

Appendices

Appendix A
Registry of Joint Stock Companies
Dexter Construction Co. Ltd.

Profile [Printer Version](#)[Profile Info](#) [People Info](#) [Activites Info](#) [Related Reg's Info](#)**PROFILE** - DEXTER CONSTRUCTION COMPANY LIMITED - as of: 2018-12-06 11:45 AM

Business/Organization Name:	DEXTER CONSTRUCTION COMPANY LIMITED
Registry ID:	1109762
Type:	Extra-Provincial Corporation
Nature of Business:	
Status:	Active
Jurisdiction:	New Brunswick
Registered Office:	900-1959 UPPER WATER STREET Halifax NS Canada B3J 3N2
Mailing Address:	PO BOX 997 Halifax NS Canada B3J 2X2

PEOPLE

Name	Position	Civic Address	Mailing Address
Carl B. Potter	Director	927 Rocky Lake Drive Bedford NS B4A 3Z2	
Carl B. Potter	Chairman	927 Rocky Lake Drive Bedford NS B4A 3Z2	
HAROLD JOHNSON	VICE PRESIDENT	927 Rocky Lake Drive Bedford NS B4A 3Z2	
Sondra Clegg	Assistant Secretary	927 Rocky Lake Drive Bedford NS B4A 3Z2	
David Pangman	Vice President, Finance	927 Rocky Lake Drive Bedford NS B4A 3Z2	
David A. Wood	VP, CFO AND TREASURER	927 Rocky Lake Drive Bedford NS B4A 3Z2	
KEN MACLEAN	VP AND SECRETARY	927 Rocky Lake Drive Bedford NS B4A 3Z2	
	Recognized Agent		

CHRISTINE C. POUND	900-1959 UPPER WATER STREET Halifax NS B3J 3N2	PO BOX 997 Halifax NS B3J 2X2
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ACTIVITIES

Activity	Date
Annual Renewal	2017-12-04
Annual Statement Filed	2017-12-04
Change of Directors	2017-10-18
Annual Renewal	2016-12-13
Annual Statement Filed	2016-12-13
Annual Renewal	2015-12-18
Annual Statement Filed	2015-12-18
Address Change	2015-08-25
Appoint an Agent	2015-08-25
Change of Directors	2015-07-10
Annual Renewal	2014-12-09
Annual Statement Filed	2014-12-09
Annual Statement Filed	2013-11-29
Annual Renewal	2013-11-26
Change of Directors	2013-09-12
Change of Directors	2013-03-18
Annual Statement Filed	2012-11-26
Annual Renewal	2012-11-26
Change of Directors	2012-06-22
Annual Statement Filed	2012-01-05
Annual Renewal	2011-12-14
Annual Renewal	2010-11-08
Annual Statement Filed	2010-11-08
Change of Directors	2010-05-14
Annual Renewal	2009-12-22
Annual Statement Filed	2009-12-22
Change of Directors	2009-07-21

Annual Renewal	2008-12-04
Change of Directors	2008-02-01
Annual Renewal	2007-11-23
Annual Statement Filed	2007-11-23
Annual Renewal	2006-11-14
Annual Statement Filed	2006-11-14
Change of Directors	2006-09-25
Annual Renewal	2005-11-22
Annual Statement Filed	2005-11-22
Annual Renewal	2004-11-04
Annual Statement Filed	2004-11-04
Annual Renewal	2003-11-13
Annual Statement Filed	2003-11-13
Annual Renewal	2002-12-17
Annual Statement Filed	2002-12-17
Change of Directors	2002-04-03
Annual Renewal	2002-01-21
Annual Statement Filed	2002-01-21
Annual Renewal	2000-11-27
Annual Statement Filed	2000-11-27
Annual Renewal	1999-11-29
Annual Statement Filed	1999-11-29
Annual Renewal	1998-11-16
Annual Statement Filed	1998-11-16
Annual Renewal	1997-12-03
Annual Statement Filed	1997-12-03
Annual Renewal	1997-01-30
Annual Statement Filed	1997-01-30
Annual Report Filed	1995-12-27
Registered Office Change	1994-12-29
Reinstated	1989-03-07
Revoked for Non-Payment	1988-12-30
Agent Filed	1983-04-28

Change of Directors	1981-03-09
Registered	1977-11-18
In Business Since	1977-11-18
Incorporated in Other Jurisdiction	1961-12-22

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RELATED REGISTRATIONS

This Company ...	
DEXTER PAVING	Registered
NOVA SCOTIAN UTILITY CONSTRUCTION CORP.	Registered
LENIHAN'S PAVING	Registered
ROAD REDI	Registered

Appendix B

Public Information Sessions Materials



DEXTER CONSTRUCTION COMPANY LIMITED

NOTICE OF PUBLIC MEETING

DEXTER CONSTRUCTION SHEET HARBOUR PROJECT
COMMUNITY INPUT SESSION

Time and Location:

Wednesday, June 20th, 2018

4:00 pm - 8:00 pm

Sheet Harbour Legion Hall

23566 Highway 7

FORMAT:

Dexter Construction will have a series of poster boards with information on topics related to a local quarry development such as baseline studies, operational plans, reclamation plans, and corporate experience. Dexter Construction staff and their consultants will be available at the session to answer questions, record concerns, and discuss the Sheet Harbour Quarry development near Mushaboom that is undergoing a Provincial Class 1 Environmental Assessment.

THANK YOU IN ADVANCE FOR YOUR INPUT AND PARTICIPATION

Dexter Construction Company Limited | Box 48100, Bedford NS | B4A 3Z2 | (902) 835-3381
info@municipalgroup.ca

For more information about Dexter Construction...

www.dexter.ca

**Dexter Construction Company Limited
Sheet Harbour Quarry
Community Information Session**

This pamphlet provides an overview of the information provided at this information session. Please feel free to ask questions or make comments now or on the [Feedback Form](#) provided.

The purpose of this session is to get public input to the Environmental Assessment process.

Additional information on the Environmental Assessment process in Nova Scotia can be found at: www.gov.ns.ca/nse/ea/pubs.asp

A quarry is being proposed in Sheet Harbour, NS by Dexter Construction Co Ltd. on leased lands. Some key aspects of the project are outlined below.

- The lifespan of the project is expected to be 60+ years, with an immediate resource plan for the next 20 years.
- Estimated production: 5,000,000 tonnes of aggregate over a 20 year period.
- Total footprint at the end of the project: 75 ha (185 acres).
- Mobile crushing facility
- Mobile asphalt plant (2-3 weeks/year)
- Blasting required at least once per year

INFORMATION SESSION PANELS

1. DEXTER CONSTRUCTION CO. LTD.

Dexter Construction Co Ltd is member of the Municipal Group of Companies headquartered in Bedford, Nova Scotia. Dexter has services that include construction, environmental, asphalt and quarry, utilities, emulsions, demolition, mining and disposal. They serve clients in Nova Scotia, New Brunswick, Newfoundland & Labrador, Northern Quebec, and the Caribbean. They are the largest civil works contractor in Atlantic Canada, with 51 approved pits/quarries in Nova Scotia and 14 approved quarries in New Brunswick. They have highly skilled, world-class employees, and a commitment to safety and efficiency.

2. PROJECT OVERVIEW

Dexter is planning to develop the Sheet Harbour Quarry to take full advantage of the highly desirable aggregate resource on the property, near Mushaboom.

The Project is planning an average production of approximately 100,000 tonnes per year, over the next 10 years, with a total of 5,000,000 tonnes projected over 20 years. This may increase or decrease depending on market demand. No permanent infrastructure, other than settling ponds to control site runoff, is required. The site has mobile crushing equipment, and a mobile asphalt plant as required.

The life span of the quarry will is anticipated to be at least 60 years, and cover approximately 75 ha (185 acres).

3. ENVIRONMENTAL ASSESSMENT

Environmental Assessment (EA) is a decision-making tool used to promote sustainable development by evaluating the potential environmental and socio-economic effects of a project, such as a quarry, before it proceeds, by involving the public, stakeholders and government during the assessment. Your input at this stage of the process helps Dexter Construction address public concerns prior to registration of the project and submission of the report to government.

The public also has an opportunity to provide comment to the government on the final documents once the EA has been registered.

For more information:

[**https://novascotia.ca/nse/ea/faqs.asp**](https://novascotia.ca/nse/ea/faqs.asp)

4. ENVIRONMENTAL BASELINE STUDIES

Many studies are required to assess the projects effect on the environment and the environments effect on the project. Typically, for a project of this size a minimum of one year of data is required. This panel provides information on the type and timing of studies and reviews conducted, including:

- Surface and Groundwater
- Flora and Fauna
- Fish and Fish Habitat
- Migratory Birds
- Species at Risk
- Wetland and Watercourse Identification
- Archaeology and Cultural Heritage
- Air Quality and Noise
- Geology and Soils
- Socio-Economic Conditions
- Mi'kmaq

5. OPERATIONS

Site activities associated with construction, operation, and decommissioning of a quarry are as follows:

- site preparation;
- construct sediment settling ponds;
- resource excavation;
- processing: blasting, crushing, stockpiling;
- transportation/trucking;
- site maintenance;
- reclamation;
- closure.

Site processes at the Sheet Harbour Quarry:

- Overburden removal and stockpiling.
- Drilling and blasting.
- Excavation of the aggregate resource.
- Material crushed to market size.
- Aggregate stockpiled on site for shipping to markets via trucking as demand requires.
- Mobile asphalt plant may be used 2-3 weeks/year to meet market demand.

Anticipated production is:

Phase	Years	Annual Tonnage*
1	1 - 5	50,000
2	6-10	150,000
3	11-15	300,000
4	16-20	500,000

6. RECLAMATION

Reclamation is the final phase of the project to return the area to a condition that is consistent with the natural surroundings and community use. Two types of reclamation will be completed – progressive (during operations on stable areas) and final reclamation (after the cessation of extraction activity). Rock slopes will be reduced to a safe and stable slope. Overburden material that was stockpiled during operation will be used to create a growing medium for a mix of grasses, native plant species and trees.

Final reclamation will be done in consultation with the community and other stakeholders.

Useful information sources for reclamation in Nova Scotia include:

Guide for Surface Coal Mine Reclamation Plans
www.novascotia.ca/nse/ea/docs/EA.Guide-SurfaceCoalMineReclamation.pdf

Canadian Land Reclamation Association
Atlantic Chapter www.atlanticclra.ca/

Thank you for attending.

NOTES

If you wish to receive more information on, or have other questions about, the project, please contact:



Box 48100, Bedford NS, B4A 3Z2
(902) 835-3381
info@municipalgroup.ca
www.dexter.ca

The Proponent

Dexter Construction Company Limited

- A member of the Municipal Group of Companies;
- The largest civil works contractor in Atlantic Canada;
- 51 approved pits/quarries in Nova Scotia; 14 approved quarries in New Brunswick
- Services include: construction, environmental, asphalt and quarry, utilities, emulsions, demolition, mining and disposal.
- Serves clients in Nova Scotia, New Brunswick, Newfoundland & Labrador, Northern Quebec, and the Caribbean.
- Highly-skilled, world-class employees, and a commitment to safety and efficiency.

Environmental Commitment

Dexter Construction is committed to:

- **Protecting the Environment** by ensuring that operations are carried out in accordance with sound principles of environmental stewardship;
- **Complying with all Environmental Laws** including applicable environmental legislation, rules and regulations at all government levels;
- **Reasonable Due Diligence** to prevent incidents and control or minimize emissions, waste, and resource use;
- **Environmental Sustainability** through the development and communication of environmental training and awareness relative to Company operations;
- **Continuous Improvement** of environmental performance through inspection, monitoring, and review of environmental protection practices.

The Project

Project Overview

Dexter Construction is planning to develop the Sheet Harbour Quarry to take full advantage of the highly desirable aggregate resource on the property.

- Develop and Operate a Quarry approved by Nova Scotia Environment.
- Production: Average 100,000 tonnes annually for the first 10 years (market driven)
- Reserves: 5,000,000 tonnes over 20 years planned; more available
- Estimated life span of quarry: 60 years plus (typically seasonal production).
- Portable crushing plant in operation only a few months per year or as market demand requires.
- Blasting required to efficiently operate the quarry.
- Footprint: Fully Developed Quarry - Approx. 75 ha (185 acres)
Maximum area disturbed - Approx. 20 ha (50 acres)
- Mobile asphalt plant facility on site as required to meet local needs (likely once per year for 2-3 weeks).



The Permitting Process

Environmental Assessment

- Environmental Assessment (EA) is a Decision Making tool used to promote Sustainable Development, while protecting and conserving the environment, by evaluating the potential environmental and socio-economic effects of a project.
- Well defined regulated process in Nova Scotia.
- Provincial Class 1 EA required
- Involves Environmental and Socio-economic Baseline Studies.
- Consultation is important and includes: General Public; Stakeholders; Mi'kmaq; Government.
 - Public input prior to registering the project and submission of the report to government (including this meeting).
 - Information sharing and open dialogue with Special Interest Groups.
 - Information sharing and open dialogue with Mi'kmaq interests.
 - Consultation with government regulators.
- Submission of the Environmental Assessment Registration Document.
- 30 Day Public Review and Comment period after Registration.
- Technical Review by EA Branch and final decision by the Minister of Environment.
- Application for an Industrial Approval to Construct, Operate and Reclaim.
 - Considers Engineering Requirements to Meet the Conditions of EA Approval.
 - Includes Monitoring, Sampling, Operations, Response Mechanisms, Record Keeping and Reporting, etc.
 - Establish a Community Liaison Committee (CLC)

EA Valued Components

Identification of Valued Components (VC) is based on the determination of potential environmental effects of the project. Where residual environmental effects from the project are expected, those VCs are identified for consideration in the cumulative effects assessment.

The Valued Components currently identified are:

- Air Quality, Noise
- Geology and Soils
- Groundwater
- Wetlands
- Surface Water
- Fish and Fish Habitat
- Flora
- Terrestrial Fauna
- Birds
- Species at Risk
- Socio-economic Considerations
- Mi'kmaq
- Cultural Resources

Baseline Studies

Preliminary Results

Habitat Assessment

- Predominantly mature, intact, softwood forest intermixed with barrens (comprising shallow and sometimes exposed bedrock).
- Minimal areas of historical disturbance (ATV Trails, linear cleared areas).
- Wooded areas dominated by spruce and balsam fir and ericaceous shrubs and mosses.
- Barrens comprise nutrient poor, acidic soils with stunted black spruce, balsam fir and ericaceous shrubs.

Vegetation Surveys

- One late season vegetation survey (2017). Surveys are ongoing throughout summer 2018.
- Vegetative composition is typical of a relatively intact, terrestrial forested landscape in NS. No priority species (rare) have been identified to date.

Wetland and Watercourse Identification

- 25 wetlands (< 9 ha) identified across the Study Area dominated by small, isolated treed and shrub swamps. The wetland types present are common to the Nova Scotia landscape and none of the wetlands identified are considered to provide significant habitat characteristics or functional significance.
- No watercourses were identified within the Project Site; therefore no fish habitat is present within the Study Area (in wetlands or watercourses).

Breeding and Migratory Bird Assessments

- Initial results indicates that bird activity is typical of terrestrial coniferous dominated habitat, located adjacent to the coastline.
- Coastal shorebird activity is very low with no unique species identified. Waterfowl species activity associated with lakes was also observed to be low.
- No unique habitats for nesting, foraging or migration stop-over.
- Songbirds are the most common users of the area. No bird congregations observed flying overhead (including raptors).
- Bird activity is consistent with habitat types.
- Songbirds are the most common users of the area - no unique habitats for nesting, foraging or migration stop-over.

Opportunistic Surveys for Priority Species

- Surveys are ongoing. To date, some priority bird and lichen species have been identified across the Study Area. No evidence of Boreal Felt Lichen (Species At Risk) was identified.
- Mainland Moose transects were conducted and none identified at or near the project site.
- Suitable habitat for other priority species not identified.

Archaeological & Cultural Heritage Studies

- Low potential for finding heritage resources
- Recommended to Nova Scotia Museum that the area be cleared of a need for any future archaeological investigation.

First Nations (Mi'kmaq)

- Millbrook First Nation - Sheet Harbour and Beaver Lake Communities
- Sipekne'katik First Nation
- Mi'kmaq Ecological Knowledge Study being conducted - Site visit; interviews with elders

Operational Plans

Site Layout

- Each development block (phase) is roughly 5 years of production.
- Anticipated production is

Phase	Years	Annual Tonnage*
1	1 - 5	50,000
2	6-10	150,000
3	11-15	300,000
4	16-20	500,000

- Quarry advancement and production rates could change with future demand.
- Set-up area includes crusher and load out with scales.
- Stockpiles will be maintained in quarry or set-up areas as required.



A typical Dexter Quarry layout

Reclamation Plans

- Create gentle side hills and fields with wetlands.
- Site is shaped to blend into the natural topography surrounding the site.
- Quarry faces are graded to a safe and stable slope.
- Wetlands, ponds, and hummocks (knoll or mound) will be introduced to add variety to the landscape.
- Grubbings (roots and logs) will be added to the surface of the redefined areas to help with natural return of the landscape to pre-operation conditions.
- Topsoil saved during the pit development will be placed on the slopes and vegetated. May be planted with native seed mix and trees.
- Drainage channels and shallow ponds will be left in place to allow drainage of the property to existing streams.
- Progressive reclamation will occur as the quarry develops.



Examples of progressive reclamation at Dexter sites.

As a quarry is developed, areas no longer required for operation are reclaimed, thereby minimizing the disturbed area.



PROJECT OVERVIEW

PROJECT NAME: Sheet Harbour Aggregate Quarry

PROJECT PROPONENT: Dexter Construction Co. Ltd. (Dexter Construction)

PREPARED BY: GHD Limited (GHD) on behalf of Dexter Construction on February 13, 2018.

PROJECT LOCATION AND ACCESS: See attached Figure 1. Approximately 6.6 km south of the community of Sheet Harbour, Halifax County, Nova Scotia, and 4 km southwest of the Port of Sheet Harbour; Property – PID 40832503; NTS Map: 11D15; Latitude: 44°51'55"N, Longitude: 62°31'53"W or UTM Zone 20 NAD 83 (CSRS): 537020E 4968090N (Figure 1). Site is accessed via a gated four-season gravel road (~2 km), by exiting south from the paved access road to the Sheet Harbour Industrial Park, and existing trails.

LAND OWNERSHIP: Private lands owned by Tusket Mining Incorporated with Dexter Construction operating on the lands through a lease agreement for the activities described.

ANTICIPATED PROJECT SCHEDULE AND ACTIVITIES:

- 2016 and Q1 2017 – Completion of technical and financial evaluation of property
- Q2 2017 – Engage GHD, initiate environmental baseline studies (EBS) including Mi'kmaq Ecological Knowledge Studies (MEKS)
- Q3 2017 to Q2 2018– Continue with EBS activities, initiate contact with public and Mi'kmaq parties based on proximity to site and known interests, plan Mi'kmaq and public engagement sessions
- Q2/Q3 2018 – Completion of EBS and MEKS, complete Mi'kmaq engagement sessions (planning one session in Sheet Harbour/Grand Lake and one at Millbrook) with notification sent to Sipekne'katik and KMKNO and public engagement session in Mushaboom, finalize Provincial Environmental Assessment Registration document(EARD).
- Q3 2018 – Submit EARD
- Q4 2018 – Submit Industrial Approval (IA) application
- Q1 or Q2 2019 – Initiate site development work depending on markets and contracts after IA issuance.

PROJECT OVERVIEW

PROJECT NAME: Sheet Harbour Aggregate Quarry

PROJECT PROPONENT: Dexter Construction Co. Ltd. (Dexter Construction)

PREPARED BY: GHD Limited (GHD) on behalf of Dexter Construction on October 25, 2018.

PROJECT LOCATION AND ACCESS: See attached Figure 1. Approximately 6.6 km south of the community of Sheet Harbour, Halifax County, Nova Scotia, and 4 km southwest of the Port of Sheet Harbour; Property – PID 40832503; NTS Map: 11D15; Latitude: 44°51'55"N, Longitude: 62°31'53"W or UTM Zone 20 NAD 83 (CSRS): 537020E 4968090N (Figure 1). Site is accessed via a gated four-season gravel road (~2 km), by exiting south from the paved access road to the Sheet Harbour Industrial Park, and existing trails.

LAND OWNERSHIP: Private lands owned by Tuskent Mining Incorporated with Dexter Construction operating on the lands through a lease agreement for the activities described.

ANTICIPATED PROJECT SCHEDULE AND ACTIVITIES:

- 2016 and Q1 2017 – Technical and financial evaluation of property have been completed.
- Q2 2017 – GHD has been engaged, environmental baseline studies (EBS) including Mi'kmaq Ecological Knowledge Studies (MEKS) have been initiated. EBS Valued Components include geology, surface water, wetlands, groundwater, terrestrial habitat, vegetation, lichens, wildlife, birds, priority species, atmosphere and air quality, noise, socio-economic, archaeological, and cultural.
- Q3 2017 to Q2 2018– EBS activities and contact with public and Mi'kmaq parties based on proximity to site and known interests, and Mi'kmaq and public engagement sessions have been initiated and are ongoing.
- Q2/Q3 2018 –Mi'kmaq engagement sessions with notification sent to Sipekne'katik and KMKNO have been initiated. A public engagement session has been held in Sheet Harbour. The Provincial Environmental Assessment Registration document (EARD) is being finalized.
- Q4 2018/Q1 2019 – Submit EARD
- Q1/2 2019 – Submit Industrial Approval (IA) application
- 2020 – Initiate site development work depending on markets and contracts after IA issuance.

Environmental Baseline Study Summary:

Potential environmental effects from the Project are currently under assessment. Preliminary analysis indicates generally low to negligible impacts of the Project on the surrounding environment. Mitigation and monitoring programs are currently being established.

