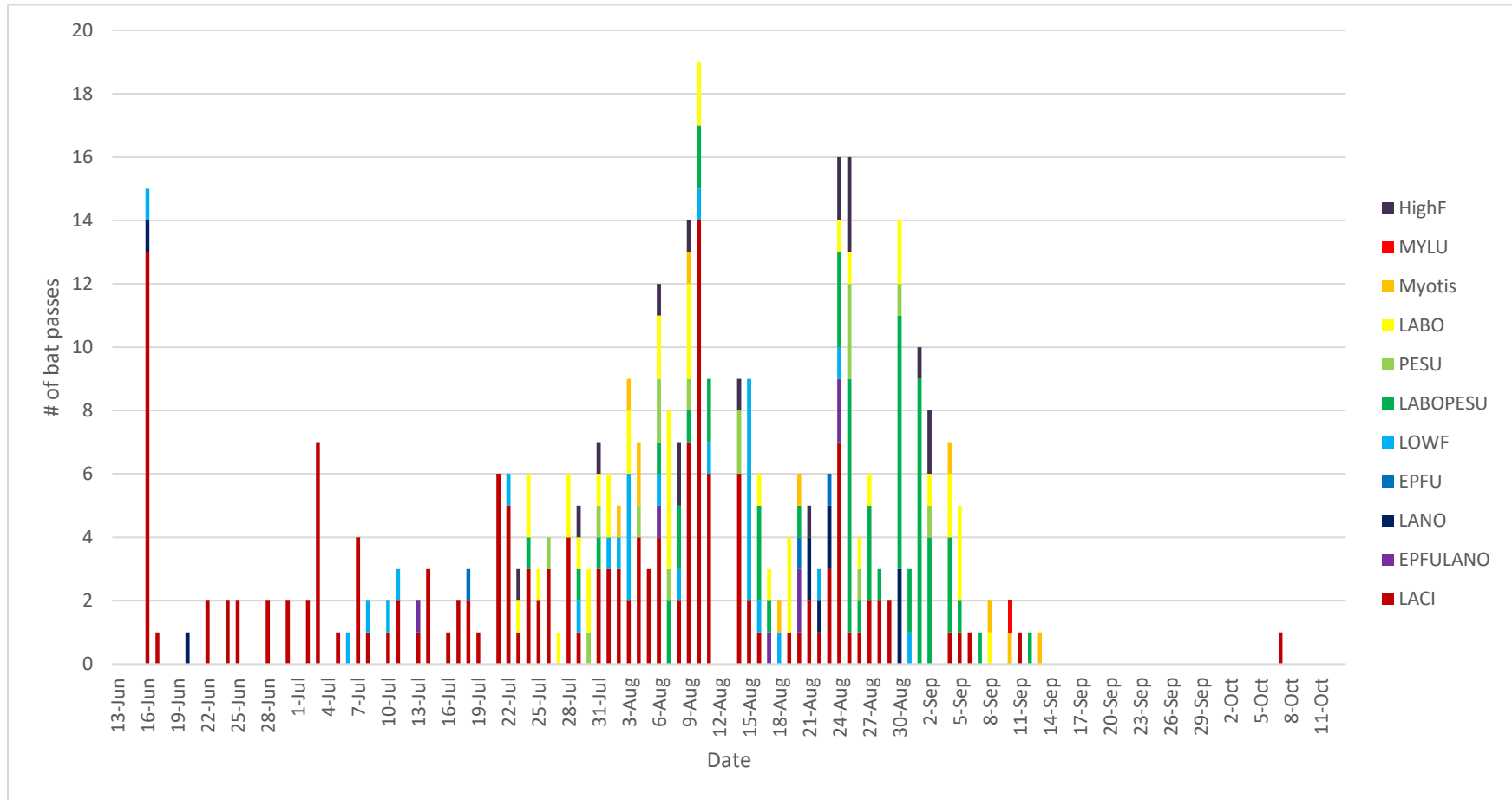


Chart 6: Nightly Bat Passes Across All Monitoring Stations

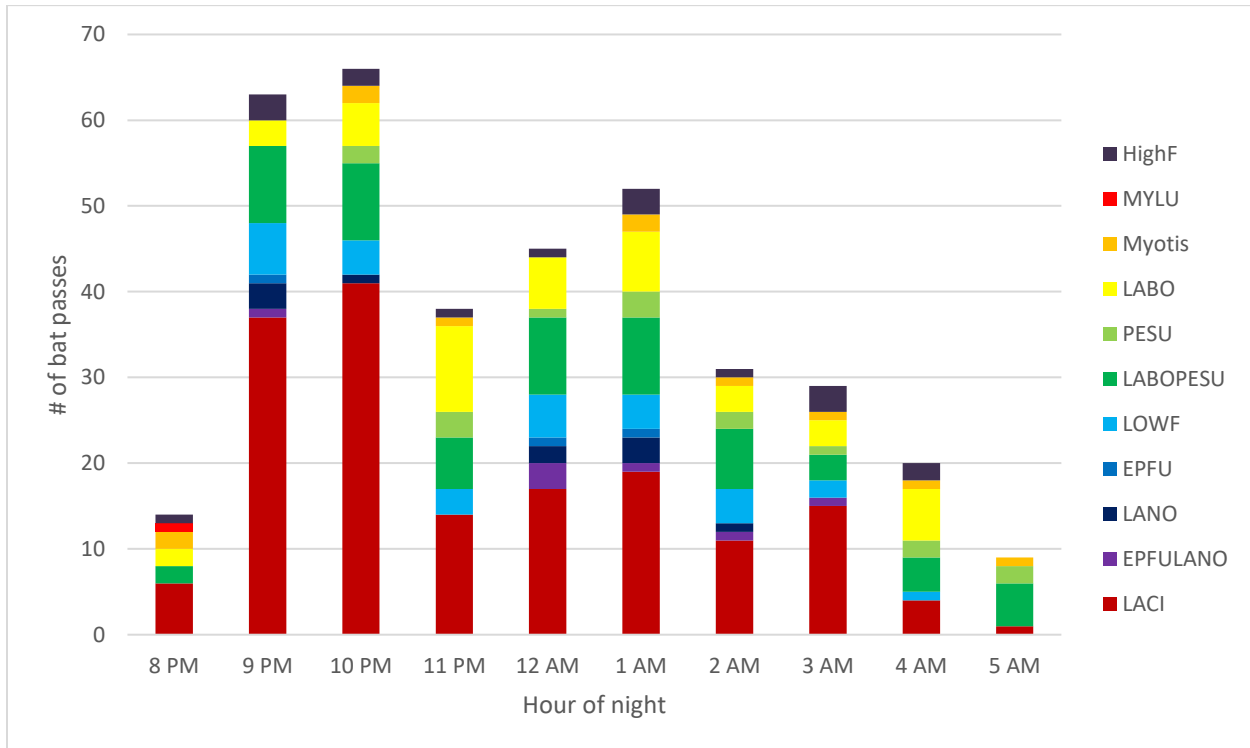


Chart 7: 2017 Nightly Timing of Recorded Passes

6.3 Discussion

There are seven species of bats that occur in New Brunswick as listed in Table 12 (above), three of which are considered listed as Endangered by COSEWIC, SARA and the NBSARA (Little brown myotis, Northern long eared myotis and the Tri-coloured bat). These species are also defined as S1 species by ACCDC (see Section 1.3 for designations). The remaining four species are defined by ACCDC as follows:

- Big brown bat (EPFU) – S3
- Eastern red bat (LABO) – S2?
- Hoary bat (LACI) – S2?
- Silver Haired bat (LANO) – S1

These four of the seven species are considered migratory, whereas the three Endangered species mentioned above are resident bats.

On an individual basis, the Hoary bat appears to be the most commonly recorded migratory species across the monitoring period. The LABO/MYLU/MYSE/PESU species group accounted for the highest non-migratory species group recorded. It is evident from the results however, that migratory species are by far the dominant bats present across the areas studied.

There is a lack of readily available data in New Brunswick to which the data collected for this Study can

be compared to. Therefore, the Alberta model has been adopted for the purposes of analysing potential impacts to bats as a result of the Richibucto Wind Power Project. Studies have shown that on average, greater than 80% of bat fatalities currently recorded at wind energy developments in North America, involve migratory species (Arnett et al. 2008). Bat fatalities, primarily migratory species, occur through direct collision with blades or indirectly from rapid decompression (barotrauma) near turbines (Baerwald et al. 2008). In Alberta, during the fall migration (July 15 to September 30), bat fatalities consist mainly of hoary and silver-haired bats (Government of Alberta, 2013)

Alberta adopts a Precautionary Principle whereby the following bat passes per night for migratory species is considered when determining project risk:

- Less than 1 migratory-bat passes per detector night = potentially acceptable risk
- 1-2 migratory bat passes per detector night = potentially moderate risk
- Greater than 2 bat passes per detector night = potentially high risk of bat fatalities

Source: Government of Alberta, 2013

Based on this model, the migratory species identified during the survey period at the Richibucto Wind Power Project have been listed in Table 13, and their respective average passes per detector night have been calculated.

Table 14: Migratory Species

Migratory Species	Detector			Total Passes	Average passes per detector night
	BM1	BM2	BM3		
Low Frequency	22	7	0	29	0.12
Hoary bat - (LACI)	135	30	0	165	0.66
Big brown bat - (EPFU)	2	1	0	3	0.01
Silver-haired bat - LANO	8	2	0	10	0.04
Eastern red bat - LABO	42	3	0	45	0.18
Silver-haired bat/Big brown bat - (EPFU/LANO)	3	4	0	7	0.03
Total Per Detector	212	47	0		
Total Migratory Passes (all detectors)				259	
Average passes per detector night				1.04	

The average passes per detector night for all migratory species has been determined to be 1.04 which falls within the *potentially moderate risk category* as outlined by Alberta government.

It should be noted that the information provided in Table 13 provides the reader a comprehensive account of bat passes and relative bat abundance across the three monitoring stations during the period studied.

The following important items should be considered:

- 1) Bat passes refers to is a sequence of 2 or more echolocation calls recorded as a bat flies within range of a bat detector (Thomas and West 1989), in comparison to relative bat

abundance. Relative bat abundance is an estimate of the number of individuals in a population (i.e. number caught or detected per unit time [frequency]). Absolute abundance is expressed as a number present per area (density). Absolute abundance can not be reliably assessed for bats. Relative abundance can be compared between localities or over time, but reliable comparisons of relative abundance can not be made between different species of bat (MELPRIB, 1998)

- 2) Average migratory bat passes per detector night provided in Table 13 have been determined based on the individual bat passes at each monitor, across the total detector days for all monitoring stations. As discussed in Section 6.2.1.2, BM3 was only monitored for 19 days during mid-September-early October 2017, in comparison to BM1 (117 days) and BM2 (112 days). According to results collected at BM1 and BM2, it appears that highest bat activity occurs during the period end July to the beginning of September and such, the time period monitored at BM3 does not account for this period. In order to account for the lack of data during this period, the following sections outline two methods by which i) potential migratory bat activity at BM3 has been accounted for and ii) the study period and data recorded for BM3 has been removed from the analysis in order to give a more conservative bat pass result for BM1 and BM2.

i) Using BM1 bat pass data

As discussed in Section 6.1.1, BM1 was positioned at the edge of the mixed-wood forest, and in close proximity to adjacent areas of open water in a former quarry. These features are contiguous with the graminoid fen wetland located adjacent west of the proposed turbine location.

Table 14 (below) repeats the same information as that within Table 13 (above), although bat pass data from BM1 has been included in the BM3 column as a “worst case” scenario. The actual bat passes at BM3 during the period end July to the beginning of September is unknown unless monitoring is completed there; however due to its relative proximity to BM1 (i.e. 550m west), and it being situated along a contiguous wetland comprising open water habitat, bat activity is predicted to be similar. In addition to utilizing the BM1 bat pass data for the BM3 location, the results in Table 14 take into consideration the bat detector nights recorded at BM1 (i.e. 117 instead of 19).

Table 15: Migratory Species Bat Passes: Predicted BM3 Data

Migratory Species	Detector			Total Passes	Average passes per detector night
	BM1	BM2	BM3 ¹		
Low Frequency	22	7	22	51	0.15
Hoary bat - (LACI)	135	30	135	300	0.87
Big brown bat - (EPFU)	2	1	2	5	0.01
Silver-haired bat - LANO	8	2	8	18	0.05
Eastern red bat - LABO	42	3	42	87	0.25
Silver-haired bat/Big brown bat - (EPFU/LANO)	3	4	3	10	0.03

Migratory Species	Detector			Total Passes	Average passes per detector night
	BM1	BM2	BM3 ¹		
Total Migratory Passes					471
Average passes per detector night					1.36

¹ Data from BM1 was used as a worst-case scenario

As is depicted in Table 14, the average passes per detector night for all migratory species based on the approach discussed above, has been determined to be 1.36 which also falls within the *potentially moderate risk category* as outlined by Alberta government.

ii) *Removing bat detector nights for period September 24 – October 13th.*

During the period September 24 – October 13th, only a single migratory bat pass was recorded at BM1 on October 7, 2017. Therefore, in order to evaluate the overall migratory bat passes per night across the active times of the study period, the data at BM3, and the time period of Sep 24-Oct 13 (19 days), has been removed from the analysis (Table 15, below). This produces a more conservative result of bat passes per night for BM1 and BM2 based on 229 total detector nights instead of 248 detector nights.

Table 16: Migratory Species Bat Passes at BM1 and BM2 During Reduced Study Period

Migratory Species	Detector		Total Passes	Average passes per detector night
	BM1	BM2		
Low Frequency	22	7	29	0.13
Hoary bat - (LACI)	134	30	164	0.72
Big brown bat - (EPFU)	2	1	3	0.01
Silver-haired bat - LANO	8	2	10	0.04
Eastern red bat - LABO	42	3	45	0.20
Silver-haired bat/Big brown bat - (EPFU/LANO)	3	4	7	0.03
Total Migratory Passes				260
Average passes per detector night				1.14

¹ Includes removal of the single bat call recorded on Oct 7, 2017

As is depicted in Table 15, the average passes per detector night for all migratory species based on the reduced study period approach for BM1 and BM2 discussed above, has been determined to be 1.14 which also falls within the *potentially moderate risk category* as outlined by Alberta government.

In summary, Table 16 provides results of the options analysed to determine average migratory bat passes per night across the Study Area as outlined in the preceding sections.

Table 17: Summary of Average Bat Pass Results of Migratory Species Using Three Options

Analysis Option	Average Bat Passes Per Night
Bat passes per night based on: - Three detectors (BM1, BM2 and BM3) - Entire study period (248 detector nights)	1.04
Bat passes per night based on: - Three detectors (BM1, BM2 and BM3) - Entire study period (248 detector nights) - Using BM1 data as a prediction tool for BM3 data during period of June 13-September 24	1.36
Bat passes per night based on: - Two detectors (BM1 and BM2) - Reducing study period to active time (i.e. 229 detector nights between June 13-September 24)	1.14

The average migratory bat passes per detector night for the options analysed above, fall between 1.04 and 1.36 migratory bat passes per detector night. As previously discussed, based on the Bat Mitigation Framework for Wind Power Development (Alberta Environment & Sustainable Resource Development, 2013), this data falls within a *potentially moderate risk category*.

It is widely understood that high levels of bat activity are typically documented in forested ridge habitats, forest canopy openings, and along the shores of large waterbodies. These areas may offer attractive migratory and feeding habitat for some species of bats, which may lead to increased bat activity and mortality risk (Ontario Ministry of Natural Resources 2011). Therefore, as part of the analysis for bat activity within the Study Area, it is important to note that the average bat passes per night stated in Table 16 are based on all three bat monitors, and that BM1 is elevating the average bat passes per night tally due to its location (i.e. ideal bat habitat, within open area adjacent to open water). In order to simplify this fact, Table 17 provides a breakdown of ALL bats and MIGRATORY bat passes per night for BM1 and BM2, during the active monitoring period (108 nights and 103 nights respectively) and provides the associated habitat of each monitor station.

Table 18: Average Bat Passes Per Night Comparison (ALL bats and MIGRATORY) – Active Period

Bat Monitor	Average Bat Passes Per Night – ALL bats	Average Bat Passes Per Night – MIGRATORY bats	Habitat Present
BM1	2.8	1.96	Open, adjacent to open water
BM2	0.62	0.46	Edge of mixed wood forest clearing

It is evident that at BM2, which exists in a clearing in similar forested habitat to that located at the proposed turbine location, exhibits far less average bat passes per night than at BM1. As such, since the proposed turbine is to be located in forested habitat, bat activity levels are expected to resemble those at BM2 (<1 migratory and all bat passes per night), rather than the bat activity experienced at BM1.

7.0 AQUATIC ENVIRONMENT

7.1 Methodology

7.1.1 Desktop Review

The Study Team reviewed geospatial data accessed from GeoNB (2016) during the desktop review of aquatic ecosystems, focusing primarily on the New Brunswick Hydrographic Network (NBHN). In addition, the recently developed Draft Wetlands Reference Map (DELG 2017) was reviewed to evaluate the potential presence of wetland habitat within the Study Area.

The goal of the desktop evaluation was to identify where wetlands, watercourses, or waterbodies may be located based on mapped systems, topography, forest cover type and satellite imagery, while also identifying where the Study Area lies within primary and secondary watersheds.

7.1.2 Aquatic Field Surveys

Field surveys were conducted in June 2017 across the Study Area to confirm presence of mapped wetlands and watercourses, and identify other aquatic features that maybe present upon the landscape, in line with the following New Brunswick's Clean Water Act definitions (GNB, 1989):

7.1.2.1 Wetlands

Wetlands are land that:

- (a) either periodically or permanently, has a water table at, near or above the land's surface or that is saturated with water, and
- (b) sustains aquatic processes as indicated by the presence of hydric soils, hydrophytic vegetation and biological activities adapted to wet conditions.

A watercourse in New Brunswick is defined as:

A feature in which the primary function is the conveyance or containment of water, described as being:

- a) *the bed, banks and sides of any watercourse that is depicted on the New Brunswick Hydrographic Network layer (available on GeoNB Map Viewer);*
- b) *the bed, banks and sides of any incised channel greater than 0.5 metres in width that displays a rock or soil (mineral or organic) bed, that is not depicted on New Brunswick Hydrographic Network layer (available on GeoNB Map Viewer); water/flow does not have to be continuous and may be absent during any time of year; or*
- c) *a natural or man-made basin (i.e. lakes and ponds).*

Wetland delineation was completed based on micro-topography, and observed surface hydrology, vegetation and soils by qualified wetland delineators Ryan Gardiner and Tessa Giroux. Wetland boundaries were documented using an SXBlue GPS unit and hand held field computer capable of sub 1m accuracy. Any inlet and outlet streams or other features associated with each wetland were marked

during the delineation process and walked and mapped. Observations were made on wetland types, water flow path, dominant vegetation communities (and SAR/SOCI, if present), fish habitat potential and characterizations, and wetland functions.

Due to the proximity of the identified wetlands to proposed Project infrastructure, wetland functional assessments were completed. The analysis of wetland function was completed for each wetland using the Wetland Ecosystem Services Protocol (Atlantic Canada) (WESPAC) wetland evaluation technique. The WESP process involves the completion of three forms; a desktop review portion that examines the landscape level aerial conditions to which the wetland is situated, and two field forms. The process serves as a rapid method for assessing individual wetland functions and values. WESP addresses 17 specific functions which wetlands may provide (Table 19). The specific wetland functions are individually allocated into grouped wetland functions and measured for “functional” and “benefit” scores. Wetland function relates to what a wetland does naturally (i.e., water storage), whereas wetland benefits are benefits of the function, whether it is ecological, social, or economic. The highest functioning wetlands are ones which have both high ‘Effectiveness’ and ‘Benefit scores for a given function. WESP enables a comparison to be made between individual wetlands within a region to gain a sense of the importance each has in providing ecosystem services.

Table 19: Wetland Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Aquatic Support	Aquatic Invertebrate Habitat
	Stream Flow Support
	Organic Nutrient Export
	Water Cooling
Water Quality	Sediment Retention & Stabilization
	Phosphorus Retention
	Nitrate Removal & Retention
	Carbon Sequestration
Aquatic Habitat	Anadromous Fish Habitat
	Resident Fish Habitat
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian and Turtle Habitat
Transition Habitat	Songbird, Raptor, & Mammal Habitat
	Pollinator Habitat
	Native Plant Habitat

In addition to the wetland functions above, WESP also measures the following functions, however these are only evaluated by their Benefit scores:

- Wetland Condition; and
- Wetland Risk.

7.1.2.2 Watercourses

Watercourses were documented using an SXBlue GPS unit and hand-held field computer capable of sub 1m accuracy. Observations were made on fish habitat quality and fish habitat potential for each identified feature, as well as wood turtle and snapping turtle potential. Physical parameters such as location and average width and depth were recorded for watercourses and drainage ditches that were encountered. Each feature that was encountered was photographed.

7.2 Results

7.2.1 Desktop Review

The Study Area is located within the Northumberland primary watershed, in the Richibucto River secondary watershed. There are no protected water areas within 54km of the Study Area (McLaughlin Road Reservoir, Moncton).

The Draft Wetlands Reference Map (DELG 2017) indicates the predicted presence of multiple areas of wetland within, and adjacent to the Study Area (Figure 5A, Appendix A). The Study Area extends entirely through an area of wetland habitat classified as “Other Wetlands” (which include freshwater marsh, aquatic bed, bog, fen, and shrub wetlands). As can also be noted on Figure 5A (Appendix A), the Study Area encroaches a Provincially Regulated Wetland (PRW) which extends northeast and drains into Weldon Creek. Weldon Creek drains into Loggie Pond prior to discharging into the Richibucto River approximately 2.2km northeast of the proposed turbine location.

Apart from the watercourse (Weldon Creek) associated with the PRW (fen), no other watercourses are identified within the Study Area by the New Brunswick Hydrographic Network (Figure 5A, Appendix A).

7.2.2 Field Surveys

One large mixed-wood treed swamp wetland was identified within the Richibucto Wind Project Study Area. In addition, the PRW was also identified to the west of the proposed turbine location within the western extent of the Study Area. Apart from the watercourse which drains through the PRW, no additional watercourses were identified within the Study Area. A combination of five ATV/skidder trails bisect the treed swamp, and during periods of high flow accumulate shallow water. The following sections provide details about the aquatic habitat identified.

7.2.2.1 Surface Water

As previously discussed, land within and adjacent to the Study Area is very flat and as such, surface water within the Study Area is very much influenced by water supplied from the upper reaches of Weldon Creek and its catchment area. Water is primarily supplied to the creek and associated fen wetland from a commercial peat producing facility located approximately 500m southwest from the Study Area boundary (Image 2). Water management techniques are currently in place at the facility in the form of surface drains and ditches, and water retention ponds. The peat facility is located on former wetland habitat, and as such, due to the expedited nature of water outflow from this area via the ditches, water level and water flow characteristics in the downstream fen, and the mixed-wood treed swamp within the Study Area are affected. The predominant flow of water is via the upper reaches of Weldon Creek, northeastward toward an abandoned quarry which contains areas of ponded water. However, due to the flat land the forested community present within the Study Area intercepts some of the water, which has resulted in the presence of forested wetland habitat.

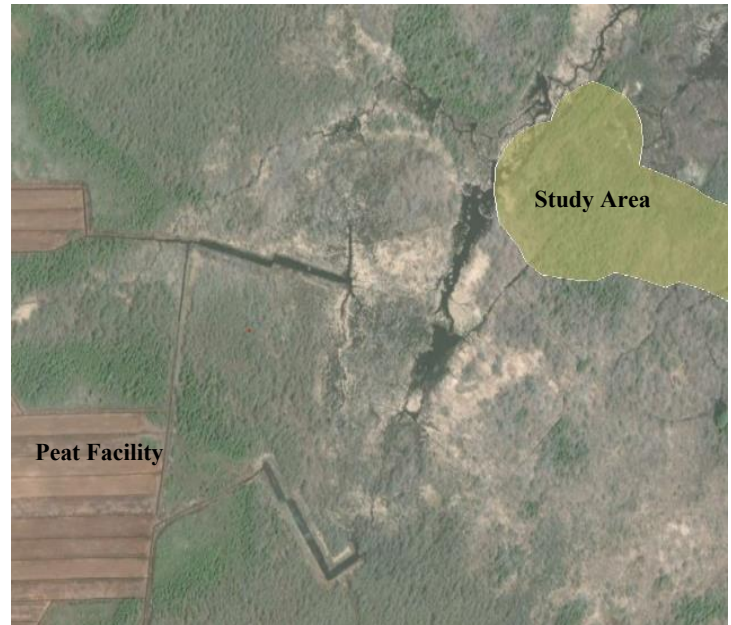


Image 2: Peat Facility and Drainage Ditching into Weldon Creek

The presence of five ATV/skidder trails which bisect the Study Area, were observed to be flooded in April 2017, and temporarily accumulate water during spring and periods of high flow (Photo 6). During drier summer months, the ATV trails lacked surface water, further suggesting that land within the Study Area acts as an overflow floodplain for the Weldon Creek and the fen during spring melt and high flow conditions.

7.2.2.2 Wetlands

During field surveys across the Study Area, one mixed-wood treed swamp was identified. The PRW (graminoid fen) located to the west of the proposed turbine was also identified.

Mixed-Wood Treed Swamp

The wetland within the Study Area is located in a throughflow position as it receives water from the floodplain of Weldon Creek, and drains water from southwest to northeast toward its outflow location at an abandoned quarry located north of the Study Area. The wetland extends to the north and south of the Study Area boundary as identified on Figure 5B (Appendix A). Water primarily moves sub-surface through the wetland (especially during the summer months),



Photo 6: Flooded ATV Trail

and the five ATV/skidder trails previously discussed which extend through the Study Area also collect and temporarily store water. Observations recorded in April 2017 indicated very wet conditions throughout the wetland, where standing water at depths of 10cm were consistently encountered (i.e. >70% of the wetland within the Study Area) (Photo 7). However, observations made during the June 2017 wetland evaluation (as well as during other biophysical evaluations) indicated drier conditions within the wetland prevailed throughout other times of the year. Although intermittent areas of standing water (1-5cm) were observed, they were restricted to small depressions/pits amounting to approximately 30% of the wetland surface within the Study Area. Elsewhere, saturated wetland surfaces were observed (Photo 8).



Photo 7: Standing Water in April



Photo 8: Saturated Surfaces in June

The dominant tree species in the mixed-wood treed swamp overstory layer are grey birch, eastern larch and balsam fir, with an understory shrub layer including red maple and eastern larch saplings, and intermittent areas of dense speckled alder, mountain holly and wild raisin shrubs. The herbaceous layer within the mixed-wood swamp is largely dominated by tussock sedge (*Carex stricta*) (Photo 8). Where this species is not present, a sparse covering of rhodora (*Rhododendron canadense*), sheep laurel (*Kalmia angustifolia*) and speckled alder are present but these species only account for less than 5% of the ground cover observed within the wetland existing in the Study Area.

Hydric soil present within the mixed-wood treed swamp is indicated by a thin layer of decomposed organic soil, underlain with sandy mineral soils with redox features (Sandy Redox S5).

The mixed-wood treed swamp is contiguous with fen habitat located west of the proposed turbine and its associated watercourse (Weldon Creek). Surface water connection between the creek and mixed-wood treed swamp only persists during the spring months (i.e. post snow melt and during periods of high flow). Although these conditions allow for potential fish passage during these conditions, fish habitat quality within the wetland itself is considered low (i.e. temporary areas of standing water). There are no direct

surface water connections between the wetland present in the Study Area and the ponded features existing in the abandoned quarry to the north.

Graminoid Fen

As previously discussed, the graminoid fen to the west of the proposed turbine is identified on the Draft Wetlands Reference Map as a PRW. The PRW drains in contiguity with Weldon Creek and exists as a lotic throughflow graminoid fen. The portion of the wetland that extends into the Study Area was observed to comprise intermittent areas of standing water across approximately 10% of the wetland during the summer months (~15cm), and other areas where surfaces were saturated (i.e. especially toward the edge of the fen where it transitions to treed swamp). The majority of surface water is confined to the main channel of Weldon Creek and some small minor side channels (Photo 9).



Photo 9: Weldon Creek in Fen (June 2017)



Photo 10: Scrubby WL Habitat (April 2017)

Observations of the fen as it extends northeastward beyond the Study Area boundary, toward the abandoned quarry were made during bird surveys and observations indicate that the wetland transitions into a modified landscape incorporating scrub, shrub fen habitat. The landscape in this area appears to have been altered by historical aggregate extraction, and standing water (~30-50cm in April) was observed upon a rocky hard pan substrate (Photo 10).

Vegetation within the graminoid portion of the fen is dominated by bluejoint (*Calamagrostis canadensis*) herbs with evidence of few intermittent speckled alder, eastern larch, and red maple saplings. There are no trees present. The scrub, shrub portion of the fen however is dominated by a dense congregation of speckled alder shrubs, black spruce and grey birch saplings. Ground cover continues to be dominated by bluejoint (Photo 9).

The fen comprises organic histosols in excess of 1 meter deep, although soil depths are much thinner in the scrub/shrub fen due to shallow rock. This is typical of a soil which experiences excessive standing water, and permanent high-water tables throughout the year, which creates anaerobic decomposition conditions.

Due to its floodplain characteristics, fish access is possible within the fen, especially during spring and periods of high flow. Small off-shoot channels and standing water provide opportunity for fish to access various parts of the wetland and utilize it for feeding and refuge, however, the overall habitat for fish within the wetland is not considered critical (i.e. spawning habitat).

7.2.2.3 Functional Assessment

The following section outlines the results of the functional assessment completed on the mixed-wood treed swamp and the graminoid fen. Each functional group is discussed below. The score pages for each evaluation are provided in Appendix D.

Hydrologic

The hydrologic functions of the wetland are determined by its ability to store water.

Both wetlands have been determined to provide moderate water storage functions. The graminoid fen scored lower (2.82) than its counterpart (4.92) due to the presence of Weldon Creek, which acts as a mechanism for surface water to flow quicker. Soil type within the treed swamp however (thin organic underlain with mineral/sand) is not favourable from a water storage perspective in comparison to deep organic soils which can hold water for a longer duration. This is evident due to excessive flooding during spring, and then relatively dry surface during the summer months. The flat topography within the treed swamp enables water from Weldon Creek and the fen to disperse across the treed swamp landscape and hence, mimic a floodplain habitat for the creek. This particular function of the treed swamp is important knowing that up-stream water outflow and timing has been significantly altered by the commercial peat facility.

The benefit scores for the hydrologic group varied considerably for the wetlands (High: 9.52 for the treed swamp and Moderate: 2.14 for the fen). This is largely due to the fact that the treed swamp is located slightly higher in the watershed, and not directly adjacent to the watercourse. Hence the wetlands ability to prevent flooding is higher than the fen which is receiving waters from upslope aquatic contributors. As well, the treed swamp lies adjacent to developed land (i.e. roads and industry), therefore its benefit importance for water retention is elevated in comparison to the fen.