Geology

Desktop reviews and field studies were conducted to determine soil types, surficial, and bedrock geology. In close proximity to Sheet Harbour and Mushaboom. The geology of the Project Site consists mainly of quartzite, with areas of interbedded slate, and surficial geology is classed as stony till plain. Based on a review of available geologic information, and site rock sampling and analysis, there are no known indications of acid generating potential in the immediate Study Area.

Surface Water, Wetlands, and Fish Habitat

Field surveys were conducted in September 2017 across the Study Area to confirm presence of mapped wetlands and watercourses and identify other aquatic features that may be present on the landscape. No streams are located within the study area and the wetlands are isolated (no connectivity) and have no potential for fish habitat. Surface water sampling is completed and a hydrologic assessment is ongoing. There are no agricultural, recreational, industrial, or potable uses of the surface water located on or near the project site.

Groundwater

The project site falls within the Sheet Harbour/ Mushaboom coastal secondary watershed (1EM-SD4) with groundwater flow direction generally towards Sheet Harbour and the Atlantic Ocean. Desktop studies were conducted to determine distance to potable waters and typical well construction and groundwater quality and quantity conditions.

Dust and Noise

A background study was undertaken in August 2018 to measure ambient noise and dust at the closest receptors to the project on Mushaboom Road. All measurements were within guidelines.

Habitat Assessment

The field components of the biophysical environmental assessment were initiated in the summer of 2017 and carried through the summer of 2018. These studies were aimed at highlighting the ecological linkages within the Study Area, as well as with the habitats surrounding the Area. This work included:

1. Botanical Surveys (Summer of 2017 / Spring of 2018)
2. Lichen surveys (Spring of 2017 / 2018)
3. Wetland and watercourse identification and surveys across the Study Area (Late summer of 2017)
4. Bird migration surveys (Fall of 2017 / Spring of 2018); Breeding bird surveys (Summer of 2018)
5. Species at Risk Surveys (Spring / Summer of 2018)
6. Moose Surveys (Winter / Spring of 2018. Moose have not been sighted to date)

Vegetation

Meandering transects and targeted land features with higher rare plant potential were investigated. A general species list was made of vascular species observed. All SAR and/or SOCI species observed were georeferenced, counted, photographed, and their habitat was recorded. The Study Area was surveyed for priority species during the field assessments in the spring and summer of 2018. Species-at-risk surveys revealed no priority flora species.

Lichens

Desktop studies and field surveys have been conducted. In total, 58 lichens were observed, seven of which were microlichens and 51 macrolichens. Four species of lichen identified as Priority Species, under SAR and/or SOCI, were identified during the Lichen surveys. The four identified lichens of conservation concern were; Blue Felt Lichen (*Degelia plumbea*), *Fuscopannaria sorediata*, Fringe Lichen (*Heterodermia neglecta*) and Slender Monk's Hood Lichen (*Hypogymnia vittata*). No Boreal Felt Lichen (*Erioderma pedicellatum*) were observed during the field surveys.

Wildlife

Habitat within the Study Area consists of primarily disturbed landscapes (historical and recent clear cutting and access roads) with scattered patches of intact, mature, conifer dominant landscapes. Wildlife access to the site from natural adjacent lands is predominantly provided from the north/northeast where large tracts of undisturbed land exist. However, land surrounding the Study Area to the east is largely fragmented as a result of logging.

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. Within the Study Area, no mainland moose tracks, or sign of the animal, were observed during the winter or spring surveys.

Birds

Surveys were completed for:

- Spring migration;
- Breeding birds;
- Fall migration; and,
- Waterfowl and shorebirds.

The Study Area provides nesting, foraging and roosting habitats for a diversity of species, particularly passerines or other land birds. There are no open waterbodies found within the Study Area and generally it did not provide breeding habitat for waterfowl and shorebirds, with the exception to some cavity nesters.

Mi'kmaq Ecological Knowledge Study (MEKS)

Membertou Geomatics Solutions conducted a Mi'kmaq Ecological Knowledge Study (MEKS) of the Study Area and a 5 km radius extending around the project site (Study Area) in Spring/Summer of 2018.

Historical review and research of the Project site and surrounding area was conducted to identify which, if any, areas are significant to the Mi'kmaq people. Based on the historical review and data documented from the MEKS, it is concluded that there is Mi'kmaq use reported on the Project Site, or in the immediate vicinity.

Archaeological and Cultural Resources

An archaeological background and field reconnaissance study was conducted by Cultural Resource Management in November 2017. Based on the environmental setting, lack of evidence of historic activity in the study area, property history, and the field reconnaissance, the proposed study area is considered to exhibit low potential for encountering significant archaeological resources.

Appendix C

Biophysical Survey Report

Biophysical Survey Report

Name of Project:

Sheet Harbour Quarry

Location: Sheet Harbour, Nova Scotia

Proponent: Dexter Construction Ltd.

927 Rocky Lake Dr.

Bedford, NS

B4A 3Z2

Report Prepared by:

McCallum Environmental Ltd.



McCallum Environmental Ltd.

2 Bluewater Road, Suite 115

Bedford, Nova Scotia

B4B 1G7

Date: September 17, 2018

EXECUTIVE SUMMARY

GHD Limited is completing a Provincial Environmental Assessment (EA) Registration document on behalf of Dexter Construction Ltd., for a proposed quarry in Sheet Harbour, NS. 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.

Habitat (soft-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. No unique habitats required to support species life cycle were identified during the Study. As such, the proposed project infrastructure is expected to impact localized habitat, but an insignificant impact in the regional context is expected.

Species at risk surveys completed within the Study Area revealed no priority flora or fauna species. During other field programs, however, such species were identified. Lichen field surveys revealed the presence of four lichens of conservation concern including *Degelia plumbea* (SAR Special Concern, NSESA Vulnerable, S3), *Fuscopannaria sorediata* (S3), *Heterodermia neglecta* (S3S4) and *Hypogymnia vittata* (S3S4). Avian field surveys revealed the following Priority bird species: Bay-breasted Warbler (S3S4B), Black-backed Woodpecker (S3S34), Boreal Chickadee (S3), Eastern Bluebird (S3B), Gray Jay (S3), Greater Yellowlegs (S3B, S3S4M), Northern Goshawk (S3S4), Pine Siskin (S2S3), Red-breasted Nuthatch (S3), Red Crossbill (S3S4), Ruby-crowned Kinglet (S3S4B), Swainson's Thrush (S3S4B), and Yellow Bellied Flycatcher (S3S4B).

Bird usage within the Study Area was determined to be low, exhibiting generally consistent bird activity throughout all seasons. The Breeding bird season was the most active (n=601), followed by Fall (n=516) and then Spring (n=358); low bird activity was recorded during focussed waterfowl and shorebird watch counts completed adjacent to the Study Area alongside areas of open water and/or coastal shoreline. Minimal avian fly-overs were observed throughout all seasons including Fall watch counts. Therefore, passage migration and diurnal movement of birds in this area is not expected to be impacted by the proposed project. Taylor Head Provincial Park is located approximately 2km west of the Study Area. The Eastern Shore Islands Important Bird Area lies approximately 2km south of the Study Area and supports important coastal island habitat for a variety of nesting shorebirds, such as Common Eiders. Field surveys revealed that suitable habitat for these species is not present within the Study Area, nor were these species identified in large quantities during field surveys. Suitable habitat for many birds is present throughout the Study Area, and any bird habitat directly within the footprint of the proposed access road and quarry infrastructure will be removed. However, construction of the access road and 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.

Twenty-seven wetlands and three watercourses were observed within the Study Area. None of the wetlands were accessible by fish. The wetlands were characterized as follows: swamp (n=22), fen (n=1), swamp-fen complex (n=1), and bog (n=2). Two of the watercourses were ephemeral streams, that lacked potential fish access, and the third, (if contiguous with upstream and downstream watercourses) was deemed to be very poor fish habitat.

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1.0 INTRODUCTION

Dexter Construction Company Limited are proposing the development of a quarry (the Project) on undeveloped land near the community of Sheet Harbour, in eastern Nova Scotia (Figure 1, Appendix A).

In support of registering a provincial Environmental Assessment (EA) Registration document with New Scotia Environment (NSE), this Study has been completed to identify the biophysical conditions existing within, and in close proximity to the proposed site (the Study Area) (Figure 1, Appendix A). This was achieved by completing a review of background desktop resources in combination with field studies to identify potential environmental constraints and sensitivities.

This report outlines the methods and results of the biophysical assessments completed within the Study Area. The following sections describe the methods and results for each assessment completed. The report concludes with a summary of the Study findings.

1.1 Biophysical Assessments

The field components of the Study were initiated in late summer 2017 and extended through until July 2018. Studies performed were done so in accordance with the requirements of a *Class 1* undertaking under Section 9(1) of the Nova Scotia Environmental Assessment Regulations. These studies were focused on highlighting the ecological linkages within the Study Area, as well as with the habitats surrounding the Study Area. The field components included:

1. Botanical Surveys (August 2017 and June 2018)
2. Wetland and Watercourse Evaluations (Late summer 2017)
3. Avian Surveys
 - (1) Fall Migration (Fall 2017)
 - (2) Spring Migration (Spring 2018)
 - (3) Breeding Bird Surveys (Summer 2018)
 - (4) Waterfowl Surveys (Fall 2017, Spring and Summer, 2018)
 - (5) Shorebird Surveys (Fall 2017, Spring and Summer, 2018)
4. Moose Surveys (Winter and Spring 2018)
5. Species at Risk Surveys (Spring and Summer, 2018)

Field surveys were completed by McCallum Environmental biologists and expert birder Chris Pepper. CVs are provided in Appendix B.

1.2 Priority Species

Assessment of wildlife, vegetation, and habitat was completed based on the requirements outlined in the Nova Scotia Environment (NSE) *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSE September 2009). A Priority Species list was generated in accordance with this guide as outlined in Section 8.0. This list was used throughout the biophysical assessments to inform the field programs as it identified a broad list of species which have the potential to be present within the Study Area. The desktop priority list was based on general species habitat requirements and the broad geographic area that individual species are known to occur.

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 2002). All species listed as Endangered, Threatened, or of Special Concern;
- 2) *Nova Scotia Endangered Species Act* (NSES 1999). All species listed as Endangered, Threatened, or Vulnerable; and,
- 3) Conservation Rank: All species designated as S1, S2 or S3 or any combination thereof (i.e. S3S4 is considered a Priority Species) as defined by the Atlantic Canadian Conservation Data Centre (ACCDC).

Collectively, this group of species is known as Priority Species. This umbrella grouping includes species of conservation interest (SOCI) that are not listed species under provincial or federal legislation (such as COSEWIC species and ACCDC S1, S2 and S3 species or any combination thereof (i.e. S3S4 is considered a Priority Species)), and Species at Risk (SAR) which are listed on SARA or NSES.

The Priority Species list is referenced across the various biophysical assessments and is provided in Appendix C. A detailed methodology for development of the Priority Species List is provided in Section 8.0.

1.3 Study Area

The Study Area for the Biophysical field studies is located approximately 1.8km north (inland) from the coastline of the eastern Shore and 90km northeast of Halifax within Nova Scotia (Figure 1, Appendix A). The closest community is Mushaboom which is located approximately 1km south of the Study Area and located on a peninsular of land between Spry Bay (~4km southwest of the Study Area) and Sheet Harbour (~6.6km north of the Study Area).

The Study Area encompasses approximately 1.5 square km for the proposed quarry, and a 4.5km long by 30m wide Study Area associated with a proposed access road. The Study Area comprises almost entirely undeveloped, forested land, except for a few forestry roads and ATV trails which extend through it. The Study Area abuts the southern shoreline of Big Eastern Lake. In general, the Study Area slopes upward toward its center, apart from a lower lying portion of land within the eastern third of the Study Area which facilitates natural drainage of water offsite to the south toward the coast.

The Project Study Area is not located in any protected or conservation areas within federal, provincial, or municipal jurisdiction. The Nova Scotia Provincial Landscape Viewer identified the following:

- a mapped Significant Habitat for Species at Risk (the Landscape Viewer does not identify what Species at Risk is identified) approximately 3.2km southwest of the Study Area within the Taylor Head Provincial Park; and
- a mainland moose concentration area approximately 11.4km west of the Study Area;
- multiple Wilderness Areas within the offshore islands located south of the Study Area (the closest being Hubleys Island approximately 1.2km southeast).

The closest NSE Wetland of Special Significance is located approximately 1km south of the Study Area, adjacent to Rocky Brook Lake.

1.4 Project Team

A project team was assembled for the completion of this study. The team was selected based on level of proficiency in their respective roles. The team members and their individual roles are presented in Table 1.

Table 1: Project Team

Team Member	Role
Andy Walter, BSc. (Hort)	Senior Project Manager
Melanie MacDonald, MREM. Ryan Gardiner, B.Sc., John Gallop B.Sc., and Jeff Bonazza B.Sc., MES. Emma Posluns, MSc.	Biologists, Wetland Delineator, Species at Risk Evaluator and Report Writers.
Chris Pepper	Expert Birder

Curriculum Vitae for the above-mentioned team members are provided in Appendix B.

2.0 HABITAT

2.1 Methodology

2.1.1 Desktop Review

In July 2017, a desktop habitat assessment was completed within the Study Area. Using available forestry, geology and wetland maps and 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 (including Priority Species). Forestry cover data was obtained from the Nova Scotia Department of Natural Resources (NSDNR) forestry cover database accessed via the Provincial Landscape Viewer. Forest cover polygons included in the database are interpreted from aerial imagery on a 10-year cycle.

2.1.2 Field Surveys

MEL biologist, John R. Gallop completed the habitat assessment within the Study Area in June 2017 and in combination with lichen surveys in March and April 2018. 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. The field biologist would periodically stop when canopy type changes and record notes on plant community and topography.

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 collected.

2.2 Results

2.2.1 Desktop Review

The Study Area lies in the Eastern Shore Ecodistrict, within the Atlantic Coastal Ecoregion. Topography in this ecodistrict varies and regions within this ecodistrict can be found in elevations of 150m above sea level (Department of Natural Resources, 2007).

Within the Eastern Shore Ecodistrict a variety of landforms occur that provide a variety of forest community types. This Ecodistrict includes the Halifax peninsula, where granite barrens can be found, and stretches eastward where sand beaches and dunes are the common landscape. Areas with well-drained soil in this ecoregion provide suitable habitat for Balsam Fir and spruce forests. The Study Area is found within the Goldenville formation within the Meguma group which primarily consists of greywacke, metasandstone, slate, schist and migmatite bedrock which gives rise to acidic soils dominated by conifers and ericaceous shrubs (NSDNR 2012a).

According to the NSDNR Forestry Cover Database (accessed via the Nova Scotia Provincial Landscape Viewer), the Study Area associated with the proposed quarry is dominated by softwood forest, with smaller inclusions of barren habitat (Figure 2, Appendix A).

2.2.2 Field Surveys

The majority of the Study Area is forested with some areas that have been historically harvested (clear cutting), but which are now in the latter stages of regeneration. Within the Study Area, habitat consisted generally of conifer dominant mature canopy with Red Spruce (*Picea rubens*), Black Spruce (*Picea mariana*), Balsam Fir (*Abies balsamea*) and scattered White Birch (*Betula papyrifera*) and Red Maple (*Acer rubrum*) (Photo 1). The forested areas consisted of mature, late successional community types with nutrient poor soils dominated by ericaceous shrubs and Schreber's and Stair-step Moss. Due to the existence of wetlands within these mature forest types, and as a result of this habitats proximity to the coast, suitable habitat for several Species of Conservation Interest (SOCI) and Species at Risk (SAR) lichens is present (See Section 4.0 and 8.0).

In regions, where soils are shallow, and bedrock is exposed, the landscape consists of open woodlands characterized by nutrient poor, acidic soils with stunted Black Spruce and Balsam Fir. The forest floor is often dominated by lichen species that grow on soil (i.e. *Cladonia*) and ericaceous shrubs (Photo 2). In regions where ATV trails exist, the plant community mainly consists of herbaceous perennials which typically indicate soil disturbances. Within these disturbed areas species included Poverty Oat Grass

(*Danthonia spicata*), Fined-leaved Sheep Fescue (*Festuca filiformis*), Narrow-panicles Rush (*Juncus bevicaudatus*) and Soft Rush (*Juncus effuses*).



Photo 1: Typical forested habitat in Study Area



Photo 2: Typical barren habitat in Study Area.

Twenty-seven (27) wetlands and three watercourses are present within the Study Area, (described in detail within Section 7.2.2.1).

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 following the guidance of the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSE, Sept 2009) (See section 8.0). Early and late botany surveys were completed concurrently with habitat surveys throughout the Study Area in August 2017 by Melanie MacDonald and June 2018 by John R. Gallop. The Priority Species list and associated ACCDC report created for the Sheet Harbour Quarry were consulted before completing botany surveys.

The Project Team walked meandering transects and targeted land features with higher rare plant potential such as tolerant hardwood landscapes (if present), seepages and wetlands. A general species list was made of vascular species observed. All SAR and/or SOCI species observed were georeferenced, counted, photographed, and their habitat was recorded.

3.2 Results

A total of 113 species were identified within the Study Area (Table 2). No Priority Species were identified. The species identified together with the associated ACCDC rarity ranks are provided in Table 2 below. Further details relating to potential SAR and SOCI flora species are provided in Section 8.0.

Table 2: Observed Vegetation

Scientific Name	Common Name	SRank
<i>Abies balsamea</i>	Balsam Fir	S5
<i>Acer rubrum</i>	Red Maple	S5
<i>Agrostis scabra</i>	Rough Bent Grass	S5
<i>Alnus incana</i>	Speckled Alder	S5
<i>Andromeda polifolia</i>	Bog Rosemary	S5
<i>Anthoxanthum odoratum</i>	Large-sweet Vernal Grass	SNA
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	S5
<i>Arethusa bulbosa</i>	Arethusa	S4
<i>Betula alleghaniensis</i>	Yellow Birch	S5
<i>Betula papyrifera</i>	Paper Birch	S5
<i>Calopogon tuberosus</i>	Tuberous Grass Pink	S4
<i>Carex arctata</i>	Black Sedge	S5
<i>Carex brunnescens</i>	Brownish Sedge	S5
<i>Carex canescens</i>	Silvery Sedge	S5
<i>Carex communis</i>	Fibrous-root Sedge	S5
<i>Carex debilis</i>	White-edge Sedge	S5
<i>Carex echinata</i>	Star Sedge	S5
<i>Carex flava</i>	Yellow Sedge	S5
<i>Carex gynandra</i>	Nodding Sedge	S5
<i>Carex magellanica</i>	Boreal Bog Sedge	S5
<i>Carex nigra</i>	Smooth Black Sedge	S5
<i>Carex pauciflora</i>	Few-Flowered Sedge	S4S5
<i>Carex scoparia</i>	Broom Sedge	S5
<i>Carex stipara</i>	Awl-fruited Sedge	S5
<i>Carex trisperma</i>	Three-seeded Sedge	S5
<i>Chamaedaphne calyculata</i>	Leatherleaf	S5
<i>Coptis trifolia</i>	Goldthread	S5
<i>Cornus canadensis</i>	Bunchberry	S5
<i>Danthonia spicata</i>	Poverty Oat Grass	S5
<i>Dennstaedtia punctilobula</i>	Eastern Hay-Scented Fern	S5
<i>Diervilla lonicera</i>	Northern Bush Honeysuckle	S5
<i>Doellingeria umbellata</i>	Hairy Flat-top White Aster	S5
<i>Drosera rotundifolia</i>	Round-leaved Sundew	S5
<i>Dryopteris campyloptera</i>	Mountain Wood Fern	S5
<i>Dryopteris cristata</i>	Crested Wood Fern	S5
<i>Dryopteris intermedia</i>	Evergreen Wood Fern	S5
<i>Dulichium arundinaceum</i>	Three-Way Sedge	S5
<i>Eleocharis tenuis</i>	Slender Spikerush	S5
<i>Empetrum nigrum</i>	Black Crowberry	S5
<i>Epigaea repens</i>	Trailing Arbutus	S5
<i>Epilobium ciliatum</i>	Northern Willowherb	S5
<i>Eriophorum angustifolium</i>	Narrow-leaved Cottongrass	S5
<i>Eriophorum virginicum</i>	Tawny Cottongrass	S5
<i>Eriophorum vaginatum</i>	Tussock Cottongrass	S5
<i>Eurybia radula</i>	Low Rough Aster	S5
<i>Euthamia graminifolia</i>	Grass-leaved Goldenrod	S5
<i>Festuca filiformis</i>	Hair Fescue	SNA

Scientific Name	Common Name	SRank
<i>Gaultheria hispidula</i>	Creeping Snowberry	S5
<i>Gaultheria procumbens</i>	Eastern Teaberry	S5
<i>Gaylussacia baccata</i>	Black Huckleberry	S5
<i>Glyceria striata</i>	Fowl Manna Grass	S5
<i>Huperzia lucidula</i>	Shining Firmoss	S5
<i>Hypericum canadense</i>	Canada St John's-wort	S5
<i>Ilex verticillata</i>	Common Winterberry	S5
<i>Iris versicolor</i>	Harlequin Blue Flag	S5
<i>Juncus canadensis</i>	Canada Rush	S5
<i>Juncus effusus</i>	Soft Rush	S5
<i>Juncus pelocarpus</i>	Brown-Fruited Rush	S5
<i>Juncus tenuis</i>	Slender Rush	S5
<i>Juniperus communis</i>	Common Juniper	S5
<i>Kalmia angustifolia</i>	Sheep Laurel	S5
<i>Kalmia polifolia</i>	Pale Bog Laurel	S5
<i>Larix laricina</i>	Tamarack	S5
<i>Ledum groenlandicum</i>	Common Labrador Tea	S5
<i>Linnaea borealis</i>	Twinflower	S5
<i>Lonicera villosa</i>	Mountain Fly Honeysuckle	S4S5
<i>Maianthemum trifolium</i>	Three-leaved False Solomon's Seal	S5
<i>Mitchella repens</i>	Partridgeberry	S5
<i>Monotropa hypopithys</i>	Pinesap	S4
<i>Monotropa uniflora</i>	Indian Pipe	S5
<i>Muhlenbergia uniflora</i>	Bog Muhly	S5
<i>Myrica gale</i>	Sweet Gale	S5
<i>Nemopanthus mucronatus</i>	Mountain Holly	S5
<i>Oclemena acuminata</i>	Whorled Wood Aster	S5
<i>Oclemena nemoralis</i>	Bog Aster	S5
<i>Oclemena x blakei</i>	a hybrid White Panicked American-Aster	S5
<i>Orthilia secunda</i>	One-sided Wintergreen	S5
<i>Osmunda cinnamomea</i>	Cinnamon Fern	S5
<i>Oxalis montana</i>	Common Wood Sorrel	S5
<i>Phegopteris connectilis</i>	Northern Beech Fern	S5
<i>Photinia melanocarpa</i>	Black Chokeberry	S5
<i>Picea mariana</i>	Black Spruce	S5
<i>Potentilla simplex</i>	Old Field Cinquefoil	S5
<i>Prenanthes altissima</i>	Tall Rattlesnakeroot	S5
<i>Pteridium aquilinum</i>	Bracken Fern	S5
<i>Rhododendron canadense</i>	Rhodora	S5
<i>Rosa nitida</i>	Shining Rose	S4S5
<i>Rubus allegheniensis</i>	Alleghaney Blackberry	S5
<i>Rubus chamaemorus</i>	Cloudberry	S4
<i>Rubus hispidus</i>	Bristly Dewberry	S5
<i>Rubus idaeus</i>	Red Raspberry	S5
<i>Rubus pubescens</i>	Dwarf Red Raspberry	S5
<i>Rumex acetosella</i>	Sheep Sorrel	SNA
<i>Sarracenia purpurea</i>	Northern Pitcher Plant	S5
<i>Scirpus atrocinctus</i>	Black-girdled Bulrush	S5
<i>Scirpus cyperinus</i>	Common Woolly Bulrush	S5
<i>Sisyrinchium angustifolium</i>	Narrowed-leaved Blue-eyed-grass	S4
<i>Solidago puberula</i>	Downy Goldenrod	S5
<i>Solidago rugosa</i>	Rough-stemmed Goldenrod	S5
<i>Sorbus americana</i>	American Mountain Ash	S5

Scientific Name	Common Name	SRank
<i>Sorbus americana</i>	American Mountain Ash	S5
<i>Symphotrichum lanceolatum</i>	Lance-leaved Aster	S4S5
<i>Thalictrum pubescens</i>	Tall Meadow-Rue	S5
<i>Thelypteris noveboracensis</i>	New York Fern	S5
<i>Triadenum virginicum</i>	Virginia St John's-wort	S5
<i>Trientalis borealis</i>	Northern Starflower	S5
<i>Vaccinium angustifolium</i>	Late Lowbush Blueberry	S5
<i>Vaccinium myrtilloides</i>	Velvet-leaved Blueberry	S5
<i>Vaccinium oxycoccos</i>	Small Cranberry	S5
<i>Vaccinium vitis-idaea</i>	Mountain Cranberry	S5
<i>Vaccinium vitis-idaea</i>	Mountain Cranberry	S5
<i>Viburnum nudum</i>	Northern Wild Raisin	S5
<i>Viola cucullata</i>	Marsh Blue Violet	S5

Note: Scientific names used are in accordance to the latest ACCDC species list retrieved in May 2018. Scientific names may no longer be in use, however, for consistency in this report, species names in the ACCDC species list are used.

4.0 LICHENS

4.1 Methodology

4.1.1 Desktop Review

Prior to undertaking the field assessment, a detailed desktop review of known lichen observations and potential habitat for rare lichens within the Study Area was conducted. The desktop review process involved three components: a review of the ACCDC database results and Priority Species list, a review of Nova Scotia Department of Natural Resources (NSDNR) predictive habitat mapping for Boreal Felt Lichen (*Erioderma pedicellatum*), and a review of the results of habitat mapping and wetland delineation.

To develop the predictive habitat maps for Boreal Felt Lichen (“BFL”), NSDNR used an algorithm that identifies all forest stands in the provincial forestry database in which Balsam Fir (*Abies balsamea*) is listed as a primary or secondary species, and that occur within 80-metres of a mapped bog or fen. The model further confines the search to only those forest stands located within 30 kilometers of the Atlantic Coast. This database is used to predict areas with a higher potential of locating BFL. This data set was reviewed in advance of field assessment and was uploaded onto the GPS units prior to conducting the field study. Other habitats identified by the project team as suitable for rare lichens were surveyed for lichens as well.

4.1.2 Field Survey

While the specific habitat requirements of each of priority lichen species varies slightly, many require mature to over-mature forests; stand age is one of the greatest determinants of epiphytic (i.e. any plant that grows upon another plant or object merely for physical support. [Encyclopedia Britannica 2018]). lichen diversity (McMullin et al., 2008). Within the Study Area, mature to over-mature stands are infrequent, with the majority of the Study Area having been harvested for timber production. Lichen surveys throughout the Study Area were focused on undisturbed stands, particularly those located near mapped wetlands and predicted BFL habitat, as these habitats have elevated potential for identifying associative priority lichen species.

All suitable habitats within the Study Area were surveyed on March 29 and April 2, 2018 by John R. Gallop. Mature trees that are appropriate for hosting priority lichen species were visually inspected by focusing on tree trunks, branches and twigs were also inspected where it was determined to be safe and appropriate. The following information was collected for any priority lichen species identified during field surveys: site location, date, scientific name, count, size, habitat (host tree and general habitat), location (waypoint in UTM NAD83), height of the specimen, direction that the specimen was facing, along with a photograph and any relevant comments. A general list of common lichens were also recorded with focus on macrolichens (i.e. foliose, fruticose, squamulose). Only visually distinctive incidental microlichen species were recorded. Any specimens that could not be identified in the field were photographed and sampled.

4.2 Results

4.2.1 Desktop Review

No rare lichen species were documented within the Study Area by the ACCDC report. As is indicated on Figure 3 (Appendix A), one area of predicted BFL habitat exists within the northwestern corner of the Study Area, while an additional predicted BFL polygon abuts the northeastern Study Area boundary. In addition, one predicted BFL polygon is intersected by the proposed access road Study Area.

4.2.2 Field Surveys

During the field surveys, 58 lichens were observed, seven of which are microlichens and 51 macrolichens. Four species were determined to be Priority Species (SAR and/or SOCI) including: Blue Felt Lichen (*Degelia plumbea*), *Fuscopannaria soredata*, Fringe Lichen (*Heterodermia neglecta*) and Slender Monk's Hood Lichen (*Hypogymnia vittata*). No Boreal Felt Lichen (*Erioderma pedicellatum*) were observed during the time of the survey.

Additional information regarding the Priority Lichen Species is provided in Section 8.0.

Lichen community observed within the Study Area consisted of primarily epiphytic species associated with mature conifer stands as well as terricolous and saxicolous lichens usually observed along trails, clearings and open woodlands. Sphagnum dominant swamps with mature Red Maples provided suitable habitat for *Fuscopannaria soredata* and *Degelia plumbea* as well as other species with an affinity towards mature hardwood stands.



Photo 3. *Degelia plumbea* found on mature Red Maple

Mature conifer swamps were present, however, consisted of an intermixing of Spruce and Fir and lacked indicator species (i.e. *Coccocarpia palmicola*) of BFL habitat. Table 3 below lists the lichens observed during dedicated surveys as well as incidentals observed during additional biophysical assessments.

Table 3: Observed Lichen Species

Scientific Name	Common Name	SAR/NSESA	SRank
<i>Arctoparmelia centrifuga</i>	Ripple Ring Lichen		S5
<i>Biatora sp.</i>	a lichen		?
<i>Bryoria sp</i>	Horsehair Lichen		--
<i>Cetrelia chicitae</i>	Frothing Seastorm Lichen		S5
<i>Cladina arbuscula</i>	Reindeer Lichen		S5
<i>Cladina rangiferina</i>	Gray Reindeer Lichen		S5
<i>Cladonia chlorophaea</i>	Mealy Pixie-cup Lichen		S5
<i>Cladonia crispata</i>	Organpipe Lichen		S5
<i>Cladonia cristatella</i>	British Soldiers Lichen		S5
<i>Cladonia gracilis ssp. turbinata</i>	Bronzed Lichen		S5
<i>Cladonia squamosa</i>	Dragon Lichen		S5
<i>Cladonia uncialis</i>	Thorn Lichen		S5
<i>Collema subflaccidum</i>	Tree Tarpaper Lichen		S5
<i>Degelia plumbea</i>	Blue Felt Lichen	SARA: Special Concern/NSESA: Vulnerable	S3
<i>Dibaeis baeomyces</i>	Pink Earth Lichen		S5
<i>Evernia mesomorpha</i>	Boreal Oakmoss Lichen		S5
<i>Fuscopannaria sorediata</i>	a Lichen		S3
<i>Graphis scripta</i>	Script Lichen		--
<i>Heterodermia neglecta</i>	Fringe Lichen		S3S4
<i>Hypogymnia incurvoides</i>	Lattice Tube Lichen		S4S5
<i>Hypogymnia physodes</i>	Monk's Hood Lichen		S5
<i>Hypogymnia tubulosa</i>	Powder-headed Tube Lichen		S5
<i>Hypogymnia vittata</i>	Slender Monk's Hood Lichen		S3S4
<i>Imshaugia aleurites</i>	Salted Starburst Lichen		S4
<i>Leptogium cyanescens</i>	Blue Jellyskin Lichen		S5
<i>Leptogium laceroides</i>	Short-bearded Jellyskin Lichen		S4
<i>Lobaria pulmonaria</i>	Lungwort Lichen		S5
<i>Lobaria quercizans</i>	Smooth Lung Lichen		S5
<i>lopadium disciforme</i>	Urn-disk Lichen		?
<i>Loxospora ochrophaea</i>	Eastern Raggedrim Lichen		?
<i>Melanelixia subaurifera</i>	Abrading Camouflage Lichen		S5
<i>Menegazzia subsimilis</i>	Tree Flute Lichen		S4
<i>Menegazzia terebrata</i>	Magic Flute Lichen		S4
<i>mycoblastus sanguineroides</i>	Bloody Heart Lichen		--
<i>Nephroma helveticum</i>	Fringed Kidney Lichen		S4S5
<i>Nephroma laevigatum</i>	Mustard Kidney Lichen		S5
<i>Normandina pulchella</i>	Rimmed Elf-ear Lichen		S4
<i>ochrolechia androgyna</i>	Powdery Saucer Lichen		?
<i>Pannaria conoplea</i>	Mealy-rimmed Shingle Lichen		S4
<i>Pannaria rubiginosa</i>	Brown-eyed Shingle Lichen		S4
<i>Parmelia squarrosa</i>	Bottlebrush Shield Lichen		S5
<i>Parmeliella triptophylla</i>	Black-bordered Shingles Lichen		S5
<i>Peltigera aphthosa</i>	Common Freckle Pelt Lichen		S5
<i>Pertusaria amara</i>	Bitter Wart Lichen		?
<i>Platismatia glauca</i>	Varied Rag Lichen		S5
<i>Platismatia tuckermanii</i>	Crumpled Rag Lichen		S5
<i>Protopannaria pezizoides</i>	Brown-gray Moss-shingle Lichen		S5
<i>Pseudocyphellaria perpetua</i>	Gilded Specklebelly Lichen		S5
<i>Punctelia rudecta</i>	Rough Speckleback Lichen		S5
<i>Pycnothelia papillaria</i>	Nipple Lichen		S5

Scientific Name	Common Name	SAR/NSESA	SRank
<i>Ramalina dilacerata</i>	Punctured Ramalina Lichen		S5
<i>Ramalina roesleri</i>	Frayed Ramalina Lichen		S5
<i>Rhizocarpon geographicum</i>	Map Lichen		--
<i>Ropalospora chlorantha</i>	Comet Lichen		?
<i>Stereocaulon sp.</i>	Foam Lichen		--
<i>Thelotrema lepadinum</i>	Bark Barnacles		?
<i>Usnea longissima</i>	Methuselah's Beard Lichen		S4
<i>Usnea strigosa</i>	Bushy Beard Lichen		S5

5.0 WILDLIFE

As discussed in Section 2.2.2, the Study Area is mainly composed of conifer dominant landscape with Red Spruce, Balsam Fir and intermixed with Red Maple and White Birch. Habitat within the Study Area consist of primarily disturbed landscapes (historical and recent clear cutting and access roads) with scattered patches of intact, mature, conifer dominant landscapes. Wildlife access to the site from natural adjacent lands is predominantly provided from the north/northeast where large tracts of undisturbed land exist. However, land surrounding the Study Area to the east is largely fragmented as a result of logging.

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.

5.1 Mammals

5.1.1 Methodology

Habitat survey results within the Study Area indicated that there was limited habitat potential within the Study Area for herptofaunal Priority Species (i.e. Wood Turtle and Snapping Turtle), therefore, no targeted herpetofauna surveys were undertaken. However, incidental observations of herptofauna across the Study Area (including species which are likely to habituate wetlands and wet seepage areas such as frogs and salamanders) were documented during all field surveys completed.

Incidental observations of mammals were documented during field surveys across the Study Area. Specific focus was given to searching for signs of Priority Species (i.e. Moose) identified as having appropriate habitat within the Study Area. 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. Observations included such features as dens and nests, scat, tracks, and forage evidence. Mammal observations were collected throughout the field surveys in 2017.

A desktop review for known bat hibernaculum nearby and within the Study Area was completed. The Nova Scotia Department of Natural Resources (NSDNR) records of abandoned mine openings (AMOs) were reviewed for the Study Area and within 5km of the Study Area, as AMOs potentially provide bat hibernacula. The ACCDC report, the Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Canada (Environment Canada, 2015), and the Nova Scotia Museum's records of bats were also consulted. During

habitat surveys within the Study Area, MEL personnel also looked for signs of habitat that could support winter bat hibernation.

5.1.2 Desktop Results

The Nova Scotia Museum's records indicate no records of species with conservation concern for the Study Area, access corridor or for the immediate area noted.

No bat hibernacula have been documented to be within the Study Area according to ACCDC. The closest known bat hibernacula is the Charlotte Lake Goldmine approximately 32 km west of the Study Area (Moseley, 2007) (See Section 8.2.2.2).

5.1.3 Field Results

A total of seven mammal species were observed, or signs of their presence noted, during field surveys. No Priority Species were identified. Table 4 lists those species that were confirmed within the Study Area either visually or by sign (scat, footprints, etc.).

Table 4: Confirmed mammalian species during field surveys.

Scientific Name	Common Name	ACCDC Prov. Rank
<i>Ursus americanus</i>	Black Bear	S5
<i>Odocoileus virginianus</i>	White-tailed Deer	S5
<i>Canis latrans</i>	Eastern Coyote	S5
<i>Erethizon dorsatum</i>	Porcupine	S5
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	S5
<i>Lepus americanus</i>	Snowshoe Hare	S5
<i>Vulpes Vulpes</i>	Red Fox	S5
<i>Thamnophis sirtalis</i>	Common Garter Snake	S5

Moose were not observed (See Section 5.2). Optimal habitat for deer species occurs within young forest stands, cut blocks and riparian and shoreline areas and 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.

It is expected that common carnivore/omnivore species such as Raccoon (*Procyon lotor*), Coyote, 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, however, they were not observed during the field surveys.

5.2 Mainland Moose

The mainland moose (*Alces alces americana*) is listed as endangered under NSESA and considered S1, or critically imperiled, by the ACCDC. The moose is the largest member of the deer family (Cervidae), which prefers boreal forest and mixed wood habitats with an abundant food source of young twigs and stems from deciduous trees and shrubs.

5.2.1 Methodology

To determine the level of concern associated with mainland moose, the project team first consulted the Endangered Mainland Moose Special Management Practices report (NSDNR, 2012), which includes the Endangered Mainland Moose Concentration Areas GIS database, as well as the Status Report on the Eastern Moose (Parker, 2003).

Tracking surveys were completed to determine the presence of mainland moose within the Study Area and surroundings. Seven transects, totaling approximately seven kilometers in length, were established through representative habitat types (i.e. cut blocks, trails, forested uplands, wetlands, clearings). The moose surveys were completed by an observer capable of identifying moose and deer tracks, browse and scat. Although moose Transect 7 extended outside the Study Area (due to it being located upon an existing trail providing access to the Study Area), observations collected while evaluating it have been included in this report.

Initially, three winter tracking surveys were planned to take place, assuming suitable snow conditions were present. However, due to milder weather conditions during the period January-March 2018, and consequent unsuitable tracking conditions, the third winter tracking survey was not possible. On February 23, 2018, the project team consulted with DNR Wildlife Biologist, Shavonne Meyer, and DNR Species at Risk Biologist, Donald Sam and it was determined that one winter track survey would be complemented by repeated spring PGI surveys. As such, winter tracking surveys were carried out by trained MEL staff and took place on January 22nd and March 12th, 2018; PGI surveys were conducted on March 1st and May 9th, 2018.

During the winter track surveys, all scat, track, sign and visual and auditory observations were recorded. All deer and moose sign were recorded, photographed and georeferenced as well as the observation of any Priority Species. During the PGI surveys the focus was on any scat present within the Study Area. All scat was recorded, photographed and georeferenced.

Mainland moose survey transects are identified on Figure 4 (Appendix A).

5.2.2 Results

The Study Area is not located within a Mainland Moose Population concentration area.

Within the Study Area, no mainland moose tracks, or sign of the animal, were observed during the winter or spring surveys.

Other mammals identified during the Moose Surveys included: Snowshoe Hare, White-tailed Deer, Eastern Coyote, Porcupine and Red Squirrel.



Photo 4. Hare tracks observed during a winter moose survey

6.0 AVIAN

6.1 Methodology

6.1.1 Desktop Review

A review of the Canada Important Bird Areas database, ACCDC database, and the Maritime Breeding Bird Atlas (MBBA) square (20NQ36) was reviewed to support bird survey design and methodology.

ACCDC further categorizes bird species using breeding bird status qualifiers that determine whether a species is a Priority Species, based on the time of year in which the species was observed. For instance, Pine Grosbeak has an SRank of S2S3B, S5N. If observed during breeding season, this species would be considered a Priority Species. Outside of breeding season, this species would not be considered a Priority Species.

6.1.2 Field Surveys

Avian field monitoring programs were completed by expert Birder Chris Pepper. The following surveys were completed:

- Spring migration survey (May 1st, 2nd, 15th, 16th, 2018);
- Breeding bird survey (June 1st, 4th, July 3rd, 4th, 2018);
- Fall migration survey (August 26th, 28th, September 22nd, 23rd, October 9th and 11th, 2017); and,
- Waterfowl and shorebird surveys (August 26th, 28th, September 22nd, 23rd, October 9th and 11th, 2017, May 1st, 2nd, 15th, 16th, June 1st, 4th, July 3rd, 4th, 2018)

In total, twenty-two-point count (PC) locations were selected within and surrounding the Study Area for all standard seasonal surveys (Spring, Breeding and Fall) and five watch count locations (2 for waterfowl and 3 for shorebirds). Point count and watch count locations are provided on Figure 5 (Appendix A).

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. shorebird and waterfowl surveys).

During each survey, weather conditions (i.e., precipitation and visibility) were monitored and 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 handheld 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).

Specific watch count surveys targeting waterfowl were completed given the Project's location in proximity to wetlands and lakes. Two locations were selected, based on the vantage point they provide over the Study Area and proximity to waterbodies that may be used by passing waterfowl. Waterfowl surveys took place during spring, breeding bird, and fall migration surveys throughout 2017 and 2018. (Figure 5, Appendix A). Each watch count location was surveyed for 20 minutes.

The proximity of the Study Area to tidal wetlands, coastal shorelines, and an Important Bird Area IBA necessitated an additional shorebird survey. Three locations were selected for this survey, based on the vantage point they provide over the Study Area and proximity to waterbodies which may be used by shorebirds (Figure 5, Appendix A). Watch counts had a duration of 20 minutes, and were surveyed during the spring, breeding bird, and fall migration surveys throughout 2017 and 2018.

6.2 Results

6.2.1 Desktop Review

The nearest IBA is the Eastern Shore Islands IBA (IBA NS027), located approximately 2km south of the Study Area (Bird Studies Canada, 2018) (Figure 5, Appendix A). This IBA extends from Popes Harbour to south of Ecum Secum, NS, and is made up of vegetated and unvegetated islands. The climate of this region is typical of the Maritimes, heavy fog and wind a lot of the year, and light snow cover in the winter. The tidal range is about 2 metres.

Large flocks of Common Eiders have been previously observed in this IBA, in numbers greater than 4,000 individuals. These islands provide breeding habitat and approximately 10,000 individuals have been observed in fall and spring. Other waterfowl observed in these islands include Scoters and Leach's Storm-petrels (Bird Studies Canada, 2018).

The habitats provided within this IBA are not consistent with habitat present within the Study Area. The IBA is mainly associated with coastal colonial nesting species and shorebirds dependant on exposed mudflats, sandy beaches and open water. The Project will not disrupt large contiguous wetland or forest habitat that may be associated with this IBA area.

The MBBA square results are included in Appendix C.

The ACCDC database identified five bird SAR within 5km of the Study Area. They are discussed in detail within Section 8.2.2.3.

6.2.2 Field Surveys

The Study Area provides nesting, foraging and roosting habitats for a diversity of species, particularly passerines or other land birds. The following habitats within the Study Area support avian life stages: mature conifer dominant forests, treed swamps, wetland complexes, dense shrubby understories, sparse herbaceous vegetation and dense herbaceous graminoids. There are no open waterbodies found within the Study Area and generally did not provide breeding habitat for waterfowl and shorebirds, with the exception to some cavity nesters such as Buffleheads and Goldeneyes (*Bucephala sp.*).