Water Quality Support

Water quality scores pertain to the wetland's ability to retain and remove unwanted water components such as nitrate, sediment, phosphorus and the sequestration of carbon. Both wetlands scored low for this function (1.49 and 3.02), for the treed swamp and fen respectively.

Sediment retention appears consistent between both wetlands (moderate). Pondered water in combination with dense herbaceous vegetation in both wetlands increases the score for this function as it provides more deposition time for sediments and frictional resistance to water. However, due to the outflow configuration in each wetland (i.e. both contiguous with a permanent outflow surface water feature [Weldon Creek]), loss of sediment is more likely than if water was stored within the wetland for a longer duration. This is especially evident in the treed swamp as it floods in spring, and then dries rapidly to a saturated hydrological regime during summer.

Both wetlands produced low scores for phosphorous retention (0 for treed swamp and 2.39 for the fen). Similar to above, deposition time increases ability for wetland to retain phosphorous. The commercial peat facility is present to the southwest of the wetlands, and sources water to them. However, water flows through additional forested wetland habitat prior to entering the Study Area, and water is not directly sourced to the wetland via developed unvegetated areas, therefore concentration of phosphorous inputs is not expected to be high as it would be if this habitat wasn't present.

The treed swamp (4.47) scored higher than the fen (3.32) for nitrate removal and retention. The retention of water within the treed swamp is higher than the fen due to a lack of channelized surface water flow (i.e. increase ponded water in swamp), and the wetlands ability to retain water for longer durations. However, as previously discussed, water is only held during spring and high flow events, which reduces the functional significance of nitrate removal and retention in the treed swamp than if it held water during the summer months.

The ability for the wetlands to sequester carbon is considerably higher in the fen (5.40) than the treed swamp (2.09) mainly as a result of the wetland type (fen), associated water regime (ponded water for longer duration) and organic soil present.

The overall benefit scores for water quality support are much higher in the fen (9.52) than the treed swamp (2.14). This is as a result of the nature of water delivery to the fen (i.e. via anthropogenic channels from commercial peat facility), and that the fen comprises higher water levels delivered from other aquatic contributors (i.e. wetlands).

Aquatic Habitat

Aquatic habitat refers to the wetlands ability to support amphibians and turtles, fish and waterbirds.

Both wetlands scored highly (6.47 for the treed swamp and 8.27 for the fen), largely as a result of the hydrological conditions present in each. The fen is directly contiguous with Weldon Creek and comprises standing water, hence it provides potential fish habitat. This is also the case within the treed swamp, although standing water is more temporary (during spring). These conditions also elevate scores for amphibian and turtle habitat across both wetlands.

Waterbird feeding, and nesting habitat scored higher in the fen due to contiguity with Weldon Creek, ponded water and herbaceous dominated surfaces, compared to the treed swamp which only comprises standing water during the spring and high flow events. Additionally, the canopy present in the treed swamp detracts from waterbird use.

The overall benefit scores for aquatic habitat are high for both wetlands (5.66 for the treed swamp and 7.089 for the fen).

Aquatic Support

Aquatic support functional scores were high for the fen (7.05) in comparison to the treed swamp which scored at 3.31.

The fen presents a more stable water regime throughout the year in comparison to the treed swamp which dries rapidly in the summer. As such, this enables the fen to contribute to aquatic support functions later in the season. In addition, its soil type (deep peat) enables water to be stored for longer durations, and its direct contiguity with the watercourse increases its importance for supporting aquatic processes.

The benefit scores for aquatic support are also higher within the fen (8.18) compared to the treed swamp (5.90) largely as a result of the benefits fish, amphibians and waterfowl would experience in the wetter, lotic fen, versus the treed swamp (terrene).

Transition Habitat

Transition habitat represents the ability for the wetland to support other wildlife (birds, mammals), insects (pollinators) and plants.

The transitional habitat functional group scored 7.38 for the fen and 5.38 for the treed-swamp wetland. The hydrological, vegetative, physical attributes and location of the fen habitat in comparison to the swamp accentuates its functional score for this group. The following provide examples:

- The fen is densely covered by graminoids which acts a method of protection for birds and smaller mammals;
- The fen comprises areas of open water suited to aerially foraging birds as well as bats, muskrat, Moose, beaver and other mammals;
- The fen is located adjacent to natural, vegetated tracts of land in comparison to the treed swamp which lies adjacent to commercial development;
- The fen provides an interspersion of habitat (i.e. ponded and saturated) as well as irregular surfaces which promotes extensive feeding areas and extensive habitats for pollinators;
- The peaty soils present in the fen provide more productive areas for plant species richness than the treed swamp.

Both the fen and treed swamp scored 10 (maximum) for the benefits of transitional habitat functions. This is largely as a result of the identification of five rare birds (Barn Swallow, Bobolink, Common Tern, Killdeer and Willet) species, directly adjacent to the wetlands within the last ten years. Species at Risk and Species of Conservation Interest are discussed further in Section 8.0.

Wetland Condition

Wetland ecological condition varies throughout the wetlands primarily as a result of shifts in vegetative composition. Also taken into consideration is each wetland's relationship with the landscape and natural or historical disturbances.

Both wetlands recorded moderate benefit scores (fen: 6.32 and treed swamp: 5.86). A lack of invasive plants, irregular ground conditions and healthy vegetated ground cover conditions increase the benefit scores.

Wetland Risk

Wetland Risk comprises benefit scores for the average of wetland stressors and wetland sensitivity.

Wetland sensitivity refers to the wetland’s ability to prevent human and natural stressors and is generally gauged on the wetlands vegetative condition within a landscape, and proximity to other natural landscapes which sustain it. Wetland stressors refers to the degree to which a wetland is or has recently been altered or exposed to risk as a result of human activities. Higher scores indicate that the wetland is more sensitive and subject to stressors compared to lower scores.

Both wetland scored highly (Fen: 8.78 and treed swamp: 10.0).

Generally speaking, both wetlands are sensitive to human stressors as a result of adjacent commercial development (industry and commercial peat farming). As a result, their integrity is at an increased risk to maintaining natural wetland characteristics and function, in comparison to wetlands located in natural landscapes, where adjacent human activities are absent.

7.2.2.4 Watercourses

No watercourses (lakes, streams or areas of open water) were identified within the Study Area.

As previously discussed however, Weldon Creek drains from southwest to northeast approximately 63 meters from the proposed turbine, and discharges into an abandoned quarry located approximately 290 meters northeast of the proposed turbine. The abandoned quarry comprises multiple large pits which over time has led to the development of small lakes and open water features. Water drains into, and out of the features northward, where it reintegrates with Weldon Creek and drains northeast into Loggies Pond and ultimately the Richibucto River.

As indicated by New Brunswick Hydrographic Network database (Government of New Brunswick, 2017), Weldon Creek is sourced water from higher land to the southwest of the Study Area, at the location of the commercial peat facility. Water flow sourced from this area has been significantly modified (i.e. ditched, re-routed and detained in linear ponds) prior to it draining into Weldon Creek. No barriers to fish passage were observed within Weldon Creek within the Study Area, although significant beaver dams and a beaver lodge is present within it. Up-stream fish habitat is not regarded high quality due to the anthropogenic features discussed above.

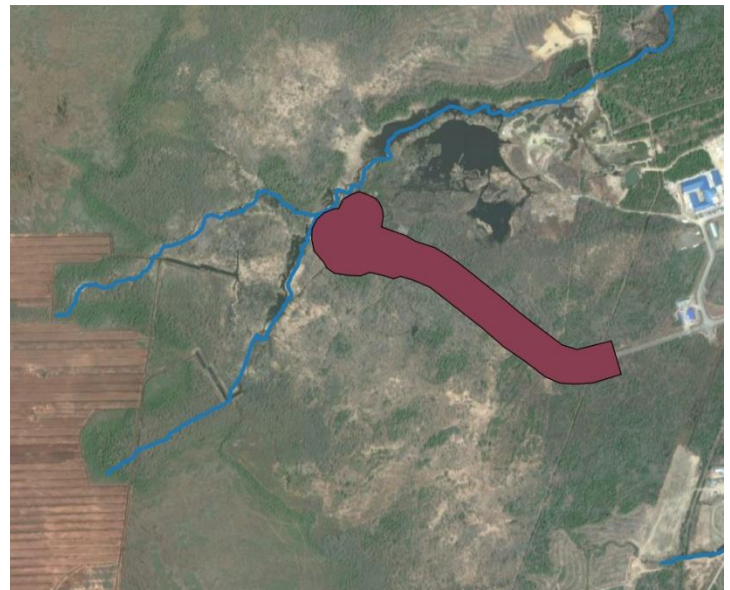


Image 3: Weldon Creek

Furthermore, in a document entitled *Ecosystem Overview of the Richibucto Watershed* (DFOC, 2008), it is stated that the results of a water quality analysis within the Richibucto estuarine have shown clearly that there is a threat of eutrophication in the estuarine part of the watershed due to accumulation of nutrients there. This is particularly the case for the small streams that empty into the Richibucto River: Mooney’s, Child’s, Beattie’s and Weldon Creeks. These conditions are as a result of draining a peat bog for harvesting purposes which induces the decomposition of organic matter and hence lead to an increase in the nutrient load in the drainage water, which flows into nearby streams such

as Weldon Creek. These conditions promote a eutrofied body of water (including presence of algae), which is depleted in oxygen and can result in the asphyxiation of the fish and other aquatic insects inhabiting it. Observations recorded during the characterisation of Weldon Creek indicated very brown water (Photos 11 and 12) and presence of algae, which is anticipated to be a result of the up-stream peat harvesting activities.



Photo 11: Algae within Weldon Creek



Photo 12: Brown water within Weldon Creek

The *Ecosystem Overview of the Richibucto Watershed* (DFOC, 2008 document also provides documented fish species within the Richibucto River above Rexton and various streams. These are provided in Table 19.

Table 20: Possible Fish Species in Weldon Creek

Atlantic salmon	American shad	Chub	Three-spined stickleback
Brook trout	Striped bass	Slimy sculpins	Nine-spined stickleback
Dace	White perch	Atlantic silversides	Black-spotted stickleback
Minnnows	Rainbow smelt	Banded killifish	Atlantic silversides
Lamprey	Atlantic tomcod	Four-spined stickleback	Banded killifish
Gaspereau	Mummichog	Four-spined stickleback	Nine-spined stickleback
Flounder	Cunner	Three-spined stickleback	Black-spotted stickleback
Common shiner			

According to DFOC (2008) the following are noted:

- The Richibucto River, and a number of its tributaries were stocked with brook trout around the period 1994-1997;
- Between 1974 and 2002, the Richibucto River and the Coal Branch were the only rivers found to be harbouring stable populations of juvenile Atlantic salmon;

- Between 1974 and 2002, there were more slimy sculpins and trout in the St. Nicholas River than in other streams, probably owing to the cold water in that river;
- An Atlantic salmon stocking project began with the collection of broodstock in 2004;
- In 2005, the Coal Branch, the Richibucto, the West Branch of the St. Nicholas, the Bass, the Molus and the St. Charles were stocked with parr.

Weldon Creek was evaluated for habitat characterizations based on parameters identified in the *Standard Methods Guide for Freshwater Fish and Fish Habitat Survey in Newfoundland and Labrador* (NL Guide; Sooley et al., 1998). As described in the guide, water quality and quantity tolerances of the Atlantic Salmon (*Salmo salar*) were used as an index of the relative health of the river for fish populations. The Atlantic Salmon were used as the indicator species for several reasons (Sooley et al., 1998);

- Salmon inhabited the Richibucto River between 1974 and 2002 and Weldon Creek is contiguous with it;
- Salmon are sensitive to acidification;
- Salmon are a predatory species at the top of the food chain; and
- Data exists that defines preferred habitat conditions for this species.

Physical characteristics along a 320 meter section of Weldon Creek evaluated as part of the field study is provided in Table 21.

Table 21: Weldon Creek Characteristics

Reference UTM's		Section Length (m)	Velocity	Gradient	Wetted Width (m)	Bankfull Width (m)	Average Depth (cm)	Bank Height (cm)	Substrate (%)	Habitat Type (%)	Habitat Type ¹
E	N										
Upstream		320	Low	1%	1-10	10-20	15-60	0-15	Muck: 100%	Pool=90, Flat=10	IV
355114	5169302										
Downstream											
355299	5169566										

¹ As determined by Sooley et al.(1998)

Based on the characteristics outlined in Table 4, Weldon Creek exhibits characteristics that describe Type IV fish habitat (i.e. potential feeding, refuge and overwintering habitat). However, expected elevated nutrient levels and poor water quality as a result of up-stream peat harvesting reduces fish habitat quality within this system.

Based on Sooley et al., 1998, Type IV watercourse consists of:

- poor juvenile salmonid rearing habitat with no spawning capability,
- provides shelter and feeding habitat for larger, older salmonid (especially Brook Trout),
- water flows usually are sluggish and varies in depth
- substrate is soft sediment or sand, occasionally large boulders or bedrock and;
- general habitat types consist of flats, pools and glides.

The footprint of the proposed turbine infrastructure will maintain a 30m setback from the fen wetland and Weldon Creek, therefore no impacts to fish habitat are expected as a result of the proposed Project.

8.0 SAR AND SOCI

A Species at Risk (SAR) is a species which is legally protected under the federal Species at Risk Act (SARA) or the provincial New Brunswick Endangered Species Act (NBSARA), while a Species of Conservation Interest is one which is listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or one which is classified as S1 to S3 by the ACCDC.

8.1 Desktop Review

A review of Atlantic Canada Conservation Data Centre (ACCDC) findings confirms the presence of several priority species in proximity to the Study Area. The ACCDC identified the following records of SAR, SOCI and Special Areas within 5 km of the Study Area including:

- 57 records of 15 vascular flora;
- 1 record of 1 nonvascular flora;
- 275 records of 42 vertebrate; and,
- 4 records of 4 invertebrates.

Of these identified records, eleven SAR were identified within 5 km of Study Area:

- Bathurst Aster (SARA Special Concern, NBSARA Endangered)
 - Habitat: Brackish or salt marshes and flats, marshes, shores of rivers or lakes. Habitat not present within the Study Area.
- Piping Plover (SARA & NBSARA Endangered)
 - Habitat: breeds in open or sparsely vegetated areas on coastal beaches, especially wide, dune-backed beaches. Habitat not present within the Study Area.
- Wood Thrush (NBSARA Threatened)
 - Habitat: forests dominated by older deciduous trees, especially poplar and red maple. The species' slight preference for immature spruce and sapling pin cherry, ash, and alder may stem from its need for a shrubby understorey to nest in. Habitat is present within the Study Area.
- Whip-poor-will (SARA & NBSARA Threatened)
 - Habitat: nests in deciduous and mixed forests that have little understorey and have nearby open areas for foraging. Habitat is present within the Study Area.
- Bank Swallow (NBSARA Threatened)
 - Habitat: nests in sandy banks and cliffs along watercourses and coastlines, but it will also take advantage of man-made habitats, such as gravel pits, roadsides, or sand piles. Nest sites require vertical banks where adults can dig nest burrows and are always close to open areas where the birds can forage. In the Maritimes, the species is strongly associated with coastal habitats such as beaches and dunes and with other open foraging areas, such as cultivated grasslands, barelands, and bogs. Nesting habitat is not present within the Study Area.
- Bobolink (NBSARA Threatened)

- Habitat: strong preference for cultivated grassland. Abundance is highest in agricultural regions, including PEI and the lowlands of NB and NS, and lowest within heavily forested regions. In the Maritimes, the Bobolink breeds in fen, floodplain, and upper saltmarsh meadows, to a limited extent. Habitat is not present within the Study Area.
- Olive Sided Flycatcher (SARA & NBSARA Threatened)
 - Habitat: typically found in moist, mixed coniferous forest with both mature and regenerating components, adjacent to shrubby forested wetlands, bogs, fens, beaver ponds, or clear-cuts. Habitat is present within the Study Area.
- Canada Warbler (SARA & NBSARA Threatened)
 - Habitat: associated with mature cedar swamps and other wet habitats such as beaver ponds and forested wetlands, as well as with complex, mature or regenerating mixed forests, partial cuts, and shrublands. Habitat is present within the Study Area.
- Eastern Wood Pewee (NBSARA Special Concern)
 - Habitat: found in older, predominantly deciduous forests, often mixed with mature hemlock or pine. It also shows some preference for riparian forests, especially in NB, and avoids young coniferous and managed forests as well as human-occupied areas. Habitat is present within the Study Area.
- Bald Eagle (NBSARA Endangered)
 - Habitat: uses a wide range of habitats, particularly lakes, reservoirs, rivers, marshes, and coasts. Habitat is not present within the Study Area.
- Peregrine Falcon – anatum/tundrius pop. (SARA Special Concern, NBSARA Threatened)
 - Habitat: offshore cliff faces near an abundance of nesting shorebirds as a prey source. Habitat is not present within the Study Area.

The Crown Lands Conservation Areas database was reviewed to determine potential significant habitat within the vicinity of the Study Area. No significant habitat for priority species was identified in the database, although as discussed in Section 2.0, the database identified some areas of Conservation Forest (Old Forest Target [Spruce/ Fir]) (Askanas, Pers. Communication, 2017).

A summary of federally and provincially protected species identified within 20km of the Study Area is provided below (Table 21). For avifaunal priority species, breeding status as documented in the second atlas survey of the Maritime Breeding Bird Atlas (square 20LS56, from 2006-2010) is also included. If the species was observed during atlas surveys, with no breeding evidence noted, this is indicated below as well.

Table 22. Summary of ACCDC observations of federally and provincially protected species within 20km of the Study Area.

Scientific Name	Common Name	COSEWIC	SARA	NBSARA	S Rank	Distance (km)	MBBA
<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	13.5 ± 1.0	Not Obs.
<i>Buteo lineatus</i>	Red-shouldered Hawk	Not At Risk	Special Concern		S2B,S2M	14.7 ± 0.0	Not Obs.
<i>Calidris canutus rufa</i>	Red Knot rufa ssp	Endangered		Endangered	S2M	13.5 ± 2.0	Not Obs.
<i>Caprimulgus vociferus</i>	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	2.5 ± 7.0	Not Obs.
<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2B,S2M	17.3 ± 13.0	Not Obs.
<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	17.8 ± 15.0	Obs.
<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	0.5 ± 10.0	Obs.
<i>Chordeiles minor</i>	Common Nighthawk	Threatened	Threatened	Threatened	S3B,S4M	13.6 ± 0.0	Obs.
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B,S3S4M	2.5 ± 2.0	Possible
<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	2.8 ± 0.0	Possible
<i>Dermochelys coriacea</i> (Atlantic pop.)	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	19.0 ± 0.0	n/a
<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened		Threatened	S3B,S3M	0.5 ± 2.0	Confirmed
<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	12.0 ± 7.0	Obs.
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B,S3M	4.7 ± 0.0	Not Obs.
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2S3	6.6 ± 0.0	n/a
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Not At Risk		Endangered	S4	0.5 ± 1.0	Obs.
<i>Hirundo rustica</i>	Barn Swallow	Threatened		Threatened	S3B,S3M	0.5 ± 10.0	Confirmed
<i>Hylocichla mustelina</i>	Wood Thrush	Threatened		Threatened	S1S2B,S1S2M	2.5 ± 7.0	Observed
<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S3	16.3 ± 0.0	n/a
<i>Morone saxatilis</i>	Striped Bass	Special Concern		Special Concern	S2	4.6 ± 10.0	n/a
<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	16.5 ± 1.0	n/a
<i>Sturnella magna</i>	Eastern Meadowlark	Threatened		Threatened	S1B,S1M	19.5 ± 7.0	Not Obs.
<i>Puma concolor pop. 1</i>	Cougar - Eastern pop.	Data Deficient		Endangered	SU	6.4 ± 1.0	n/a
<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Threatened	S3S4B,S3S4M	2.4 ± 0.0	Possible
<i>Alasmidonta varicosa</i>	Brook Floater	Special Concern		Special Concern	S2	14.3 ± 0.0	n/a
<i>Juglans cinerea</i>	Butternut	Endangered	Endangered	Endangered	S1	18.1 ± 0.0	n/a
<i>Listera australis</i>	Southern Twayblade			Endangered	S2	17.9 ± 0.0	n/a
<i>Symphyotrichum laurentianum</i>	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	12.4 ± 0.0	n/a
<i>Symphyotrichum subulatum</i> (Bathurst pop)	Bathurst Aster - Bathurst pop.	Special Concern	Special Concern	Endangered	S2	3.2 ± 0.0	n/a

8.2 Field Results

8.2.1 Flora

The Study Area was assessed for rare, sensitive and at-risk vegetation during the field surveys in 2017. Early spring ephemeral surveys and late season surveys were completed throughout the Study Area. Care was taken to assess for potential rare vegetation species and habitats that were identified from the ACCDC data search and present on the priority species list.

During field studies at the Study Area, no flora species of conservation interest (SOCI) or species at risk (SAR) were identified.

8.2.2 Herpetofauna

The Study Area was assessed for rare, sensitive and at-risk herpetofauna species during the field surveys in 2017. Care was taken to assess for potential rare species and habitats that were identified from the ACCDC data search and the priority species list. Based on data provided by the ACCDC, Wood Turtles (*Glyptemys insculpta*) and Snapping Turtles (*Chelydra serpentina*), which are both considered location sensitive species, have not been documented within 5km of the Study Area.

No herpetofaunal species at risk or species of conservation interest were observed within the Study Area during 2017 field surveys. Weldon Creek and the adjacent fen wetland habitat provides potential Snapping Turtle habitat (i.e. slow-moving streams and sometimes in brackish water if these water bodies have soft mud bottoms and abundant aquatic vegetation). However, there is no suitable Wood Turtle habitat present within the Study Area. Snapping Turtles could access the treed swamp from the fen during periods of high flow/flooded spring conditions, but the treed swamp does not provide ideal habitat for this species generally.

8.2.3 Mammals

Based on data available in the priority species list and the ACCDC report, the Study Area has potential to support several species of bats and the Southern Bog Lemming. Bat species are discussed in further detail in Section 6.0.

The Southern Bog Lemming (*Synaptomys cooperi*, S3S4) occur in a wide variety of habitats, and it has been documented within 2km of the Study Area by the ACCDC. As their common name suggests, they are often found in sphagnum bogs and low moist places, but they are also found in grasslands, mixed deciduous/coniferous forests, spruce-fir forests, freshwater wetlands, marshes, and meadows. Care was taken to identify signs of the Southern Bog Lemming during field evaluations completed in 2017. No evidence was observed; however, it is important to note that small species such as lemmings are very elusive and difficult to identify in the field. Ideal tracking conditions are required to identify tracks, and even under ideal conditions, tracks are very difficult to distinguish from common Meadow Vole (*Microtus pennsylvanicus*). Furthermore, scat is virtually non-distinguishable from other lemmings, mice and voles. No evidence of the Southern Bog Lemming, or other mammalian priority species were documented during field assessments. Given the proximity of the Southern Bog Lemming observations to the Study Area, it is expected that this species uses the Study Area periodically.

8.2.4 Avifauna

Several Avian priority species have been documented within the vicinity of the Study Area, as outlined in Table 22 above. Based on the desktop review and habitat present within, and surrounding the Study Area, MEL established bird survey protocols to identify the diversity of species using the Study Area, particularly the priority species. This included focused surveys for Common Nighthawk (breeding season) and waterfowl surveys (fall), in addition to point count surveys (Spring, Breeding and Fall). Six avian priority species (five SAR and one SOCI) were observed within and surrounding the Study Area during bird surveys completed in 2017 (see Table 23 and discussions below).

Table 23: Observed Avian SAR and SOCI

Scientific Name	Common Name	COSEWIC	SARA	NBSARA	S Rank
<i>Haliaeetus leucocephalus</i>	Bald Eagle	-	-	Endangered	S3B
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon	Special Concern	Special Concern	Endangered	S1B
<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B
<i>Charadrius vociferus</i>	Killdeer	-	-	-	S3B
<i>Contopus virens</i>	Eastern Wood Pewee	Special Concern	-	Special Concern	S4BS4M

Bald Eagle

Two immature Bald Eagles were observed 200m west of the “Lake N” survey location on October 17th and were observed to be flying west to east across the middle of the larger pond to the northeast of the Study Area, slightly above the tree line.

The Bald Eagle is adaptable to a wide range of habitats, including agricultural landscapes but generally requires relatively large areas of suitable habitat in mixed or deciduous forest for breeding. Nests are often associated with large rivers or lakes and often located in prominent old growth trees (NSDNR, 2012).

Suitable habitat is not present for roosting (breeding) within the Study Area as it does not comprise old growth trees or larger areas of open water. Weldon Creek offers potential adjacent habitat for roosting, however large old growth trees are not present within the Study Area. In addition, no raptor nests were identified during all field surveys completed within the Study Area and surrounding habitats during bird surveys.

As described above, diurnal movement of two eagles across the Study Area was observed once during the October 17th waterfowl survey, however no other evidence of eagles was noted during all other surveys completed during 2017. As such, the proposed turbine is not expected to interact with significant populations of Bald Eagle.

Peregrine Falcon

One Peregrine Falcon was observed 40m east of the “Lake S” survey location (Figure 4, Appendix A) on November 1st, 2017.

Preferred Peregrine Falcon nesting habitat on shoreline cliff faces where an abundance of migrating shorebirds as a ready prey source during brooding and fledging is present. They breed in open landscapes with cliffs (or skyscrapers) for nest sites, as well as along rivers and coastlines or in cities, where the local Rock Pigeon populations offer a reliable food supply. In migration and winter, you can find Peregrine Falcons in nearly any open habitat, but with a greater likelihood along barrier islands, mudflats, coastlines, lake edges, and mountain chains (Cornell Lab of Ornithology, 2015). The Study Area and surrounding landscape do not provide preferred nesting habitat due to the lack of elevation provided by trees, cliffs or buildings, however the open areas of the abandoned quarry may offer some potential for food supply. With this being said, the low numbers of birds observed at this location during fall surveys in combination with a lack of migrating shorebirds suggests that that the habitat within and surrounding the Study Area are not ideal habitat to support this species.

Similar to the Bald Eagle, it is possible the Peregrine Falcon may be at elevated risk of turbine collision when in pursuit of prey (i.e. during diurnal activities). However, due to the lack of activity observed for this species, the proposed turbine is not expected to interact with significant populations of Peregrine Falcon.

Rusty Blackbird

One Rusty Blackbird was observed on October 17th, 70m north of “Lake N” during waterfowl surveys. This location falls alongside habitat adjacent to Weldon Creek as it adjoins the abandoned quarries. This habitat conforms to the Rusty Blackbird’s preferred habitat which includes forest wetlands, such as slow moving streams, peat bogs, sedge meadows, marshes, swamps, beaver ponds and pasture edges. In winter, it occurs primarily in damp woodlands and cultivated fields (COSEWIC, 2006). Appropriate habitat for the Rusty Blackbird is therefore present along Weldon Creek which extends to the north of the proposed turbine. With that being said however, only one Rusty Blackbird was observed during 2017 bird surveys, and the fen wetland providing the suited habitat is to be avoided by the proposed activities. Therefore, limited suitable habitat is provided within the majority of the Study Area, and as such potential nesting habitat for this species will not be impacted.

The Rusty Blackbird is generally absent from wetlands in regions above the tree line (i.e. they prefer to remain within, or below the canopy) (COSEWIC, 2006), therefore interaction with the turbine RSA is not expected.

Olive-sided Flycatcher

One Olive-sided Flycatcher (*Contopus cooperi*, ranked S3B, S3M, SARA and NBSARA Threatened) was observed during a breeding season survey at PC6, north of the Study Area on June 30th, 2017 (Figure 4, Appendix A). It was observed singing, which is evidence of possible breeding. Olive-sided Flycatchers build their nest in conifer trees with twigs and rootlets. They nest within the forest edge near forest clearings (natural or man-made). There are forest clearings within the Study Area that provide suitable breeding habitat for the Olive-sided Flycatcher.

Construction of the access road and turbine pad may disrupt breeding birds such as the Olive-sided Flycatcher. While this species was not observed within the Study Area, and it is identified as a possible breeder only, it is reasonable to expect this species may use the Study Area to breed from time to time. Clearing and grubbing in preparation of ground disturbance should be conducted outside of the breeding season (May-September for most species) to avoid direct or indirect impact to nesting birds in the vicinity of the Study Area. The Olive-sided Flycatcher does not have specific behaviours (foraging strategies, mating displays, etc) which place it at an elevated risk of interaction with the turbine.

Eastern Wood Pewee

A single Eastern Wood Pewee (*Contopus virens*, ranked S4B, S4M, COSEWIC and NBSARA SC) was observed at PC4 on June 13th, 2017. PC4 is located adjacent to the proposed turbine location, however, the bird was heard calling from approximately 100m to the north (two faint calls). This is evidence of possible breeding within close proximity to the proposed turbine. The Eastern Wood Pewee is found in older, predominantly deciduous forests, often mixed with mature hemlock or pine. It also shows some preference for riparian forests, especially in NB, and avoids young coniferous and managed forests as well as human-occupied areas. Suitable breeding habitat is available within the Study Area for this species.

The Eastern Wood Pewee was documented as a possible breeder in an area north of the proposed turbine location. Similar to the Olive-sided Flycatcher, the Eastern Wood Pewee may be disturbed, either directly or indirectly through on-site construction of the access road and the turbine pad. This species does not have specific behaviours (foraging strategies, mating displays, etc) which place it at an elevated risk of interaction with the turbine. Limiting clearing activities to outside the accepted breeding bird season will reduce potential impacts to this species.

Killdeer

One Killdeer (*Charadrius vociferous*, ranked S3M, S3M) was observed at PC7, east of the Study Area on May 13th and PC6 (north of the Study Area within the scrubby fen habitat) on August 29th, 2017. The Killdeer is associated primarily with open habitats dominated by cultivated grasslands or, especially in NB, coastal marshes and mudflats. The Killdeer is most often detected in the lowlands of NB and NS, regions characterized by open landscapes, especially farmlands. Suitable breeding habitat for this species is provided in the nearby quarry and roadsides within the Study Area.

Where Killdeer are attracted to bare ground for nesting, the Project has the potential to increase habitat availability for this species through construction of roads. To minimize potential interactions, it is recommended that bare ground is minimized, by re-vegetating lay-down yards and as much of the turbine pad area as is possible following construction of the Turbine.

8.2.4.1 Avian Summary

Based on surveys completed in 2017, the Study Area supports very few avifauna Species at Risk or Species of Conservation Interest. Potential site sensitivity was determined to be high, based on the site's proximity to the coastline, coastal islands, and an IBA (Kouchibouguac National Park Sand Islands IBA). The IBA, located approximately 5km northeast of the Study Area is a collection of sand spits and coastal barrier islands which supports breeding sites for Common Terns and Piping Plovers, along with an abundance of other shorebirds. Habitat present within the Study Area does not support the same

assemblage of species, however, it is important to understand how congregations of shorebirds move into, and out of the IBA, and whether the construction of a single turbine would elevate risk to migrating shorebirds. Spring and Fall migration surveys were conducted, and no significant congregations of migrating species of any kind was observed. In the Spring, Waterfowl, Shorebirds and Other Waterbirds (Bird groups 1-3, defined in Section 5.3) accounted for 9.1% of all individuals observed, and the majority of these were Canada Geese, observed in groups of 1-5 individuals. During fall migration surveys, these groups accounted for 10.9% of individuals observed. Similar to the spring migration, the majority of these observations were of Canada Geese and Common Loons. During focused waterfowl surveys conducted during the fall of 2017, species within these groups accounted for only 5% of individuals observed. The Study Area does not appear to be a migratory flyway for shorebirds to move into or out of the Kouchibouguac NP IBA.

Construction, in particular site preparation, during the breeding season for birds has the potential to cause direct mortality, abandonment of nests, the destruction of nest contents, which could include species designated as SAR or SOCI. If adjacent suitable habitat is not available, birds that have been displaced will not likely nest until nearby habitat becomes available, as most birds return to the same general area from year to year. This may result in a higher non-breeding population. The construction phase of the Project is planned to take place outside of the nesting season for most birds (May-August). General mitigation for avifauna is expected to be suitable to minimize direct and indirect effects to avifauna SAR and SOCI.

8.2.5 Fish

Based on data provided by the ACCDC, one priority freshwater fish species has been documented within 20km of the Study Area. The Striped Bass (*Morone saxatilis*, Southern Gulf of St. Lawrence Population, COSEWIC & NBSARA Special Concern, S2) is identified approximately 4.6 km from the Study Area. The Striped Bass is typically associated with estuaries and coastal waters. The species requires high quality spawning and nursery habitat and abundant aquatic species for food. Striped bass spawn in freshwater and occasionally brackish water. Egg incubation, larval and young-of-the-year development correspond to a gradual movement downstream to saltwater, where they typically feed and grow for several years before reaching maturity. A particular feature of the Canadian striped bass population is that they overwinter in rivers in order to escape the cold ocean waters.

While not documented within 20km by the ACCDC, Atlantic Salmon (*Salmo salar*, NBSARA and COSEWIC Special Concern, S2S3) are identified to potentially be located within Weldon Creek in the Ecosystem Overview of the Richibucto Watershed (DFOC, 2008). The Atlantic Salmon is an anadromous fish, typically spending 2-3 years in freshwater, migrating to the ocean where it also spends 2-3 years, and then returning to its natal river to spawn. Suitable spawning habitat consists of gravel or rubble in areas of moving water. Eggs hatch in March or April and become fry. Fry remain buried in the gravel for about six weeks. The fry emerge from the gravel about mid-May and start feeding on plankton and small invertebrates. Emergent fry quickly disperse from nests (called redds) within the gravel. They develop camouflaging stripes along their sides and enter what is termed the parr stage. Parr habitat, often called "nursery habitat," is typically riffle areas characterized by adequate cover, shallow water depth, and moderate to fast water flow. Salmon parr spend 2-3 years in freshwater and then undergo a physiological transformation called smoltification that prepares them for life in a marine habitat.

A review of field results of the aquatic environment (wetlands and watercourses) confirms that a mixed-wood treed swamp, a graminoid fen, and a single watercourse (Weldon Creek) is present within the Study Area. Weldon Creek flows through the graminoid fen at the northern extent of the Study Area through Loggies Pond, eventually into the Richibucto River.

As discussed in Section 7.0, the mixed-wood treed swamp is contiguous with fen habitat located west of the proposed turbine and its associated watercourse (Weldon Creek). Although potential for fish passage during high flow conditions is possible in the treed swamp, fish habitat quality within the wetland itself is considered low (i.e. temporary areas of standing water). There are no direct surface water connections between the wetland present in the Study Area and the ponded features existing in the abandoned quarry to the north.

Due to its floodplain characteristics, fish access is possible within the fen, especially during spring and periods of high flow. Small off-shoot channels and standing water provide opportunity for fish to access various parts of the wetland and utilize it for feeding and refuge, however, the overall habitat for fish within the wetland is not considered critical (i.e. spawning habitat). No direct impacts to the fen will occur as a result of the proposed activities.

Due to an up-stream commercial peat facility and anthropogenic features associated with it, up-stream fish habitat is not regarded high quality.

The proposed Project is not expected to directly impact fish habitat, and quality fish habitat was not identified within the Study Area, therefore dedicated fish surveys were not completed. No fish SAR or SOCI were observed during biophysical watercourse and wetland characterisation and evaluations completed during 2017. Suitable fish habitat for Atlantic Salmon and Striped Bass (both are Southern Gulf of St. Lawrence Populations) is present within Weldon Creek which flows through the graminoid fen described previously, however habitat quality for these species is low within these features (i.e. mucky substrate, slow moving water).

The proposed turbine will be setback a minimum of 30m from the fen/Weldon Creek system, therefore no direct impacts are expected to this habitat, and general mitigation for aquatic environments is expected to be suitable to minimize indirect effects to fish SAR and SOCI.

9.0 SUMMARY

This biophysical study was completed in support of registering a provincial Environmental Impact Assessment (EIA) with New Brunswick Department of Environment and Local Government (DELG) for a one turbine wind power project in Richibucto, NB. The Study encompasses a general review of desktop resources, and the completion of a field assessment to identify existing biophysical conditions and determine potential environmental constraints and sensitivities occurring within, and in close proximity to the Study Area.

This Report has considered relevant factors and influences pertinent within the scope of the assessment and has completed and provided relevant information in accordance with the methodologies described.

The undersigned has considered relevant factors and influences pertinent within the scope of the assessment and written and combined and referenced the report accordingly.



Andy Walter
Senior Project Manager
McCallum Environmental Ltd.

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Appendix A. FIGURES


Prepared For:



FIGURE 1

**Richibucto Wind Project
Project Location**

**Location:
Richibucto, Nova Scotia**

 Study Area Boundary



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 500 1,000 2,000 m

1:35,000 Scale when printed @ 11" x 17"

Drawn By: LP

Date: 2017-11-13



McCallum Environmental Ltd.



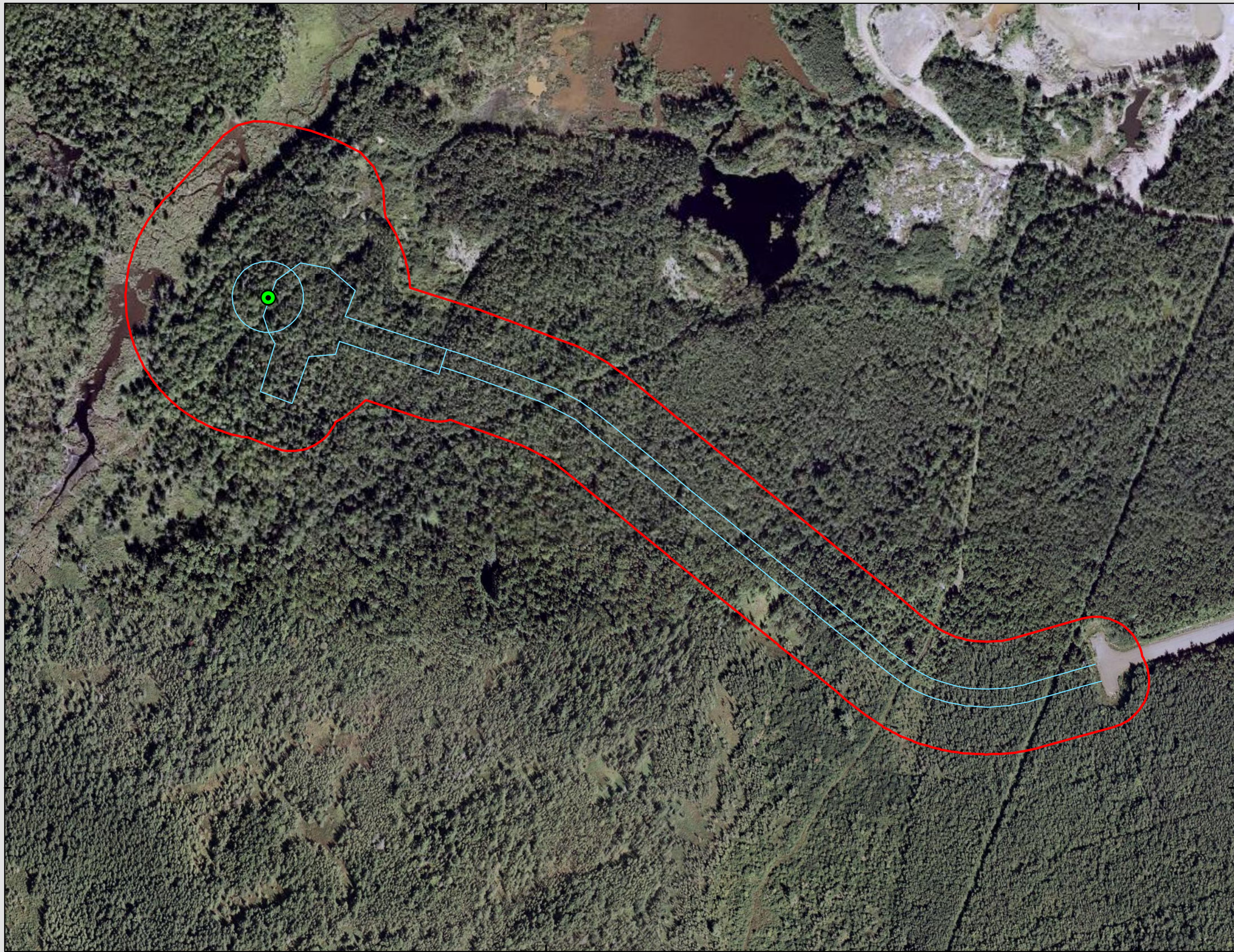






FIGURE 2
Richibucto Wind Project
Study Area and
Infrastructure

Location:
Richibucto, Nova Scotia

-  Proposed Turbine Location
-  Project Infrastructure
-  Study Area Boundary



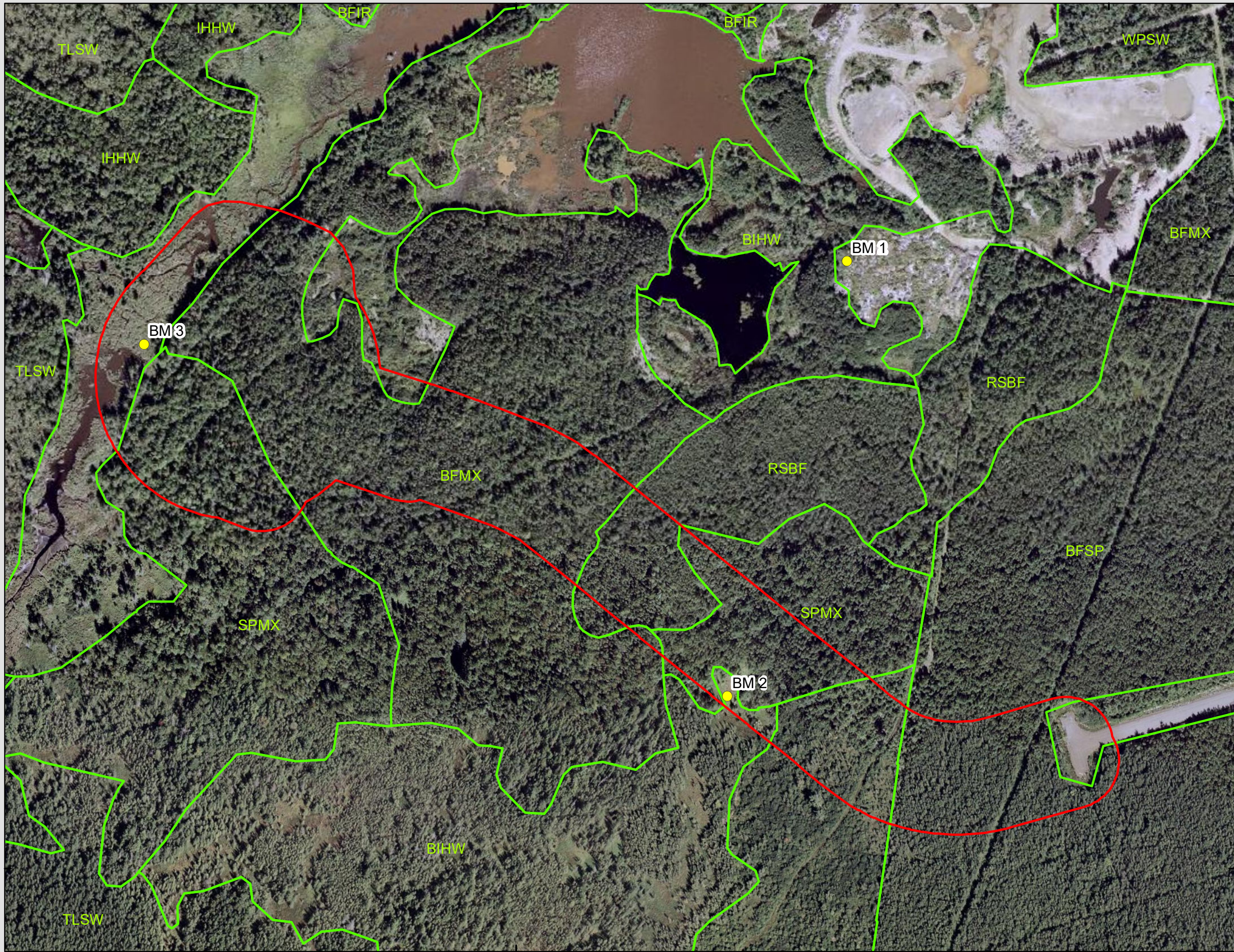
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 Projection: Transverse Mercator
 Datum: North American 1983 CSRS
 Units: Meter



0 37.5 75 150 m

1:3,000 Scale when printed @ 11" x 17"

Drawn By: LP Date: 2017-11-13



Prepared For:



FIGURE 3

**Richibucto Wind Project
Habitat and Bat Monitor
Locations**

**Location:
Richibucto, Nova Scotia**

- Bat Monitor Locations
- Study Area Boundary
- GeoNB Forest Layer



Coordinate System: NAD 1983 CSRS UTM Zone 20N
 Projection: Transverse Mercator
 Datum: North American 1983 CSRS
 Units: Meter



0 37.5 75 150 m

1:3,000 Scale when printed @ 11" x 17"

Drawn By: LP

Date: 2017-11-13



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Prepared For:







FIGURE 4

Richibucto Wind Project
Bird Survey Locations

Location:
Richibucto, Nova Scotia

Bird Survey Type

-  Common Nighthawk Survey
-  Point Count
-  Waterfowl Watch
-  Study Area Boundary



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



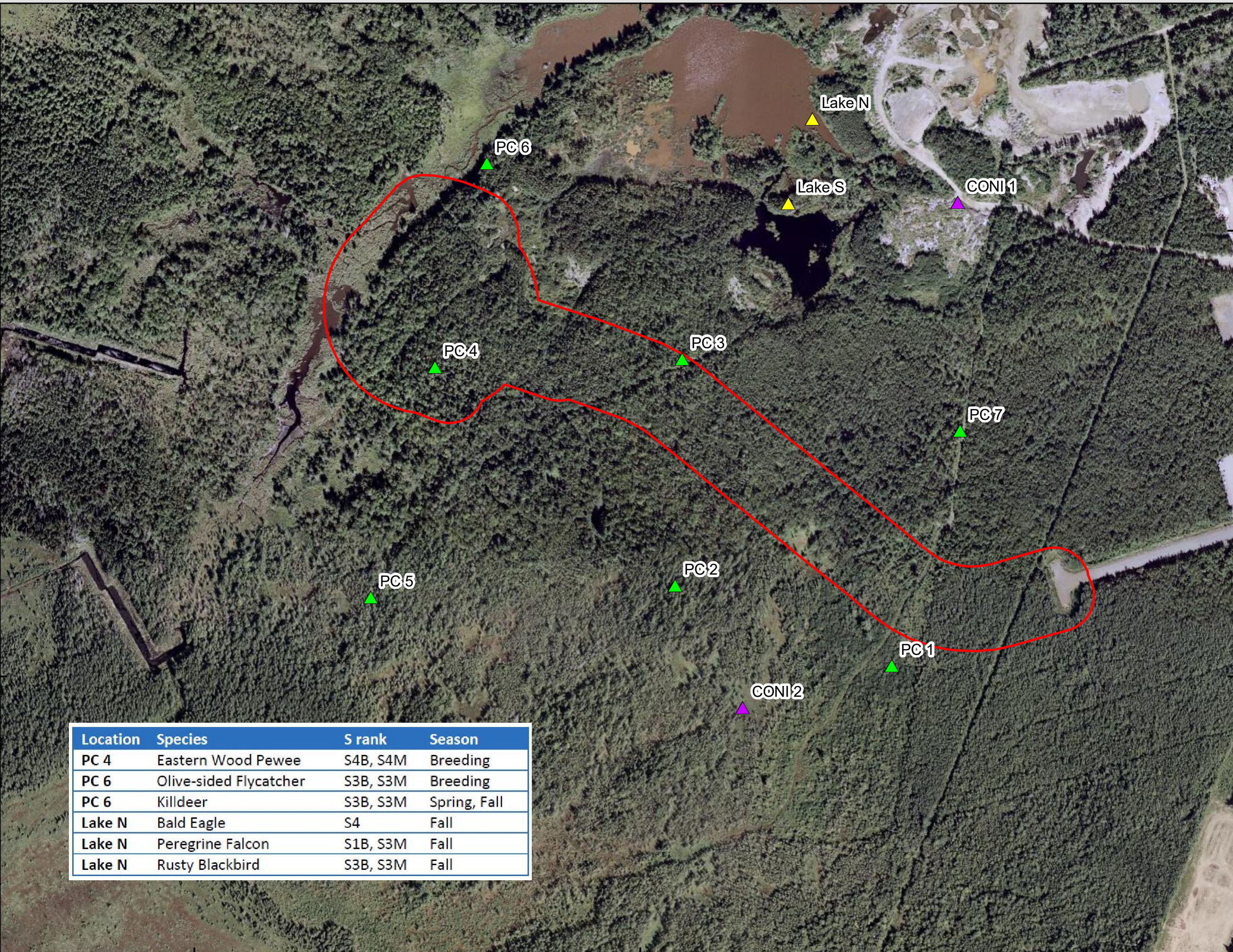
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Drawn By: LP

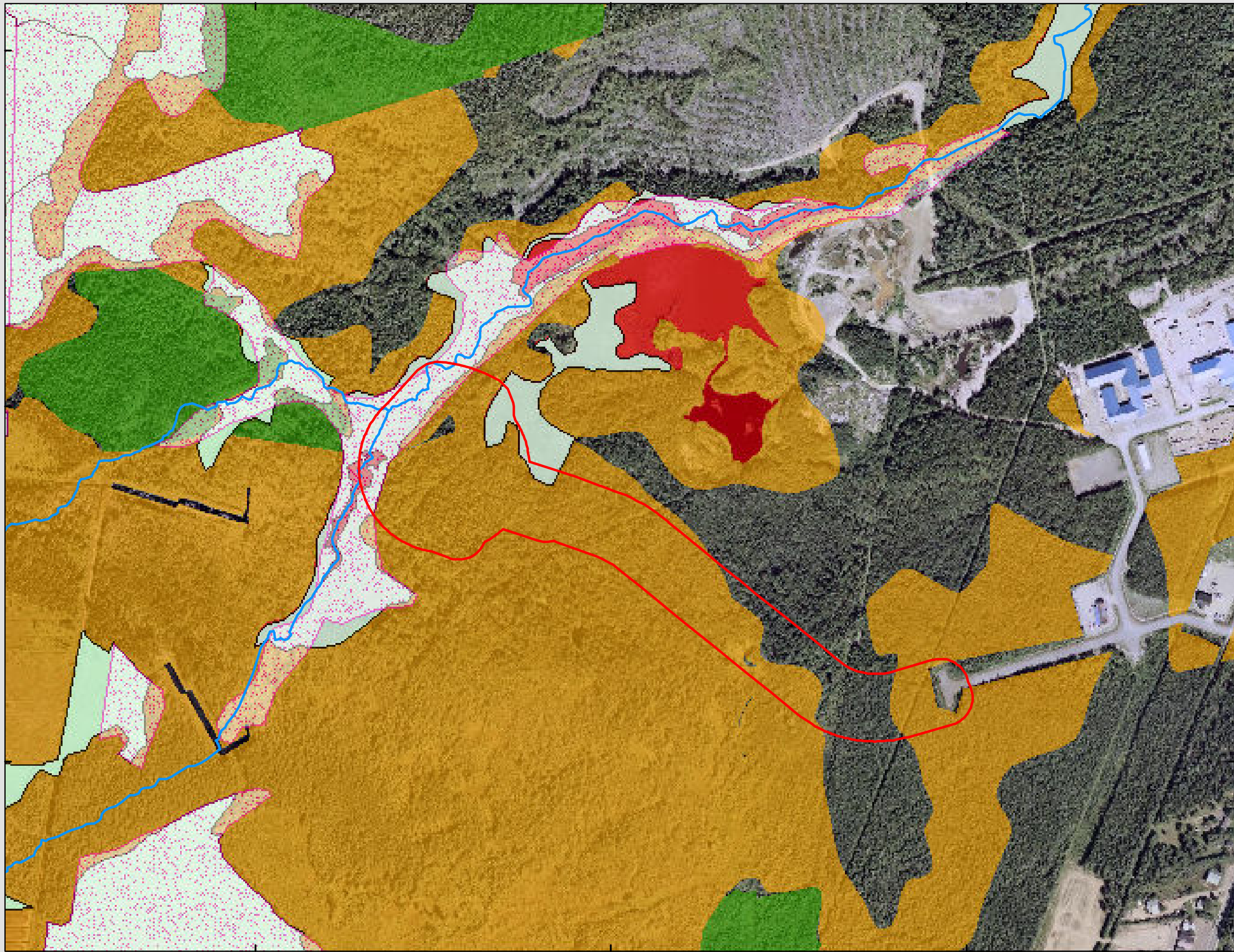
Date: 2017-11-13



McCallum Environmental Ltd.



Location	Species	S rank	Season
PC 4	Eastern Wood Pewee	S4B, S4M	Breeding
PC 6	Olive-sided Flycatcher	S3B, S3M	Breeding
PC 6	Killdeer	S3B, S3M	Spring, Fall
Lake N	Bald Eagle	S4	Fall
Lake N	Peregrine Falcon	S1B, S3M	Fall
Lake N	Rusty Blackbird	S3B, S3M	Fall



Prepared For:



FIGURE 5A

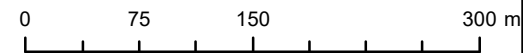
**Richibucto Wind Project
Aquatic Desktop Review**

**Location:
Richibucto, Nova Scotia**

-  NBHN Mapped Watercourse
-  NBHN Mapped Wetlands
- Wetlands (draft)**
-  Provincially Significant Wetlands
-  Intermediate Wetlands
-  Forested Wetlands
-  Provincially Significant Wetlands Layer
-  Regulated Wetlands
-  Study Area Boundary



Coordinate System: NAD 1983 CSRS UTM Zone 20N
 Projection: Transverse Mercator
 Datum: North American 1983 CSRS
 Units: Meter



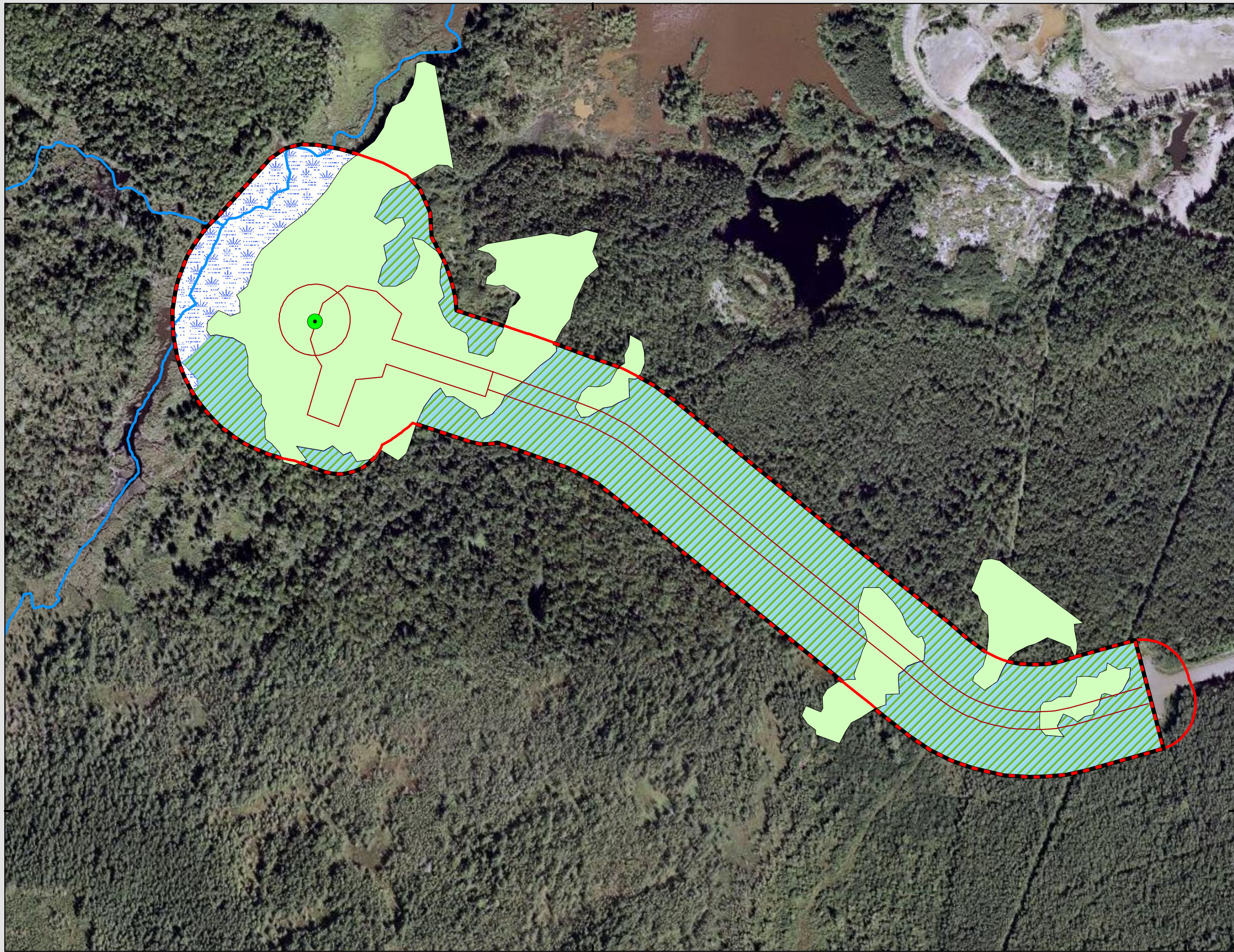
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Drawn By: LP

Date: 2017-11-13



McCallum Environmental Ltd.











Prepared For:



FIGURE 5B

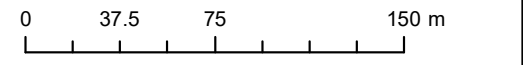
**Richibucto Wind Project
Aquatic Field Results**

**Location:
Richibucto, Nova Scotia**

-  Proposed Turbine Location
-  Project Infrastructure
-  NBHN Mapped Watercourse
-  Wetland extends past boundary
-  Field Delineated Upland
-  Fen Wetland
-  Mixedwood Treed Swamp
-  Study Area Boundary



Coordinate System: NAD 1983 CSRS UTM Zone 20N
 Projection: Transverse Mercator
 Datum: North American 1983 CSRS
 Units: Meter



1:3,000 Scale when printed @ 11" x 17"

Drawn By: LP Date: 2017-11-13



McCallum Environmental Ltd.

Appendix B. PROJECT TEAM MEMBERS' CVs

Years in Practice

8

Certifications

Nova Scotia Advanced Wetlands Delineator and Evaluator

Memberships

Nova Scotia Wetlands Delineation, Maritime College of Forest Technology

Education

- BSc. (Horticulture), Essex University (UK), 2003-2005

Training

- Wetland Construction: Principles, Planning and Design, Rutgers, 2016
- Wetland Functional Assessment Training Workshop, NSE 2013
- Urban Wetland Restoration: A Watershed Approach, 2012
- Nova Scotia Advanced Wetlands Delineation and Evaluation Course, 2010;
- Water Management and Wetland Restoration Training Course, 2014;
- Identifying and Delineating Wetlands for Nova Scotia, 2009
- Watercourse Alteration Certification (Nova Scotia Environment) (2008)
- Saint John Ambulance Emergency First Aid, AED, CPR(C). 2016

Summary

Mr. Walter is a trained biologist and wetland specialist, and has extensive experience managing technical biophysical projects and ecological studies within Atlantic Canada. Mr. Walter is knowledgeable in federal, provincial, and municipal environmental regulations and guidelines applicable to Atlantic Canada, and works closely with all necessary regulatory agencies to facilitate project implementation. As senior project manager, Mr. Walter ensures biophysical field programs are tailored to the needs of the client and project, while meeting regulatory standards. Mr. Walter has provided environmental support to the planning process in a wide range of project types including residential development, industrial projects (mining, pit and quarry), transmission line and hydro dam infrastructure and highway construction to name a few. Mr. Walter has managed the environmental processes associated with multiple wind energy developments in Nova Scotia, including compilation of provincial environmental assessment (EA) documents, and implementation of associated EA biophysical field surveys and ecological inventories, as well as acquiring pertinent environmental information required for regulatory permitting.

Mr. Walter has been a board member of the Atlantic Canadian Land Reclamation Association (CLRA) since 2014, and has a vested interest, and experience in reclaiming and restoring degraded habitats. Mr. Walter assists in the identification of potential compensation sites for wetland and fish habitat alterations, reviews databases, mapping, and aerial imagery, completes ground truthing and consults with local environmental groups and government to identify potential sites.

Mr. Walter is proficient in engagement with project related stakeholders, including community groups, governmental departments and other stakeholders. He has facilitated and executed many public information sessions and open house events for wind energy developments in the Maritimes, and has proved proficient at effectively communicating environmental study findings and information to members of the public.

Mr. Walter's ability to effectively and successfully manage environmental projects stems from his experiences completing a wide range of biophysical field studies. As a trained field biologist, Mr. Walter has completed terrestrial and stream habitat assessments, and flora and fauna surveys, including desktop reviews and characterization of biophysical environments. Mr. Walter also completes numerous fish habitat/watercourse assessments for effects monitoring, watercourse alteration, and HADD authorization projects. Assessments have also included water quality sampling, benthic sampling, and biophysical characterization (channel depth and width, stream velocity, fish habitat assessment) of water bodies.