6.2.2.1 Spring Migration Survey

Two rounds of twenty-two point count locations were surveyed during the spring migration period. The surveys were conducted May 1st, May 2nd, May 15th and May 16th, 2018. During spring migration, 358 individuals, representing 36 species, were observed during the dedicated survey periods. Four additional woodpecker species were also identified but could not be identified to species at the time of survey. Nine Priority Species were observed during the Spring Migration surveys. Priority Species observed were: Pine Siskin (S2S3), Boreal Chickadee (S3), Gray Jay (S3), Red-breasted Nuthatch (S3), Greater Yellowlegs (S3B, S3S4M), Black-backed Woodpecker (S3S34), Northern Goshawk S3S4), Ruby-crowned Kinglet (S3S4B) and Swainson's Thrush (S3S4B). No SAR were observed during Spring Migration surveys.

Table 5, below provides a summary of results from Spring Migration 2018 point count surveys. Abundance indicates the number of individuals observed, while frequency indicates the number of times each species was observed.

Table 5: Species and abundance of birds observed during Spring Migration

Code	Common Name	S-Rank	Group	Abundance	Frequency
AMCR	American Crow	S5	6	6	6
AMRO	American Robin	S5B, S3N	6	1	1
BAWW	Black-and-white Warbler	S5B	6	13	13
BBWO	Black-backed Woodpecker	S3S4	6	4	3
BCCH	Black-capped Chickadee	S5	6	9	6
BHVI	Blue-headed Vireo	S5B	6	14	12
BLJA	Blue Jay	S5	6	6	5
BOCH	Boreal Chickadee	S3	6	6	5
BRCR	Brown Creeper	S5	6	5	4
BTNW	Black-throated Green Warbler	S5B	6	7	6
BWHA	Broad-winged Hawk	S5B	4	1	1
CORA	Common Raven	S5	6	2	2
COYE	Common Yellowthroat	S5B	6	3	3
DEJU	Dark-eyed Junco	S4S5	6	28	23
GCKI	Golden-crowned Kinglet	S5	6	34	24

Code	Common Name	S-Rank	Group	Abundance	Frequency
GRAJ	Gray Jay	S3	6	7	4
GRYE	Greater Yellowlegs	S3B, S3S4M	2	3	3
HETH	Hermit Thrust	S5B	6	26	21
LISP	Lincoln's Sparrow	S4B	6	1	1
MAWA	Magnolia Warbler	S5B	6	6	4
NAWA	Nashville Warbler	S4S5B	6	3	3
NOFL	Northern Flicker	S5B	7	9	9
NOGO	Northern Goshawk	S3S4	4	1	1
PAWA	Palm Warbler	S5B	6	45	29
PISI	Pine Siskin	S2S3	6	1	1
PUFI	Purple Finch	S4S5B, S3S4N	6	20	18
PUFI	Common Grackle	S5B	6	2	1
RBNU	Red-breasted Nuthatch	S3	6	1	1
RCKI	Ruby-crowned Kinglet	S3S4B	6	8	8
RUGR	Ruffed Grouse	S5	7	1	1
SPGR	Spruce Grouse	S4	7	6	6
SWSP	Swamp Sparrow	S5B	6	1	1
SWTH	Swainson's Thrush	S3S4B	6	1	1
WIWR	Winter Wren	S5B	6	13	10
WTSP	White-throated Sparrow	S5B	6	21	15
YRWA	Yellow-rumped Warbler	S5B	6	39	28

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.

During spring migration, abundance and diversity of species increased steadily throughout the season. Passerines comprised 95% 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 4.5% of individuals observed, followed by diurnal hawks (0.6% of individuals). Palm Warbler (*Setophaga palmarum*) was the most abundant species observed (n=45), followed by Yellow-rumped Warbler (*Setophaga petechia*, n=39), followed by Golden-crowned Kinglet (*Regulus satrapa*, n=34) and Dark-eyed Junco (*Junco hyemalis*, n=28).

All of the species identified are native species in this region of Nova Scotia 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 (96%) were of one or two individuals. No obvious concentration of waterfowl or shorebirds were observed, nor identifiable migratory flight pathways noted.

Frequency and abundance of species identified during 2018 Spring Migration surveys are provided in Figure 1 (below).

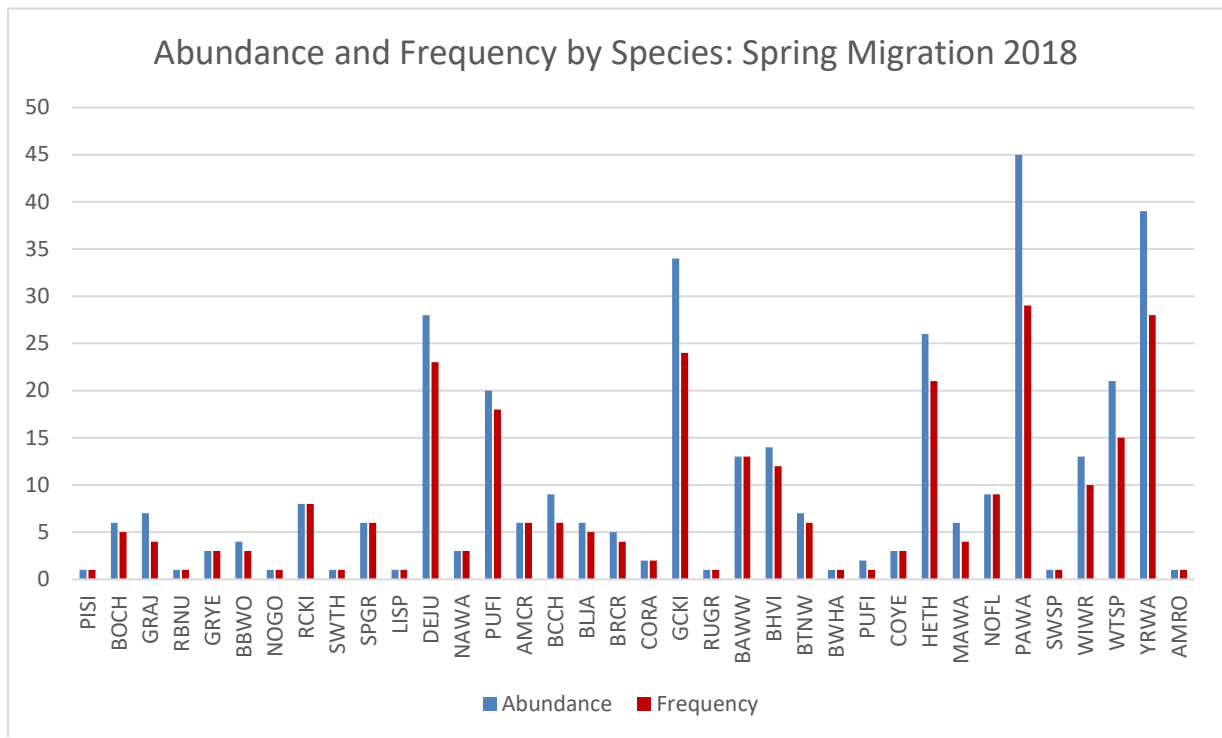


Figure 1. Frequency and Abundance of Species identified during 2018 Spring Migration Surveys

6.2.2.2 Breeding Bird Survey

The same twenty-two point count locations used during Spring Migration surveys were visited during Breeding Bird surveys. Two rounds of surveys took place: the first round occurred on June 1st and 4th, the second round took place on July 3rd and 4th, 2018. During Breeding Bird surveys, 601 individuals representing 46 species were observed, ten of which were Priority Species. These included Black-backed Woodpecker (S3S4), Gray Jay (S3), Red-breasted nuthatch (S3), Boreal Chickadee (S3), Pine Siskin (S2S3), Red Crossbill (S3S4), Ruby Crowned Kinglet (S3S4B), Swainson’s Thrush (S3S4B), Yellow Bellied Flycatcher (S3S4B) and the Bay-breasted Warbler (S3S4B). A summary of results of point count surveys conducted in the breeding bird season of 2018 is included in Table 6. Abundance indicates the number of individuals observed, while frequency indicates the number of times each species was observed. Breeding status is noted for all observed species (Table 6).

Table 6: Species and abundance of birds observed during Breeding Season Surveys

Code	Common name	S-Rank	Group	Abundance	Frequency	Breeding Status
ALFL	Alder Flycatcher	S5B	6	5	5	Possible
AMCR	American Crow	S5	6	6	4	Possible
AMGO	American Goldfinch	S5	6	1	1	Possible
AMRE	American Redstart	S4S5B	6	2	2	Possible
AMRO	American Robin	S5B, S3N	6	1	1	Possible
BAWW	Black and White Warbler	-	6	29	27	Possible
BBWA	Bay-breasted Warbler	S3S4B	6	1	1	Possible

Code	Common name	S-Rank	Group	Abundance	Frequency	Breeding Status
BBWO	Black-backed Woodpecker	S3S4	7	1	1	Possible
BCCH	Black-capped Chickadee	S5	6	10	10	Possible
BHVI	Blue-headed Vireo	S5B	6	25	23	Possible
BLJA	Blue Jay	S5	6	3	3	Possible
BOCH	Boreal Chickadee	S3	6	5	5	Possible
BRCR	Brown Creeper	S5	6	3	3	Possible
BTNW	Black-throated Green Warbler	S5B	6	13	12	Possible
CEDW	Cedar Waxwing	S5B	6	4	3	Possible
COGR	Common Grackle	S5B	6	7	6	Possible
COLO	Common Loon	S4B, S4N	3	2	2	Possible
CORA	Common Raven	S5	6	2	2	Possible
COYE	Common Yellowthroat	S5B	6	46	30	Possible
DEJU	Dark-eyed Junco	S4S5	6	29	26	Possible
EAPH	Eastern Phoebe	S4B	6	1	1	Possible
GCKI	Golden Crowned Kinglet	S5	6	26	23	Possible
GRAJ	Gray Jay	S3	6	13	8	Possible
HERG	Herring Gull	S5	3	1	1	Possible
HETH	Hermit Thrush	S5	6	44	36	Possible
LISP	Lincoln's Sparrow	S4B	6	4	3	Possible
MAWA	Magnolia Warbler	S5B	6	70	22	Possible
MODO	Mourning Dove	S5	6	6	6	Possible
NAWA	Nashville Warbler	S4S5B	6	27	22	Possible
NOFL	Northern Flicker	S5B	7	8	8	Possible
PAWA	Palm Warbler	S5B	6	26	22	Possible
PISI	Pine Siskin	S2S3	6	2	1	Possible
PIWO	Pileated Woodpecker	S5	7	1	1	Possible
PUFI	Purple Finch	S4S5B, S3S4N	6	6	6	Possible
RBNU	Redbreasted Nuthatch	S3	6	12	11	Possible
RCKI	Ruby Crowned Kinglet	S3S4B	6	9	9	Possible
RECR	Red Crossbill	S3S4	6	14	6	Possible
REVI	Red-eyed Vireo	S5B	6	1	1	Possible
RUGR	Ruffed Grouse	S5	7	1	1	Possible
SPGR	Spruce Grouse	S4	7	3	3	Possible
SWTH	Swainson's Thrush	S3S4B	6	9	7	Possible
TRES	Tree Swallow	S4B	6	1	1	Possible
UNWO	Unknown Woodpecker	--	7	3	3	Possible
WIWR	Winter Wren	S5B	6	19	18	Possible
WTSP	White-throated Sparrow	S5B	6	26	21	Possible
YBFL	Yellow-bellied Flycatcher	S3S4B	6	43	30	Possible
YRWA	Yellow-rumped Warbler	S5B	6	30	27	Possible

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.

Similar to Spring survey results, Passerines comprised 83% of all individuals observed. Other landbirds (such as Woodpeckers, grouse, etc) were the next most abundant bird group representing 13% of individuals observed, followed by waterfowl (3% of individuals). The most abundant species observed were Magnolia Warbler (*Setophaga magnolia*; n=70), Common Yellowthroat (*Geothlypis trichas*; n=46) and Hermit Thrush (*Catharus guttatus*; n=44).

All of the species identified are native species in this region of Nova Scotia 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 waterfowl or shorebirds were observed. Of the 46 species observed, 100% 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. No breeding was confirmed during the surveys.

Frequency and abundance of species identified during 2018 Breeding surveys are provided in Figure 2 (below).

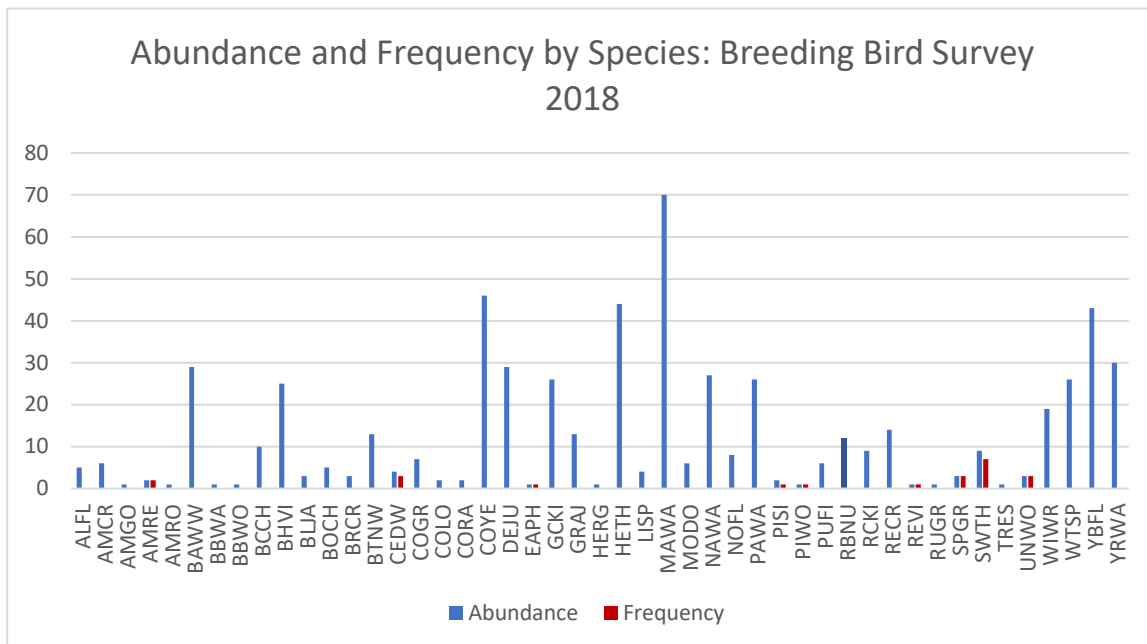


Figure 2. Frequency and Abundance of Species identified during 2017 Breeding Bird Surveys

6.2.2.3 Fall Migration

The same twenty-two point count locations used during Spring Migration surveys were visited during Fall 2017 Migration surveys. The point counts were surveyed over two days, and the surveys were repeated three times. Surveys were completed on August 26th, 28th, September 22nd, 23rd, October 9th and 11th, 2017. During the fall point count surveys, 516 individuals (15 of which were Warblers which could not be identified to species level) representing 43 species were observed. Seven Priority Species, Black-backed Woodpecker (S3S4), Gray Jay (S3), Red-breasted nuthatch (S3), Boreal Chickadee (S3), Pine Siskin (S2S3), Greater Yellowlegs (S3S4M) and Solitary Sandpiper (S3S4M) were observed during the Fall Migration surveys.

A summary of results of point count surveys conducted in the fall migration season of 2017 is included in . Abundance indicates 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 Fall Migration

Code	Common Name	S-Rank	Group	Abundance	Frequency
ALFL	Alder Flycatcher	S5B	6	1	1
AMCR	American Crow	S5	6	21	14
AMGO	American Goldfinch	S5	6	3	2
AMPI	American Pipit	S4M	2	2	1
AMRE	American Redstart	S4S5B	6	2	2
AMRO	American Robin	S5B, S3N	6	15	8
BAWW	Black-and-white Warbler	S5B	6	7	6
BBWO	Black-backed Woodpecker	S3S4	7	2	2
BCCH	Black-capped Chickadee	S5	6	32	18
BEKI	Belted Kingfisher	S5B	3	2	2
BHVI	Blue-headed Vireo	S5B	6	10	10
BLJA	Blue Jay	S5	6	25	16
BLPW	Blackpoll Warbler	S3S4B	6	10	7
BOCH	Boreal Chickadee	S3	6	21	13
BRCR	Brown Creeper	S5	6	4	4
BTNW	Black-throated Green Warbler	S5B	3	3	3
BWHA	Broad-winged Hawk	S5B	4	1	1
CEDW	Cedar Waxwing	S5B	6	4	3
COLO	Common Loon	S4B, S4N	3	2	1
CORA	Common Raven	S5	6	11	11
COYE	Common Yellowthroat	S5B	6	11	10
DCCO	Double-crested Cormorant	S4B	3	1	1
DEJU	Dark-eyed Junco	S4S5	6	33	21
DOWO	Downy Woodpecker	S5	7	3	3
GCKI	Golden-crowned Kinglet	S5	6	64	31
GRAJ	Gray Jay	S3	6	21	13
GRYE	Greater Yellowlegs	S3B, S3S4M	2	2	2

Code	Common Name	S-Rank	Group	Abundance	Frequency
HAWO	Hairy Woodpecker	S5	7	2	2
HETH	Hermit Thrush	S5B	7	22	14
LEFL	Least Flycatcher	S4S5B	6	1	1
MAWA	Magnolia Warbler	S5B	6	12	8
NOFL	Northern Flicker	S5B	6	3	3
OSPR	Osprey	S4B	4	2	2
PAWA	Palm Warbler	S5B	6	51	31
PISI	Pine Siskin	S2S3	6	2	1
PIWO	Pileated Woodpecker	S5	7	2	2
PUFI	Purple Finch	S4S5B, S3S4N	6	8	7
RBNU	Red-breasted Nuthatch	S3	6	5	5
RUGR	Ruffed Grouse	S5	7	3	2
SOSA	Solitary Sandpiper	SUB, S3S4M	2	1	1
SPGR	Spruce Grouse	S4	7	6	5
WTSP	White-throated Sparrow	S5B	6	5	4
YRWA	Yellow-rumped Warbler	SNA	6	63	36

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.

Throughout the Fall Migration surveys, overall abundance and diversity of species observed decreased as the season progressed. Passerines comprised 89% of all individuals observed, which is consistent with Spring and Breeding survey results. All other bird groups comprised less than 9% each of individuals observed. The Golden-crowned Kinglet (*Regulus satrapa*) was the most abundant species observed (n=64), followed by Yellow-rumped Warbler (*Dendroica coronata*, n=64), Dark-eyed Junco (*Junco hyemalis*, n=33) and Black-capped Chickadee (*Poecile atricapillus*, n=32).

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 were of one or two individuals, and the largest group of birds observed at one time were five Palm Warblers, American Crows and Yellow-rumped Warbler. No identifiable migratory flight pathways were observed.

No obvious concentration of waterfowl or shorebirds were observed during the fall migration point counts.

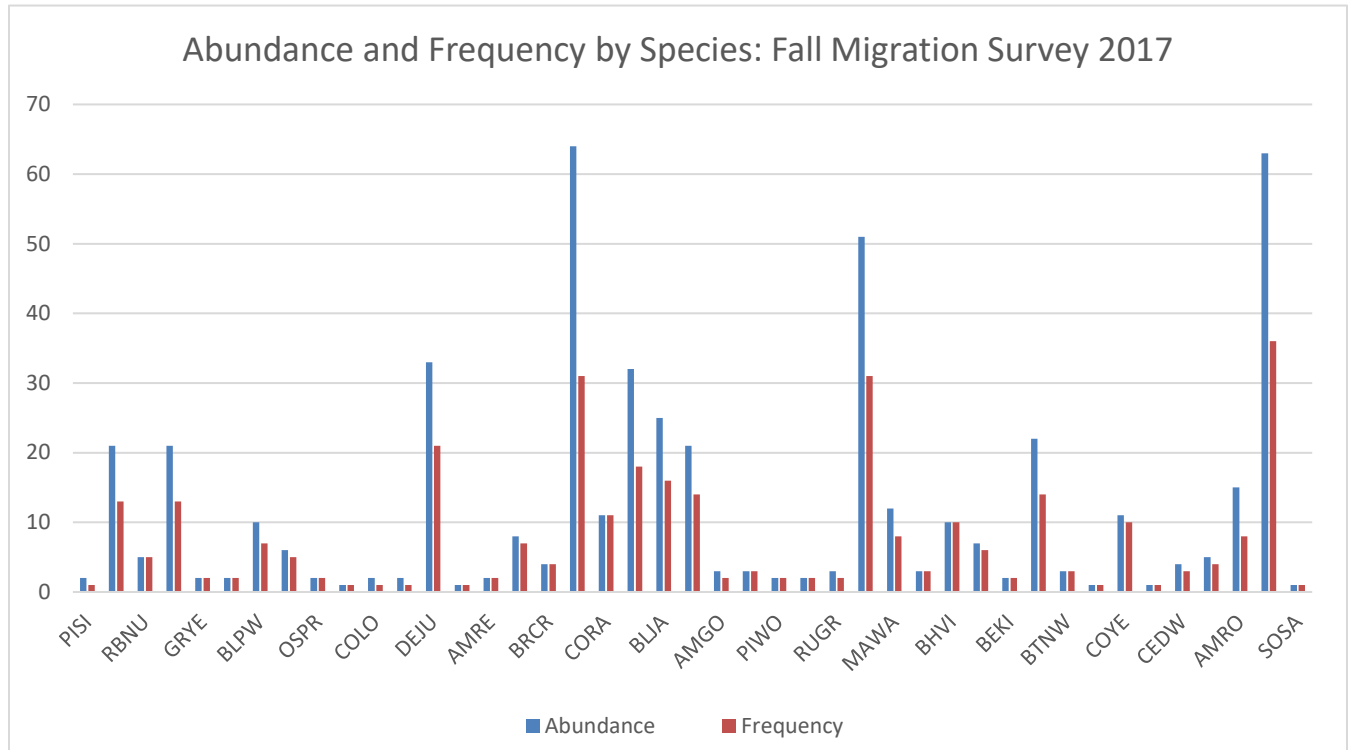


Figure 3. Frequency and Abundance of Species identified during 2017 Fall Migration Surveys

6.2.2.4 Waterfowl Surveys

Waterfowl surveys were completed along the shoreline of Big Eastern Lake abutting the northern Study Area boundary and an unnamed lake located approximately 0.4km south from the Study Area. During these surveys, 167 individuals representing 38 species were observed. Five species were waterfowl/other water birds: American Black Duck, Hooded Merganser, Common Loon, Double-crested Cormorant, and Herring Gull. Seven SOCI were observed: Boreal Chickadee (S3), Gray Jay (S3), Eastern Bluebird (S3B), Greater Yellowlegs (S3B, S3S4M), Black-backed Woodpecker (S3S4), Ruby-crowned Kinglet (S3S4B), and Yellow-bellied Flycatcher (S3S4B). The Blackpoll Warbler is also a SOCI (S3S4B) however it was not observed during the breeding period when its rank specifies that it is of concern. No other Priority Species were observed.