As a qualified wetland delineator and wetland function evaluator for Atlantic Canada, Andy has completed delineation of hundreds of wetlands. Projects often involve the completion of species at risk assessments, functions assessments, and detailed wetland characterization in support of provincial wetland alteration applications. In addition, following alteration approval, Mr. Walter supervises construction activities for numerous construction projects in wetland habitat ensuring that erosion and sedimentation control measures are implemented prior to construction, and monitors activities during construction to ensure wetland protection measures are effective.

Project Experience

- Managed and executed an extensive desktop study to evaluate wetland restoration potential within two Secondary watersheds in Nova Scotia. The

Andy Walter, BSc. (Hort)
andy@mccallumenvironmental.com
Senior Project Manager

study was completed to identify wetland compensation sites in support of the Nova Scotia Wetland Conservation Policy. 2016-2017.

- In collaboration with Nova Scotia Environment, designed, planned and implemented a study to facilitate a new method of wetland functional assessment (known as WESP) in the province. The study included the completion of baseline WESP evaluations at 125 wetlands throughout the province and regionalizing the WESP process for Nova Scotia.
- Management and completion of terrestrial habitat mapping, wetland delineation and vegetation surveys in support of EA and regulatory permitting for the South Canoe Wind Project (80MW wind Project in Nova Scotia) 2011-2014.
- Management of a multi-faceted avian study in support of a provincial EA at Aulds Cove, NS.
- Completion of seven provincial environmental assessments and baseline surveys for community wind projects in Nova Scotia in 2012-2014.
- Terrestrial habitat mapping, wetland delineation and vegetation surveys in support of a 65km distribution transmission line in central Nova Scotia.
- Wetland delineation, species at risk, watercourses and flora surveys at the site of a proposed quarry in Nova Scotia. Subsequent facilitation of wetland alteration permit to alter in excess of 20 hectares of wetland.
- Implemented the passive wetland restoration strategy at a disturbed wetland on NSDNR property. Completed regular monitoring of vegetation, soil, and hydrology conditions and developed project recommendations accordingly (2009-2011).
- Wetland delineation, species at risk, watercourses and flora surveys at the site of a proposed 22km railway line and shipping container terminal in eastern Nova Scotia (2012-2014).
- Completion of wetland delineation and watercourse identification and associated regulatory permitting at multiple developments in Nova Scotia (2009-2016).

Work Experience

Strum Environmental Services Ltd., Nova Scotia 2008-2015

Environmental Specialist/Project Manager- provided project management and biophysical field evaluation expertise for development clients across Atlantic Canada. Projects included environmental assessment, large scale commercial, residential and wind power developments, wetland and watercourse alteration projects, wetland compensation planning and implementation, wetland restoration and creation projects, avian studies, and regulatory consultation.

Years in Practice

12

Education

Masters of Resource and Environmental Management, Dalhousie University, 2009-2011

B.Sc. Advanced Major in Biology & Interdisciplinary Studies in Aquatic Resources, St. Francis Xavier University, 2001-2005

Training

- ◆ WHMIS, 2017
- ◆ Wetland Delineation Certification, 2013
- ◆ Saint John Ambulance Standard First Aid, AED, CPR(C), 2013
- ◆ Health Safety and Environmental Leadership training and Advanced Safety Audit training, 2009
- ◆ Emergency Operations Centre crisis management training, 2006-2008
- ◆ Introduction to the Fisheries Act and Navigable Waters Protection Act course – ESAA
- ◆ Bear Awareness training and ATV training – Alberta Safety Council, 2006
- ◆ Site Supervisor Safety Training, Construction Safety Training System 2005

Summary

Ms. MacDonald has been in the environmental consulting profession since 2005. She has worked on both project related and research related field assessments in Nova Scotia, Prince Edward Island, and Alberta.

Ms. MacDonald is responsible for completing biophysical assessments, including flora and fauna surveys, avian surveys, and species at risk evaluations, primarily for clients in the energy sector, mining sector, and commercial development sector. Ms. MacDonald coordinates all field staff required to complete all environmental baseline programs for Provincial Environmental Assessment registration. Ms. MacDonald has been responsible for the implementation of six environmental baseline programs for mining, quarry development and energy sector development projects in Nova Scotia in advance of environmental assessment registration.

Selected Project Experience

- Completion of environmental baseline surveys for the federal environmental assessment process for a proposed development of a gold mine in eastern Nova Scotia in 2015 and 2016
- Completion of environmental baseline surveys for Quebec based company for a proposed gold mine expansion in eastern Nova Scotia and the completion of environmental baseline surveys for four Nova Scotian quarry expansion projects in 2012-2016.
- Completed watershed planning for the Sackville River Secondary watershed and Musquodoboit River Secondary Watershed to evaluate wetland restoration potential and to aid in better land use planning, source water protection and management of water resources.
- Completion of surveys associated with wetland alteration applications and associated compensation for multiple wetlands (32 and 24) associated with residential and industrial development in Nova Scotia (2013 and 2016).
- Completion of wetland delineation and watercourse identification for five large scale developments (2 - 200 ha, 300 ha, 400 ha, and 450 ha) from 2012 to 2014.

Experience

McCallum Environmental Ltd., Halifax, Nova Scotia

Biologist and Environmental Specialist/Coordinator:

May-Aug 2011, Jan 2012-Present

- Completing biophysical assessments, including flora and fauna surveys, with emphasis on species at risk. Completing wetland and watercourse delineations and assessments and coordinating migratory bird and bat monitoring. Communicating field survey results and methodologies for Environmental Assessments and other Provincial regulatory applications. Instructed Wetland Delineation course with Fern Hills Institute, Summer 2016.

Amec Colt, Shell/Albian Sands Expansion 1 - Fort McMurray, Alberta.
Environmental Specialist and Area Environmental Lead

July 2008 – October 2009.

- Proactively monitored construction activities via inspections, audits and Environmental Work Permits & Protection Plans to ensure compliance with regulatory approvals, the projects' Environmental Control Plan, and best management practices. Investigated and reported incidents, and liaised between contractors and project owners. Implemented Environmental Awareness and communicated issues via weekly newsletters. Worked as an independent contractor to Amec Colt.

Canadian Natural Resources Ltd. - Fort McMurray, Alberta

Regulatory and Environmental Specialist: October 2005 – July 2008

- Conducted extensive field work in various fish and wildlife programs. Communicated issues with government agencies, contractors and external stakeholders. Performed on-call duties, spill response, and non-compliance reporting and response. Expanded upon site wide procedures for protection of water, wildlife and waterbirds. Played a pivotal role in planning & completion of a fish salvage of 38 km of the Tar River, and in construction of a 77 hectare fish habitat compensation lake (Horizon Lake). Horizon Lake earned CAPP Steward of Excellence Award for Environmental Performance. Hired, trained, and supervised teams of up to four summer interns. Chaired the regional 'Oil Sands Bird and Wildlife Protection Committee.

Years in Practice
3

Education

Bachelor Environmental Science 2011, Dalhousie University

Training

- Saint John Ambulance Emergency First Aid, AED, CPR(A), 2014
- Wetland Delineator's Course – Nova Scotia/New Brunswick
- Watercourse Alteration |Certification for Sizars - Nova Scotia, 2016
- Watercourse Alteration Certification for Installers - Nova Scotia, 2016

Summary

Ryan has worked in biology related environmental consulting since 2011. He has worked on both research related field assessments and project related field assessments in Nova Scotia and Honduras.

Environmental Work Experience

McCallum Environmental Ltd., Halifax, Nova Scotia

Environmental Specialist

June – August 2013; September 2014 - Present

Completing biophysical assessments, including flora and fauna surveys, with emphasis on species at risk. Completing wetland and watercourse delineations and assessments and coordinating migratory monitoring. Communicating field survey results and methodologies for Environmental Assessments and other Provincial regulatory applications.

Tasks

- Flora and Fauna field surveys
- Biophysical assessments including species at risk assessments
- Watercourse and Wetland identification and assessment
- Wetland Delineation, functions assessments and alteration applications
- Construction Monitoring
- Reporting of methodology and results
- Provincial regulatory applications
- GIS

Operation Wallacea (Honduras)

Field Biologist

June-August 2011/2012

Safety, training and engagement of university students; providing direction and guidance that would be used to strengthen their resume and collect data for a dissertation or thesis. Experience and knowledge was used to inspire volunteers in wildlife and conservation research, while providing the collection of large temporal and spatial datasets used for assessing the effectiveness of conservation management interventions.

Tasks

- Biodiversity surveying by sight, auidial and spoor identification
- Guiding dissertation student in data collection techniques
- Jungle Survival & Neo-Tropical Forest Ecology Training
- Working with and fostering solid relationships with local guides
- Contribute (team effort) information to organize effective conservation management programs
- Giving presentations on project aims and goals to volunteers
- Data entry into project database
- ArcGIS and GPS utilization

Years in Practice
5

Education

Bachelor of Natural
Resource Science,
Thompson Rivers
University, 2014

Renewable Resource
Management Diploma,
Lethbridge College, 2011

Training

- ♦ Wetland Delineation Certification, 2013
- ♦ Saint John Ambulance Standard First, AED, CPR(C), 2014
- ♦ ATV Training Course, 2015
- ♦ Certified Crew Supervisor Backpack Electrofishing, June 2015
- ♦ Wildlife Awareness, April 2015

Summary

Ms. Giroux has been in the environmental consulting profession since 2010. She has worked on project related field assessments in Alberta, British Columbia, Manitoba, Nova Scotia and Saskatchewan.

Ms. Giroux is responsible for completing biophysical assessments, including flora and fauna surveys, bird surveys, aquatic surveys, wetland monitoring and species at risk evaluations, primarily for clients in the energy sector, mining sector, and commercial development sector. Ms. Giroux coordinates field programs required to complete environmental baseline programs for Provincial Environmental Assessment registration. Ms. Giroux has been responsible for the implementation of an environmental baseline biophysical programs for mining development a project in Nova Scotia in advance of environmental assessment registration.

Selected Project Experience

- Completion of environmental baseline surveys for the federal environmental assessment process for a proposed development of a gold mine in eastern Nova Scotia in 2016
- Project Scientist; Storm Water Ponds Sediment Sampling; City of Calgary; Alberta; 2015. Conducted storm water pond sediment sampling as crew lead for a municipality-regulated project. Prepared sediment samples for the lab. Assisted in compiling field data for the technical report.
- Water Quality Monitoring; ATCO Pipeline Ltd.; Alberta; 2015. Conducted water quality monitoring on various wetlands along the pipeline corridor.

Experience

McCallum Environmental Ltd., Halifax, Nova Scotia

Biologist and Environmental Specialist:
April 2016-Present

- Completing biophysical assessments, including flora and fauna surveys, with emphasis on species at risk. Completing wetland and watercourse delineations and assessments and coordinating migratory bird and bat monitoring. Communicating field survey results and methodologies for Environmental Assessments and other Provincial regulatory applications.

CH2M Hill, Calgary, Alberta

Intermediate Wetland Ecologist:
2011-2016

- Experienced field biologist who collected field data, including soil, vegetation, noxious weeds, wildlife, hydrologic parameters for various temporary and permanent disturbances to wetlands associated with linear construction projects, including transmission line and pipeline projects, lease sites and facility projects throughout western Canada. Crew lead for wetlands surveys, water quality monitoring, sediment sampling, environmental integrity screenings and reclamation surveys, including noxious weed surveys, soil compaction and crop surveys. Assisted with compiling field data and writing technical reports for various federally, provincially and municipality-regulated projects.

1-506-536-7348

corvus@nbnet.nb.ca

28 High Marsh Road
Sackville NB
E4L 1K2

Experience

**Aster Group Environmental Services Co-operative & Environmental, 2014 to present.*

ACCIONA, BDA Landscape Architects, CBCL, City of Moncton, Daly Point, Dillon Consulting Limited, DTI, Dougan & Associates, Fundy Biosphere Reserve, Get Outside NB, Great Minds Think Outside, Fisheries and Oceans, Fundy Trail Park, Canada, GEMTEC, Groupe Hémisphères inc., Fundy Trail Parkway, Jacques Whitford (Fredericton), McCallum environmental, M. K. Ince and Associates Ltd, Nature Conservancy of Canada, Overdale, Rescan Environmental Services Ltd., Roy Consultants, Stantec, Tetra Tech |Environment Practice, WSP.

**Manager of Education and Outreach, Cape Jourimain Nature Centre, June 2009 to January 2014.*

- Planned, developed and delivered nature and human heritage interpretative programs to visitors, children in schools and at the Cape Jourimain Nature Centre using PowerPoint, story telling, props, images, guided walks, experiments, hands-on activities, movies, ecological games and nature exploration.
 - Developed, evaluated and delivered, in collaboration with the Cocagne Sustainable Development Group Inc., a curriculum elementary program relating to biodiversity for schoolyards.
 - Supervised, trained and evaluated seasonal staff for the nature interpretation program.
 - Organized, with a team, 3 peer-training workshops for environmental educators (Professional Development Team of the Sustainable Education Alliance of NB, formerly the Environmental Education Caucus of the New Brunswick Environmental Network).
 - Managed Renewables NB web site (<http://renewablesnb.ca/>), including planning meetings with stakeholders in the renewables energy field and overseeing the budget.
-

**Consultant, & Conservation Biologist, 2001-9 & 2014*

- Conservation Planning Strategy for the Northumberland Strait Natural Area for the Nature Conservancy of Canada, 2008.
- Curriculum reviewer for Resources for Rethinking (<http://resources4rethinking.ca/en/about>), 2012-2015
- Nature Trail Creation, Cormier Village with the Centre Sportif Cormier Village Inc., 2008.
- Biological Habitat Assessment and Zoning of Sensitive Areas of Irishtown Nature Park, Irishtown Nature Park Committee & the City of Moncton; 2006 & 2007.
- Nature Interpretation Panels, Memramcook Village; 2010.
- Consultations with environmental groups about Fisheries and Oceans Canada's Integrated Management approach within the Oceans Action Plan; 2006.
- Rural Smart planning concepts presented to New Brunswick francophone planning commissions, Canadian Parks and Wilderness Association; 2004.

**Conservation Biologist and Educator, Nature NB, Acadian Peninsula 1988 - 2003.*

- Piping Plover and coastal conservation educational school programming.

**Teacher, École la Fontaine, Neguac (School District 9, Acadian Peninsula), September 2003 – June 2004*

- Grade 7 and & 8 Science and English to francophone students.

**Nature Interpreter, Parks Canada, Atlantic Canada 1991 - 1994*

Education

- Bachelor of Education, Major in Biology & Environmental Studies Mount Allison University, Sackville, NB, 1991
 - Masters in Environmental Studies, Biological Conservation & Nature Education, York University, Downsview, Ontario, 1988
 - Bachelor of Science, Specialization in Wildlife Biology, Acadia University, Wolfville, NS, 1984
-

Volunteer Work

- Board member of the NB Wildlife Trust Council since Spring 2015
- Chair of the Sustainable Education Alliance of New Brunswick, a collaborative effort on sustainable education issues in New Brunswick for multidisciplinary teams composed of educators, teachers, environmental groups, and government employees from the departments of education and environment.
- Past President of EOS Eco-Energy (www.eosecoenergy.com/)
- Past president (2007 - 2010) of Nature NB (N.B. Federation of Naturalists) (www.naturenb.ca).

Selected Publications

Chiasson, Roland. 2006. Irishtown Nature Park Biological Inventory Background Document. Presented To The Irishtown Nature Park Committee.

Chiasson, Roland. 2010. Rapport sur les recensements de herons dans la Péninsule acadienne automne.

L.A. Comeau, R. Chiasson, A. Chiasson, F. Pernet, and T. Landry. 2006. Birds perching on oyster culture gear in eastern New Brunswick, Canada. Can. Tech. Rep. Fish. Aquat. Sci. 2681.

Chiasson, Roland & Dietz, Sabine. 2000. The Brothers Important Bird Area. Conservation Concerns and Measures. Can. Nature Fed., Bird Studies Can., NB Federation of Naturalists, Natural History Soc. of P.E.I., Federation of NS Naturalists, 17pp. (Please note: more than 10 conservation plans for the Important Bird Areas Program were written).

SEnPAq Consultants, Piper Project/ Projet Siffleur, BDA Ltd. Consultants. 1999. Deux Rivières Tracadie Centre Ecologique. Prepared for la Corporation du Lien de Deux Rivières Inc, Tracadie- Sheila.

Appendix C. PRIORITY SPECIES, ACCDC and MARITIME BREEDING BIRD ATLAS REPORT

Appendix C: Richibucto Wind Power Project: List of Priority Species Based on Habitat Requirements.

Scientific Name	Common Name	SARA ⁱ	COSEWIC ⁱⁱ	NBSARA ⁱⁱⁱ	SRank ^{iv}	Habitat Requirements
Avifauna						
<i>Empidonax vireescens</i>	Acadian Flycatcher	E	E		SNA	The Acadian Flycatcher has been observed incidentally in NB. Breeds in mature forest, especially deciduous woods, along streams, in ravines, and in swamps. Winters in lowland tropical forest and second growth.
<i>Fulica americana</i>	American Coot	NAR	NAR		S1S2B, S1S2M	East of the prairies the American Coot is a scarce and local breeder. Artificial impoundments for waterfowl and sewage lagoons are its chief haunts in the Maritimes. Most breeding records for the species in NB have been along the New Brunswick-Nova Scotia border region.
<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	American Golden-plovers nest primarily on arctic and subarctic tundra, sometimes on montane tundra. During spring and fall migration, birds use variety of inland and coastal habitats, both natural and human-made: native prairie, pastures, tilled farmland, untilled harvested fields, rice fields, burned fields, golf courses, airports, mudflats, shorelines, estuaries, and beaches. Tundra ridges and hillsides blown free of snow particularly important in early spring.
<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S2S3	The American Three-toed Woodpecker is the most northerly woodpecker species; it breeds in boreal coniferous forests nearly to the arctic tree-line. In the Maritime provinces, nesting habitat tends to include black spruce and cleared areas, often near bogs. The American Three-toed Woodpecker is most often found in old spruce-fir forests typical of the NB Highlands, where the majority of confirmed breeding attempts were reported. Breeding was also reported from locations scattered across several other regions, except southernmost NB.
<i>Haliaeetus leucocephalus</i>	Bald Eagle	NAR	NAR	E	S3B	Look for Bald Eagles near lakes, reservoirs, rivers, marshes, and coasts. For a chance to see large Bald Eagle congregations, check out wildlife refuges or large bodies of water in winter over much of the continent, or fish processing plants and dumpsters. The Bald Eagle is adaptable to a wide range of habitats, including agricultural landscapes. In NB, most observations are from the Valley Lowlands, particularly along the Saint John River Valley, although the species occurs across the province.
<i>Tyto alba</i>	Barn Owl (Eastern pop.)	E	E		SNA	Barn Owls require large areas of open land over which to hunt. This can either be marsh, grasslands, or mixed agricultural fields. For nesting and roosting, they prefer quiet cavities, either in trees or man-made structures such as barns or silos.
<i>Hirundo rustica</i>	Barn Swallow	T	T	T	S2B, S2M	For breeding, the Barn Swallow requires a shelf or vertical substrate for placing its nest, typically found on buildings; a source of mud for nest building; and an open area for foraging on flying insects. Atlas habitat analyses correspondingly show a strong association with cultivated grasslands, human-occupied areas, and travel routes, with nearby aquatic habitats such as lakes, ponds, rivers, marshes, and bogs. In the Maritimes, the Barn Swallow occurs mostly in agricultural areas close to aquatic habitats, it is virtually absent from the region's densely forested highlands.

Scientific Name	Common Name	SARA ⁱ	COSEWIC ⁱⁱ	NBSARA ⁱⁱⁱ	SRank ^{iv}	Habitat Requirements
<i>Chlidonias niger</i>	Black Tern	NAR	NAR		S2B, S2M	In the Maritimes, the Black Tern nests almost exclusively in rich freshwater emergent marshes with stable water levels, such as impounded wetlands. It is found primarily in NB with one NS location, Amherst Point MBS, which contains several impoundments. The species' preference for wetland complexes that provide adequate open water for foraging and stable water levels for its semifloating nests explains its concentration in the Grand Lake Lowlands.
<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S1N,S2M	Breeds along lakes, rivers, bogs, moors, grasslands, swamps, and coastal marshes. In winter, found primarily along seacoasts, estuaries, and bays.
<i>Dolichonyx oryzivorus</i>	Bobolink		T	Threatened	S3B, S3M	The Bobolink may be one of the most agriculture-dependent species in the Maritimes; habitat analyses confirm its strong preference for cultivated grassland. Correspondingly, abundance is highest in agricultural regions, including PEI and the lowlands of NB and NS, and lowest within heavily forested regions. In the Maritimes, the Bobolink breeds in fen, floodplain, and upper saltmarsh meadows, to a limited extent.
<i>Molothrus ater</i>	Brown-headed Cowbird				S3B, S3M	In the Maritimes, the species is found primarily in grassland-dominated areas, especially those with active livestock farming. Thus it breeds mainly in the lowland regions, and its distribution, like that of other grassland birds, closely follows rural and agricultural lands. It is most readily detected in NB's Valley Lowlands, primarily along the Upper Saint John River Valley, as well as in the Annapolis Valley and on PEI, three areas where farms and fields are plentiful.
<i>Chordeiles minor</i>	Common Nighthawk	T	T	T	S3B, S4M	The Common Nighthawk uses a wide variety of open and semi-open habitats, ranging from clear-cuts to urban rooftops, as long as there are gravel or littered substrates for nesting and open areas for foraging. In the Maritimes, too, its varied habitat associations include open areas such as regenerating forests and some types of wetlands.
<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B, S3S4M	The Eastern Kingbird prefers open habitats with scattered shrubs and trees, often along woodland edges and typically near water, where it breeds in higher densities. In the Maritimes it is strongly associated with cultivated grasslands and freshwater marshes, as well as bogs, lakes, rivers, and ponds. The species occurs throughout the region but is most often encountered in lowland areas that have large, open wetlands, especially the Valley Lowlands along NB's Upper Saint John River Valley.
<i>Sturnella magna</i>	Eastern Meadowlark	T	T	T	S1B, S1M	In the Maritimes, where the species' distribution is limited, breeding habitat includes a variety of grasslands that have some tree and shrub cover.
<i>Coccothraustes vespertinus</i>	Evening Grosbeak				S3B, S3S4N, SUM	In the Maritimes, the Evening Grosbeak is generally associated with older coniferous and mixed forests, but it can take advantage of many habitats, especially if insects such as beetles and moth larvae are

Scientific Name	Common Name	SARA ⁱ	COSEWIC ⁱⁱ	NBSARA ⁱⁱⁱ	SRank ^{iv}	Habitat Requirements
						abundant. Partial cutting of mature stands also maintains habitat for this species.
<i>Contopus virens</i>	Eastern Wood-Pewee		SC		S4B, S4M	In the Maritimes the Eastern Wood-pewee is found in older, predominantly deciduous forests, often mixed with mature hemlock or pine. It also shows some preference for riparian forests, especially in NB, and avoids young coniferous and managed forests as well as human-occupied areas.
<i>Anas strepera</i>	Gadwall				S2B, S3M	Gadwalls choose well-vegetated wetlands with plenty of emergent plants to feed among and take cover in. Equally important for breeding are adjacent uplands with vegetation to conceal nests and for ducklings to hide in. On migration and in winter, look for Gadwalls in fresh and salt water marshes and well-vegetated reservoirs, beaver ponds, farm ponds, and streams. In the Maritimes, records suggest a strong affinity for agricultural landscapes near the coast with open ground and with relatively plentiful, rich marsh habitats.
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	T	T		SNA	Golden-winged Warblers breed in tangled, shrubby habitats such as regenerating clearcuts, wet thickets, tamarack bogs, and aspen or willow stands. They tend to occur in wetland habitats more often than the closely related (and competitive) Blue-winged Warbler.
<i>Podiceps auritus</i>	Horned Grebe	SC	SC	SC	S4M,S4N	Breeds on small to moderate-sized, shallow freshwater ponds and marshes. Winters along coasts and on large bodies of water.
<i>Eremophila alpestris</i>	Horned Lark				S2B	The few Horned Larks that now breed in the Maritimes are found on coastal barrens and pastures in northeastern NB, in scattered agricultural areas, and in similarly suitable locales, such as airports.
<i>Charadrius vociferus</i>	Killdeer				S3B	In the Maritimes, the Killdeer is associated primarily with open habitats dominated by cultivated grasslands or, especially in NB, coastal marshes and mudflats. The Killdeer was most often detected in the lowlands of NB and NS, regions characterized by open landscapes, especially farmlands.
<i>Asio otus</i>	Long-eared Owl				S2S3	The Long-eared Owl nests in many woodland types. In NB, it is associated with immature tamarack, as well as older birch and poplar, near aquatic habitats like fens and beaver ponds.
<i>Cistothorus palustris</i>	Marsh Wren				S2B, S2M	True to its name, the Marsh Wren nests in a variety of fresh- and saltwater marshes with tall emergent vegetation, primarily at low elevations. In the Maritimes, the species is found in freshwater marshes, typically waterfowl impoundments and large, natural cattail marshes. These habitats are common in the Saint John River Valley and the NB-NS border region.
<i>Mimus polyglottos</i>	Northern Mockingbird				S2B, S2M	Look for Northern Mockingbirds in towns, suburbs, backyards, parks, forest edges, and open land at low elevations.
<i>Anas acuta</i>	Northern Pintail				S3B, S5M	This Northern Pintail's breeding habitat is characterized by shallow wetlands with emergent vegetation set within open landscapes. Habitats

Scientific Name	Common Name	SARA ⁱ	COSEWIC ⁱⁱ	NBSARA ⁱⁱⁱ	SRank ^{iv}	Habitat Requirements
						described in atlas records include small rivers, estuaries, and both fresh- and saltwater ponds. The pintail's preference for open landscapes may explain why its distribution is concentrated around NB's Grand Lake and Eastern lowlands, as well as coastal areas throughout the province.
<i>Anas clypeata</i>	Northern Shoveler				S2S3B, S2S3M	The Northern Shoveler breeds in open, shallow wetlands, including brackish, fresh, and saltwater marshes, and often occupies impoundments. Despite these apparently broad habitat preferences, as a species at the edge of its range, its Maritime distribution is limited. Records are primarily from impoundments, sewage lagoons, and wetlands along the Lower Saint John and Petitcodiac rivers; on PEI; and in the NB-NS border region. The probability of observing the Northern Shoveler is marginally higher in the Inner Bay of Fundy, where several of its preferred habitat types meet and where most observations are clustered.
<i>Contopus cooperi</i>	Olive-sided Flycatcher	T	T	T	S3B, S3M	In the Maritimes, this flycatcher is typically found in moist, mixed coniferous forest with both mature and regenerating components, adjacent to shrubby forested wetlands, bogs, fens, beaver ponds, or clear-cuts. Although widely distributed throughout the Maritimes, the species is scarcer in western PEI and NB's Valley and Eastern lowlands, and most abundant in NB's Central Uplands and northwestern Highlands, Cape Breton's uplands, and Western NS.
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	SC	SC	Endangered	S1B, S3M	The Peregrine Falcon is found primarily along NB's Fundy Coast, which provides all the essentials: Appropriate nesting habitat on shoreline cliff faces and an abundance of migrating shorebirds as a ready prey source during brooding and fledging. A nest on the Saint John Harbour Bridge and another atop an office building in downtown Moncton attest to the fact that Peregrines adapt well to urban environments, where the Rock Pigeon is a preferred prey species.
<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	E	E	Endangered	S1B, S1M	The Atlantic coast population of Piping Plovers breeds in open or sparsely vegetated areas on coastal beaches, especially wide, dune-backed beaches.
<i>Progne subis</i>	Purple Martin				S1B, S1M	Availability of nest sites strongly determines Purple Martin distribution. Much of the eastern population is now found where nest boxes are provided, and the species occupies a wide variety of habitats near human settlements. In the Maritimes, most records are also adjacent to water.
<i>Loxia curvirostra</i>	Red Crossbill				S3	In the Maritimes, the Red Crossbill is loosely associated with older spruce, balsam fir, and pine. However, species-habitat associations should be examined with a discerning eye, as breeding may occur throughout the year and detections on point counts (used to determine habitat associations) include flocks or individuals flying overhead. In particular, the species' apparent association with human-occupied habitats may reflect its prevalence at feeders.

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<i>Calidris canutus rufa</i>	Red Knot rufa ssp	E	E	Endangered	S2M	Breeds in drier tundra areas, such as sparsely vegetated hillsides. Outside of breeding season, it is found primarily in intertidal, marine habitats, especially near coastal inlets, estuaries, and bays.
<i>Podiceps grisegena</i>	Red-necked Grebe	NAR	NAR		S3M,S2N	Breeds on shallow freshwater lakes, bays of larger lakes, marshes, and other inland bodies of water. Winters on open ocean or on large lakes.
<i>Phalaropus lobatus</i>	Red-necked Phalarope	SC	SC		S3M	Ocean, bays, lakes, ponds; tundra in summer. At sea, often concentrates over upwellings or tide rips, sometimes around edges of kelp beds. Inland, stops on ponds or lakes with abundant small creatures to eat; often favors sewage ponds, where insects are numerous. Breeds in tundra regions, mainly on marshy edges of ponds and lakes.
<i>Euphagus carolinus</i>	Rusty Blackbird	SC	SC	SC	S3B, S3M	In the Maritimes, the Rusty Blackbird is associated with forested wetlands and beaver ponds that are surrounded by regenerating coniferous and mixed forest. Regenerating clear-cuts and plantations are also used.
<i>Tringa solitaria</i>	Solitary Sandpiper				S2B, S5M	In the Maritimes, the Solitary Sandpiper is associated with wet coniferous forests often dominated by regenerating black spruce and with wetlands or bogs. Breeding is uncommon throughout the Maritimes; most atlas records are from NB's northern Eastern Lowlands, a region rich in wetlands, peatlands, and black spruce. Several additional, individual records are scattered throughout NB.
<i>Rallus limicola</i>	Virginia Rail				S3B, S3M	In the Maritimes, the Virginia Rail nests in thick emergent vegetation in impounded and natural freshwater wetlands, as well as along the marshy margins of freshwater lakes and rivers. The species is most concentrated in lowlands with relatively large, rich wetland complexes, such as the Lower Saint John River Valley and the NB-NS border region, although there are other occurrences scattered throughout the Maritimes.
<i>Caprimulgus vociferus</i>	Whip-Poor-Will	T	T	Threatened	S2B, S2M	The Eastern Whip-poor-will nests in deciduous and mixed forests that have little understorey and have nearby open areas for foraging. Such habitat is typical of the main areas where the species is found in NB: the Valley and Grand Lake lowlands, and the Miramichi River Valley.
<i>Hylocichla mustelina</i>	Wood Thrush		T		S1S2B, S1S2M	In the Maritimes the Wood Thrush is restricted largely to forests dominated by older deciduous trees, especially poplar and red maple. The species' slight preference for immature spruce and sapling pin cherry, ash, and alder may stem from its need for a shrubby understory to nest in. In the Maritimes, the Wood Thrush is neither widespread nor abundant, with most observations occurring in areas characterized by southern plants and hardwood forest, such as NB's Grand Lake and Valley lowlands.
Other Vertebrates						
<i>Hemidactylum scutatatum</i>	Four-toed Salamander	NAR	NAR		S1?	The Four-toed Salamander inhabits forests and breeds in sphagnum bogs, swamps, vernal pools and other fish-free wetlands. The eggs are typically deposited above the water in sphagnum moss within or around

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						the edges of the wetlands. Individuals overwinter below the frost line in mammal burrows, root hollows or other underground cavities.
<i>Perimyotis subflavus</i>	Eastern Pipistrelle	E	E	E	S1	Eastern pipistrelles are found in open woods near the edges of water. They often fly over water while hunting. These bats are not usually found in open fields or deep forests.
<i>Myotis lucifugus</i>	Little Brown Myotis	E	E	E	S1	Little Brown Myotis is one of the few bat species that uses buildings and other anthropogenic structures (e.g., bat boxes, bridges, and barns) to roost (particularly for maternity roosting), but it will also use cavities of canopy trees, foliage, tree bark, crevices on cliffs, and other structures. Hibernacula for Little Brown Myotis are generally underground openings, including caves, abandoned mines, wells, and tunnels, but at some sites only specific sections of the site will be used for hibernation. The sections used for hibernating typically have a temperature range between 2°C and 10°C.
<i>Lasionycteris noctivagans</i>	Silver-haired Bat				S1?	This Silver-haired Bat is typically found in temperate woodland and montane coniferous forest, close to streams, ponds or rivers. During the spring and summer, the silver-haired bat roosts in tree hollows, behind loose bark, in birds' nests, and sometimes in buildings or caves.
<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3S4	Southern Bog Lemmings occur in a wide variety of habitats. As their common name suggests, they are often found in sphagnum bogs and low moist places, but they are also found in grasslands, mixed deciduous/coniferous forests, spruce-fir forests, freshwater wetlands, marshes, and meadows.
<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon		T	Threatened	S3	Primarily marine, but close to shore, when not breeding; migrates to rivers for spawning, moves downstream afterward (may stay upstream in winter in some northern areas).
<i>Salvelinus namaycush</i>	Lake Trout				S3	Cool, clear waters of large, deep lakes and rivers. In the extreme north they are known to occur in shallower lakes that remain cool throughout the year.
<i>Morone saxatilis</i>	Striped Bass	No status	SC		S2	The Striped Bass is typically associated with estuaries and coastal waters. The species requires high quality spawning and nursery habitat and abundant aquatic species for food. Striped bass spawn in freshwater and occasionally brackish water. Egg incubation, larval and young-of-the-year development correspond to a gradual movement downstream to saltwater, where they typically feed and grow for several years before reaching maturity. A particular feature of the Canadian striped bass population is that they overwinter in rivers in order to escape the cold ocean waters.
<i>Chelydra serpentina</i>	Snapping Turtle	SC	SC	Special Concern	S3	Snapping Turtles inhabit southern New Brunswick and parts of mainland Nova Scotia in ponds, lakes, slow-moving streams and sometimes in brackish water if these water bodies have soft mud bottoms and abundant aquatic vegetation.
Vascular Plants						
<i>Antennaria parlinii</i>	a Pussytoes				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, meadows and fields, woodlands.

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<i>Isoetes acadensis</i>	Acadian Quillwort				S2S3	Shallow water to about 1 m.
<i>Polygonum viviparum</i>	Alpine Bistort				S1	Pond margins, marshy shores, depressions in treed bogs and fens, and shrubby tundra meadows.
<i>Littorella uniflora</i>	American Shoreweed				S3	Lacustrine (in lakes or ponds).
<i>Carex appalachica</i>	Appalachian Sedge				S1?	Forests.
<i>Viola sagittata</i>	Arrow-Leaved Violet				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields, shores of rivers or lakes, swamps, wetland margins (edges of wetlands), woodlands.
<i>Glyceria obtusa</i>	Atlantic Manna Grass				S1	Shores of rivers or lakes, swamps.
<i>Carex atlantica</i>	Atlantic Sedge				S1	Bogs, swamps, wetland margins (edges of wetlands).
<i>Salix serissima</i>	Autumn Willow				S1	Fens, meadows and fields, swamps
<i>Carex comosa</i>	Bearded Sedge				S1	Fens, meadows and fields, shores of rivers or lakes, swamps.
<i>Geranium bicknellii</i>	Bicknell's Crane's-bill				S3	Disturbed soils, burns and clearings.
<i>Crataegus macrosperma</i>	Big-Fruit Hawthorn				S2?	Anthropogenic (man-made or disturbed habitats), forest edges, meadows and fields, shrublands or thickets.
<i>Polygala sanguinea</i>	Blood Milkwort				S3	Open woods, clearings (often old burn sites) and roadsides.
<i>Osmorhiza depauperata</i>	Blunt Sweet Cicely				S2	Forests.
<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	Still waters.
<i>Botrychium oneidense</i>	Blunt-lobed Moonwort				S1	Forests, swamps, wetland margins (edges of wetlands).
<i>Betula pumila</i>	Bog Birch				S3	Weakly acidic or alkaline boggy thickets and wet shrubby meadows.
<i>Thelypteris simulata</i>	Bog Fern				S1S2	Moist, shady woods, cedar and sphagnum swamps.
<i>Salix pedicellaris</i>	Bog Willow				S3	Bogs and wet, acid, shrubby meadows.
<i>Xyris difformis</i>	Bog Yellow-eyed-grass				S1	Bogs, fens, shores of rivers or lakes.
<i>Bartonia paniculata</i>	Branched Bartonia				S2S3	Wet peaty or sandy lowlands.
<i>Corema conradii</i>	Broom Crowberry				S1	Anthropogenic (man-made or disturbed habitats), grassland, sandplains and barrens, shrublands or thickets, woodlands.
<i>Rhynchospora fusca</i>	Brown Beakrush				S3	Springy or boggy ground.
<i>Juglans cinerea</i>	Butternut	E	E	E	S1	Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), forests.
<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S1S3	Anthropogenic (man-made or disturbed habitats), meadows and fields, shores of rivers or lakes, swamps.
<i>Sanguisorba canadensis</i>	Canada Burnet				S3	Bogs and on wet open ground.
<i>Potentilla canadensis</i>	Canada Cinquefoil				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields.
<i>Allium canadense</i>	Canada Garlic				S1	Floodplain (river or stream floodplains), forests.
<i>Teucrium canadense</i>	Canada Germander				S3	Coastal sands, thickets and woods.
<i>Pedicularis canadensis</i>	Canada Lousewort				S1	Anthropogenic (man-made or disturbed habitats), forests, meadows and fields, woodlands.

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<i>Amelanchier canadensis</i>	Canada Serviceberry				S3	Along borders of swamps and streams.
<i>Viola canadensis</i>	Canada Violet				S1	Forests.
<i>Lobelia cardinalis</i>	Cardinal Flower				S3	On shores and in adjacent meadows and swamps.
<i>Polygonum careyi</i>	Carey's Smartweed				S2	Rich cultivated ground, clearings and swamp margins.
<i>Spiranthes casei</i>	Case's Ladies'-Tresses				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields, ridges or ledges.
<i>Dryopteris clintoniana</i>	Clinton's Wood Fern				S1	Forests, wetland margins (edges of wetlands).
<i>Rubus chamaemorus</i>	Cloudberry				S3S4	Acid bogs.
<i>Sanicula odorata</i>	Clustered Sanicle				S2	Floodplain (river or stream floodplains), forests.
<i>Carex exilis</i>	Coastal Sedge				S3	Sphagnum bogs often in calcareous areas.
<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed				S1	Anthropogenic (man-made or disturbed habitats), shores of rivers or lakes.
<i>Cephalanthus occidentalis</i>	Common Buttonbush				S2	Swamps and along stream margins.
<i>Botrychium lunaria</i>	Common Moonwort				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields, wetland margins (edges of wetlands).
<i>Carex crawei</i>	Crawe's Sedge				S1S2	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, meadows and fields, shores of rivers or lakes, swamps.
<i>Carex chordorrhiza</i>	Creeping Sedge				S3	Sphagnum bogs and marshy often calcareous areas.
<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1	Anthropogenic (man-made or disturbed habitats), fresh tidal marshes or flats, marshes, swamps.
<i>Botrychium dissectum</i>	Cut-leaved Moonwort				S3	Pastures, swampy woods and rich hardwoods.
<i>Cardamine concatenata</i>	Cut-leaved Toothwort				S1	Floodplain (river or stream floodplains), forests, talus and rocky slopes.
<i>Scirpus atrovirens</i>	Dark-green Bulrush				S1S3	Anthropogenic (man-made or disturbed habitats), marshes, meadows and fields, wetland margins (edges of wetlands).
<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S1	Forests.
<i>Epilobium strictum</i>	Downy Willowherb				S3	Wet meadows, boggy swales and marshes.
<i>Pseudognaphalium obtusifolium</i>	Eastern Cudweed				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields.
<i>Dirca palustris</i>	Eastern Leatherwood				S2	Rich deciduous or mixed woods.
<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S2	Alder thickets and swampy woods.
<i>Carex blanda</i>	Eastern Woodland Sedge				S1	Forests.
<i>Carex conoidea</i>	Field Sedge				S3	Damp, grassy areas.
<i>Danthonia compressa</i>	Flattened Oat Grass				S1	Anthropogenic (man-made or disturbed habitats), forest edges, meadows and fields.
<i>Stellaria crassifolia</i>	Fleshy Stitchwort				S1	Flowering early summer. Marshes, streams, cold, wet, grassy places.

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<i>Dichanthelium dichotomum</i>	Forked Panic Grass				S1	Anthropogenic (man-made or disturbed habitats), bogs, cliffs, balds, or ledges, forests, meadows and fields, shores of rivers or lakes, swamps, wetland margins (edges of wetlands), woodlands.
<i>Platanthera huronensis</i>	Fragrant Green Orchid				S2?	Anthropogenic (man-made or disturbed habitats), fens, marshes, meadows and fields, shores of rivers or lakes.
<i>Pedicularis furbishiae</i>	Furbish Lousewort	E	E	E	S1	Floodplain (river or stream floodplains), meadows and fields, shores of rivers or lakes, shrublands or thickets.
<i>Prenanthes racemosa</i>	Glaucous Rattlesnakeroot				S3	Along shores, meadows and thickets.
<i>Spirodela polyrrhiza</i>	Great Duckweed				S3S4	Quiet waters and borders of streams.
<i>Juncus greenei</i>	Greene's Rush				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, grassland, meadows and fields, ridges or ledges.
<i>Polygonum arifolium</i>	Halberd-leaved Tearthumb				S3	Swampy areas.
<i>Scirpus pendulus</i>	Hanging Bulrush				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields.
<i>Vaccinium corymbosum</i>	Highbush Blueberry				S1	Bogs, fens, forests, shores of rivers or lakes, swamps, woodlands.
<i>Cyperus lupulinus</i>	Hop Flatsedge				S1	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields.
<i>Carex lupulina</i>	Hop Sedge				S3	Borders on wet woods and along swampy shores.
<i>Utricularia gibba</i>	Humped Bladderwort				S3S4	Shallow water and bogs.
<i>Crataegus jonesiae</i>	Jones' Hawthorn				S1	Anthropogenic (man-made or disturbed habitats), forest edges, forests, meadows and fields.
<i>Hieracium kalmii</i>	Kalm's Hawkweed				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, forest edges, grassland, meadows and fields, shores of rivers or lakes.
<i>Hieracium kalmii</i> var. <i>fasciculatum</i>	Kalm's Hawkweed				S1?	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, forest edges, grassland, meadows and fields, shores of rivers or lakes.
<i>Scrophularia lanceolata</i>	Lance-leaved Figwort				S2	Open woods and old fields.
<i>Ranunculus lapponicus</i>	Lapland Buttercup				S1	Part shade, shade; watery hollows in forested sphagnum bogs, cedar or alder swamps, boreal forest.
<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid				S1	Forests, swamps.
<i>Taraxacum latilobum</i>	Large-lobed Dandelion				S2?	Anthropogenic (man-made or disturbed habitats).
<i>Botrychium simplex</i>	Least Moonwort				S3	Rocky slopes, in clearings and rich hardwoods.
<i>Pyrola minor</i>	Lesser Pyrola				S3	Cool, moist woods.
<i>Galium brevipes</i>	Limestone Swamp Bedstraw				S1	Fens, shores of rivers or lakes, swamps.
<i>Schizaea pusilla</i>	Little Curlygrass Fern				S1	In full sun or light shade in moist to wet, acidic soil. Grows on hummocks, around edges, or on tree bases (e.g. Atlantic white cedar) in bogs, such as Sphagnum bogs or, rarely, abandoned cranberry bogs.

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						Also found in wet depressions in sandy, peaty, or sphagnum substrates within open wooded habitats such as savannas, pine barrens, or low mossy open woods. Can also occur on sedge tussocks or hummocks in wet graminoid-dominated habitats, in peaty borders of lakes, and in crevices of ledgy shores and tablelands.
<i>Utricularia radiata</i>	Little Floating Bladderwort				S3	Shallow water.
<i>Liparis loeselii</i>	Loesel's Twayblade				S3	Damp alder thickets, meadows, roadside ditches, calcareous fens, abandoned gravel pits and low sandy areas.
<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	Anthropogenic (man-made or disturbed habitats), marshes, meadows and fields, shores of rivers or lakes, wetland margins (edges of wetlands).
<i>Carex laxiflora</i>	Loose-Flowered Sedge				S1?	Forests, ridges or ledges, talus and rocky slopes.
<i>Cyperus diandrus</i>	Low Flatsedge				S1	Shores of rivers or lakes, wetland margins (edges of wetlands).
<i>Selaginella selaginoides</i>	Low Spikemoss				S2	Alkaline bogs (fens) and on wet calcareous ledges.
<i>Lysimachia hybrida</i>	Lowland Yellow Loosestrife				S1	Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), forests, meadows and fields, shores of rivers or lakes, wetland margins (edges of wetlands).
<i>Pseudognaphalium macounii</i>	Macoun's Cudweed				S2	Anthropogenic (man-made or disturbed habitats), forest edges.
<i>Chenopodium simplex</i>	Maple-leaved Goosefoot				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, forests, talus and rocky slopes, woodlands.
<i>Viburnum acerifolium</i>	Maple-leaved Viburnum				S1	Forests, woodlands.
<i>Carex merritt-fernaldii</i>	Merritt Fernald's Sedge				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, meadows and fields, woodlands.
<i>Sisyrinchium mucronatum</i>	Michaux's Blue-eyed-grass				S1?	Forest edges, meadows and fields, shores of rivers or lakes.
<i>Carex michauxiana</i>	Michaux's Sedge				S3	Peat bogs and boggy meadows.
<i>Juncus stygius</i>	Moor Rush				S1	Fens, wetland margins (edges of wetlands).
<i>Viburnum lentago</i>	Nannyberry				S2	Along stream margins, swamps and thickets.
<i>Sisyrinchium angustifolium</i>	Narrow-leaved Blue-eyed-grass				S1	Meadows and fields, shores of rivers or lakes, wetland margins (edges of wetlands).
<i>Festuca subverticillata</i>	Nodding Fescue				S1	Forests.
<i>Hackelia deflexa</i>	Nodding Stickseed				S1	Cliffs, balds, or ledges, forests, talus and rocky slopes.
<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	Open slopes, on the edge of old logging roads, in moist dune depressions and on disturbed logging depot sites.
<i>Viburnum recognitum</i>	Northern Arrow-Wood				S2	Forests, fields, open areas, and wet areas.
<i>Carex arcta</i>	Northern Clustered Sedge				S3	Along shores and in wet woods.
<i>Geocaulon lividum</i>	Northern Comandra				S3S4	Sphagnum bogs and sandy coniferous woods.

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<i>Huperzia selago</i>	Northern Firmoss				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, forests, meadows and fields, shores of rivers or lakes.
<i>Galium kamtschaticum</i>	Northern Wild Licorice				S2	Cool, mossy coniferous woods.
<i>Xyris montana</i>	Northern Yellow-Eyed-Grass				S3	Peaty open areas and margins of bog ponds.
<i>Agalinis neoscotica</i>	Nova Scotia Agalinis				S2	Open, wet, sandy or gravelly soils of roadside ditches, backshore areas, swales, pond edges and disturbed sites.
<i>Elodea nuttallii</i>	Nuttall's Waterweed				S2	Shallow quiet waters.
<i>Potamogeton oakesianus</i>	Oakes' Pondweed				S3S4	Peaty or sandy bottomed ponds.
<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2	Rich woods and thickets.
<i>Impatiens pallida</i>	Pale Jewelweed				S2	Forests, shores of rivers or lakes.
<i>Hieracium paniculatum</i>	Panicled Hawkweed				S1	Anthropogenic (man-made or disturbed habitats), forests, woodlands.
<i>Rubus pensilvanicus</i>	Pennsylvania Blackberry				S2S3	Clearings and along roadsides.
<i>Calamagrostis pickeringii</i>	Pickering's Reed Grass				S3	Boggy heaths and wet, sandy, open woods.
<i>Rubus plicatifolius</i>	Plait-leaved Dewberry				S1	Grassy banks and roadside ditches.
<i>Toxicodendron radicans</i>	Poison Ivy				S2?	Swampy woods or thickets.
<i>Ribes cynosbati</i>	Prickly Gooseberry				S1	Forest edges, forests, talus and rocky slopes.
<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S2S3	Still waters.
<i>Isoetes prototypus</i>	Prototype Quillwort	SC	SC	E	S2	Lacustrine (in lakes or ponds).
<i>Gentiana rubricaulis</i>	Purple-stemmed Gentian				S1	Anthropogenic (man-made or disturbed habitats), marshes, meadows and fields.
<i>Antennaria howellii ssp. petaloidea</i>	Pussy-Toes				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, meadows and fields, ridges or ledges, woodlands.
<i>Nuphar lutea ssp. rubrodisca</i>	Red-disked Yellow Pond-lily				S2	Lakes, floodplain ponds, slow moving streams and backwaters.
<i>Sporobolus compositus</i>	Rough Dropseed				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, coastal beaches (sea beaches), forest edges, grassland, meadows and fields, ridges or ledges, shores of rivers or lakes, talus and rocky slopes.
<i>Lespedeza capitata</i>	Round-headed Bush-clover				S1	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields, woodlands
<i>Drosera rotundifolia var. comosa</i>	Round-leaved Sundew				S1?	Bogs, fens, shores of rivers or lakes, swamps, wetland margins (edges of wetlands).
<i>Botrychium rugulosum</i>	Rugulose Moonwort				S1	Forests, meadows and fields.
<i>Cyperus bipartitus</i>	Shining Flatsedge				S1	Shores of rivers or lakes, wetland margins (edges of wetlands).

Scientific Name	Common Name	SARA ⁱ	COSEWIC ⁱⁱ	NBSARA ⁱⁱⁱ	SRank ^{iv}	Habitat Requirements
<i>Agalinis tenuifolia</i>	Slender Agalinis				S1	Anthropogenic (man-made or disturbed habitats), brackish or salt marshes and flats, fresh tidal marshes or flats, meadows and fields, woodlands.
<i>Rhynchospora capillacea</i>	Slender Beakrush				S1	Fens, floodplain (river or stream floodplains), meadows and fields, shores of rivers or lakes, swamps.
<i>Eriophorum gracile</i>	Slender Cottongrass				S2	Peat bogs or fens and boggy ditches.
<i>Dichanthelium xanthophyllum</i>	Slender Panic Grass				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields, shrublands or thickets, woodlands.
<i>Amerorchis rotundifolia</i>	Small Round-leaved Orchis				S2	Calcareous bogs, fens and cedar swamps.
<i>Symphotrichum racemosum</i>	Small White Aster				S2	Meadows and fields, shores of rivers or lakes.
<i>Agalinis paupercula</i>	Small-flowered Agalinis				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields, shores of rivers or lakes, wetland margins (edges of wetlands).
<i>Alnus serrulata</i>	Smooth Alder				S2	Shores of rivers or lakes, swamps, wetland margins (edges of wetlands).
<i>Symphotrichum laeve</i>	Smooth Aster				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields, woodlands.
<i>Symphotrichum laeve var. laeve</i>	Smooth Aster				S1	Roadsides and along old fields and thickets.
<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2?	Moist woods and clearings.
<i>Cladium mariscoides</i>	Smooth Twigrush				S3S4	Boggy shores.
<i>Platanthera flava</i>	Southern Rein-Orchid				S1	Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), forest edges, forests, fresh tidal marshes or flats, grassland, meadows and fields, riverine (in rivers or streams), shrublands or thickets, swamps, wetland margins (edges of wetlands), woodlands.
<i>Listera australis</i>	Southern Twayblade			E	S2	Acid bogs dominated by black spruce, usually on mounds of sphagnum at the bases of stunted black spruce near the edge of the bog, and preferring areas with little competition from ericaceous shrubs.
<i>Alisma subcordatum</i>	Southern Water Plantain				S1	Anthropogenic (man-made or disturbed habitats), lacustrine (in lakes or ponds), marshes, riverine (in rivers or streams), shores of rivers or lakes, wetland margins (edges of wetlands).
<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S2	In fens and boggy meadows in lime rich areas.
<i>Elymus hystrix</i>	Spreading Wild Rye				S1	Floodplain (river or stream floodplains), forests, ridges or ledges, woodlands.
<i>Lemna trisulca</i>	Star Duckweed				S2	Quiet waters.
<i>Carex sterilis</i>	Sterile Sedge				S1	Fens, meadows and fields, shores of rivers or lakes, swamps.
<i>Ionactis linariifolius</i>	Stiff Aster				S2	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields, shores of rivers or lakes, woodlands.
<i>Chenopodium capitatum</i>	Strawberry-blite				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields
<i>Lonicera oblongifolia</i>	Swamp Fly Honeysuckle				S2S3	Found mostly in calcareous fens and swamps.

Scientific Name	Common Name	SARA ⁱ	COSEWIC ⁱⁱ	NBSARA ⁱⁱⁱ	SRank ^{iv}	Habitat Requirements
<i>Decodon verticillatus</i>	Swamp Loosestrife				S1	Lacustrine (in lakes or ponds), shores of rivers or lakes, swamps, wetland margins (edges of wetlands).
<i>Rosa palustris</i>	Swamp Rose				S3	Wet shores and in marshes and swamps.
<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S1	Floodplain (river or stream floodplains), forests, marshes, shores of rivers or lakes, swamps, wetland margins (edges of wetlands).
<i>Solidago altissima</i>	Tall Goldenrod				S2S3	Anthropogenic (man-made or disturbed habitats), meadows and fields.
<i>Carex tenera</i>	Tender Sedge				S3	Moist, open ground and woodlands.
<i>Helianthus decapetalus</i>	Ten-rayed Sunflower				S1	Floodplain (river or stream floodplains), forest edges, forests.
<i>Callitriche terrestris</i>	Terrestrial Water- Starwort				S1	Anthropogenic (man-made or disturbed habitats), wetland margins (edges of wetlands).
<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	Lacustrine (in lakes or ponds), riverine (in rivers or streams).
<i>Najas gracillima</i>	Thread-Like Naiad				S2	Lacustrine (in lakes or ponds), riverine (in rivers or streams).
<i>Galium trifidum ssp. subbiflorum</i>	Three-petaled Bedstraw				S1?	Brackish or salt marshes and flats, fens, marshes, meadows and fields, shores of rivers or lakes, swamps, wetland margins (edges of wetlands).
<i>Arabis glabra</i>	Tower Mustard				S3	Clearings, roadsides and ledges.
<i>Botrychium lanceolatum</i>	Triangle Moonwort				S3	Rich hardwoods and clearings.
<i>Polemonium vanbruntiae</i>	Van Brunt's Jacob's- ladder	T	T	T	S1	Anthropogenic (man-made or disturbed habitats), fens, forest edges, meadows and fields, shores of rivers or lakes, swamps.
<i>Myriophyllum heterophyllum</i>	Variable-leaved Water Milfoil				S3	Streams and ponds.
<i>Woodwardia virginica</i>	Virginia Chain Fern				S2	Acid bogs and swamps.
<i>Pycnanthemum virginianum</i>	Virginia Mountain Mint				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields.
<i>Triadenum virginicum</i>	Virginia St John's- wort				S1	Shores of rivers or lakes, swamps, wetland margins (edges of wetlands).
<i>Heteranthera dubia</i>	Water Stargrass				S3	Shallow, quiet water.
<i>Platanthera blephariglottis</i>	White Fringed Orchid				S3	Open sphagnous bogs and meadows.
<i>Carex albicans</i>	White-tinged Sedge				S2	Bogs, fens, forests, talus and rocky slopes, woodlands.
<i>Polygala verticillata</i>	Whorled Milkwort				S1	Anthropogenic (man-made or disturbed habitats), cliffs, balds, or ledges, meadows and fields, ridges or ledges, woodlands.
<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife				S1	Whorled yellow-loosestrife is native to eastern North America, and grows in woodlands, clearings, sandplains, dry fields and roadsides. As the name suggests, the leaves are conspicuously whorled.
<i>Cynoglossum virginianum</i>	Wild Comfrey				S1	Forest edges, forests.
<i>Symphotrichum praealtum</i>	Willow-leaved Aster	T	T		SNA	Meadows and fields.
<i>Pterospora andromedea</i>	Woodland Pinedrops			E	S1	Forests.
<i>Bartonia virginica</i>	Yellow Bartonia				S1	Meadows and fields, swamps, wetland margins (edges of wetlands).

Scientific Name	Common Name	SARA ⁱ	COSEWIC ⁱⁱ	NBSARA ⁱⁱⁱ	SRank ^{iv}	Habitat Requirements
<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S1	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields, swamps, wetland margins (edges of wetlands), woodlands.
<i>Carex annectens</i>	Yellow-Fruited Sedge				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields.

ⁱ Government of Canada. 2017. Species at Risk Public Registry. Accessed online, 18 October 2017. <https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

ⁱⁱ Government of Canada. 2017. Committee on the Status of Endangered Wildlife in Canada. Accessed online, 18 October 2017. http://www.cosewic.gc.ca/eng/sct5/index_e.cfm

ⁱⁱⁱ Government of New Brunswick. 2017. New Brunswick Regulation 2013-38 under the Species at Risk Act (O.C. 2013-143). Accessed online, 18 October 2017.