A summary of results of the watch count surveys conducted in the all waterfowl surveys are included in Table 8. Abundance indicates the number of individuals observed, while frequency indicates the number of times each species was observed. The survey season during which the species was observed is also indicated.

Table 8: Species and abundance of birds observed during Waterfowl Season Surveys

Code	Common Name	S-Rank	Bird Group	Abundance	Frequency	Survey Season
alfl	Alder Flycatcher	S5B	6	2	1	BB
ABDU	American Black Duck	S5	1	2	2	F, S
AMCR	American Crow	S5	6	4	3	F, S

Code	Common Name	S-Rank	Bird Group	Abundance	Frequency	Survey Season
AMGO	American Goldfinch	S5	6	4	3	BB, F
AMRO	American Robin	S5B, S3N	6	6	2	F, S
baww	Black-and-white Warbler	S5B	6	5	4	BB, S
bbwo	Black-backed Woodpecker	S3S4	7	2	1	BB
BCCH	Black-capped Chickadee	S5	6	7	5	BB, F, S
BLPW	Blackpoll Warbler	S3S4B	6	1	1	S
BTNW	Black-throated Green Warbler	S5B	6	1	1	S
BLJA	Blue Jay	S5	6	2	2	BB, F
bhvi	Blue-headed Vireo	S5B	6	2	2	BB, S
boch	Boreal Chickadee	S3	6	1	1	BB
brcr	Brown Creeper	S5	6	1	1	BB
cogr	Common Grackle	S5B	6	9	4	BB, S
colo	Common Loon	S4B, S4N	3	1	1	BB
CORA	Common Raven	S5	6	1	1	S
COYE	Common Yellowthroat	S5B	6	7	5	BB, F
DEJU	Dark-eyed Junco	S4S5	6	4	4	F, S
dcco	Double-crested Cormorant	S4B	3	5	4	BB, F, S
EABL	Eastern Bluebird	S3B	6	2	1	BB
GCKI	Golden-crowned Kinglet	S5	6	13	10	BB, F, S
GRAJ	Gray Jay	S3	6	1	1	F
GRYE	Greater Yellowlegs	S3B, S3S4M	2	1	1	F
HAWO	Hairy Woodpecker	S5	7	3	3	BB, F, S
heth	Hermit Thrush	S5B	6	2	2	S, BB
HERG	Herring Gull	S5	3	8	5	BB, F, S
HOME	Hooded Merganser	S5B	1	1	1	F
mawa	Magnolia Warbler	S5B	6	4	4	BB
nawa	Nashville Warbler	S5B	6	1	1	BB
nofl	Northern Flicker	S5B	7	3	3	BB, S
OSPR	Osprey	S4B	4	1	1	F
PAWA	Palm Warbler	S5B	6	10	7	BB, F, S
PUFI	Purple Finch	S4S5B, S3S4N	6	3	3	S
rcki	Ruby-crowned Kinglet	S3S4B	6	4	4	BB, S
rugr	Ruffed Grouse	S5	7	1	1	BB
SPGR	Spruce Grouse	S4	7	1	1	F
SWSP	Swamp Sparrow	S5B	6	7	6	BB, F, S

Code	Common Name	S-Rank	Bird Group	Abundance	Frequency	Survey Season
WTSP	White-throated Sparrow	S5B	6	8	6	BB, F, S
wiwr	Winter Wren	S5B	6	3	1	BB, S
ybfl	Yellow-bellied Flycatcher	S3S4B	6	2	2	BB
YRWA	Yellow-rumped Warbler	S5B	6	22	13	BB, F, S

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.

Season Codes: BB: Breeding Bird, F: Fall, S: Spring

Despite the location and survey methods employed during the waterfowl surveys, passerines still accounted for the vast majority of all individuals observed (83%). Waterbirds and waterfowl together accounted for 10% of individuals, while shorebirds and other land birds accounted for 6% of the individuals observed. Yellow-rumped Warblers and Golden-crowned Kinglets were the most abundant species, with 22 and 13 individuals observed, respectively. No obvious concentrations of waterfowl were observed.

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 were of one or two individuals, and the largest group of birds observed at one time were four Herring Gulls, American Robins, and Yellow-rumped Warblers.

No obvious concentration of waterfowl or shorebirds were observed during any of the survey periods.

6.2.2.5 Shorebird Surveys

Shorebird surveys were completed at three locations: two tidal marshes and one rocky shoreline, all of which provide suitable habitat for shorebird foraging. During these surveys, 263 individuals representing 37 species were observed. Seven species observed were shorebirds (Black Guillemot, Common Tern, Great Blue Heron, Greater Yellowlegs, Herring Gull, Hudsonia Whimbrel, and Willet). Six SOCI were observed across all shorebird surveys. A summary of results of watch count surveys conducted are included in Table 9. Abundance indicates the number of individuals observed, while frequency indicates the number of times each species was observed. The survey season during which the species was observed is also indicated.

Table 9: Species and abundance of birds observed during Summer Shorebird Surveys

Code	Common Name	S-Rank	Bird Group	Abundance	Frequency	Season
ABDU	American Black Duck	S5	1	1	1	S
AMCR	American Crow	S5	6	6	4	BB, F, S
AMGO	American Goldfinch	S5	6	6	4	BB, F, S
BEKI	Belted Kingfisher	S5B	3	5	3	F, S
BLGU	Black Guillemot	S4	2	1	1	F

Code	Common Name	S-Rank	Bird Group	Abundance	Frequency	Season
BCCH	Black-capped Chickadee	S5	6	5	3	F, S
BTNW	Black-throated Green Warbler	S5B	6	1	1	BB
BLJA	Blue Jay	S5	6	1	1	S
CAGO	Canada Goose	SNAB, S4N	1	6	1	BB
COEI	Common Eider	S3S4	1	31	2	F, S
COGR	Common Grackle	S5B	6	1	1	S
COLO	Common Loon	S4B, S4N	3	4	1	F
COME	Common Merganser	S5	1	7	1	F
CORA	Common Raven	S5	6	1	1	S
COTE	Common Tern	S3B	3	13	3	BB, F, S
COYE	Common Yellowthroat	S5B	6	4	3	BB, F
DEJU	Dark-eyed Junco	S4S5	6	1	1	S
DCCO	Double-crested Cormorant	S4B	3	80	8	F, S
GCKI	Golden-crowned Kinglet	S5	6	2	2	F, S
GBHE	Great Blue Heron	S4B	3	1	1	F
GRYE	Greater Yellowlegs	S3B, S3S4M	2	4	3	F
HAWO	Hairy Woodpecker	S5	7	1	1	S
HETH	Hermit Thrush	S5B	6	1	1	S
HERG	Herring Gull	S5	3	53	9	BB, F, S
MAWA	Magnolia Warbler	S5B	6	3	3	BB, S
NOFL	Northern Flicker	S5B	7	1	1	S
PAWA	Palm Warbler	S5B	6	4	4	BB, F, S
PUFI	Purple Finch	S4S5B, S3S4N	6	2	2	S
RCKI	Ruby-crowned Kinglet	S3S4B	6	1	1	S
SOSP	Song Sparrow	S5B	6	4	4	BB, F, S
SWSP	Swamp Sparrow	S5B	6	1	1	S
TRES	Tree Swallow	S4B	6	4	10	BB, S
WHIM	Whimbrel	S2S3M	1	1	1	F
WTSP	White-throated Sparrow	S5B	6	1	1	S
WILL	Willet	S2S3B	1	1	1	S
WIWR	Winter Wren	S5B	6	1	1	BB
YWAR	Yellow Warbler	S5B	6	1	1	BB
YBFL	Yellow-bellied Flycatcher	S3S4B	6	1	1	BB
YRWA	Yellow-rumped Warbler	S5B	6	1	1	S

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/webbranks/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.

Season Codes: BB: Breeding Bird, F: Fall, S: Spring

Waterbirds accounted for 58% of individuals observed during Shorebird surveys, while shorebirds only accounted for less than 2% of the individuals observed. Double-crested Cormorants (n=80) and Herring Gulls (n=53) were the most abundant bird species recorded during the shorebird watch counts. No obvious large concentration of ducks or shorebirds were observed.

Suitable habitat for all species identified is present in the Study Area and surrounding landscapes (i.e. coastal environment). The majority of observations were of one or two individuals, and the largest group of birds observed at one time were 40 Double-crested Cormorants.

No obvious concentration of waterfowl or shorebirds were observed during any survey periods.

7.0 AQUATIC ENVIRONMENT

7.1 Methodology

7.1.1 Desktop Review

The Project Team reviewed the Nova Scotia Topographic Database (NSTDB) and NSDNR Provincial Landscape Viewer to locate mapped watercourses and wetlands.

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 Surveys

Field surveys were conducted in August 2017 across the Study Area to confirm presence of mapped wetlands and watercourses and identify other aquatic features that may be present on the landscape.

7.1.2.1 Wetlands

The NS Environment Act defines wetlands as:

Land referred to as a marsh, swamp, fen, or bog that either periodically or permanently has the water table at, near, or above the land surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation, and biological activities adapted to wet conditions (Environment Act, 2006).

Wetland delineation was completed based on micro-topography, and observed surface hydrology, vegetation and soils by qualified wetland delineators on September 19-22, 26-28, 2017. Wetland boundaries were documented using an SXBlue GPS unit and handheld field computer capable of sub 1m accuracy. Any inlet and outlet streams or other features associated with each wetland were flagged (pink tape was used to delineate wetlands) during the delineation process, walked and mapped. Observations were made on wetland types, water flow path, dominant vegetation communities, SAR/SOCI (if present), fish habitat potential and characterizations, and wetland functions.

7.1.2.2 Wetland Functional Analysis

Wetland functional assessments were completed for each wetland using the Wetland Ecosystem Services Protocol - Atlantic Canada (WESP) 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 benefits. WESP addresses 17 specific functions that wetlands may provide (Table 10). The specific wetland functions are individually allocated into grouped wetland functions and measured for “Function” and “Benefit” scores. Wetland Function relates to what a wetland does naturally through physical, chemical, and/or biological processes (i.e., water storage). Wetland Benefits are the importance of the functions, whether that is ecological, social, or economic importance. The highest functioning wetlands are those that have both high ‘Function and ‘Benefit’ scores for a given function. WESP enables us to compare individual wetlands within a region to gain a sense of the importance each has in providing ecosystem services.

Table 10: 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 grouped wetland functions above, WESP also measures the following groups, however these are only evaluated by their Benefit scores:

- Wetland Condition; and
- Wetland Risk.

Furthermore, there are four additional specific wetland functions that do not contribute to the above groups, and are only evaluated by their Benefit scores:

- Public Use & Recognition;
- Wetland Sensitivity;
- Wetland Ecological Condition; and
- Wetland Stressors.

For each wetland evaluated the WESP process calculates the overall score for the seven grouped wetland functions and the 17 specific wetland functions listed in Table 10 above. One score each is provided for Function and Benefit. Scores are ranked as 'Lower', 'Moderate', or 'Higher', allowing for analysis of the wetland as compared to baseline wetland scores in Nova Scotia. A 'Higher' WESP score means that wetland has a greater capacity to support those processes as compared to other wetlands in the province. A 'Higher' WESP score in both the Function and Benefits category means the wetland supports the natural ecosystem functions and provides services potentially important to society. For example, a 'Higher' Function and Benefit score in the specific wetland function 'Surface Water Storage' means the wetland effectively slows water running off of the landscape while at the same time providing flood control to communities downstream.

For our analysis, MEL weighted the WESP scores to quantitatively compare wetlands. The following weights were applied to scores for grouped wetland functions and specific wetland functions:

- Lower score = 1 point
- Moderate score = 2 points
- Higher score = 3 points

7.1.2.3 Watercourses

The NS Environment Act defines watercourses as:

The bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water... (Environment Act, 2006)

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 (Priority Herpetofauna Species). 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. Watercourses were flagged (blue tape was used to delineate watercourses), walked and mapped during the delineation process.

7.2 **Results**

7.2.1 *Desktop Review*

The Study Area is located within two secondary watersheds. The bulk of the Study Area is located in the Shore Direct secondary watershed (1EM-SD4) watershed and the northern section of the access road is within the Grand Lake secondary watershed (1EM-3), both of which discharge to the Atlantic Ocean. The Study Area is within the East/West Sheet Harbour Primary Watershed (1EM). There were no wetlands of special significance within the Study Area; however, there are two such wetlands 1km south of the Study Area, near the Atlantic coast (Figure 6, Appendix A).

The NSTDB and NSDNR Provincial Landscape Viewer identifies one mapped swamp wetland in the northwestern corner of the Study Area, and two mapped swamp wetlands which intersect the access road (Figure 6, Appendix A).

One mapped watercourse is identified within the eastern extent of the quarry portion of the Study Area and is assumed to drain southward toward the coast. Two mapped watercourses are identified to drain across the access road portion of the Study Area. Big Eastern Lake is visible from aerial photographs and the NSTD database adjacent to the northern boundary of the Study Area.

7.2.2 Field Surveys

Twenty-seven (27) wetlands were identified in the Study Area, along with three watercourses. These features are described below.

7.2.2.1 Wetlands

Field surveys resulted in the identification of 22 swamps, one fen, one swamp-fen complex, one swamp-bog complex, and two bogs. Wetland types along with characterizations are provided in Table 11 below.

Table 11: Wetland Characteristics

Wetland Number	Wetland Type	Vegetation	Wetland Size (m ²)	Water Flow Path	Landscape Position	Landform
1	Swamp	Treed	11,844	Isolated	Terrene	Basin
2	Swamp	Shrub	2,016	Throughflow – (Via Drainage)	Terrene	Sloped Basin
3	Swamp	Treed	953	Isolated	Terrene	Basin
4	Swamp	Treed	449	Isolated	Terrene	Basin
5	Swamp	Treed	540	Isolated	Terrene	Basin
6	Swamp	Treed	4,524	Isolated	Terrene	Sloped Basin
7	Bog	Shrub	4,829	Isolated	Terrene	Flat
8	Swamp	Treed	6,608	Isolated	Terrene	Basin
9	Swamp	Treed	818	Isolated	Terrene	Basin
10	Swamp	Treed	270	Isolated	Terrene	Basin
11	Complex	Treed Swamp/Shrub Bog	14,204	Isolated	Terrene	Basin
12	Swamp	Treed	3,990	Isolated	Terrene	Basin
13	Swamp	Treed	1,489	Isolated	Terrene	Basin
14	Swamp	Treed	1,096	Isolated	Terrene	Basin
15	Bog	Treed	424	Isolated	Terrene	Basin
16	Swamp	Treed	4,868	Isolated	Terrene	Basin
17	Swamp	Treed	991	Isolated	Terrene	Basin
18	Swamp	Treed	13,749	Isolated	Terrene	Basin
19	Fen	Graminoid	600	Isolated (assumed)	Terrene	Basin
20	Swamp	Treed	1,043	Isolated	Terrene	Basin
21	Swamp	Treed	335	Isolated	Terrene	Sloped Basin
22	Swamp	Treed	599	Isolated	Terrene	Basin
23	Complex	Treed Swamp/Graminoid Fen	6,642	Throughflow – Via Drainage	Terrene	Basin
24	Swamp	Treed	4,005	Outflow – (Via Drainage)	Terrene	Basin
25	Swamp	Treed	2,054	Isolated	Terrene	Basin
26	Swamp	Treed	670	Isolated	Terrene	Basin

Wetland Number	Wetland Type	Vegetation	Wetland Size (m2)	Water Flow Path	Landscape Position	Landform
27	Swamp	Treed	286	Isolated	Terrene	Basin

Swamps

Twenty-two (22) of the 27 wetlands identified within the Study Area are classified as a swamp, with all but one existing as treed swamps and the remainder being a shrub swamp (Photo 5).

The dominant water flow characteristics among the swamp habitat comprise hydrologically isolated features (i.e. they lack surface water inputs and/or outputs). Conversely, Wetlands 2, 23, and 24 which had drainage either moving through them, or as an outflow.

All swamp wetlands are densely vegetated and commonly dominated by Black Spruce (*Picea mariana*), Balsam Fir (*Abies balsamea*), Red Maple (*Acer rubrum*), and Larch (*Larix laricina*) trees. The shrub strata of these wetlands are largely dominated by Speckled Alder (*Alnus incana*), Mountain Holly (*Ilex mucronata*), Balsam Fir (*Abies balsamea*), Black Spruce (*Picea mariana*), Northern Wild Raisin (*Viburnum nudum*), and Red Maple (*Acer rubrum*). The herb layer was comprised mainly of Cinnamon Fern (*Osmunda cinnamomea*), Three-seeded Sedge (*Carex trisperma*), New York Fern (*Thylypteris noveboracensis*), Sheep Laurel (*Kalmia angustifolia*), Star Sedge (*Carex echinata*), and Bunchberry (*Cornus canadensis*). These vegetative characteristics are very representative of swamp habitats through Nova Scotia and in the region generally.

Hydric soils within treed swamps was indicated by an organic layer of varied depths ranging from approximately 10-40 cm, underlaid by a rocky restrictive layer. None of the treed swamp wetlands identified provide access or habitat for fish.



Photo 5. Typical Swamp Vegetation

Graminoid Fen

Wetland 19, which is located in the access road Study Area corresponds to the same location as a wetland predicted by the mapped (desktop) wetland layer. This wetland was dominated by grass-like species

(graminoids) and has peat depth to approximately 65cm, confirming a histosol hydric soil indicator. Wetland 19 is assumed to be isolated from hydrological features (as per desktop mapping) and contains small areas of pooling surface water.

Vegetation predominantly consisted of Tawny Cottongrass (*Eriophorum virginicum*), Sheep Laurel (*Kalmia angustifolia*), Three-seeded Sedge (*Carex trisperma*), and Labrador Tea (*Rhododendron groenlandicum*). Wetland 19 appears to be part of a larger wetland that extends east of the access route Study Area. The delineated portion of this wetland is not accessible to fish.



Photo 6. Graminoid Fen

Swamp-Bog Complex

Wetland 11 exists as a complex comprising treed swamp and shrub bog habitats. The swamp portion is dominated by Black Spruce (*Picea mariana*), Balsam Fir (*Abies balsamea*), and Red Maple (*Acer rubrum*) trees, while Speckled Alder (*Alnus incana*) and Balsam Fir (*Abies balsamea*) dominate the shrub stratum. Cinnamon Fern (*Osmunda cinnamomea*) dominates the herb layer. The bog habitat is dominated by Black Spruce (*Picea mariana*) trees, Black Spruce (*Picea mariana*), Red Maple (*Acer rubrum*), and Mountain Holly (*Ilex mucronata*) shrubs, and Three-seeded Sedge (*Carex trisperma*), Tawny Cottongrass (*Eriophorum virginicum*), and Canada Manna Grass (*Glyceria canadensis*) herbs.

Wetland 11 is hydrologically isolated and provides no access to fish. The wetland contains large snags and downed wood, making it ideal habitat for songbirds, raptors and mammals. Both the swamp and bog areas of this wetland comprise in excess of 35cm of organic soil, demonstrating histosol hydric soil conditions.



Photo 8: Treed Swamp Portion of Wetland 11



Photo 7: Shrub Bog Portion of Wetland 11

Swamp–Fen Complex

Wetland 23 is a treed swamp/graminoid fen complex located in the northwestern corner of the Study Area. This wetland confirms the presence of the desktop predicted wetland identified at this location.

The swamp habitat is dominated by Black Spruce (*Picea mariana*) trees, Black Spruce (*Picea mariana*), Mountain Holly (*Ilex mucronata*), and Northern Wild Raisin (*Viburnum nudum*) shrubs and a very dense herb layer composed of mostly Cinnamon Fern (*Osmunda cinnamomea*) and Canada Manna Grass (*Glyceria canadensis*). The bog habitat is dominated by graminoid species such as Tussock Sedge (*Carex stricta*), Canada reed grass (*Calamagrostis canadensis*), and Labrador Tea (*Rhododendron groenlandicum*).

Wetland 23 has visible drainage entering and exiting its boundaries, and also appears to be part of a larger wetland that extends northwest of the Study Area. The delineated portion of this wetland is not accessible by fish. Hydric soil in both swamp and fen portions was indicated by a deep layer of organic peat (>35 cm).



Photo 8. Bog Portion of Wetland 23



Photo 9. Swamp Portion of Wetland 23

Bog

Wetlands 7 and 15 are both bogs that are isolated from other surface water features. Wetland 15 is located less than 10m from Big Eastern Lake north of the Study Area, however there is no direct surficial connection between the features and as such Wetland 15 is not accessible to fish. Wetland 7 also isolated and lacks fish access.