<http://laws.gnb.ca/en/showdoc/cr/2013-38>

^{iv} Atlantic Canada Conservation Data Centre. 2017. Status Ranks. Accessed online, 18 October 2017. <http://accdc.com/en/ranks.html>

DATA REPORT 5809: Rexton, NB

Prepared 22 March 2017
by J. Churchill, Data Manager

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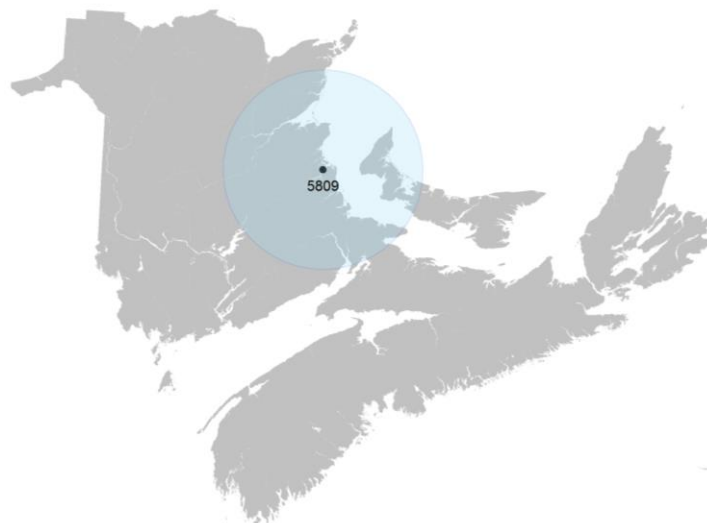
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Map 1. A 100 km buffer around the study area

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
RextonNB_5809ob.xls	All Rare and legally protected <i>Flora and Fauna</i> within 5 km of your study area
RextonNB_5809ob100km.xls	A list of Rare and legally protected <i>Flora and Fauna</i> within 100 km of your study area
RextonNB_5809sa.xls	All <i>Significant Natural Areas</i> in your study area
RextonNB_5809ff.xls	Rare and common <i>Freshwater Fish</i> in your study area (DFO database)
RextonNB_5809bc.xls	Rare and common <i>Colonial Birds</i> in your study area

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

sblaney@mta.ca

Animals (Fauna)

John Klymko, Zoologist

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Plant Communities

Sarah Robinson, Community Ecologist

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Data Management, GIS

James Churchill, Data Manager

Tel: (902) 679-6146

jlchurchill@mta.ca

Billing

Jean Breau

Tel: (506) 364-2657

jrbreau@mta.ca

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
(902) 634-7525
Donald.Sam@novascotia.ca

Central: Shavonne Meyer
(902) 893-6353
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(902) 893-5630
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Mark.Pulsifer@novascotia.ca

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(902) 295-3949
Donald.Anderson@novascotia.ca

Eastern: Terry Power
(902) 563-3370
Terrance.Power@novascotia.ca

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

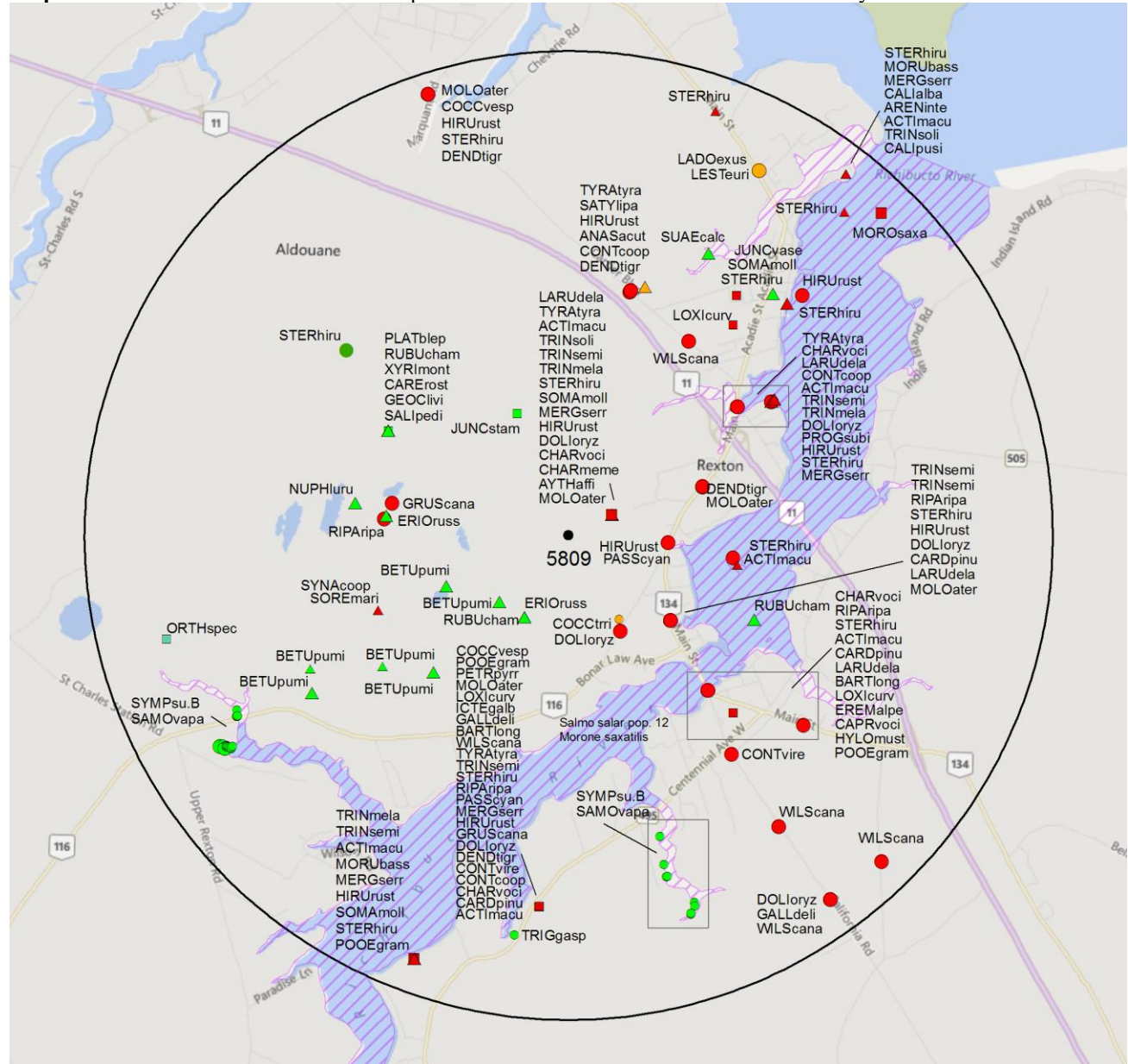
2.1 FLORA

A 5 km buffer around the study area contains 57 records of 15 vascular, 1 record of 1 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

A 5 km buffer around the study area contains 275 records of 42 vertebrate, 4 records of 4 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 5 km of 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 no managed areas in the vicinity of the study area (Map 3)

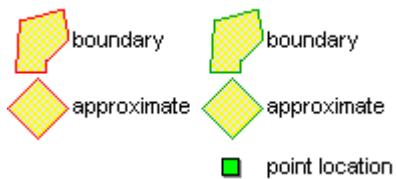
3.2 SIGNIFICANT AREAS

The GIS scan identified 1 biologically significant site 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 5 km of 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 5 km-buffered 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)
N	<i>Orthotrichum speciosum</i>	Showy Bristle Moss				S2S3	5 Undetermined	1	4.3 \pm 4.0
P	<i>Symphotrichum subulatum</i> (Bathurst pop)	Bathurst Aster - Bathurst pop.	Special Concern	Special Concern	Endangered	S2	1 At Risk	20	3.2 \pm 0.0
P	<i>Juncus stygius</i> ssp. <i>americanus</i>	Moor Rush				S1	2 May Be At Risk	1	1.4 \pm 5.0
P	<i>Nuphar lutea</i> ssp. <i>rubrodiscalis</i>	Red-disked Yellow Pond-lily				S2	3 Sensitive	1	2.2 \pm 1.0
P	<i>Carex rostrata</i>	Narrow-leaved Beaked Sedge				S2	3 Sensitive	1	2.2 \pm 5.0
P	<i>Juncus vaseyi</i>	Vasey Rush				S2	3 Sensitive	1	3.3 \pm 1.0
P	<i>Betula pumila</i>	Bog Birch				S3	4 Secure	14	1.0 \pm 1.0
P	<i>Samolus valerandi</i> ssp. <i>parviflorus</i>	Seaside Brookweed				S3	4 Secure	7	3.7 \pm 0.0
P	<i>Salix pedicellaris</i>	Bog Willow				S3	4 Secure	1	2.2 \pm 1.0
P	<i>Platanthera blephariglottis</i>	White Fringed Orchid				S3	4 Secure	1	2.2 \pm 1.0
P	<i>Xyris montana</i>	Northern Yellow-Eyed-Grass				S3	4 Secure	1	2.2 \pm 1.0
P	<i>Suaeda calceoliformis</i>	Horned Sea-bite				S3S4	4 Secure	1	3.2 \pm 1.0
P	<i>Rubus chamaemorus</i>	Cloudberry				S3S4	4 Secure	3	1.0 \pm 2.0
P	<i>Geocaldon lividum</i>	Northern Comandra				S3S4	4 Secure	1	2.2 \pm 1.0
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	4 Secure	3	1.0 \pm 1.0
P	<i>Triglochin gaspensis</i>	Gasp Arrowgrass				S3S4	4 Secure	1	4.2 \pm 0.0

4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	1	0.5 \pm 10.0
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened		Threatened	S1S2B,S1S2M	2 May Be At Risk	1	2.5 \pm 7.0
A	<i>Caprimulgus vociferus</i>	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	1	2.5 \pm 7.0
A	<i>Riparia riparia</i>	Bank Swallow	Threatened			S2S3B,S2S3M	3 Sensitive	6	1.4 \pm 0.0
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened		Threatened	S3B,S3M	3 Sensitive	15	0.5 \pm 0.0
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened		Threatened	S3B,S3M	3 Sensitive	28	0.5 \pm 2.0
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	7	2.5 \pm 2.0
A	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	21	2.4 \pm 0.0
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	4 Secure	6	2.8 \pm 0.0
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	50	0.5 \pm 1.0
A	<i>Morone saxatilis</i>	Striped Bass	E,E,SC			S3	2 May Be At Risk	1	4.6 \pm 10.0
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S1?B,S5M	4 Secure	7	0.5 \pm 2.0
A	<i>Grus canadensis</i>	Sandhill Crane				S1B,S1M	8 Accidental	2	1.8 \pm 0.0
A	<i>Bartramia longicauda</i>	Upland Sandpiper				S1B,S1M	3 Sensitive	2	2.5 \pm 7.0
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	2 May Be At Risk	1	2.5 \pm 2.0
A	<i>Aythya affinis</i>	Lesser Scaup				S1B,S4M	4 Secure	1	0.5 \pm 0.0
A	<i>Eremophila alpestris</i>	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	1	2.5 \pm 7.0
A	<i>Pooecetes gramineus</i>	Vesper Sparrow				S2B,S2M	2 May Be At Risk	5	2.5 \pm 7.0
A	<i>Tringa solitaria</i>	Solitary Sandpiper				S2B,S5M	4 Secure	3	0.5 \pm 2.0
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	1	3.8 \pm 7.0
A	<i>Loxia curvirostra</i>	Red Crossbill				S3	4 Secure	5	2.5 \pm 7.0
A	<i>Carduelis pinus</i>	Pine Siskin				S3	4 Secure	3	1.4 \pm 0.0
A	<i>Sorex maritimensis</i>	Maritime Shrew				S3	4 Secure	1	2.1 \pm 0.0
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	3 Sensitive	7	0.5 \pm 10.0
A	<i>Tringa semipalmata</i>	Willet				S3B,S3M	3 Sensitive	17	0.5 \pm 0.0

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B,S3M	4 Secure	3	1.0 ± 0.0
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	5	0.5 ± 10.0
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B,S3M	4 Secure	1	3.8 ± 7.0
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak				S3B,S3S4N,SUM	3 Sensitive	3	3.8 ± 7.0
A	<i>Somateria mollissima</i>	Common Eider				S3B,S4M,S3N	4 Secure	3	0.5 ± 7.0
A	<i>Dendroica tigrina</i>	Cape May Warbler				S3B,S4S5M	4 Secure	12	1.5 ± 0.0
A	<i>Anas acuta</i>	Northern Pintail				S3B,S5M	3 Sensitive	3	2.6 ± 0.0
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	8	0.5 ± 10.0
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	4 Secure	1	4.7 ± 0.0
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3S4	4 Secure	1	2.1 ± 0.0
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	6	0.5 ± 10.0
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B,S5M	4 Secure	18	0.5 ± 1.0
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B,S5M	4 Secure	4	3.8 ± 7.0
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B,S5M	4 Secure	8	0.5 ± 10.0
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3S4M	4 Secure	1	4.7 ± 0.0
A	<i>Calidris alba</i>	Sanderling				S3S4M,S1N	3 Sensitive	2	4.7 ± 0.0
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	4 Secure	3	4.7 ± 0.0
I	<i>Ladona exusta</i>	White Corporal				S2	5 Undetermined	1	4.3 ± 0.0
I	<i>Lestes eurinus</i>	Amber-Winged Spreadwing				S3	4 Secure	1	4.3 ± 0.0
I	<i>Satyrium liparops</i>	Striped Hairstreak				S3S4	4 Secure	1	2.7 ± 1.0
I	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle				SH	2 May Be At Risk	1	1.0 ± 0.0

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 a 5 km buffer of your study area are indicated below with “YES”.

New Brunswick

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within 5 km of 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	YES
<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.

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 25397 records of 126 vertebrate and 583 records of 57 invertebrate fauna; 4926 records of 261 vascular, 130 records of 66 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	15	16.5 \pm 1.0	NB
A	<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	8	65.5 \pm 0.0	PE
A	<i>Perimyotis subflavus</i>	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	1 At Risk	11	76.8 \pm 1.0	NB
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	2252	0.5 \pm 10.0	NB
A	<i>Dermochelys coriacea</i> (Atlantic pop.)	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	6	19.0 \pm 0.0	NB
A	<i>Calidris canutus rufa</i>	Red Knot rufa ssp	Endangered		Endangered	S2M	1 At Risk	395	13.5 \pm 2.0	NB
A	<i>Rangifer tarandus pop. 2</i>	Woodland Caribou (Atlantic-Gasp [r-sie pop.]	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	4	47.2 \pm 1.0	NB
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened		Threatened	S1B,S1M	2 May Be At Risk	32	19.5 \pm 7.0	NB
A	<i>Ixobrychus exilis</i>	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	1 At Risk	5	63.8 \pm 7.0	NB
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened		Threatened	S1S2B,S1S2M	2 May Be At Risk	47	2.5 \pm 7.0	NB
A	<i>Caprimulgus vociferus</i>	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	48	2.5 \pm 7.0	NB
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2B,S2M	1 At Risk	6	17.3 \pm 13.0	NB
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	553	6.6 \pm 0.0	NB
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	128	17.8 \pm 15.0	NB
A	<i>Riparia riparia</i>	Bank Swallow	Threatened		Threatened	S2S3B,S2S3M	3 Sensitive	640	1.4 \pm 0.0	NB
A	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	Threatened		Threatened	S3	4 Secure	1	70.6 \pm 1.0	NB
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened		Threatened	S3B,S3M	3 Sensitive	887	0.5 \pm 10.0	NB
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened		Threatened	S3B,S3M	3 Sensitive	899	0.5 \pm 2.0	NB
A	<i>Chordeiles minor</i>	Common Nighthawk	Threatened	Threatened	Threatened	S3B,S4M	1 At Risk	233	13.6 \pm 0.0	NB
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	361	2.5 \pm 2.0	NB
A	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	377	2.4 \pm 0.0	NB
A	<i>Anguilla rostrata</i>	American Eel	Threatened		Threatened	S4	4 Secure	80	47.9 \pm 1.0	NB
A	<i>Coturnicops noveboracensis</i>	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	2 May Be At Risk	5	89.0 \pm 0.0	NB
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	1 At Risk	1	86.2 \pm 1.0	NB
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B,S3M	1 At Risk	95	4.7 \pm 0.0	NB
A	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	31	13.5 \pm 1.0	NB
A	<i>Bucephala islandica</i> (Eastern pop.)	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	130	23.6 \pm 0.0	NB
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	106	12.0 \pm 7.0	NB
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern		Special Concern	S3M	3 Sensitive	16	20.2 \pm 1.0	NB
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	4 Secure	423	2.8 \pm 0.0	NB
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern		Special Concern	S4N,S4M	4 Secure	45	45.3 \pm 12.0	NB
A	<i>Odobenus rosmarus rosmarus</i>	Atlantic Walrus	Special Concern		Extirpated	SX		2	59.7 \pm 1.0	NB
A	<i>Bubo scandiacus</i>	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	42	28.5 \pm 0.0	NB
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	2 May Be At Risk	3	42.1 \pm 5.0	NB
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1S2B,S1S2M	3 Sensitive	40	58.7 \pm 1.0	NB
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	15	11.0 \pm 7.0	NB
A	<i>Sorex dispar</i>	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	3	95.8 \pm 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Buteo lineatus</i>	Red-shouldered Hawk	Not At Risk	Special Concern		S2B,S2M	2 May Be At Risk	11	14.7 ± 0.0	NB
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S2B,S2M	3 Sensitive	26	13.4 ± 0.0	NB
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk			S2S3		1	63.5 ± 1.0	NB
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	18	16.3 ± 0.0	NB
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	745	0.5 ± 1.0	NB
A	<i>Podiceps grisegena</i>	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	44	17.8 ± 0.0	NB
A	<i>Lagenorhynchus acutus</i>	Atlantic White-sided Dolphin	Not At Risk			S3S4		1	93.5 ± 1.0	NB
A	<i>Haliaeetus leucocephalus</i>	Bald Eagle	Not At Risk		Endangered	S4	1 At Risk	825	0.5 ± 1.0	NB
A	<i>Canis lupus</i>	Gray Wolf	Not At Risk		Extirpated	SX	0.1 Extirpated	1	26.5 ± 100.0	NB
A	<i>Puma concolor pop. 1</i>	Cougar - Eastern pop.	Data Deficient		Endangered	SU	5 Undetermined	63	6.4 ± 1.0	NB
A	<i>Morone saxatilis</i>	Striped Bass	E,E,SC			S3	2 May Be At Risk	48	4.6 ± 10.0	NB
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S1?B,S5M	4 Secure	1433	0.5 ± 2.0	NB
A	<i>Gallinula chloropus</i>	Common Moorhen				S1B,S1M	3 Sensitive	13	69.8 ± 0.0	NB
A	<i>Bartramia longicauda</i>	Upland Sandpiper				S1B,S1M	3 Sensitive	40	2.5 ± 7.0	NB
A	<i>Phalaropus tricolor</i>	Wilson's Phalarope				S1B,S1M	3 Sensitive	29	69.8 ± 0.0	NB
A	<i>Leucophaeus atricilla</i>	Laughing Gull				S1B,S1M	3 Sensitive	7	19.1 ± 0.0	NB
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	2 May Be At Risk	68	2.5 ± 2.0	NB
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B,S2S3M	4 Secure	98	24.7 ± 0.0	NB
A	<i>Aythya affinis</i>	Lesser Scaup				S1B,S4M	4 Secure	148	0.5 ± 0.0	NB
A	<i>Aythya marila</i>	Greater Scaup				S1B,S4M,S2N	4 Secure	18	17.8 ± 12.0	NB
A	<i>Eremophila alpestris</i>	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	114	2.5 ± 7.0	NB
A	<i>Sterna paradisaea</i>	Arctic Tern				S1B,SUM	2 May Be At Risk	38	15.2 ± 7.0	NB
A	<i>Branta bernicla</i>	Brant				S1N,S2S3M	4 Secure	63	11.0 ± 10.0	NB
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S1N,S2M	3 Sensitive	12	16.9 ± 0.0	NB
A	<i>Butorides virescens</i>	Green Heron				S1S2B,S1S2M	3 Sensitive	5	63.8 ± 7.0	NB
A	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	15	17.8 ± 10.0	NB
A	<i>Empidonax traillii</i>	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	44	29.8 ± 7.0	NB
A	<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	1	17.3 ± 1.0	NB
A	<i>Troglodytes aedon</i>	House Wren				S1S2B,S1S2M	5 Undetermined	14	48.1 ± 7.0	NB
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S1S2B,S4N,S5M	4 Secure	2	34.2 ± 0.0	NB
A	<i>Calidris bairdii</i>	Baird's Sandpiper				S1S2M	3 Sensitive	18	14.0 ± 0.0	NB
A	<i>Cistothorus palustris</i>	Marsh Wren				S2B,S2M	3 Sensitive	25	63.8 ± 7.0	NB
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S2B,S2M	3 Sensitive	121	11.1 ± 7.0	NB
A	<i>Toxostoma rufum</i>	Brown Thrasher				S2B,S2M	3 Sensitive	29	19.5 ± 7.0	NB
A	<i>Poocetes gramineus</i>	Vesper Sparrow				S2B,S2M	2 May Be At Risk	112	2.5 ± 7.0	NB
A	<i>Anas strepera</i>	Gadwall				S2B,S3M	4 Secure	199	11.1 ± 7.0	NB
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	29	15.5 ± 7.0	NB
A	<i>Tringa solitaria</i>	Solitary Sandpiper				S2B,S5M	4 Secure	116	0.5 ± 2.0	NB
A	<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel				S2B,SUM	3 Sensitive	1	62.1 ± 0.0	NB
A	<i>Chen caerulescens</i>	Snow Goose				S2M	4 Secure	27	27.8 ± 0.0	NB
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2N,S2M	4 Secure	48	18.9 ± 4.0	NB
A	<i>Somateria spectabilis</i>	King Eider				S2N,S2M	4 Secure	5	54.5 ± 0.0	NB
A	<i>Larus hyperboreus</i>	Glaucous Gull				S2N,S2M	4 Secure	96	18.8 ± 1.0	NB
A	<i>Asio otus</i>	Long-eared Owl				S2S3	5 Undetermined	22	18.1 ± 0.0	NB
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S2S3	3 Sensitive	21	20.7 ± 7.0	NB
A	<i>Salmo salar</i>	Atlantic Salmon				S2S3	2 May Be At Risk	47	34.9 ± 50.0	NB
A	<i>Anas clypeata</i>	Northern Shoveler				S2S3B,S2S3M	4 Secure	257	12.0 ± 7.0	NB
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	30	13.8 ± 7.0	NB
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	383	3.8 ± 7.0	NB
A	<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	3 Sensitive	114	18.9 ± 2.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S2S3N,SUM	3 Sensitive	44	18.9 ± 5.0	NB
A	<i>Cephus grylle</i>	Black Guillemot				S3	4 Secure	30	37.9 ± 0.0	PE
A	<i>Loxia curvirostra</i>	Red Crossbill				S3	4 Secure	103	2.5 ± 7.0	NB
A	<i>Carduelis pinus</i>	Pine Siskin				S3	4 Secure	201	1.4 ± 0.0	NB
A	<i>Sorex maritimensis</i>	Maritime Shrew				S3	4 Secure	144	2.1 ± 0.0	NB
A	<i>Eptesicus fuscus</i>	Big Brown Bat				S3	3 Sensitive	4	60.6 ± 10.0	NB
A	<i>Cathartes aura</i>	Turkey Vulture				S3B,S3M	4 Secure	46	19.0 ± 1.0	NB
A	<i>Rallus limicola</i>	Virginia Rail				S3B,S3M	3 Sensitive	60	36.0 ± 1.0	NB
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	3 Sensitive	819	0.5 ± 2.0	NB
A	<i>Tringa semipalmata</i>	Willet				S3B,S3M	3 Sensitive	766	0.5 ± 0.0	NB
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B,S3M	4 Secure	90	6.2 ± 7.0	NB
A	<i>Vireo gilvus</i>	Warbling Vireo				S3B,S3M	4 Secure	61	33.8 ± 7.0	NB
A	<i>Piranga olivacea</i>	Scarlet Tanager				S3B,S3M	4 Secure	53	17.3 ± 4.0	NB
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B,S3M	4 Secure	24	1.0 ± 0.0	NB
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	214	0.5 ± 10.0	NB
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B,S3M	4 Secure	105	3.8 ± 7.0	NB
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak				S3B,S3S4N,SUM	3 Sensitive	183	3.8 ± 7.0	NB
A	<i>Somateria mollissima</i>	Common Eider				S3B,S4M,S3N	4 Secure	156	0.5 ± 7.0	NB
A	<i>Dendroica tigrina</i>	Cape May Warbler				S3B,S4S5M	4 Secure	197	1.5 ± 0.0	NB
A	<i>Anas acuta</i>	Northern Pintail				S3B,S5M	3 Sensitive	204	2.6 ± 0.0	NB
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	341	0.5 ± 2.0	NB
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	4 Secure	884	4.7 ± 0.0	NB
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S3M	3 Sensitive	4	15.5 ± 0.0	NB
A	<i>Melanitta nigra</i>	Black Scoter				S3M,S1S2N	3 Sensitive	252	8.4 ± 0.0	NB
A	<i>Bucephala albeola</i>	Bufflehead				S3M,S2N	3 Sensitive	100	20.5 ± 10.0	NB
A	<i>Calidris maritima</i>	Purple Sandpiper				S3M,S3N	4 Secure	20	48.8 ± 0.0	NB
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3S4	4 Secure	12	2.1 ± 0.0	NB
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	387	0.5 ± 10.0	NB
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B,S5M	4 Secure	1112	0.5 ± 1.0	NB
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B,S5M	4 Secure	576	3.8 ± 7.0	NB
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B,S5M	4 Secure	449	0.5 ± 10.0	NB
A	<i>Dendroica striata</i>	Blackpoll Warbler				S3S4B,S5M	4 Secure	41	19.2 ± 7.0	NB
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3S4M	4 Secure	933	10.1 ± 0.0	NB
A	<i>Limosa haemastica</i>	Hudsonian Godwit				S3S4M	4 Secure	375	14.0 ± 0.0	NB
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3S4M	4 Secure	1602	4.7 ± 0.0	NB
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S3S4M	4 Secure	318	18.9 ± 5.0	NB
A	<i>Calidris alba</i>	Sanderling				S3S4M,S1N	3 Sensitive	651	4.7 ± 0.0	NB
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	4 Secure	245	4.7 ± 7.0	NB
A	<i>Lanius ludovicianus</i>	Loggerhead Shrike				SXB,SXM	1 At Risk	1	58.5 ± 0.0	NB
I	<i>Gomphus ventricosus</i>	Skillet Clubtail	Endangered		Endangered	S1S2	2 May Be At Risk	2	83.7 ± 0.0	NB
I	<i>Ophiogomphus howei</i>	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	2 May Be At Risk	26	67.2 ± 0.0	NB
I	<i>Alasmidonta varicosa</i>	Brook Floater	Special Concern		Special Concern	S2	3 Sensitive	26	14.3 ± 0.0	NB
I	<i>Lampsilis cariosa</i>	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	8	87.4 ± 0.0	NB
I	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern			S3?	3 Sensitive	10	56.3 ± 0.0	NB
I	<i>Danaus plexippus</i>	Monarch	Special Concern	Special Concern	Special Concern	S3B,S3M	3 Sensitive	31	27.4 ± 0.0	NB
I	<i>Appalachina sayana</i>	Spike-lip Crater	Not At Risk			S3?		1	93.8 ± 1.0	NB
I	<i>Erora laeta</i>	Early Hairstreak				S1	2 May Be At Risk	1	54.7 ± 1.0	NB
I	<i>Leucorrhinia patricia</i>	Canada Whiteface				S1	2 May Be At Risk	7	16.5 ± 1.0	NB
I	<i>Plebejus saepiolus</i>	Greenish Blue				S1S2	4 Secure	4	75.7 ± 1.0	NB
I	<i>Cicindela ancocisconensis</i>	Appalachian Tiger Beetle				S2	5 Undetermined	1	73.1 ± 0.0	NB
I	<i>Strymon melinus</i>	Grey Hairstreak				S2	4 Secure	6	49.0 ± 1.0	NB
I	<i>Somatochlora brevicincta</i>	Quebec Emerald				S2	5 Undetermined	1	49.1 ± 0.0	NB
I	<i>Somatochlora</i>	Clamp-Tipped Emerald				S2	5 Undetermined	6	19.2 ± 0.0	NB

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I	<i>tenebrosa</i>									
I	<i>Ladona exusta</i>	White Corporal				S2	5 Undetermined	1	4.3 ± 0.0	NB
I	<i>Coenagrion interrogatum</i>	Subarctic Bluet				S2	3 Sensitive	5	32.1 ± 1.0	NB
I	<i>Callophrys henrici</i>	Henry's Elfin				S2S3	4 Secure	12	45.0 ± 5.0	NB
I	<i>Agonum consimile</i>	a Ground Beetle				S3	4 Secure	1	62.5 ± 1.0	NB
I	<i>Amara pallipes</i>	a Ground Beetle				S3	4 Secure	1	62.5 ± 1.0	NB
I	<i>Agonum crenistriatum</i>	a Ground Beetle				S3	5 Undetermined	1	62.5 ± 1.0	NB
I	<i>Carabus maeander</i>	a Ground Beetle				S3	5 Undetermined	1	62.5 ± 1.0	NB
I	<i>Carabus serratus</i>	a Ground Beetle				S3	4 Secure	1	67.7 ± 1.0	NB
I	<i>Hippodamia parenthesis</i>	Parenthesis Lady Beetle				S3	4 Secure	6	19.5 ± 1.0	NB
I	<i>Hesperia sassacus</i>	Indian Skipper				S3	4 Secure	2	14.7 ± 5.0	NB
I	<i>Euphyes bimacula</i>	Two-spotted Skipper				S3	4 Secure	8	10.7 ± 1.0	NB
I	<i>Papilio brevicauda</i>	Short-tailed Swallowtail				S3	4 Secure	33	12.0 ± 0.0	NB
I	<i>Papilio brevicauda bretonensis</i>	Short-tailed Swallowtail				S3	4 Secure	11	28.5 ± 0.0	NB
I	<i>Lycaena hyllus</i>	Bronze Copper				S3	3 Sensitive	57	37.0 ± 0.0	NB
I	<i>Lycaena dospassosi</i>	Salt Marsh Copper				S3	4 Secure	75	9.6 ± 1.0	NB
I	<i>Satyrium acadica</i>	Acadian Hairstreak				S3	4 Secure	5	60.9 ± 0.0	NB
I	<i>Callophrys polios</i>	Hoary Elfin				S3	4 Secure	9	39.0 ± 0.0	NB
I	<i>Callophrys eryphon</i>	Western Pine Elfin				S3	4 Secure	3	82.3 ± 10.0	NB
I	<i>Plebejus idas</i>	Northern Blue				S3	4 Secure	15	17.8 ± 0.0	NB
I	<i>Plebejus idas empetri</i>	Crowberry Blue				S3	4 Secure	8	46.0 ± 0.0	NB
I	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	4 Secure	5	46.5 ± 0.0	NB
I	<i>Boloria eunomia</i>	Bog Fritillary				S3	5 Undetermined	5	97.4 ± 2.0	NB
I	<i>Boloria chariclea</i>	Arctic Fritillary				S3	4 Secure	10	70.1 ± 1.0	NB
I	<i>Boloria chariclea grandis</i>	Purple Lesser Fritillary				S3	4 Secure	3	82.3 ± 10.0	NB
I	<i>Polygonia satyrus</i>	Satyr Comma				S3	4 Secure	11	47.8 ± 0.0	NB
I	<i>Polygonia gracilis</i>	Hoary Comma				S3	4 Secure	11	14.0 ± 0.0	NB
I	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S3	4 Secure	5	20.5 ± 0.0	NB
I	<i>Gomphus abbreviatus</i>	Spine-crowned Clubtail				S3	4 Secure	12	72.2 ± 0.0	NB
I	<i>Dorocordulia lepida</i>	Petite Emerald				S3	4 Secure	5	73.6 ± 1.0	NB
I	<i>Somatochlora cingulata</i>	Lake Emerald				S3	4 Secure	2	91.8 ± 0.0	NB
I	<i>Somatochlora forcipata</i>	Forcipate Emerald				S3	4 Secure	9	19.2 ± 0.0	NB
I	<i>Williamsonia fletcheri</i>	Ebony Boghaunter				S3	4 Secure	11	46.7 ± 0.0	NB
I	<i>Lestes eurinus</i>	Amber-Winged Spreadwing				S3	4 Secure	14	4.3 ± 0.0	NB
I	<i>Enallagma geminatum</i>	Skimming Bluet				S3	5 Undetermined	4	91.2 ± 0.0	NB
I	<i>Enallagma signatum</i>	Orange Bluet				S3	4 Secure	1	91.2 ± 0.0	NB
I	<i>Stylurus scudleri</i>	Zebra Clubtail				S3	4 Secure	6	59.7 ± 0.0	NB
I	<i>Alasmidonta undulata</i>	Triangle Floater				S3	3 Sensitive	17	18.3 ± 1.0	NB
I	<i>Leptodea ochracea</i>	Tidewater Mucket				S3	4 Secure	7	90.0 ± 1.0	NB
I	<i>Pantala hymenaea</i>	Spot-Winged Glider				S3B,S3M	4 Secure	2	37.1 ± 0.0	NB
I	<i>Satyrium liparops</i>	Striped Hairstreak				S3S4	4 Secure	15	2.7 ± 1.0	NB
I	<i>Satyrium liparops strigosum</i>	Striped Hairstreak				S3S4	4 Secure	12	16.4 ± 10.0	NB
I	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	4 Secure	1	76.8 ± 1.0	NB
I	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle				SH	2 May Be At Risk	30	1.0 ± 0.0	NB
N	<i>Peltigera hydrothyria</i>	Eastern Waterfan	Threatened			S1	5 Undetermined	1	98.6 ± 1.0	NB
N	<i>Aulacomnium heterostichum</i>	One-sided Groove Moss				S1	2 May Be At Risk	1	20.7 ± 0.0	NB
N	<i>Campylostelium saxicola</i>	a Moss				S1	2 May Be At Risk	1	23.1 ± 0.0	NB