Both wetlands are dominated by Black Spruce (*Picea mariana*) trees and shrubs. Wetland 15 also comprises Balsam Fir (*Abies balsamea*) in its shrub stratum. The herb stratum in Wetland 7 is composed of Sheep Laurel (*Kalmia angustifolia*), Cloudberry (*Rubus chamaemorus*), Northern Pitcher Plant (*Sarracenia purpurea*) and Labrador Tea (*Rhododendron groenlandicum*). Wetland 15 is mostly dominated by Three-seeded Sedge (*Carex trisperma*) and Sheep Laurel (*Kalmia angustifolia*) herbs.

Hydric soil in both wetlands is indicated by a histosol, which is defined as over 40cm of organic peat over a restrictive layer (i.e. shallow rock).

7.2.3 *Wetland Functional Analysis*

The WESP process calculates the overall scores for the seven wetland functional groups including a functional and benefit rating for five of the groups (Hydrologic, Water Purification, Aquatic Support, Aquatic Habitat and Terrestrial Habitat) and the benefit rating for the Wetland Condition and Wetland Risk wetland functional groups. The WESP calculator utilized the responses from desktop, field and stressor questions (included in the WESP calculator) to determine whether the functions and benefits for each group are Low, Moderate or High in comparison to baseline wetland scores in Nova Scotia. In order to complete an effective, quantitative comparison of WESP results for wetlands within the Study Area, scores were weighted numerically as follows:

- LOW: 1 point
- MODERATE: 2 points
- HIGH: 3 Points

Table D1 (Appendix D), provides the overall numerically weighted scores for the evaluation of 27 wetlands completed across the Study Area. It should be noted that Functions scores are not provided for wetland functional groups Wetland Condition and Wetland Risk as the WESP calculator does not consider these wetland functions, rather wetland benefits only. The numerically weighted scores for wetland functions and benefits were totaled on a per wetland basis, averaged and are indicated in the far-right columns of Table D1. This provides an ability to compare wetland to wetland scores across the Study Area. The categorized range of total accumulated average function and benefit scores on a per wetland basis was developed using the following ranges: 1-1.4 = Low, 1.5-2.4 = Moderate and 2.5-3= High.

Of the 27 wetlands evaluated, the average accumulated functional score per wetland was 1.8 (Moderate). Based on the same analysis, the average accumulated benefit score per wetland was 1.5 (Low-Moderate End). WESP guidance states that the most valuable wetlands are those that possess high functions and benefits. Benefits relate to the perceived worth of the wetland function to societal needs (Adamus, P., & Verble, K., 2016). Based on the ranges evaluated, it is evident that of the 27 wetlands evaluated, none of the wetlands evaluated scored in the HIGH accumulated range for both functions and benefits (see Table D1, Appendix D). It is evident from Table D1 (Appendix D) however that the majority (18 of 27) wetlands scored in the Moderate range for Function, and Benefits.

Additional analysis was completed on the individual wetland functional groups being provided by the wetlands present within the Study Area. The following sections provide results of this analysis on a per wetland functional group basis.

7.2.3.1 WESP Grouped Wetland Function Results

Tables 12 to 16 outline the results of the five grouped wetland functions.

Hydrologic Group

The hydrological wetland service group evaluates the effectiveness of a wetland to store or delay the downslope movement of surface water. Wetlands that have the highest functions within this group include those that do not have surface water outlets, and instead are isolated from flowing surface water. The model does not account for wetland size, and in turn, does not account for larger wetlands having the ability to store more water than smaller wetlands.

Table 12: Hydrologic Group Wetland Scores

Hydrologic Group		Function		
		Low	Moderate	High
Benefit	Low	WL2	WL1, WL8, WL11, WL12, WL14, WL25, WL18, WL19, WL21, WL22, WL24, WL25	WL3, WL4, WL5 WL6, WL7, WL9, WL10, WL13, WL16, WL17, WL20
	Moderate	WL23		WL26, WL27
	High			

The majority of wetlands within the Study Area scored Moderate to High largely as a result of their existence as isolated wetlands across the landscape. The two wetlands which scored highest in the

Hydrologic Group (i.e. WL26 and WL27) exist at higher elevations than other wetlands and as such, presented higher scores due to their ability to store water higher in the watershed. However, it should be noted that the small size of both wetlands reduces the capacity of this function in comparison to other wetlands (although this isn't considered by WESP).

Water Purification Group

This wetland functional group is compiled from four different functions: Sediment Retention and Stabilization; Phosphorus Retention; Nitrate Removal; Carbon Sequestration. The main function of this group is the evaluate the wetlands potential to intercept, retain, and filter sediments, particulates, and organic matter. Similar to the hydrologic group, the wetlands that have the highest functions in this regard include those that do not have a surface water outlet, and instead are isolated from flowing surface water. This model also does not account for wetland size and as such, larger wetlands do not necessarily score higher for water purification than small wetlands.

Table 13: Water Purification Group Wetland Scores

Water Purification Group		Function		
		Low	Moderate	High
Benefit	Low	WL2		WL1, WL3, WL4, WL5, WL6, WL7, WL8, WL9, WL10, WL11, WL12, WL13, WL14, WL15, WL16, WL17, WL18, WL19, WL20, WL21, WL22, WL24, WL25
	Moderate		WL23	WL26, WL27
	High			

Wetlands 26 and 27 also scored High/Moderate for the Water Purification Group, demonstrating they are also effective at intercepting, retaining, and filtering suspended sediments, particulates, and organic matter due to their lack out outlet.

Aquatic Support Group

The aquatic support group comprises four individual functions: Stream Flow Support, Aquatic Invertebrate Habitat, Organic nutrient export, and Water cooling. The main function of this group is to determine the wetlands ability to support ecological stream functions that promote habitat health, therefore wetlands lying adjacent to or containing flowing water score higher than those that do not (i.e. isolated wetlands). In addition, however, headwater wetlands are crucial for supporting stream flow during the dry season by contributing to water flow via groundwater input and storage capacity.

Table 14: Aquatic Support Group Wetland Scores

Aquatic Support Group		Function		
		Low	Moderate	High
Benefit	Low	WL1, WL2, WL7, WL8, WL11, WL12, WL18, WL19, WL21, WL22, WL23, WL25	WL3, WL4, WL5, WL6, WL9, WL10, WL13, WL14, WL16, WL17, WL20, WL24, WL26, WL27	
	Moderate	WL15		
	High			

The majority of wetlands scored in the Low range for function since they are not associated with other flowing surface water systems.

Aquatic Habitat Group

The aquatic habitat group is compiled from five different functions: Anadromous Fish Habitat, Resident Fish Habitat, Amphibian and Turtle Habitat, Waterbird Feeding Habitat, Waterbird Nesting Habitat. Wetlands that have the highest functions within this group include those that are adjacent to or contain flowing water.

Table 15: Aquatic Habitat Group Wetland Scores

Aquatic Habitat Group		Function		
		Low	Moderate	High
Benefit	Low	WL4, WL5, WL6, WL7, WL26, WL27		
	Moderate	WL3, WL9, WL10, WL13, WL14, WL16, WL17, WL20	WL1, WL2, WL8, WL23, WL24, WL25	
	High		11, 12, 15, 18, 19, 21,22,	

Many of the on-site wetlands scored within the Low range for function due to their lack of association other surface water features and fish habitat. However, thirteen (130 of the wetland did score Moderately for function in this regard due to their provision of other aquatic habitat support such as amphibian and turtle habitat.

Benefits were generally Low to Moderate most likely due to the fact that the landscape comprises many other wetlands which can also provide highly scoring aquatic habitat functions (i.e. the benefit of the wetland function increases if similar wetlands providing those functions are absent from the landscape).

Terrestrial Habitat Group

The terrestrial habitat group comprises three different functions: Songbird, Raptor, and Mammal Habitat, Native Plant Habitat and Pollinator habitat. The main function of the collective group is to evaluate the wetlands ability to support healthy habitat for birds, mammals, and native plants.

Table 16: Terrestrial Habitat Group Wetland Scores

Terrestrial Habitat Group		Function		
		Low	Moderate	High
Benefit	Low		WL6, WL7, WL26	WL2, WL4, WL5, WL8, WL23, WL24, WL25, WL27
	Moderate		WL13, WL16, WL17	WL3, WL9, WL10, WL11, WL12, WL14, WL15, WL18, WL19, WL20, WL21, WL22
	High	WL1		

As can be noted, scores for function fall within the Moderate or High categories for all but one wetland within the Study Area. In general, wetlands within the Study Area provide ideal habitat, which includes downed wood, prevalent ground cover, varied microtopography, tree and shrub cover in and around the

wetlands, and naturally vegetated buffer zones. The wetlands have a variety of woody heights and diverse forms, which allows for nesting habitat, perches, and feeding grounds. In addition, the wetlands provide a diverse range of herbaceous vegetation. As such wetlands within the Study Area generally provide habitat for songbirds, mammals and potentially rare plants (although none were observed during field studies).

This group resulted in Moderate to Low benefit scores: 8 Low, 12 Moderate, and only one High. However, it should be noted that benefit scoring within this group is based largely on two key factors: proximity to an Important Bird Area (2km away) and the observation of rare plant species. There was a lack of observations of rare plants across the Study Area which likely limited the benefit scoring potential for this group.

Wetland Condition

Wetland Condition refers to the integrity or health of a wetland as defined by its vegetative composition and richness of native species. Scores are derived from the similarity between the wetland being evaluated and reference wetlands of the same type and landscape setting (Adamus 1996).

All wetlands scored High for Wetland Condition which indicates that currently, the wetlands indicate healthy vegetative communities.

Wetland Risk

Wetland Risk takes sensitivity and stressors into account by averaging the two. Sensitivity is the lack of intrinsic resistance and resilience of the wetland to human or naturally caused stress (Niemi et al., 1990). The model uses six metrics to measure stress: abiotic resistance, biotic resistance, site fertility, availability of colonizers, and growth rate. Stress relates to the degree to which the wetland is or has recently been altered by humans in a way that degrades its ecological condition. The model applies four stress groups: hydrologic stress, water quality stress, fragmentation stress, and general disturbance stress. Wetlands that are highly resilient may have lower risk scores despite their exposure to multiple stressors. Additionally, wetlands exposed to fewer threats, but with low resilience may have high risk scores. Wetland resilience is tied to multiple factors, but may include size, proximity to natural land cover, and presence of invasive species.

The majority of wetlands analyzed had Medium risk scores. Four wetlands had Lower scores (i.e. less at risk) (Wetlands 2, 7, 19 and 23), with the remaining 23 having Moderate scores (i.e. more at risk). No wetlands presented High wetland risk scores. The Moderate risk scores are likely attributed to historical clear cutting or access/ATV trails intersecting wetlands. The lack of adjacent other stressors from human impacts such as development, roads, and residences are reasons for the low scores obtained.

7.2.3.2 WESP Specific Wetland Function Results

The results of the specific wetland function for each analyzed wetland can be found in Table D2 (Appendix D). Out of the 27 wetlands assessed, seven wetlands had High scores in Function and Benefits for at least one of the categories. Wetlands 11, 12, 15, 18, 19, 21, and 22 all had High scores in Function and Benefit in the category “Songbird, Raptor, & Mammal Habitat”. These wetlands effectivity support the necessary habitat for these species, and in doing so they maintain biodiversity within the region. Wetland 15 also had High scores in Function and Benefit for the category “Waterbird Feeding Habitat”. Wetland 15 was a treed bog near a large lake, which increases its potential importance for nesting

waterbirds within the region. Wetland 15 also had a mix of High/Moderate scores in “Sediment & Toxicant Retention & Stabilization” and “Amphibian Habitat”.

In general, wetlands present within the Study Area had high functionality in “Nitrate Removal & Retention” and “Pollinator Habitat”. The former specific wetland function describes the ability to retain particulate matter and either allow for particle settling or the release of gas into the atmosphere, (which both help to filter water). The Pollinator Habitat function describes the wetlands ability to support habitats used by pollinating insects, thus enhancing plant biodiversity.

The wetlands generally had high benefit scores in “Wetland Ecological Condition” and “Wetland Sensitivity”. Both of these specific wetland functions only receive benefit scores (function scores are not provided). These results indicate that many of the wetlands are healthy (as indicated by their vegetation composition) and are resilient to change.

7.2.4 *Watercourses*

Three watercourses were identified within the Study Area, all of which were located within the proposed access road Study Area.

Watercourse 1 is an unmapped watercourse located in the northern extent of the access road. The watercourse initiates along the northern edge of the access road and flows through a 60cm hung culvert beneath the road to the southwest (i.e. the culvert invert is approximately 60cm above the bed of the watercourse and does not drain water effectively). Watercourse 1 continues flowing southwest toward a mapped watercourse system. It is anticipated that WC1 drains into the mapped system.

Watercourse 2 (WC2) is an unmapped watercourse; however, it is assumed that it connects to a mapped watercourse and wetland approximately 350m northwest (Figure 6, Appendix A). Should this be the case, Watercourse 2 within the Study Area may provide fish passage and low-quality habitat during periods of high flow only. The road currently impedes fish passage, as evidenced by Photo 12.

Watercourse 3 (WC3) confirms the location of a mapped watercourse which is connected to a mapped wetland located approximately 275m northwest of WC3 (Figure 6, Appendix A). At the time of evaluation, there was minimal water flow and water flowed subterranean in sections (Photo 14) and comprise large rock piles. It was deemed to not provide fish access.



Photo 10. Watercourse 1



Photo 11. Watercourse 2



Photo 12: Watercourse 2



Photo 13 Watercourse 3



Photo 14. Dry Portion of Watercourse 3

Watercourse characteristics are presented in Table 17 (below).

Table 17: Watercourse Characteristics

Water-course Number	Reference UTM's		Section Length (m)	Velocity	Gradient	Wetted Width (cm)	Bankfull Width (cm)	Avg Depth (cm)	Bank Height (cm)	Substrate (%)	Habitat Type (%)
	E	N									
1	Upstream		15	No water present	7-10%	0-15	35	5	15	Muck: 100%	Flat: 100%
	538264	4971907									
	Downstream										
	538272	4971906									
2	Upstream		50	No water present	2-5%	0-50	100	5	15-40	Cobble: 40% Rubble: 30% Muck: 10% Pebble: 20%	Flat: 100%
	537681	4970756									
	Downstream										
	537653	4970784									
3	Upstream		50	Low	5%	0-150	35-200	10	60	Gravel: 10% Pebble: 10% Cobble: 40% Rubble: 10% Small Boulder: 30%	Flat: 100%
	537481	4970615									
	Downstream										
	537468	4970644									

Based on the characteristics outlined in Table 17 (below), these three watercourses do not contain evidence of fish habitat. Watercourse 2 has the potential to provide poor fish passage, however, this would only be in high flow events, and only if there is connectivity upstream and downstream.

8.0 PRIORITY SPECIES

As described in Section 1.2, a Species at Risk (SAR) is a species that is legally protected under the federal *Species at Risk Act* (SARA) or the provincial *Nova Scotia Endangered Species Act* (NSES), while a Species of Conservation Interest (SOI) 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 S3S4 by the ACCDC. The following sections describe the assessment of these species.

8.1 Methodology

8.1.1 Desktop Review

A priority species list was developed as outlined in Section 1.2. The priority list of species was first narrowed by broad geographic area and then further narrowed by identifying specific habitat requirements for each species. For example, if a listed species on the NSES 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 Study Area.

Data was requested from the Nova Scotia Communities Culture and Heritage (NSCCH) Environmental Screening Report and ACCDC to obtain records of rare species existing or historically found within the general location of the property. 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 using the Priority Species List and the ACCDC report 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 20 km of the Study Area by the ACCDC. The in-text list is provided in Table 19.

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. Locations of Priority Species as identified by ACCDC is provided on Figure 7 (Appendix A).

8.1.2 *Field Surveys*

Targeted SOCI and SAR surveys, including vegetation and lichens, were completed in Summer 2017 and Spring 2018. Moose surveys were completed from January to May of 2018, to assess for all identified Priority Species across the Study Area. All incidental Priority Species were noted during all field surveys.

8.2 **Results**

8.2.1 *Desktop Results*

The NSCCH report (Appendix C) for the presence of natural and heritage resources was requested and consulted prior to completion of field surveys. The NSCCH report contained no records of Priority Species. A review of the 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 5km of the Study Area including:

- 1 record of one vascular flora;
- 2 records of one nonvascular flora;
- 151 records of 37 vertebrates;
- No records of invertebrates; and
- 4 managed areas in the vicinity.

Of these identified records, six SAR were identified within 5km of Study Area. Habitat suitability within the study Area is also provided:

- Boreal Felt Lichen (*Erioderma pedicellatum*) (SARA Endangered, NSESA Endangered)
 - Habitat: Undisturbed Mature Balsam Fir/sphagnum dominant wetlands and lake edges. Areas of suitable habitat present however, surrounding areas were highly disturbed and lacking key indicator species (*Coccolarpia*). *Habitat not present within the Study Area.*
- Piping Plover (*Charadrius melodus melodus*) (SARA & NSESA Endangered)
 - Habitat: breeds in open or sparsely vegetated areas on coastal beaches, especially wide, dune-backed beaches. *Habitat not present within the Study Area.*
- Olive-sided Flycatcher (*Contopus cooperi*) (SARA Threatened & NSESA Threatened)

- Habitat: Coniferous forest edges and openings such as meadows, rivers, bogs, swamps and ponds. It can also be found in disturbed areas like post-fire landscapes. *Habitat is present within the Study Area.*
- Barn Swallow (*Hirundo rustica*) (SARA Threatened & NSESA Endangered)
 - Habitat: nests in deciduous and mixed forests that have little understorey and have nearby open areas for foraging. *Habitat is not present within the Study Area.*
- Canada Warbler (SARA Threatened & NSESA Endangered)
 - 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 (SARA Special Concern & NSESA Vulnerable)
 - 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.*

The managed areas that were identified by ACCDC within 5km of the Study Area include the Taylor Head Provincial Park and Eastern Shore Islands IBA.

A summary of federally and provincially protected species identified within 20km of the Study Area (i.e. in-text short list) is provided below (Table 18). For avifaunal Priority Species, breeding status as documented in the second atlas survey of the Maritime Breeding Bird Atlas (square 20NQ36) is also included. If the species was observed during atlas surveys, with no breeding evidence noted, this is indicated below as well.

Table 18. Summary of ACCDC observations of federally and provincially protected species within 20km of the Study Area.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	S Rank	Distance (km)	MBBA
<i>Riparia riparia</i>	Bank Swallow	Threatened			S2S3B	12.4 ± 7.0	Not Obs.
<i>Hirundo rustica</i>	Barn Swallow	Threatened		Endangered	S2S3B	1.5 ± 0.0	Confirmed
<i>Degelia plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	9.7 ± 0.0	NA
<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	4.4 ± 0.0	NA
<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	S3B	3.7 ± 7.0	Probable
<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	12.4 ± 7.0	Not Obs.
<i>Chordeiles minor</i>	Common Nighthawk	Threatened	Threatened	Threatened	S2B	7.2 ± 7.0	Not Obs.
<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern		Vulnerable	S3S4B	3.7 ± 7.0	Possible
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern			S3S4B,S3N	3.7 ± 7.0	Not Obs.
<i>Sclerophora peronella</i> (Nova Scotia pop.)	Frosted Glass-whiskers Lichen - Nova Scotia pop.	Special Concern	Special Concern		S1?	18.4 ± 0.0	NA
<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered		Endangered	S1S2	20.0 ± 0.0	NA
<i>Histrionicus histrionicus</i> pop. 1	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	9.4 ± 0.0	Not Obs.
<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern		S2B	17.6 ± 0.0	NA
<i>Accipiter gentilis</i>	Northern Goshawk	Not At Risk			S3S4	12.4 ± 7.0	Not Obs.
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S2B	3.1 ± 0.0	Probable
<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	3.7 ± 7.0	Possible
<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1B	8.1 ± 0.0	Not Obs.
<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	8.2 ± 0.0	Not Obs.
<i>Passerculus sandwichensis princeps</i>	Savannah Sparrow princeps ssp	Special Concern	Special Concern		S1B	7.6 ± 0.0	Confirmed

8.2.2 Field Results

8.2.2.1 Flora

The Study Area was assessed for rare, sensitive and at-risk vegetation during the field surveys in summer 2017 and spring 2018. Early spring 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 SAR or SOCI flora species were identified.

8.2.2.2 Mammals

Table 19 provides a summary of mammalian SOCI and SAR with potential to be found within the Study Area, based on habitat preference.

Table 19. Potential Mammalian Priority Species within Study Area

Scientific Name	Common Name	COSEWIC	SARA	NSESA	ACCDC Provincial Rank
<i>Alces americanus</i>	Mainland Moose			Endangered	S1
<i>Perimyotis subflavus</i>	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1
<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1
<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1

Mainland Moose

According to the ACCDC report, Mainland Moose (*Alces americanus*) have been recorded within a 22.5km radius from the Study Area. The habitat requirements for Mainland Moose are mixed wood habitats, where its food source, twigs, stems and foliage of young deciduous trees and shrubs are abundant. In mainland Nova Scotia, it is estimated less than 1,000 Mainland Moose individuals are present (Department of Lands and Forestry, 2018).

No observations of Mainland Moose were recorded during dedicated surveys or incidentally during field assessments. See Section 5.2 for a detailed account of Moose survey observations.

Bats

According to the ACCDC report, Eastern Pipistrelle (*Perimyotis subflavus*) has been recorded within a 73.4km radius from the Study Area, Little Brown Myotis (*Myotis lucifugus*) was recorded within 36.5km, and Northern Long-eared Myotis (*Myotis septentrionalis*) was recorded within 36.8km. The ACCDC report states there are known bat hibernaculum present within 5km of the Study Area.