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N	<i>Zygodon viridissimus</i> <i>var. viridissimus</i>	a Moss				S1	2 May Be At Risk	1	22.0 ± 0.0	NB
N	<i>Dicranum bonjeanii</i>	Bonjean's Broom Moss				S1?	2 May Be At Risk	1	46.4 ± 1.0	NB
N	<i>Entodon brevisetus</i>	a Moss				S1?	2 May Be At Risk	1	84.4 ± 10.0	NB
N	<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss				S1?	2 May Be At Risk	4	21.8 ± 0.0	NB
N	<i>Seligeria recurvata</i>	a Moss				S1?	2 May Be At Risk	3	61.9 ± 15.0	NB
N	<i>Rhizomnium pseudopunctatum</i>	Felted Leafy Moss				S1?	2 May Be At Risk	1	18.7 ± 0.0	NB
N	<i>Cephaloziella spinigera</i>	Spiny Threadwort				S1S2	6 Not Assessed	2	63.9 ± 0.0	NB
N	<i>Odontoschisma sphagni</i>	Bog-Moss Flapwort				S1S2	6 Not Assessed	1	30.6 ± 0.0	NB
N	<i>Pallavicinia lyellii</i>	Lyell's Ribbonwort				S1S2	6 Not Assessed	2	72.9 ± 1.0	NB
N	<i>Ditrichum pallidum</i>	Pale Cow-hair Moss				S1S2	2 May Be At Risk	1	97.5 ± 1.0	NB
N	<i>Drummondia prorepens</i>	a Moss				S1S2	2 May Be At Risk	1	23.1 ± 0.0	NB
N	<i>Seligeria brevifolia</i>	a Moss				S1S2	3 Sensitive	4	21.7 ± 0.0	NB
N	<i>Pseudotaxiphyllum distichaceum</i>	a Moss				S1S2	2 May Be At Risk	1	80.3 ± 1.0	NB
N	<i>Calypogeia neesiana</i>	Nees' Pouchwort				S1S3	6 Not Assessed	1	90.3 ± 1.0	NB
N	<i>Anomodon viticulosus</i>	a Moss				S2	2 May Be At Risk	1	80.1 ± 10.0	NB
N	<i>Cirriphyllum piliferum</i>	Hair-pointed Moss				S2	3 Sensitive	3	84.4 ± 1.0	NB
N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2	3 Sensitive	1	61.9 ± 15.0	NB
N	<i>Pohlia elongata</i>	Long-necked Nodding Moss				S2	3 Sensitive	4	20.7 ± 0.0	NB
N	<i>Pohlia sphagnicola</i>	a moss				S2	3 Sensitive	1	17.2 ± 0.0	NB
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S2	3 Sensitive	1	98.4 ± 0.0	NB
N	<i>Sphagnum flexuosum</i>	Flexuous Peatmoss				S2	3 Sensitive	2	20.9 ± 10.0	NB
N	<i>Tayloria serrata</i>	Serrate Trumpet Moss				S2	3 Sensitive	2	74.8 ± 1.0	NB
N	<i>Tetradontium brownianum</i>	Little Georgia				S2	3 Sensitive	5	20.7 ± 0.0	NB
N	<i>Thamnobryum alleghaniense</i>	a Moss				S2	3 Sensitive	1	93.8 ± 1.0	NB
N	<i>Nephroma laevigatum</i>	Mustard Kidney Lichen				S2	2 May Be At Risk	1	14.5 ± 0.0	NB
N	<i>Anacamptodon splachnoides</i>	a Moss				S2?	3 Sensitive	1	5.2 ± 1.0	NB
N	<i>Anomodon minor</i>	Blunt-leaved Anomodon Moss				S2?	2 May Be At Risk	1	78.4 ± 1.0	NB
N	<i>Bryum pallescens</i>	Pale Bryum Moss				S2?	5 Undetermined	1	21.9 ± 100.0	NB
N	<i>Dichelyma capillaceum</i>	Hairlike Dichelyma Moss				S2?	3 Sensitive	1	84.0 ± 3.0	NB
N	<i>Sphagnum angermanicum</i>	a Peatmoss				S2?	3 Sensitive	2	26.0 ± 0.0	NB
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss				S2?	3 Sensitive	2	61.9 ± 15.0	NB
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2?	5 Undetermined	1	20.8 ± 0.0	NB
N	<i>Calliergonella cuspidata</i>	Common Large Wetland Moss				S2S3	3 Sensitive	2	75.2 ± 5.0	NB
N	<i>Orthotrichum speciosum</i>	Showy Bristle Moss				S2S3	5 Undetermined	4	4.3 ± 4.0	NB
N	<i>Pohlia prolifera</i>	Cottony Nodding Moss				S2S3	3 Sensitive	9	18.7 ± 0.0	NB
N	<i>Sphagnum subfulvum</i>	a Peatmoss				S2S3	2 May Be At Risk	2	16.5 ± 0.0	NB
N	<i>Zygodon viridissimus</i>	a Moss				S2S3	2 May Be At Risk	1	21.8 ± 0.0	NB
N	<i>Dendroscocaulon umhausense</i>	a lichen				S2S3	3 Sensitive	1	23.5 ± 0.0	NB
N	<i>Schistidium maritimum</i>	a Moss				S3	4 Secure	1	18.7 ± 0.0	NB
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	3 Sensitive	1	23.5 ± 0.0	NB
N	<i>Ahtiana aurescens</i>	Eastern Candlewax Lichen				S3	5 Undetermined	1	18.0 ± 0.0	NB
N	<i>Usnea strigosa</i>	Bushy Beard Lichen				S3	5 Undetermined	3	64.4 ± 0.0	NB
N	<i>Aulacomnium androgynum</i>	Little Groove Moss				S3?	4 Secure	5	18.7 ± 0.0	NB

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N	<i>Dicranella rufescens</i>	Red Forklet Moss				S3?	5 Undetermined	1	88.8 ± 7.0	NB
N	<i>Sphagnum lescurii</i>	a Peatmoss				S3?	5 Undetermined	1	96.1 ± 0.0	NS
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss				S3S4	4 Secure	1	51.9 ± 15.0	NB
N	<i>Dicranum majus</i>	Greater Broom Moss				S3S4	4 Secure	4	16.2 ± 0.0	NB
N	<i>Dicranum leioneuron</i>	a Dicranum Moss				S3S4	4 Secure	2	45.2 ± 10.0	NB
N	<i>Fissidens bryoides</i>	Lesser Pocket Moss				S3S4	4 Secure	1	16.6 ± 5.0	NB
N	<i>Heterocladium dimorphum</i>	Dimorphous Tangle Moss				S3S4	4 Secure	2	15.0 ± 0.0	NB
N	<i>Pogonatum dentatum</i>	Mountain Hair Moss				S3S4	4 Secure	1	22.9 ± 0.0	NB
N	<i>Sphagnum compactum</i>	Compact Peat Moss				S3S4	4 Secure	2	22.9 ± 1.0	NB
N	<i>Sphagnum torreyanum</i>	a Peatmoss				S3S4	4 Secure	1	11.8 ± 0.0	NB
N	<i>Sphagnum austinii</i>	Austin's Peat Moss				S3S4	4 Secure	1	96.1 ± 0.0	NS
N	<i>Sphagnum contortum</i>	Twisted Peat Moss				S3S4	4 Secure	1	11.8 ± 0.0	NB
N	<i>Tetraphis geniculata</i>	Geniculate Four-tooth Moss				S3S4	4 Secure	3	16.2 ± 0.0	NB
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	1	20.8 ± 0.0	NB
N	<i>Rauvolfia scita</i>	Smaller Fern Moss				S3S4	3 Sensitive	1	16.8 ± 0.0	NB
N	<i>Pseudocyphellaria perpetua</i>	Gilded Specklebelly Lichen				S3S4	3 Sensitive	5	15.5 ± 0.0	NB
N	<i>Stereocaulon paschale</i>	Easter Foam Lichen				S3S4	5 Undetermined	1	89.6 ± 1.0	NB
N	<i>Leucodon brachypus</i>	a Moss				SH	2 May Be At Risk	9	13.8 ± 0.0	NB
N	<i>Splachnum luteum</i>	Yellow Collar Moss				SH	5 Undetermined	1	21.9 ± 100.0	NB
N	<i>Cyrto-hypnum minutulum</i>	Tiny Cedar Moss				SH	2 May Be At Risk	3	89.0 ± 10.0	NB
P	<i>Juglans cinerea</i>	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	25	18.1 ± 0.0	NB
P	<i>Symphyotrichum laurentianum</i>	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	1 At Risk	22	12.4 ± 0.0	NB
P	<i>Symphyotrichum subulatum</i> (Bathurst pop)	Bathurst Aster - Bathurst pop.	Special Concern	Special Concern	Endangered	S2	1 At Risk	84	3.2 ± 0.0	NB
P	<i>Lechea maritima</i> var. <i>subcylindrica</i>	Beach Pinweed	Special Concern			S2	3 Sensitive	498	8.7 ± 0.0	NB
P	<i>Eriocaulon parkeri</i>	Parker's Pipewort	Not At Risk		Endangered	S2	1 At Risk	82	61.6 ± 0.0	NB
P	<i>Cryptotaenia canadensis</i>	Canada Honewort				S1	2 May Be At Risk	1	81.5 ± 1.0	NB
P	<i>Antennaria howellii</i> ssp. <i>petaloidea</i>	Pussy-Toes				S1	2 May Be At Risk	1	65.7 ± 5.0	PE
P	<i>Symphyotrichum subulatum</i> (non-Bathurst pop)	Annual Saltmarsh Aster				S1	2 May Be At Risk	12	98.5 ± 0.0	NB
P	<i>Bidens eatonii</i>	Eaton's Beggarticks				S1	2 May Be At Risk	7	61.6 ± 1.0	NB
P	<i>Pseudognaphalium obtusifolium</i>	Eastern Cudweed				S1	2 May Be At Risk	26	22.2 ± 5.0	NB
P	<i>Solidago multiradiata</i>	Multi-rayed Goldenrod				S1	2 May Be At Risk	10	90.4 ± 0.0	NB
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch				S1	2 May Be At Risk	3	36.7 ± 0.0	NB
P	<i>Draba incana</i>	Twisted Whitlow-grass				S1	2 May Be At Risk	4	80.1 ± 0.0	PE
P	<i>Stellaria crassifolia</i>	Fleshy Stitchwort				S1	2 May Be At Risk	4	48.2 ± 10.0	NB
P	<i>Chenopodium simplex</i>	Maple-leaved Goosefoot				S1	2 May Be At Risk	5	84.1 ± 5.0	NB
P	<i>Suaeda rolandii</i>	Roland's Sea-Blite				S1	3 Sensitive	2	97.6 ± 0.0	NB
P	<i>Triadenum virginicum</i>	Virginia St John's-wort				S1	2 May Be At Risk	1	47.7 ± 0.0	NB
P	<i>Corema conradii</i>	Broom Crowberry				S1	2 May Be At Risk	6	80.1 ± 0.0	PE
P	<i>Vaccinium boreale</i>	Northern Blueberry				S1	2 May Be At Risk	3	56.1 ± 0.0	PE
P	<i>Vaccinium uliginosum</i>	Alpine Bilberry				S1	2 May Be At Risk	1	64.7 ± 1.0	PE
P	<i>Chamaesyce polygonifolia</i>	Seaside Spurge				S1	2 May Be At Risk	20	14.6 ± 10.0	NB
P	<i>Bartonia virginica</i>	Yellow Bartonia				S1	2 May Be At Risk	3	46.6 ± 0.0	NB
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1	2 May Be At Risk	1	48.4 ± 100.0	NB

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P	<i>Amelanchier fernaldii</i>	Fernald's Serviceberry				S1	2 May Be At Risk	1	86.0 ± 1.0	NB
P	<i>Crataegus jonesiae</i>	Jones' Hawthorn				S1	2 May Be At Risk	1	74.6 ± 1.0	NB
P	<i>Dryas integrifolia</i>	Entire-leaved Mountain Avens				S1	2 May Be At Risk	11	88.8 ± 3.0	NB
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S1	5 Undetermined	1	93.9 ± 0.0	NB
P	<i>Waldsteinia fragarioides</i>	Barren Strawberry				S1	2 May Be At Risk	1	97.5 ± 1.0	NB
P	<i>Salix myrtillofolia</i>	Blueberry Willow				S1	2 May Be At Risk	24	89.6 ± 0.0	NB
P	<i>Agalinis paupercula</i> var. <i>borealis</i>	Small-flowered Agalinis				S1	2 May Be At Risk	35	68.2 ± 0.0	PE
P	<i>Carex annectens</i>	Yellow-Fruited Sedge				S1	2 May Be At Risk	3	62.0 ± 0.0	NB
P	<i>Carex atlantica</i> ssp. <i>atlantica</i>	Atlantic Sedge				S1	2 May Be At Risk	2	81.8 ± 0.0	NB
P	<i>Carex backii</i>	Rocky Mountain Sedge				S1	2 May Be At Risk	2	94.5 ± 0.0	NB
P	<i>Carex merritt-fernalidii</i>	Merritt Fernald's Sedge				S1	2 May Be At Risk	1	94.9 ± 0.0	NB
P	<i>Carex rariflora</i>	Loose-flowered Alpine Sedge				S1	2 May Be At Risk	1	80.0 ± 0.0	PE
P	<i>Carex sterilis</i>	Sterile Sedge				S1	2 May Be At Risk	1	76.8 ± 2.0	NB
P	<i>Cyperus diandrus</i>	Low Flatsedge				S1	2 May Be At Risk	2	71.7 ± 0.0	NB
P	<i>Cyperus bipartitus</i>	Shining Flatsedge				S1	2 May Be At Risk	13	62.6 ± 0.0	NB
P	<i>Scirpus pendulus</i>	Hanging Bulrush				S1	2 May Be At Risk	7	38.7 ± 0.0	PE
P	<i>Schoenoplectus smithii</i>	Smith's Bulrush				S1	2 May Be At Risk	18	61.6 ± 0.0	NB
P	<i>Juncus greenei</i>	Greene's Rush				S1	2 May Be At Risk	10	20.7 ± 10.0	NB
P	<i>Juncus stygius</i>	Moor Rush				S1	2 May Be At Risk	1	52.3 ± 0.0	NB
P	<i>Juncus stygius</i> ssp. <i>americanus</i>	Moor Rush				S1	2 May Be At Risk	16	1.4 ± 5.0	NB
P	<i>Allium canadense</i>	Canada Garlic				S1	2 May Be At Risk	1	70.9 ± 1.0	NB
P	<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S1	2 May Be At Risk	4	83.2 ± 5.0	NB
P	<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid				S1	2 May Be At Risk	1	83.1 ± 0.0	NB
P	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	Slim-stemmed Reed Grass				S1	2 May Be At Risk	2	18.9 ± 0.0	NB
P	<i>Catabrosa aquatica</i> var. <i>laurentiana</i>	Water Whorl Grass				S1	2 May Be At Risk	3	63.2 ± 5.0	PE
P	<i>Puccinellia ambigua</i>	Dwarf Alkali Grass				S1	5 Undetermined	1	65.4 ± 5.0	PE
P	<i>Zizania aquatica</i> var. <i>brevis</i>	Indian Wild Rice				S1	2 May Be At Risk	16	61.3 ± 0.0	NB
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S1	2 May Be At Risk	6	62.9 ± 3.0	PE
P	<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	2 May Be At Risk	2	68.6 ± 0.0	NB
P	<i>Dryopteris filix-mas</i>	Male Fern				S1	2 May Be At Risk	2	88.6 ± 1.0	NB
P	<i>Bidens heterodoxa</i>	Connecticut Beggar-Ticks				S1?	2 May Be At Risk	4	25.9 ± 0.0	NB
P	<i>Carex crawei</i>	Crawe's Sedge				S1S2	2 May Be At Risk	1	88.3 ± 0.0	NB
P	<i>Thelypteris simulata</i>	Bog Fern				S1S2	2 May Be At Risk	1	50.0 ± 1.0	NB
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S1S3	2 May Be At Risk	11	12.1 ± 0.0	NB
P	<i>Eriophorum russeolum</i> var. <i>albidum</i>	Russet Cotton-Grass				S1S3	5 Undetermined	1	91.7 ± 1.0	NB
P	<i>Listera australis</i>	Southern Twayblade			Endangered	S2	1 At Risk	31	17.9 ± 0.0	NB
P	<i>Osmorhiza depauperata</i>	Blunt Sweet Cicely				S2	3 Sensitive	2	89.8 ± 1.0	NB
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	3 Sensitive	2	80.1 ± 0.0	NB
P	<i>Pseudognaphalium macounii</i>	Macoun's Cudweed				S2	3 Sensitive	41	37.7 ± 0.0	PE
P	<i>Ionactis linariifolius</i>	Stiff Aster				S2	3 Sensitive	18	10.9 ± 5.0	NB
P	<i>Symphotrichum subulatum</i>	Annual Saltmarsh Aster				S2	1 At Risk	128	41.9 ± 0.0	NB
P	<i>Arabis drummondii</i>	Drummond's Rockcress				S2	3 Sensitive	4	65.4 ± 1.0	NB
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S2	3 Sensitive	2	68.6 ± 0.0	PE
P	<i>Sagina nodosa</i> ssp. <i>borealis</i>	Knotted Pearlwort				S2	3 Sensitive	3	70.7 ± 0.0	PE

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P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	3 Sensitive	3	37.7 ± 1.0	NB
P	<i>Atriplex franktonii</i>	Frankton's Saltbush				S2	4 Secure	4	45.0 ± 0.0	NB
P	<i>Chenopodium rubrum</i>	Red Pigweed				S2	3 Sensitive	16	10.4 ± 0.0	NB
P	<i>Hypericum dissimulatum</i>	Disguised St John's-wort				S2	3 Sensitive	2	66.4 ± 0.0	PE
P	<i>Shepherdia canadensis</i>	Soapberry				S2	3 Sensitive	5	86.3 ± 1.0	NB
P	<i>Astragalus eucosmus</i>	Elegant Milk-vetch				S2	2 May Be At Risk	1	68.6 ± 0.0	NB
P	<i>Gentiana linearis</i>	Narrow-Leaved Gentian				S2	3 Sensitive	3	24.8 ± 50.0	NB
P	<i>Nuphar lutea ssp. rubrodiscalis</i>	Red-disked Yellow Pond-lily				S2	3 Sensitive	8	2.2 ± 1.0	NB
P	<i>Orobanche uniflora</i>	One-Flowered Broomrape				S2	3 Sensitive	2	71.6 ± 1.0	NB
P	<i>Polygala paucifolia</i>	Fringed Milkwort				S2	3 Sensitive	3	92.9 ± 1.0	NB
P	<i>Polygonum amphibium var. emersum</i>	Water Smartweed				S2	3 Sensitive	1	68.6 ± 0.0	NB
P	<i>Polygonum careyi</i>	Carey's Smartweed				S2	3 Sensitive	2	37.9 ± 1.0	NB
P	<i>Podostemum ceratophyllum</i>	Horn-leaved Riverweed				S2	3 Sensitive	5	70.6 ± 1.0	NB
P	<i>Anemone parviflora</i>	Small-flowered Anemone				S2	3 Sensitive	8	89.9 ± 0.0	NB
P	<i>Hepatica nobilis var. obtusa</i>	Round-lobed Hepatica				S2	3 Sensitive	3	84.7 ± 0.0	NB
P	<i>Crataegus scabrada</i>	Rough Hawthorn				S2	3 Sensitive	1	69.7 ± 1.0	NB
P	<i>Crataegus succulenta</i>	Fleshy Hawthorn				S2	3 Sensitive	2	72.2 ± 0.0	PE
P	<i>Salix candida</i>	Sage Willow				S2	3 Sensitive	2	74.5 ± 0.0	PE
P	<i>Euphrasia randii</i>	Rand's Eyebright				S2	2 May Be At Risk	2	78.1 ± 0.0	PE
P	<i>Dirca palustris</i>	Eastern Leatherwood				S2	2 May Be At Risk	1	79.4 ± 1.0	NB
P	<i>Sagittaria calycina var. spongiosa</i>	Long-lobed Arrowhead				S2	4 Secure	144	11.3 ± 0.0	NB
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S2	3 Sensitive	93	97.7 ± 0.0	NS
P	<i>Carex comosa</i>	Bearded Sedge				S2	2 May Be At Risk	3	90.8 ± 0.0	NB
P	<i>Carex granularis</i>	Limestone Meadow Sedge				S2	3 Sensitive	9	21.9 ± 5.0	NB
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S2	3 Sensitive	1	75.5 ± 0.0	PE
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2	3 Sensitive	13	26.3 ± 0.0	NB
P	<i>Carex livida var. radicaulis</i>	Livid Sedge				S2	3 Sensitive	8	95.0 ± 0.0	NS
P	<i>Carex rostrata</i>	Narrow-leaved Beaked Sedge				S2	3 Sensitive	1	2.2 ± 5.0	NB
P	<i>Carex salina</i>	Saltmarsh Sedge				S2	3 Sensitive	1	76.2 ± 0.0	NB
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S2	2 May Be At Risk	10	42.6 ± 0.0	NB
P	<i>Carex albicans var. emmonsii</i>	White-tinged Sedge				S2	3 Sensitive	15	57.3 ± 0.0	NB
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S2	2 May Be At Risk	38	20.9 ± 10.0	NB
P	<i>Blysmus rufus</i>	Red Bulrush				S2	3 Sensitive	30	6.4 ± 0.0	NB
P	<i>Juncus vaseyi</i>	Vasey Rush				S2	3 Sensitive	9	3.3 ± 1.0	NB
P	<i>Allium tricoccum</i>	Wild Leek				S2	2 May Be At Risk	1	83.2 ± 5.0	NB
P	<i>Calypso bulbosa var. americana</i>	Calypso				S2	2 May Be At Risk	6	79.0 ± 5.0	NB
P	<i>Coeloglossum viride var. virescens</i>	Long-bracted Frog Orchid				S2	2 May Be At Risk	4	85.5 ± 10.0	NB
P	<i>Cypripedium parviflorum var. makasin</i>	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	1	62.1 ± 5.0	NB
P	<i>Goodyera oblongifolia</i>	Menzies' Rattlesnake-plantain				S2	3 Sensitive	3	65.5 ± 0.0	PE
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	3 Sensitive	6	39.2 ± 0.0	NB
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S2	2 May Be At Risk	5	87.8 ± 0.0	NB
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S2	3 Sensitive	2	71.0 ± 0.0	NB
P	<i>Elymus canadensis</i>	Canada Wild Rye				S2	2 May Be At Risk	1	61.5 ± 1.0	NB

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P	<i>Piptatherum canadense</i>	Canada Rice Grass				S2	3 Sensitive	3	51.5 ± 10.0	NB
P	<i>Puccinellia laurentiana</i>	Nootka Alkali Grass				S2	3 Sensitive	2	18.6 ± 10.0	NB
P	<i>Puccinellia phryganodes</i>	Creeping Alkali Grass				S2	3 Sensitive	1	65.8 ± 1.0	NB
P	<i>Zizania aquatica</i> var. <i>aquatica</i>	Indian Wild Rice				S2	5 Undetermined	7	24.5 ± 0.0	NB
P	<i>Piptatherum pungens</i>	Slender Rice Grass				S2	2 May Be At Risk	2	5.5 ± 5.0	NB
P	<i>Potamogeton vaseyi</i>	Vasey's Pondweed				S2	3 Sensitive	1	64.1 ± 0.0	PE
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S2	3 Sensitive	1	94.7 ± 1.0	NB
P	<i>Woodwardia virginica</i>	Virginia Chain Fern				S2	3 Sensitive	11	12.3 ± 0.0	NB
P	<i>Lycopodium sitchense</i>	Sitka Clubmoss				S2	3 Sensitive	3	86.4 ± 0.0	NB
P	<i>Toxicodendron radicans</i>	Poison Ivy				S2?	3 Sensitive	7	30.0 ± 0.0	NB
P	<i>Symphotrichum novibeltii</i> var. <i>crenifolium</i>	New York Aster				S2?	5 Undetermined	2	10.9 ± 0.0	NB
P	<i>Humulus lupulus</i> var. <i>lupuloides</i>	Common Hop				S2?	3 Sensitive	3	15.5 ± 5.0	NB
P	<i>Rubus recurvicaulis</i>	Arching Dewberry				S2?	4 Secure	3	44.6 ± 0.0	NB
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw				S2?	4 Secure	9	14.0 ± 10.0	NB
P	<i>Salix myricoides</i>	Bayberry Willow				S2?	3 Sensitive	3	75.7 ± 5.0	NB
P	<i>Carex vacillans</i>	Estuarine Sedge				S2?	3 Sensitive	3	63.6 ± 1.0	NB
P	<i>Barbarea orthoceras</i>	American Yellow Rocket				S2S3	3 Sensitive	1	74.7 ± 0.0	NB
P	<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S2S3	3 Sensitive	15	56.6 ± 0.0	NB
P	<i>Callitriche hermaphroditica</i>	Northern Water-starwort				S2S3	4 Secure	4	64.5 ± 0.0	NB
P	<i>Elatine americana</i>	American Waterwort				S2S3	3 Sensitive	20	22.7 ± 2.0	NB
P	<i>Bartonia paniculata</i> ssp. <i>iodandra</i>	Branched Bartonia				S2S3	3 Sensitive	1	32.0 ± 0.0	NB
P	<i>Geranium robertianum</i>	Herb Robert				S2S3	4 Secure	55	37.8 ± 0.0	PE
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2S3	3 Sensitive	4	16.9 ± 50.0	NB
P	<i>Rumex maritimus</i> var. <i>persicarioides</i>	Peach-leaved Dock				S2S3	5 Undetermined	3	12.4 ± 0.0	NB
P	<i>Rumex pallidus</i>	Seabeach Dock				S2S3	3 Sensitive	6	20.3 ± 0.0	NB
P	<i>Rubus pensilvanicus</i>	Pennsylvania Blackberry				S2S3	4 Secure	13	39.9 ± 0.0	PE
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2S3	3 Sensitive	10	50.3 ± 0.0	PE
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	4 Secure	5	15.1 ± 1.0	NB
P	<i>Corallorhiza maculata</i> var. <i>occidentalis</i>	Spotted Coralroot				S2S3	3 Sensitive	6	47.5 ± 0.0	NB
P	<i>Listera auriculata</i>	Auricled Twayblade				S2S3	3 Sensitive	9	42.5 ± 0.0	NB
P	<i>Spiranthes cernua</i>	Nodding Ladies'-Tresses				S2S3	3 Sensitive	7	68.7 ± 0.0	PE
P	<i>Eragrostis pectinacea</i>	Tufted Love Grass				S2S3	4 Secure	4	61.2 ± 0.0	NB
P	<i>Stuckenia filiformis</i> ssp. <i>alpina</i>	Thread-leaved Pondweed				S2S3	3 Sensitive	2	47.8 ± 1.0	NB
P	<i>Stuckenia pectinata</i>	Sago Pondweed				S2S3	3 Sensitive	31	4.1 ± 0.0	NB
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S2S3	4 Secure	9	43.6 ± 0.0	PE
P	<i>Panax trifolius</i>	Dwarf Ginseng				S3	3 Sensitive	20	20.9 ± 5.0	NB
P	<i>Arnica lanceolata</i>	Lance-leaved Arnica				S3	4 Secure	10	87.6 ± 0.0	NB
P	<i>Artemisia campestris</i> ssp. <i>caudata</i>	Field Wormwood				S3	4 Secure	5	65.0 ± 0.0	NB
P	<i>Bidens hyperborea</i>	Estuary Beggarticks				S3	4 Secure	100	11.9 ± 0.0	NB
P	<i>Bidens hyperborea</i> var. <i>hyperborea</i>	Estuary Beggarticks				S3	4 Secure	13	12.9 ± 1.0	NB
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	4 Secure	15	86.1 ± 1.0	NB

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P	<i>Symphotrichum boreale</i>	Boreal Aster				S3	3 Sensitive	5	12.2 ± 0.0	NB
P	<i>Betula pumila</i>	Bog Birch				S3	4 Secure	107	1.0 ± 1.0	NB
P	<i>Arabis glabra</i>	Tower Mustard				S3	5 Undetermined	1	89.2 ± 0.0	NB
P	<i>Arabis hirsuta</i> var. <i>pycnocarpa</i>	Western Hairy Rockcress				S3	4 Secure	6	51.7 ± 0.0	NB
P	<i>Cardamine maxima</i>	Large Toothwort				S3	4 Secure	5	79.5 ± 0.0	NB
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S3	4 Secure	6	6.7 ± 0.0	NB
P	<i>Hudsonia tomentosa</i>	Woolly Beach-heath				S3	4 Secure	248	8.6 ± 5.0	NB
P	<i>Crassula aquatica</i>	Water Pygmyweed				S3	4 Secure	49	11.9 ± 0.0	NB
P	<i>Elatine minima</i>	Small Waterwort				S3	4 Secure	4	61.6 ± 0.0	NB
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill				S3	4 Secure	13	39.0 ± 0.0	NB
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil				S3	4 Secure	9	24.2 ± 0.0	NB
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil				S3	4 Secure	10	65.4 ± 1.0	NB
P	<i>Teucrium canadense</i>	Canada Germander				S3	3 Sensitive	105	8.8 ± 0.0	NB
P	<i>Nuphar lutea</i> ssp. <i>pumila</i>	Small Yellow Pond-lily				S3	4 Secure	7	63.1 ± 0.0	NB
P	<i>Epilobium hornemannii</i>	Hornemann's Willowherb				S3	4 Secure	3	85.0 ± 10.0	NB
P	<i>Epilobium strictum</i>	Downy Willowherb				S3	4 Secure	13	55.0 ± 5.0	PE
P	<i>Polygala sanguinea</i>	Blood Milkwort				S3	3 Sensitive	26	40.1 ± 0.0	NB
P	<i>Polygonum arifolium</i>	Halberd-leaved Tearthumb				S3	4 Secure	60	8.8 ± 0.0	NB
P	<i>Polygonum punctatum</i>	Dotted Smartweed				S3	4 Secure	3	12.2 ± 2.0	NB
P	<i>Polygonum punctatum</i> var. <i>confertiflorum</i>	Dotted Smartweed				S3	4 Secure	45	14.5 ± 0.0	NB
P	<i>Polygonum scandens</i>	Climbing False Buckwheat				S3	4 Secure	47	6.9 ± 0.0	NB
P	<i>Samolus valerandi</i>	Seaside Brookweed				S3	4 Secure	6	10.7 ± 0.0	NB
P	<i>Samolus valerandi</i> ssp. <i>parviflorus</i>	Seaside Brookweed				S3	4 Secure	205	3.7 ± 0.0	NB
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	4 Secure	4	65.4 ± 0.0	NB
P	<i>Clematis occidentalis</i>	Purple Clematis				S3	4 Secure	2	93.8 ± 0.0	NB
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup				S3	4 Secure	23	21.0 ± 5.0	NB
P	<i>Thalictrum venulosum</i>	Northern Meadow-rue				S3	4 Secure	1	74.7 ± 0.0	NB
P	<i>Amelanchier canadensis</i>	Canada Serviceberry				S3	4 Secure	14	13.3 ± 1.0	NB
P	<i>Rosa palustris</i>	Swamp Rose				S3	4 Secure	5	13.7 ± 5.0	NB
P	<i>Galium boreale</i>	Northern Bedstraw				S3	4 Secure	2	77.1 ± 1.0	NB
P	<i>Salix interior</i>	Sandbar Willow				S3	4 Secure	1	85.3 ± 1.0	NB
P	<i>Salix pedicellaris</i>	Bog Willow				S3	4 Secure	32	2.2 ± 1.0	NB
P	<i>Comandra umbellata</i>	Bastard's Toadflax				S3	4 Secure	88	8.7 ± 0.0	NB
P	<i>Parnassia glauca</i>	Fen Grass-of-Parnassus				S3	4 Secure	3	69.4 ± 0.0	NB
P	<i>Limosella australis</i>	Southern Mudwort				S3	4 Secure	122	7.4 ± 0.0	NB
P	<i>Veronica serpyllifolia</i> ssp. <i>humifusa</i>	Thyme-Leaved Speedwell				S3	4 Secure	4	45.5 ± 1.0	NB
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle				S3	3 Sensitive	7	76.1 ± 0.0	NB
P	<i>Pilea pumila</i>	Dwarf Clearweed				S3	4 Secure	26	38.4 ± 0.0	PE
P	<i>Viola adunca</i>	Hooked Violet				S3	4 Secure	2	94.9 ± 0.0	NB
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S3	4 Secure	3	50.4 ± 1.0	PE
P	<i>Carex aquatilis</i>	Water Sedge				S3	4 Secure	13	7.0 ± 0.0	NB
P	<i>Carex arcta</i>	Northern Clustered Sedge				S3	4 Secure	3	14.9 ± 0.0	NB
P	<i>Carex chordorrhiza</i>	Creeping Sedge				S3	4 Secure	47	63.1 ± 5.0	PE
P	<i>Carex conoidea</i>	Field Sedge				S3	4 Secure	3	18.4 ± 10.0	NB
P	<i>Carex eburnea</i>	Bristle-leaved Sedge				S3	4 Secure	1	94.3 ± 100.0	NB
P	<i>Carex garberi</i>	Garber's Sedge				S3	3 Sensitive	6	48.4 ± 0.0	NB
P	<i>Carex haydenii</i>	Hayden's Sedge				S3	4 Secure	5	63.2 ± 0.0	NB
P	<i>Carex lupulina</i>	Hop Sedge				S3	4 Secure	1	13.5 ± 1.0	NB
P	<i>Carex michauxiana</i>	Michaux's Sedge				S3	4 Secure	4	86.7 ± 0.0	NB