The NSDNR records of abandoned mine openings (AMOs) were reviewed for the Study Area and was determined to identify ten abandoned mine openings between 2.5 and 9km away from the Study Area. The two closest openings are located 2.5km west and are identified as a pit and shaft opening types. The

other eight abandoned mine openings are to the north of the Study Area, their opening types are shaft (n=6), adit (n=1), and pit (n=1).

The Species at Risk Act Recovery Strategy Serious states the closest critical habitat for the Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Nova Scotia is approximately 50km southwest of the Study Area, near the community of Ship Harbour, NS (Environment Canada, 2015). Critical habitat as defined by Environment Canada (2015) is the habitat necessary for the survival or recovery of the species.

No observations of bats or of potential bat hibernacula (caves, abandoned mines or wells) were identified in the Study Area during field evaluations and surveys.

8.2.2.3 Avifauna

Fifteen (15) avian Priority Species (all SOCI) were documented within the vicinity of the Study Area during field surveys, as outlined in Table 20 below. 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 Priority Species. This included focused surveys for shorebirds and waterfowl surveys, in addition to point count (PC) surveys (Spring, Breeding and Fall). Additionally, Boreal Chickadee and Black-backed Woodpecker were observed incidentally during moose surveys.

Table 20: SAR and SOCI observed during dedicated survey periods

Scientific Name	Common Name	COSEWIC	SARA	NSESA	S Rank
<i>Dendroica castanea</i>	Bay-breasted Warbler	-	-	-	S3S4B
<i>Picoides arcticus</i>	Black-backed Woodpecker	-	-	-	S3S4
<i>Poecile hudsonica</i>	Boreal Chickadee	-	-	-	S3
<i>Sterna hirundo</i>	Common Tern	-	-	-	S3B
<i>Sialia sialis</i>	Eastern Bluebird	-	-	-	S3B
<i>Perisoreus canadensis</i>	Gray Jay	-	-	-	S3
<i>Tringa melanoleuca</i>	Greater Yellowlegs	-	-	-	S3B, S3S4M
<i>Accipiter gentilis</i>	Northern Goshawk	-	-	-	S3S4
<i>Carduelis pinus</i>	Pine Siskin	-	-	-	S2S3
<i>Loxia curvirostra</i>	Red Crossbill	-	-	-	S3S4
<i>Sitta canadensis</i>	Red-breasted Nuthatch	-	-	-	S3
<i>Regulus calendula</i>	Ruby Crowned Kinglet	-	-	-	S3S4B
<i>Tringa solitaria</i>	Solitary Sandpiper	-	-	-	SUB, S3S4M
<i>Catharus ustulatus</i>	Swainson's Thrush	-	-	-	S3S4B
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	-	-	-	S3S4B

A description of the species and their preferred habitat is evaluated below.

Bay-breasted Warbler

One Bay-breasted Warbler was observed at PC22 during the Breeding Bird survey. This species breeds in boreal forest dominated by spruce and fir species as well as regenerating areas, and nest in dense spruce trees (Cornell University, 2015). Potential breeding habitat is present throughout the Study Area.

Black-backed Woodpecker

Black-backed Woodpeckers were observed during all avian survey periods. Four were observed during Spring Migration surveys: three at PC19 and one at PC2. During Breeding Bird surveys, one was observed at PC19. During Fall Migration surveys one was observed at PC22 and one at PC2. This species preferred habitat includes coniferous forests, especially in swampy areas (iBird, 2017); habitat which present throughout the Study Area

Boreal Chickadee

Boreal Chickadees were observed during breeding bird, spring, and fall migration surveys. During Spring they were observed at the following point count locations: PC1 (n=1), PC5 (n=2), PC 10 (n=1), and PC18 (n=1). During Breed Bird surveys they were observed at: PC4 (n=1), PC9 (n=1), PC11 (n=1), PC19 (n=1), and PC 22 (n=1). During Fall Migration surveys they were observed at: PC1 (n=2), PC3 (n=2), PC4 (n=2), PC7 (n=2), PC9 (n=3), PC10 (n=4), PC13 (n=1), PC17 (n=3), and PC21 (n=2). The Boreal Chickadee nests in tree cavities within conifer dominated forests and in mixed forest (Audubon, 2017). Potential breeding habitat is scattered throughout the Study Area.

Common Tern

Three Common Terns were observed at shorebird PC3: two were seen during Fall Migration and one during Spring Migration survey. This species' preferred habitat includes sand and shell beaches, and other coastal areas, which the Study Area does not contain.

Eastern Bluebird

Two Eastern Bluebirds were observed during the waterfowl survey at PC Ik2 (Figure 5, Appendix A). This species inhabits open woodland, clearings, and farmland therefore its preferred habitat is not within the Study Area.

Gray Jay

Seven Gray Jays were observed during the Spring Migration survey. They were observed at PCs 5, 8, 13, and 16. Thirteen were observed during Breeding Bird surveys; they were observed at PCs 2, 4, 5, 7, 9, 17 and 19. Gray Jay habitat includes coniferous and deciduous forests, which can be found in the Study Area.

Greater Yellowlegs

Greater Yellowlegs were observed during Spring Migration surveys, one each was seen at PCs 1, 15, and 18. Four individuals were also seen during Fall Waterfowl surveys. This species preferred habitat is mostly in pools, lake-shores and tidal flats. They are not likely to use the Study Area for breeding.

Northern Goshawk

One Northern Goshawk was observed during the Spring Migration survey at PC4. The preferred habitat of this bird species is dense coniferous and deciduous forests, both of which were found in and around the Study Area.

Pine Siskin

Pine Siskins were observed during all three surveys, at PC 13, 21, and 22. Preferred habitat for the Pine Siskin consists of coniferous or mixed wood forest with open canopies. They nest within conifer trees (Cornell University, 2015). Potential breeding habitat is scattered throughout the Study Area.

Red Crossbill

Red Crossbills were observed during Breeding Bird surveys at PC 1, 2, 8, 12, 14, 22 and shorebird PC 1. This passerine species prefers coniferous forests where it builds nests near the end of conifer branches (iBird, 2017). This habitat is present throughout the Study Area.

Red-breasted Nuthatch

Nineteen Red-breasted Nuthatches were observed during Spring (PC11) and Fall Migration (PC9, PC11, PC17, PC20, and PC21) Breeding Bird surveys (PC1, PC2, PC3, PC6, PC9, PC11, PC16, PC17, PC20, PC21, PC22, and shorebird PC1). Possible breeding evidence was observed during the Breeding Bird survey. Red-breasted Nuthatches preferred habitat is mainly in coniferous forests of spruce, fir, pine, hemlock, and larch (Cornell University, 2015). Potential breeding habitat is scattered throughout the Study Area.

Ruby-crowned Kinglet

Fourteen Ruby-crowned Kinglets were observed during Spring (PC8, PC19-22, shorebird PC 1, and waterfowl PC1) and Breeding Bird surveys (PC3, PC16-22, waterfowl PC1). Possible breeding evidence was observed during the Breeding Bird survey. Ruby-crowned Kinglets build their nests high on a conifer tree within conifer dominant or mixed wood forests. They also use isolated trees in meadows and floodplain forests (Cornell University, 2015). Potential breeding habitat is scattered throughout the Study Area.

Solitary Sandpiper

One Solitary Sandpiper was observed during the Fall Migration survey. Although this bird was heard at PC16, it was estimated to be approximately 100m northeast of that location, putting it near the lake north of the Study Area. This species prefers brackish pools or freshwater ponds, which lie adjacent (northwest) the Study Area.

Swainson's Thrush

Ten Swainson's Thrush were observed during spring (PC3) and breeding bird surveys (PC14, PC18-20, and PC22). Possible breeding evidence was observed during the Breeding Bird survey. Swainson's Thrush nest within the understory of conifer-dominated forests, commonly in thickets of deciduous shrubs or conifer saplings (Cornell University, 2015). Potential breeding habitat for this species is provided in re-generating cut blocks within the Study Area.

Yellow-bellied Flycatcher

Forty-seven Yellow-bellied Flycatchers were observed during Breeding Bird surveys (PC1-12, PC14-20, PC22, waterfowl PC1 and PC2, shorebird PC1 and PC3). Yellow-bellied Flycatchers build their nest on or near the ground in moist coniferous forests, bogs, swamps, and peatlands (Cornell University, 2015). Breeding habitat is located throughout this Study Area.

8.2.2.4 Lichens

As discussed in Section 4.0, four Priority Species (SAR and/or SOCI) lichens including: Blue Felt Lichen (*Degelia plumbea*), *Fuscopannaria soreliata*, Fringe Lichen (*Heterodermia neglecta*) and Slender Monk's Hood Lichen (*Hypogymnia vittata*) were identified across the Study Area. No Boreal Felt Lichen (*Erioderma pedicellatum*) were observed during the time of the survey. All species exist as SOCI, apart from the Blue Felt Lichen which is federally listed as Special Concern under SARA and vulnerable under NSESA and is as such, considered a SAR.

Blue Felt Lichen is usually found on the trunks of old broad-leaved trees growing in moist habitats or close to stream and lake margins and seems to prefer mature deciduous trees, particularly maple, ash and yellow birch (COSEWIC 2018). The Blue Felt Lichen was identified at four locations across the Study Area all upon Red Maple trees, two of which were located at the edge of wetlands.

9.0 SUMMARY

This biophysical study was completed in support of registering a provincial Environmental Assessment (EA) with Nova Scotia Department of Environment (NSE) for a quarry project in Sheet Harbour, NS. 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.

The following summary of results is provided:

Habitat (soft-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. No unique habitats required to support species life cycle were identified during the Study. As such, the proposed project infrastructure is expected to impact localized habitat, but an insignificant impact in the regional context is expected.

Species at risk surveys completed within the Study Area revealed no priority flora or fauna species. During other field programs, however, such species were identified. Lichen field surveys revealed the presence of four lichens of conservation concern including *Degelia plumbea* (SAR Special Concern, NSESA Vulnerable, S3), *Fuscopannaria soreliata* (S3), *Heterodermia neglecta* (S3S4) and *Hypogymnia vittata* (S3S4). Avian field surveys revealed the following Priority bird species: Bay-breasted Warbler (S3S4B), Black-backed Woodpecker (S3S34), Boreal Chickadee (S3), Eastern Bluebird (S3B), Gray Jay (S3), Greater Yellowlegs (S3B, S3S4M), Northern Goshawk (S3S4), Pine Siskin (S2S3), Red-breasted Nuthatch (S3), Red Crossbill (S3S4), Ruby-crowned Kinglet (S3S4B), Swainson's Thrush (S3S4B), and Yellow Bellied Flycatcher (S3S4B).

Bird usage within the Study Area was determined to be low, exhibiting generally consistent bird activity throughout all seasons. The Breeding bird season was the most active (n=601), followed by Fall (n=516) and then Spring (n=358); low bird activity was recorded during focussed waterfowl and shorebird watch counts completed adjacent to the Study Area alongside areas of open water and/or coastal shoreline. Minimal avian fly-overs were observed throughout all seasons including Fall watch counts. Therefore, passage migration and diurnal movement of birds in this area is not expected to be impacted by the proposed project. Taylor Head Provincial Park is located approximately 2km west of the Study Area. The Eastern Shore Islands Important Bird Area lies approximately 2km south of the Study Area and supports important coastal island habitat for a variety of nesting shorebirds, such as Common Eiders. Field surveys revealed that suitable habitat for these species is not present within the Study Area, nor were these species identified in large quantities during field surveys. Suitable habitat for many birds is present throughout the Study Area, and any bird habitat directly within the footprint of the proposed access road and quarry infrastructure will be removed. However, construction of the access road and 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.

Twenty-seven wetlands and three watercourses were observed within the Study Area. None of the wetlands were accessible by fish. The wetlands were characterized as follows: swamp (n=22), fen (n=1), swamp-fen complex (n=1), and bog (n=2). Two of the watercourses were ephemeral streams, that lacked potential fish access, and the third, (if contiguous with upstream and downstream watercourses) was deemed to be very poor fish habitat.

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

Project Location

Proposed Quarry,
PID 40832503
Sheet Harbour, NS

-  Study Area
-  Mapped Watercourse
-  Mapped Wetland of Special Significance
-  Mapped Wetland
-  Secondary Watershed Boundaries
-  Road



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



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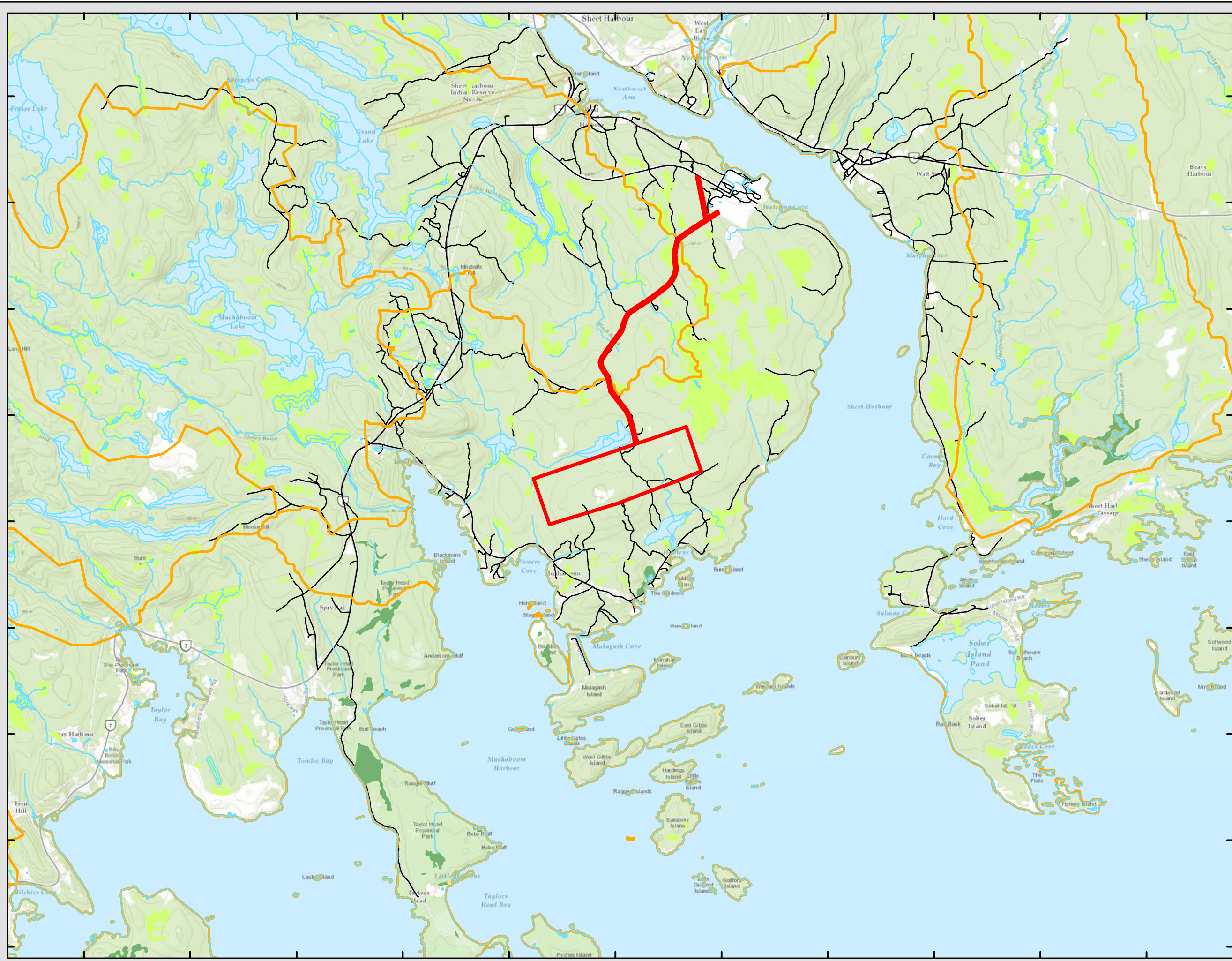
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Drawn By: EP

Date: 2018-09-19



McCallum Environmental Ltd.



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Prepared For:



FIGURE 2

Forest Cover Sheet Harbour, NS

Forestry/Non-forestry Group	
	Natural Stand
	Christmas Trees
	Old Field
	Dead
	Treated Stand
	Brush
	Alders
	Clear Cut
	Wetlands General
	Open Bogs
	Treed Bogs
	Coastal Habitat Areas
	Lake Wetland
	Cliffs, Dunes, Coastal Rocks
	Inland Water
	Rock Barren
	Barren
	Urban
	Miscellaneous
	Gravel Pit
	Powerline Corridor
	Road Corridor

Forest Cover Type	
	Softwood >75%
	Mixed Forest 25-75%
	Hardwood >75%
	Study Area



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

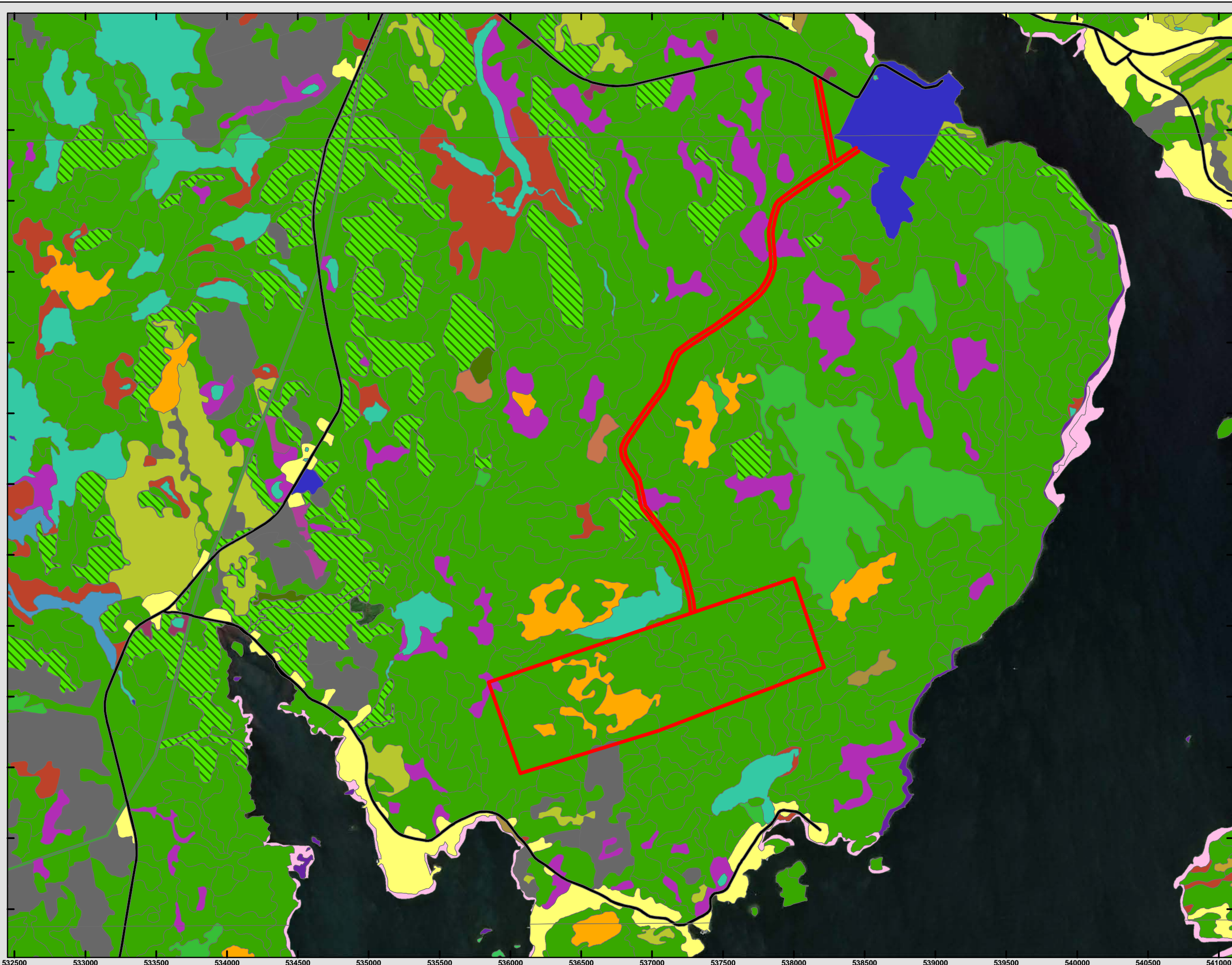


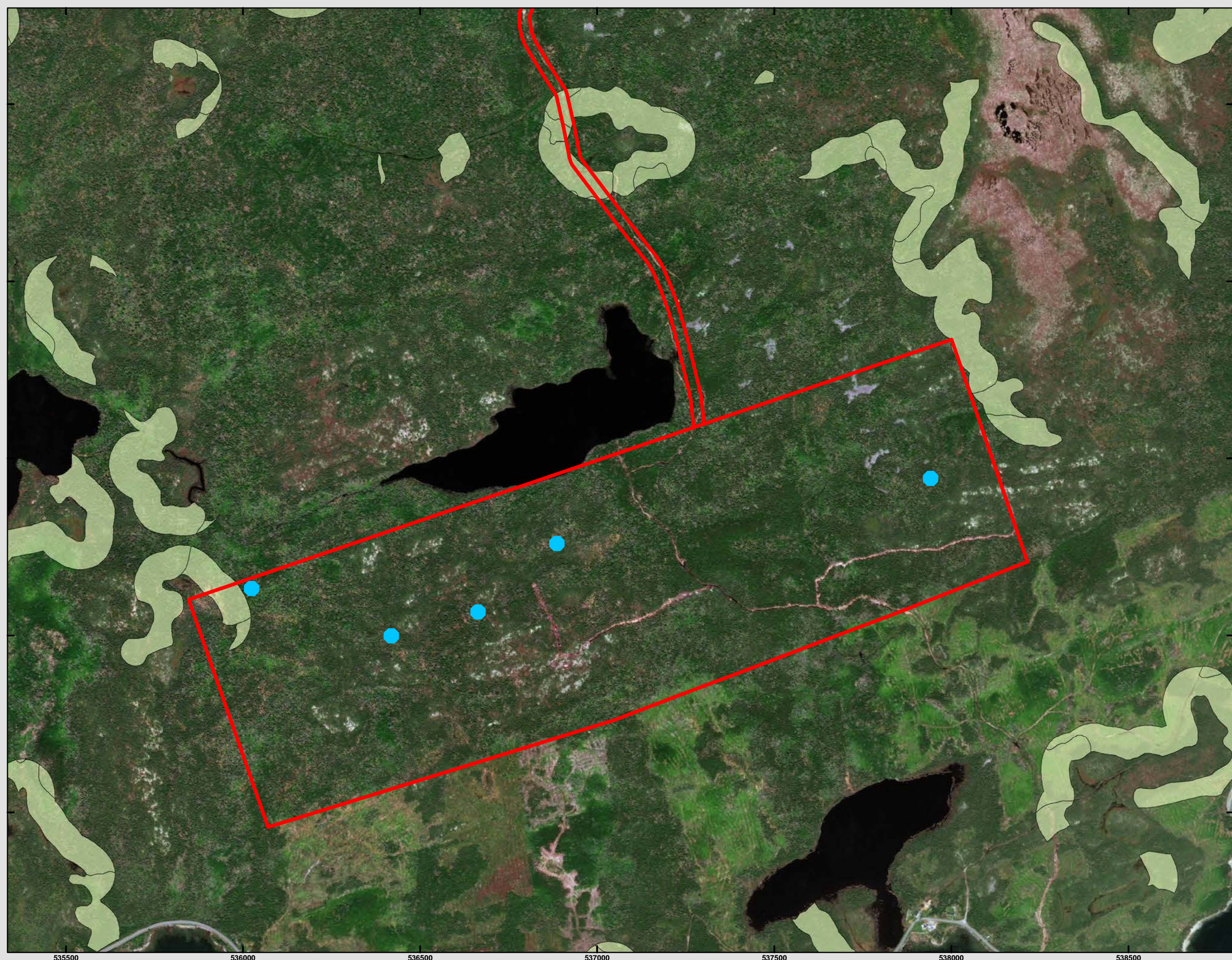
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FIGURE 3