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P	<i>Carex ormostachya</i>	Necklace Spike Sedge				S3	4 Secure	6	63.6 ± 1.0	NB
P	<i>Carex tenera</i>	Tender Sedge				S3	4 Secure	6	18.4 ± 10.0	NB
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S3	4 Secure	10	18.4 ± 10.0	NB
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	4 Secure	107	12.0 ± 0.0	NB
P	<i>Carex recta</i>	Estuary Sedge				S3	4 Secure	12	11.7 ± 0.0	NB
P	<i>Cyperus dentatus</i>	Toothed Flatsedge				S3	4 Secure	2	9.1 ± 1.0	NB
P	<i>Cyperus esculentus</i>	Perennial Yellow Nutsedge				S3	4 Secure	4	71.0 ± 0.0	NB
P	<i>Eleocharis intermedia</i>	Matted Spikerush				S3	4 Secure	1	80.9 ± 0.0	NB
P	<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush				S3	4 Secure	1	74.3 ± 0.0	PE
P	<i>Rhynchospora capitellata</i>	Small-headed Beakrush				S3	4 Secure	34	70.4 ± 0.0	NB
P	<i>Rhynchospora fusca</i>	Brown Beakrush				S3	4 Secure	7	95.2 ± 0.0	NS
P	<i>Trichophorum clintonii</i>	Clinton's Clubrush				S3	4 Secure	2	93.6 ± 0.0	NB
P	<i>Schoenoplectus fluviatilis</i>	River Bulrush				S3	3 Sensitive	4	79.1 ± 1.0	NB
P	<i>Schoenoplectus torreyi</i>	Torrey's Bulrush				S3	4 Secure	8	57.3 ± 0.0	NB
P	<i>Lemna trisulca</i>	Star Duckweed				S3	4 Secure	8	55.0 ± 5.0	PE
P	<i>Triantha glutinosa</i>	Sticky False-Asphodel				S3	4 Secure	4	83.5 ± 0.0	NB
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S3	3 Sensitive	30	39.2 ± 5.0	PE
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3	4 Secure	29	13.5 ± 1.0	NB
P	<i>Platanthera blephariglottis</i>	White Fringed Orchid				S3	4 Secure	99	2.2 ± 1.0	NB
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	3 Sensitive	13	15.1 ± 5.0	NB
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S3	3 Sensitive	6	74.9 ± 0.0	NB
P	<i>Calamagrostis pickeringii</i>	Pickering's Reed Grass				S3	4 Secure	6	8.5 ± 0.0	NB
P	<i>Dichanthelium depauperatum</i>	Starved Panic Grass				S3	4 Secure	15	10.9 ± 0.0	NB
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	4 Secure	24	43.6 ± 0.0	PE
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S3	3 Sensitive	1	76.6 ± 0.0	NB
P	<i>Xyris montana</i>	Northern Yellow-Eyed-Grass				S3	4 Secure	67	2.2 ± 1.0	NB
P	<i>Zannichellia palustris</i>	Horned Pondweed				S3	4 Secure	80	7.9 ± 0.0	NB
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S3	4 Secure	2	86.1 ± 0.0	NB
P	<i>Asplenium trichomanes-ramosum</i>	Green Spleenwort				S3	4 Secure	1	94.6 ± 1.0	NB
P	<i>Dryopteris fragrans</i> var. <i>remotiuscula</i>	Fragrant Wood Fern				S3	4 Secure	9	19.1 ± 0.0	NB
P	<i>Isoetes tuckermanii</i>	Tuckerman's Quillwort				S3	4 Secure	4	61.6 ± 0.0	NB
P	<i>Lycopodium sabinifolium</i>	Ground-Fir				S3	4 Secure	9	13.9 ± 0.0	NB
P	<i>Huperzia appalachiana</i>	Appalachian Fir-Clubmoss				S3	3 Sensitive	1	65.4 ± 1.0	NB
P	<i>Botrychium dissectum</i>	Cut-leaved Moonwort				S3	4 Secure	4	38.3 ± 1.0	NB
P	<i>Botrychium lanceolatum</i> var. <i>angustisegmentum</i>	Lance-Leaf Grape-Fern				S3	3 Sensitive	5	16.9 ± 0.0	NB
P	<i>Botrychium simplex</i>	Least Moonwort				S3	4 Secure	6	12.9 ± 0.0	NB
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	4 Secure	3	91.2 ± 1.0	NB
P	<i>Lobelia kalmii</i>	Brook Lobelia				S3S4	4 Secure	6	83.5 ± 0.0	NB
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	4 Secure	41	3.2 ± 1.0	NB
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	4 Secure	8	71.3 ± 3.0	PE
P	<i>Stachys pilosa</i>	Hairy Hedge-Nettle				S3S4	5 Undetermined	1	74.6 ± 0.0	NB
P	<i>Utricularia gibba</i>	Humped Bladderwort				S3S4	4 Secure	4	41.5 ± 1.0	NB
P	<i>Rumex maritimus</i>	Sea-Side Dock				S3S4	4 Secure	66	13.7 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Rumex maritimus</i> var. <i>fuiginus</i>	Tierra del Fuego Dock				S3S4	4 Secure	10	12.4 ± 0.0	NB
P	<i>Potentilla arguta</i>	Tall Cinquefoil				S3S4	4 Secure	1	97.1 ± 50.0	NB
P	<i>Rubus chamaemorus</i>	Cloudberry				S3S4	4 Secure	83	1.0 ± 2.0	NB
P	<i>Geocaulon lividum</i>	Northern Comandra				S3S4	4 Secure	54	2.2 ± 1.0	NB
P	<i>Juniperus horizontalis</i>	Creeping Juniper				S3S4	4 Secure	13	38.9 ± 0.0	PE
P	<i>Cladium mariscoides</i>	Smooth Twigrush				S3S4	4 Secure	6	75.7 ± 1.0	NB
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	4 Secure	208	1.0 ± 2.0	NB
P	<i>Triglochin gaspensis</i>	Gasp Arrowgrass				S3S4	4 Secure	74	4.2 ± 0.0	NB
P	<i>Spirodela polyrrhiza</i>	Great Duckweed				S3S4	4 Secure	2	91.4 ± 0.0	NB
P	<i>Corallorhiza maculata</i>	Spotted Coralroot				S3S4	3 Sensitive	11	10.7 ± 3.0	NB
P	<i>Calamagrostis stricta</i>	Slim-stemmed Reed Grass				S3S4	4 Secure	21	6.4 ± 0.0	NB
P	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	Slim-stemmed Reed Grass				S3S4	4 Secure	2	74.8 ± 1.0	PE
P	<i>Calamagrostis stricta</i> var. <i>stricta</i>	Slim-stemmed Reed Grass				S3S4	4 Secure	9	11.5 ± 0.0	NB
P	<i>Distichlis spicata</i>	Salt Grass				S3S4	4 Secure	94	6.0 ± 0.0	NB
P	<i>Potamogeton oakesianus</i>	Oakes' Pondweed				S3S4	4 Secure	5	71.5 ± 0.0	NB
P	<i>Polygonum rail</i>	Sharp-fruited Knotweed				SH	0.1 Extirpated	1	94.2 ± 10.0	NB
P	<i>Montia fontana</i>	Water Blinks				SH	2 May Be At Risk	3	56.2 ± 1.0	NB
P	<i>Agalinis maritima</i>	Saltmarsh Agalinis				SX	0.1 Extirpated	2	7.5 ± 50.0	NB

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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.

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3	MacQuarrie, K. 1991-1999. Site survey files, maps. Island Nature Trust, Charlottetown PE, 60 recs.
3	Mazerolle, D. 2003. Assessment and Rehabilitation of the Gulf of St Lawrence Aster (Symphyotrichum laurentianum) in Southeastern New Brunswick. Irving Eco-centre, la Dune du Bouctouche, 13 recs.
3	Nelson Poirier. 2009. Rare plant finds in the Exmoor & Lyttleton areas. Pers. comm. to S. Blaney. 4 recs, 4 recs.
3	Nye, T. 2002. Wood Turtle observations in Westmorland, Queens Cos. , Pers. com. to S.H. Gerriets, Dec. 3. 3 recs.

# recs	CITATION
3	Sabine, D.L. 2012. Bronze Copper records, 2003-06. New Brunswick Dept of Natural Resources, 5 recs.
3	Stevens, C. 1999. Cam Stevens field data from PEI vegetation plots. Sent along with specimens to C.S. Blaney. UNB masters research project, 732 recs.
3	Toner, M. 2001. Lynx Records 1973-2000. NB Dept of Natural Resources, 29 recs.
3	Toner, M. 2005. Lynx Records 1996-2005. NB Dept of Natural Resources, 48 recs.
2	Bouchard, A. Herbar Marie-Victorin. Universite de Montreal, Montreal QC. 1999.
2	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.
2	Chaput, G. 1999. Atlantic Salmon: Miramichi & SFA 16 Rivers. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-05. 6 recs.
2	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
2	Cowie, Faye. 2007. Surveyed Lakes in New Brunswick. Canadian Rivers Institute, 781 recs.
2	Donelle, R. 2007. Bouctouche Dune Rare Coastal Plant Data. Irving Eco-centre, la Dune du Bouctouche, 2 recs.
2	Gagnon, J. 2003. Prince Edward Island plant records. Societe de la faune et des parcs Quebec, 13 recs.
2	Godbout, V. 2001. Recherche de l'Aster du St-Laurent (Symphyotrichum laurentianum) 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	Harding, R.W. 2008. Harding Personal Insect Collection 1999-2007. R.W. Harding, 309 recs.
2	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2010. New Brunswick Dept Natural Resources, 16 recs (11 active).
2	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 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	McLeod, D. & Saunders, J. 2004. Cyripedium reginae. Pers. comm. to C.S. Blaney. 4 recs, 4 recs.
2	Mills, E. Connell Herbarium Specimens, 1957-2009. University New Brunswick, Fredericton. 2012.
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2	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/ . 582 recs.
1	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
1	Belland, R.J. 2012. PEI moss records from Devonian Botanical Garden. DBG Cryptogam Database, Web site: https://secure.devonian.ualberta.ca/bryo_search.php 748 recs.
1	Belland, R.J. 2012. PEI moss records from New York Botanical Garden. NYBG Virtual Herbarium, Web site: http://sciweb.nybg.org/science2/vii2.asp 135 recs.
1	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
1	Blaney, C.S. 1999. Fieldwork 1999. Atlantic Canada Conservation Data Centre. Sackville NB, 292 recs.
1	Blaney, C.S. 2014. 2014 Bank Swallow colony observation, Westcock, NB. Atlantic Canada Conservation Data Centre.
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 Center, 16 recs.
1	Bredin, K.A. 2002. NB Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Center, 30 recs.
1	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
1	Clavette, A., and others. 2013. Peregrine Falcon nesting information from NatureNB listserv. NatureNB.
1	Clayden, S.R. 2012. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 57 recs.
1	Curley, F.R. Two rare aquatic plant specimens collected by F.R. Curley in PEI and given to D.M. Mazerolle. retired provincial biologist. 2015.
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	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
1	Edsall, J. 2007. Lepidopteran Records from Halls Creek, 1994-2000. Edsall, 43 recs.
1	Gerriets, S.H. 1997-2001. Element Occurrence Database. Atlantic Canada Conservation Data Centre, Sackville NB, 1 rec.
1	Glen, W. 1991. 1991 Prince Edward Island Forest Biomass Inventory Data. PEI Dept of Energy and Forestry, 10059 recs.
1	Goltz, J.P. 2007. Field Notes: <i>Listera australis</i> at Kouchibouguac National Park. , 7 recs.
1	Hall, R.A. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 189 recs.
1	Houle, F; Haber, E. 1990. Status of the Gulf of St. Lawrence Aster, <i>Aster laurentianus</i> (Asteraceae) in Canada. Can. Field-Nat., 104:455-459. 3 recs.
1	Kelly, Glen 2004. Botanical records from 2004 PEI Forestry fieldwork. Dept of Environment, Energy & Forestry, 71 recs.
1	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2009. New Brunswick Dept Natural Resources, 19 recs (14 active).
1	Kirkland, G.L. Jr. & Schmidt, D.F. 1982. Abundance, habitat, reproduction & morphology of forest-dwelling small mammals of NS & south-eastern NB. Can. Field-Nat., 96(2): 156-162. 1 rec.
1	Kirkland, G.L. Jr., Schmidt, D.F. & Kirkland, C.J. 1979. First record of the long-tailed shrew (<i>Sorex dispar</i>) in New Brunswick. Can. Field-Nat., 93: 195-198. 1 rec.
1	Loo, J. & MacDougall, A. 1994. GAP analysis: Summary Report. Fundy Model Forest, 2 recs.
1	Miller, D.G. 2013. Peregrine Falcon nesting information from birdingnewbrunswick.ca .
1	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
1	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
1	Saunders, J. 2009. White-Fringe Orchis photo and coordinates. Pers. comm. to S. Blaney, July 17. 1 rec, 1 rec.
1	Sollows, M.C., 2009. NBM Science Collections databases: Coccinellid & Cerambycid Beetles. New Brunswick Museum, Saint John NB, download Feb. 2009, 569 recs.
1	Spicer, C.D. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 211 recs.
1	Spicer, C.D. 2004. Specimens from CWS Herbarium, Mount Allison Herbarium Database. Mount Allison University, 5939 recs.
1	Steeves, R. 2004. <i>Goodyera pubescens</i> occurrence from Colpitts Brook, Albert Co. , Pers. comm. to C.S. Blaney. 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.

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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. <i>Wilson Journal of Ornithology</i> , 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. <i>Can. J. Zool.</i> , 64: 2339-2343.
1	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.



Square Summary (20LS56)

#species (1st atlas)				#species (2nd atlas)				#hours		#pc done	
poss	prob	conf	total	poss	prob	conf	total	1st	2nd	road	offrd
18	21	66	105	39	32	35	106	43	31.5	15	0

Region summary (#9: Kent)

#squares	#sq with data		#species		#pc done	target #pc
	1st	2nd	1st	2nd		
65	60	61	141	162	385	243

Target number of point counts in this square: 12 road side, 3 off road (1 in Mature coniferous, 2 in Shrubby wetlands). Please try to ensure that each off-road station is located such that the entire 100m radius circle is within the prescribed habitat.

SPECIES	Code		%		SPECIES	Code		%		SPECIES	Code		%	
	1st	2nd	1st	2nd		1st	2nd	1st	2nd		1st	2nd	1st	2nd
Canada Goose		FY	3	36	Great Blue Heron §			25	14	Wilson's Snipe	FL	H	51	44
Wood Duck		P	11	19	Snowy Egret ‡			0	0	American Woodcock	T	H	33	50
Gadwall ‡			1	1	Cattle Egret ‡			0	0	Wilson's Phalarope †			0	0
Eurasian Wigeon ‡			0	0	Green Heron †			0	0	Laughing Gull † §			0	0
American Wigeon	FL	P	18	13	Black-crown N.-Heron † §			0	0	Ring-billed Gull ‡§			3	0
American Black Duck	FL	FY	43	44	Glossy Ibis †			0	0	Herring Gull §	H	A	11	8
Mallard		FY	6	13	Turkey Vulture ‡ª			0	3	Great Black-backed Gull §	NE	A	11	11
Mallard x Am. Black Duck			3	0	Osprey	ON	H	35	32	Black Tern ‡§			0	1
Blue-winged Teal			18	11	Bald Eagle ¢			5	24	Common Tern §		DD	10	11
Northern Shoveler ‡			0	4	Northern Harrier	T	H	30	34	Arctic Tern ‡§			1	1
Northern Pintail ‡			0	1	Sharp-shinned Hawk	H		16	8	Rock Pigeon	NB	AE	36	42
Green-winged Teal		H	13	14	Cooper's Hawk †			0	0	Mourning Dove	P	S	30	60
Redhead †			0	0	Northern Goshawk			10	14	Black-billed Cuckoo			11	9
Ring-necked Duck	FL	P	11	16	Red-should Hawk †			0	0	Eastern Screech-Owl ‡			0	3
Greater Scaup †			0	0	Broad-winged Hawk	P	H	30	52	<u>Great Horned Owl</u>	T		11	19
Common Eider ‡§			0	0	Red-tailed Hawk	H	P	16	22	Barred Owl			8	39
Common Goldeneye			1	3	Virginia Rail †			1	0	Long-eared Owl †			0	4
Hooded Merganser		H	15	21	Sora ‡			6	3	Short-eared Owl †			0	0
Common Merganser			18	27	American Coot †			0	0	Boreal Owl †			1	1
Red-breast Merganser		FY	18	9	Sandhill Crane †		H	0	1	North Saw-whet Owl			3	26
Chukar †			0	0	Semipalmated Plover †			0	0	Common Nighthawk †			30	11
Ring-necked Pheasant			1	11	Piping Plover †			5	13	<u>Whip-poor-will ‡</u>	H		10	0
Ruffed Grouse	FL	S	28	47	Killdeer	NE	P	51	24	<u>Chimney Swift †</u>	H		26	11
Spruce Grouse		H	5	9	Spotted Sandpiper	H	H	48	32	Ruby-thr Hummingbird	T	P	40	57
Common Loon	P	H	10	16	Solitary Sandpiper †			3	1	Belted Kingfisher	ON	CF	41	49
Pied-billed Grebe			1	4	Greater Yellowlegs †			0	1	Yellow-bellied Sapsucker	NY	FY	68	72
Double-crest Cormorant §			1	4	Willet		H	10	9	Downy Woodpecker	FL	P	35	54
Great Cormorant ‡§			0	0	<u>Upland Sandpiper †</u>	T		5	4	Hairy Woodpecker	H	CF	40	59
American Bittern		H	15	18	Least Sandpiper †			0	0	Am Three-toed Woodpecker †			1	1

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Maritimes Breeding Bird Atlas - Summary Sheet for Square 20LS56 (page 2 of 3)

SPECIES	Code		%		SPECIES	Code		%		SPECIES	Code		%	
	1st	2nd	1st	2nd		1st	2nd	1st	2nd		1st	2nd	1st	2nd
<u>Black-back Woodpecker</u>	H		20	16	Black-capp Chickadee	FL	FY	81	86	Magnolia Warbler	AY	CF	91	86
Northern Flicker	ON	FY	85	88	Boreal Chickadee	AY	FY	20	26	Bay-breasted Warbler	AY	P	61	59
Pileated Woodpecker	AY	T	20	55	Red-breast Nuthatch	FL	FY	66	73	Blackburnian Warbler	AY	CF	46	50
American Kestrel	NY	H	45	45	White-breast Nuthatch			0	1	Yellow Warbler	A	P	60	49
Merlin		P	8	26	Brown Creeper	AY	S	18	44	Chestn-sided Warbler	H	FY	63	73
Peregrine Falcon †			0	0	Winter Wren	FL	S	68	72	Blackpoll Warbler			3	6
Olive-sided Flycatcher †	AY	S	51	36	Golden-crown Kinglet	AY	FY	63	73	Black-thr Blue Warbler		S	21	60
Eastern Wood-Pewee	NE	S	56	42	Ruby-crown Kinglet	AY	D	88	78	Palm Warbler	H	FY	43	59
Yellow-bellied Flycatcher	H	S	63	63	Eastern Bluebird †		H	6	31	Pine Warbler †		P	0	26
Alder Flycatcher	NE	S	83	73	Veery	AY	S	80	54	Yellow-rumped Warbler	NY	FY	83	83
Willow Flycatcher †			1	3	Swainson's Thrush	AY	D	88	75	Black-thr Green Warbler	A	P	53	50
Least Flycatcher	FL	S	80	75	Hermit Thrush	AY	FY	86	85	Canada Warbler †	A	S	63	29
Eastern Phoebe			15	27	<u>Wood Thrush †</u>	H		3	1	<u>Wilson's Warbler</u>	A		48	22
<u>Gr Crested Flycatcher ‡</u>	H		3	3	American Robin	NY	CF	95	88	Eastern Towhee ‡			0	0
Eastern Kingbird	T	AE	41	24	Gray Catbird	A	A	60	37	Chipping Sparrow	AY	P	80	62
Blue-headed Vireo	AY	P	86	78	Northern Mockingbird †			5	6	Clay-colored Sparrow ‡			0	0
Warbling Vireo †			1	1	Brown Thrasher †			1	0	Field Sparrow †			0	0
Philadelphia Vireo		H	18	26	European Starling	NY	CF	66	57	<u>Vesper Sparrow †</u>	T		5	4
Red-eyed Vireo	FL	D	95	83	Cedar Waxwing	NB	P	78	75	Savannah Sparrow	AY	CF	60	57
Gray Jay	FL	H	43	55	Ovenbird	A	D	90	80	Nelson's Sh.-tail Sparrow			8	6
Blue Jay	H	FY	68	73	North Waterthrush	A	A	60	32	Fox Sparrow			1	1
American Crow	NE	FY	78	83	Black-white Warbler	AY	D	78	77	Song Sparrow	FL	D	85	75
Common Raven	NY	FY	80	77	Tennessee Warbler	AY	S	76	29	Lincoln's Sparrow	DD	A	41	31
<u>Horned Lark †</u>	H		13	1	Nashville Warbler	FL	FY	60	81	Swamp Sparrow	FL	DD	45	63
Purple Martin ‡			0	0	<u>Mourning Warbler</u>	H		33	9	White-throat Sparrow	AY	CF	98	86
Tree Swallow	NE	AE	86	72	Common Yellowthroat	AY	P	96	88	Dark-eyed Junco	AY	P	81	65
Bank Swallow §	ON	P	55	14	American Redstart	AY	S	96	83	Scarlet Tanager †			8	4
<u>Cliff Swallow †§</u>	ON		53	11	Cape May Warbler	T	S	28	14	Northern Cardinal ‡			0	0
Barn Swallow	NY	AE	86	40	Northern Parula	AY	CF	90	81	<u>Rose-breast Grosbeak</u>	AY		85	22

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Maritimes Breeding Bird Atlas - Summary Sheet for Square 20LS56 (page 3 of 3)

SPECIES	Code		%	
	1st	2nd	1st	2nd
Indigo Bunting ‡		H	1	1
Dickcissel ‡			1	0
Bobolink	AY	FY	61	34
Red-wing Blackbird	A	A	70	50
Eastern Meadowlark †			0	0
Rusty Blackbird †			21	11
Common Grackle	AY	CF	81	80
<u>Brown-head Cowbird</u>	FL		48	11
<u>Baltimore Oriole</u>	AY		16	4
Pine Grosbeak			5	1
Purple Finch	AY	S	75	70
House Finch †		S	0	4
Red Crossbill †	P	H	8	19
<u>White-winged Crossbill</u>	H		18	52
Pine Siskin	H	H	41	29
American Goldfinch	P	P	66	65
Evening Grosbeak	AY	S	48	14
House Sparrow	NY	H	33	6

This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #9 (Kent). Underlined species are those that you should try to add to this square (20LS56). They have not yet been reported during the 2nd atlas, but were found during the 1st atlas in this square or have been reported in more than 50% of the squares in this region during the 2nd atlas so far. "Code" is the code for the highest breeding evidence for that species in square 20LS56 during the 2nd and 1st atlas respectively. The % columns give the percentage of squares in that region where that species was reported during the 2nd and 1st atlas (this gives an idea of the expected chance of finding that species in region #9). Rare/Colonial Species Report Forms should be completed for species marked: § (Colonial), ‡ (regionally rare), † (rare in the Maritimes) or * (rare in the Maritimes, documentation only required for confirmed records). Current as of 25/10/2017. An up-to-date version of this sheet is available from <http://www.mba-aom.ca/jsp/summaryform.jsp?squareID=20LS56?lang=en>

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Appendix D. WETLAND FUNCTIONAL ASSESSMENT SHEETS

Wetland ID:	WL1 Treed Swamp
Date:	June 14th 2017
Observer:	T. Giroux and R. Gardiner
Latitude & Longitude (decimal degrees):	355669.53 m E 5169189.03 m N

Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed. *Note: Benefits scores will be provided in the final calculator for WBF, WBN, SBM, and POL; their models are currently being revised.*

Results for this Assessment Area (AA):

Wetland Functions or Other Attributes:	Function Score (normalized)	Function Rating	Benefits Score (normalized)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Surface Water Storage (WS)	4.92	Moderate	9.52	Higher	5.43	6.39
Stream Flow Support (SFS)	2.01	Lower	7.01	Higher	1.07	5.27
Water Cooling (WC)	3.00	Moderate	0.94	Lower	2.00	0.61
Sediment Retention & Stabilisation (SR)	3.47	Moderate	1.77	Lower	5.39	1.07
Phosphorus Retention (PR)	0.00	Lower	1.11	Lower	3.04	1.33
Nitrate Removal & Retention (NR)	4.47	Moderate	1.88	Lower	5.52	4.58
Carbon Sequestration (CS)	2.09	Lower			5.34	
Organic Nutrient Export (OE)	5.38	Moderate			4.27	
Anadromous Fish Habitat (FA)	4.24	Moderate	2.45	Moderate	2.72	1.81
Resident Fish Habitat (FR)	5.86	Moderate	2.41	Moderate	4.07	1.71
Aquatic Invertebrate Habitat (INV)	3.93	Lower	6.12	Higher	4.83	4.59
Amphibian & Turtle Habitat (AM)	6.60	Higher	8.49	Higher	6.95	4.57
Waterbird Feeding Habitat (WBF)	5.65	Moderate			4.53	
Waterbird Nesting Habitat (WBN)	3.09	Moderate			2.58	
Songbird, Raptor, & Mammal Habitat (SBM)	8.06	Higher			6.67	
Pollinator Habitat (POL)	7.86	Higher			6.33	
Native Plant Habitat (PH)	3.88	Moderate	7.62	Higher	5.01	4.33
Public Use & Recognition (PU)			2.36	Moderate		1.76
Wetland Sensitivity (Sens)			9.20	Higher		5.17
Wetland Ecological Condition (EC)			5.86	Moderate		7.50
Wetland Stressors (STR) (higher score means more)			10.00	Higher		5.22
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	4.92	Moderate	9.52	Higher	5.43	6.39
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR)	0.67	0.00	3.55	Moderate	5.17	3.46
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	3.31	0.00	5.90	Moderate	3.94	4.38
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	6.47	0.00	5.66	Higher	5.56	3.63
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	5.38	0.00	8.80	Higher	6.34	4.33
WETLAND CONDITION (EC)			5.86	Moderate		7.50
WETLAND RISK (average of Sensitivity & Stressors)			10.00	Higher		5.19

Latitude & Longitude (decimal degrees):	355210.06 m E 5169470.18 m N
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Scores will appear below after data are entered in worksheets OF, F, and S. See Manual for definitions and descriptions of how scores were computed. *Note: Benefits scores will be provided in the final calculator for WBF, WBN, SBM, and POL; their models are currently being revised.*

Results for this Assessment Area (AA):						
Wetland Functions or Other Attributes:	Function Score (normalized)	Function Rating	Benefits Score (normalized)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Surface Water Storage (WS)	2.82	Moderate	2.14	Moderate	3.76	2.08
Stream Flow Support (SFS)	10.00	Higher	5.97	Moderate	6.11	4.49
Water Cooling (WC)	3.08	Moderate	6.38	Higher	2.06	4.11
Sediment Retention & Stabilisation (SR)	4.61	Moderate	6.62	Moderate	6.20	4.02
Phosphorus Retention (PR)	2.39	Moderate	6.08	Higher	4.97	5.83
Nitrate Removal & Retention (NR)	3.32	Lower	10.00	Higher	5.17	10.00
Carbon Sequestration (CS)	5.40	Moderate			6.82	
Organic Nutrient Export (OE)	7.14	Higher			5.66	
Anadromous Fish Habitat (FA)	8.67	Higher	2.38	Moderate	5.56	1.76
Resident Fish Habitat (FR)	8.33	Higher	2.34	Moderate	5.79	1.66
Aquatic Invertebrate Habitat (INV)	5.76	Moderate	9.57	Higher	5.61	6.38
Amphibian & Turtle Habitat (AM)	6.25	Higher	10.00	Higher	6.77	6.28
Waterbird Feeding Habitat (WBF)	7.86	Higher			6.30	
Waterbird Nesting Habitat (WBN)	7.57	Higher			6.31	
Songbird, Raptor, & Mammal Habitat (SBM)	9.11	Higher			7.54	
Pollinator Habitat (POL)	8.75	Higher			7.04	
Native Plant Habitat (PH)	5.94	Higher	8.55	Higher	5.87	4.86
Public Use & Recognition (PU)			2.16	Lower		1.62
Wetland Sensitivity (Sens)			6.37	Higher		4.25
Wetland Ecological Condition (EC)			6.32	Moderate		7.78
Wetland Stressors (STR) (higher score means more)			8.78	Higher		4.39
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	2.82	Moderate	2.14	Moderate	3.76	2.08
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR)	3.02	0.00	9.78	Higher	6.31	8.31
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	7.05	0.00	8.18	Higher	5.49	5.69
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	8.27	0.00	7.89	Higher	6.46	4.76
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	7.38	0.00	9.87	Higher	7.18	4.86
WETLAND CONDITION (EC)			6.32	Moderate		7.78
WETLAND RISK (average of Sensitivity & Stressors)			8.78	Higher		4.32