**Lichen Survey Results
Sheet Harbour, NS**

- Study Area
- Degelia plumbea
- Predictive Boreal Felt Lichen Habitat



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



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Drawn By: John R. Gallop Date: 2018-09-17





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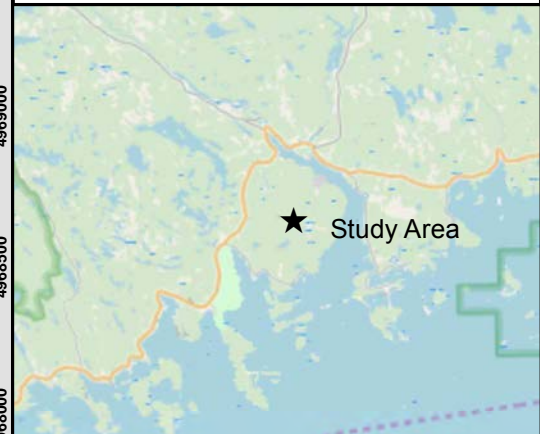
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FIGURE 4

**Moose Survey Transects,
Sheet Harbour, NS**

-  Moose Survey Transects
-  Study Area



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



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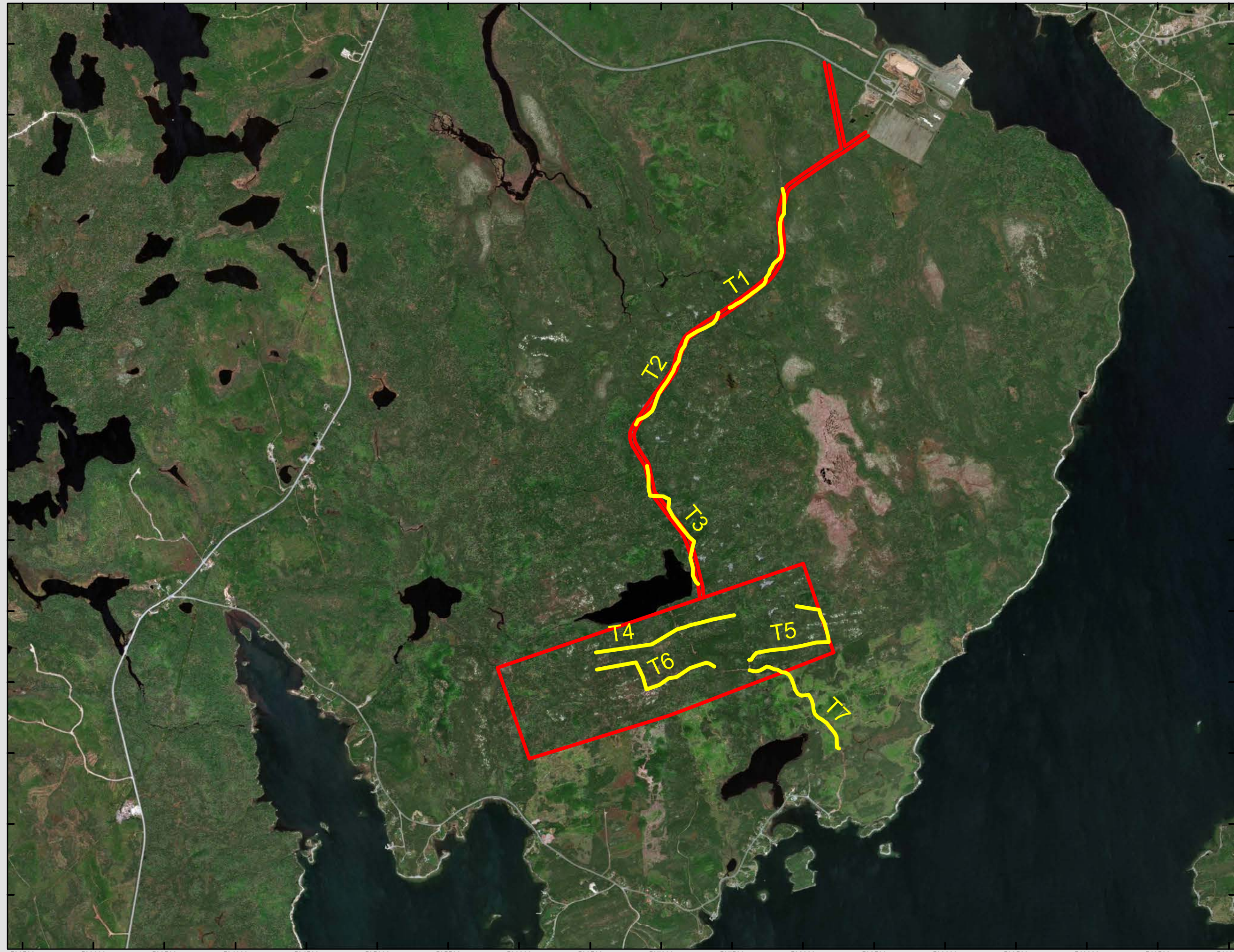
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Date: 2018-09-17



McCallum Environmental Ltd.








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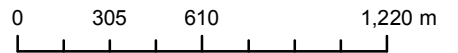
FIGURE 5

Avian Survey Locations,
Sheet Harbour, NS

-  Study Area
-  Point Count Survey
-  Shorebird Survey
-  Waterfowl Survey
-  Eastern Shore Island Important Bird Area



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

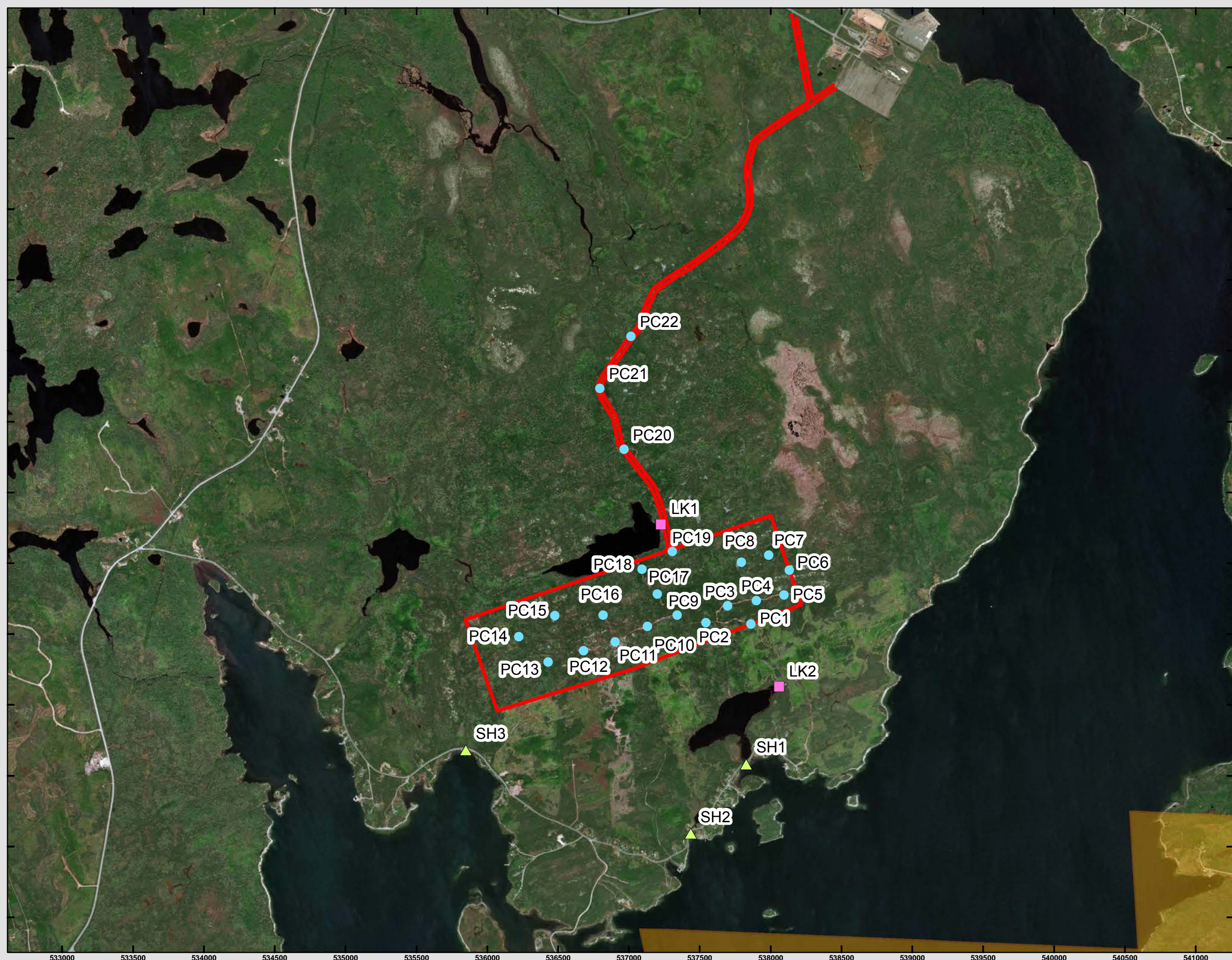



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Drawn By: J Bonazza Date: 2018-09-19



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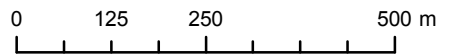
FIGURE 6

**Desktop Review Results
and Field Delineated
Wetlands & Watercourses,
Sheet Harbour, NS**

-  Study Area
-  Field Delineated Watercourse
-  Mapped Watercourses (NSHN)
-  Field Delineated Wetland
-  Mapped Wetlands (NSE)
-  Drainage



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

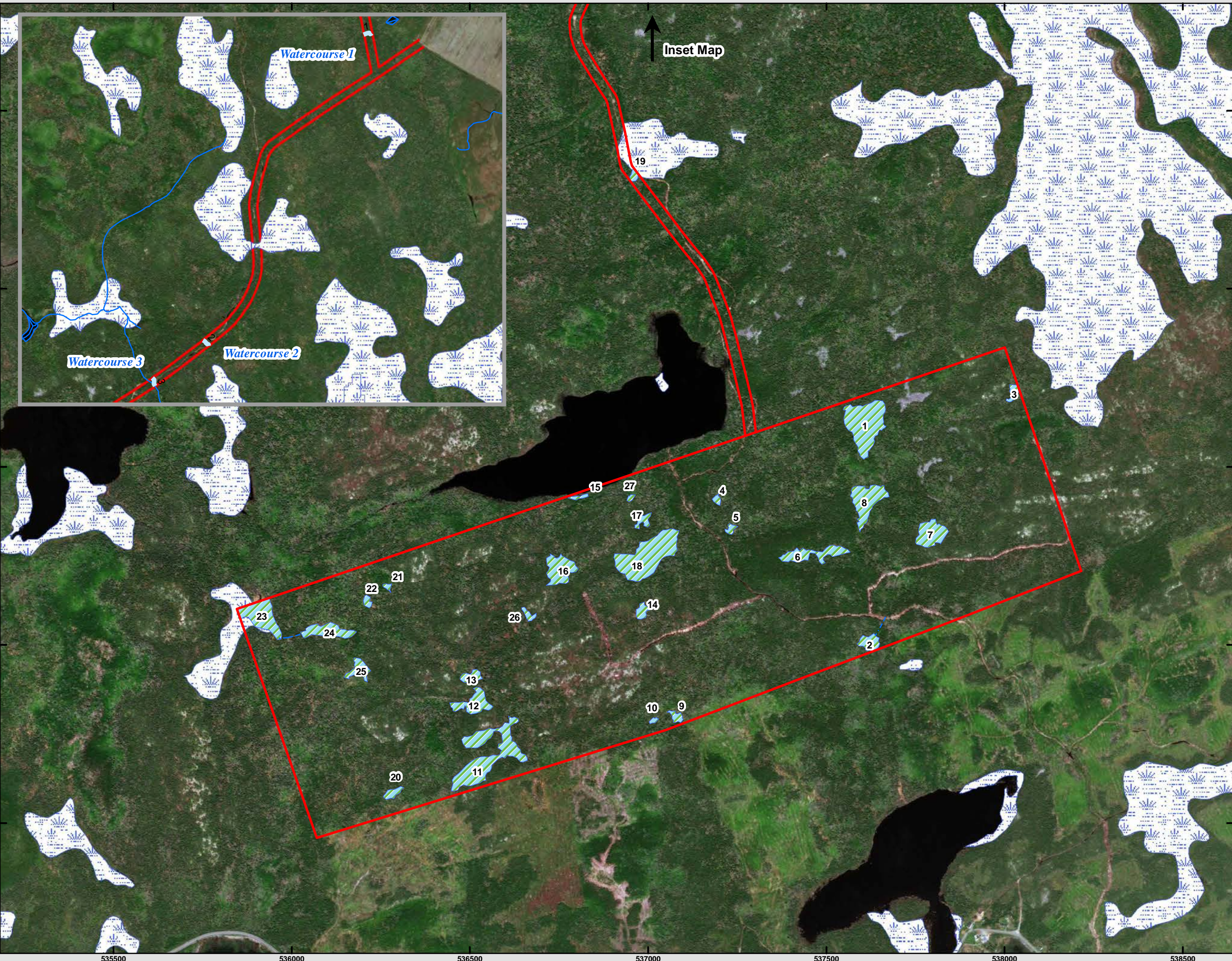



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Inset Map

Watercourse 1

Watercourse 2

Watercourse 3

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4967500

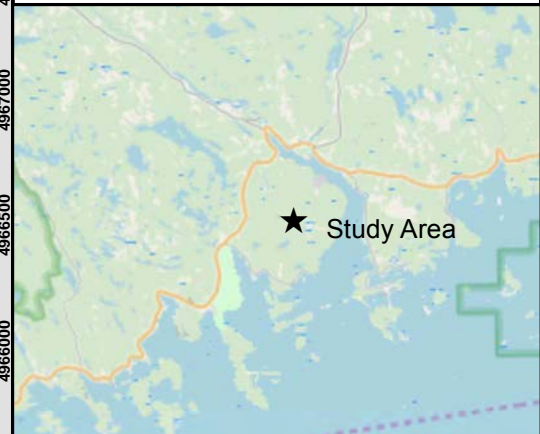
Prepared For:



FIGURE 7

ACCDC Priority Species Observations, Sheet Harbour, NS

- ACCDC Observations
- Study Area
- Eastern Shore Islands IBA



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



0 370 740 1,480 m

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Date: 2018-09-17



McCallum Environmental Ltd.

Appendix B. PROJECT TEAM MEMBERS' CVs

Years in Practice

10

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 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 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, as well as acquiring pertinent environmental information required for regulatory permitting.

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, Mr. Walter assists in the identification of potential wetland restoration and creation 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. 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

- Managing, and currently in the process of implementing a new wetland functional assessment tool for use in Nova Scotia. This Project included the collection of baseline wetland information across Nova Scotia by completing 120 wetland functional assessments using the Wetland Ecosystem Services Protocol (WESP). Ongoing collaboration with Nova Scotia Environment to support the rolling out of this method to wetland practitioners.
- Management and implementation of a 18 hectare agricultural wetland restoration project in Middle Stewiacke, NS.
- 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.

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

- Management of a multi-faceted avian study in support of a provincial EA at Aulds Cove, NS.
- Completion of six 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 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

13

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

- ◆ Field Hike Leader Certification, Basic and Winter modules, Outdoor Council of Canada, 2015 & 2018
- ◆ Wetland Ecosystem Services Protocol (WESP-AC) training, 2017
- ◆ WHMIS, 2017
- ◆ Saint John Ambulance Standard First Aid, AED, CPR(C), 2016
- ◆ Electrofishing Crew Leader, 2015
- ◆ Wetland Delineation Certification, 2013
- ◆ Health Safety and Environmental Leadership training and Advanced Safety Audit training, 2009
- ◆ Small Vessel Operator Proficiency & Marine Emergency Duties A3 certified, 2006
- ◆ Emergency Operations Centre crisis management training, 2006-2008
- ◆ Bear Awareness & ATV training – Alberta Safety Council, 2006

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.

In her academic career, Ms. MacDonald studied environmental ecology of aquaculture, oceanography, marine biology and recent case studies of Salmon aquaculture environmental assessments in Nova Scotia. She completed research on the Blue Mussel aquaculture industry in Nova Scotia and participated in a two-week ground fish survey in the Southern Gulf of St. Lawrence with the Department of Fisheries and Oceans.

Ms. MacDonald is responsible for completing biophysical assessments and ecological inventories, 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 is an ecologist, and is highly skilled at completing ecological habitat assessments via geo-spatial desktop review (GIS), and implementation of field studies. During the past six years of her career, Ms. MacDonald has gained extensive experience completing habitat and ecological integrity studies across the Nova Scotia landscape. Her in-depth knowledge of Nova Scotia flora and fauna has provided her with the tools to effectively determine habitat uniqueness, and ecological sensitivity.

Ms. MacDonald coordinates all field biologists required to complete all environmental baseline and ecological inventory programs for Provincial and Federal Environmental Assessment registration. Ms. MacDonald has been responsible for the implementation of more than ten environmental baseline programs for mining, quarry development and energy sector development projects in Nova Scotia in advance of environmental assessment registration. In addition, Ms. MacDonald has been largely responsible for communicating the results of baseline environmental conditions to industry and project related stakeholders. Her effective communication skills, and personable demeanor has furthered her involvement in multiple community liaison committees, and other community organizations.

Selected Project Experience

- Completion of environmental baseline surveys for the federal environmental assessment process for proposed development of three separate gold mines in eastern Nova Scotia from 2015-2018
- Completed baseline studies on 125 wetlands across the province to implement a new wetland functional assessment technique (WESP-AC) to the Nova Scotian regulatory landscape.
- Completed watershed planning for the Sackville River Secondary watershed and Musquodoboit River Secondary Watershed to

Melanie MacDonald, BSc. (ISAR & Bio), MREM
melanie@mccallumenvironmental.com

evaluation wetland restoration potential and to aid in better land use planning, source water protection and water resource management.

- Completion of surveys associated with wetland alteration applications and associated compensation for multiple wetlands associated with residential, commercial and industrial development in Nova Scotia.

Experience

McCallum Environmental Ltd., Halifax, Nova Scotia

Senior Environmental Specialist & Field 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 2016-2017.

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 training programs 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. Chaired the regional 'Oil Sands Bird and Wildlife Protection Committee.
- 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 the CAPP Steward of Excellence Award for Environmental Performance (2009).



McCallum Environmental Ltd.

Years in Practice

4

Education

Bachelor Environmental Science 2011, Dalhousie University

Training

- Saint John Ambulance Emergency First Aid, AED, CPR(A), 2017
- Wetland Delineator's Course – Nova Scotia/New Brunswick, 2014
- Wetland Ecosystem Services Protocols (Freshwater, Tidal) – Nova Scotia / New Brunswick, 2016
- Watercourse Alteration | Certification for Sizers - Nova Scotia, 2016
- Watercourse Alteration Certification for Installers - Nova Scotia, 2016
- Bat Acoustics Training (Techniques and Analysis) – Ontario, 2017

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, Newfoundland 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

Ryan Gardiner BSc.

Years in Practice

5

Education

B.Sc. (Honours, Biology),
Waterloo University,
2009-2011.

Training

- ◆ Saint John Ambulance
Standard First Aid,
AED, CPR(C), 2015
- ◆ Wildlife Awareness
training and ATV
training – 2015
- ◆ W.H.M.I.S – 2015
- ◆ H2S Alive - 2015

Summary

Mr. Gallop has been in the environmental consulting profession since 2011. He has worked on both project related and research related field assessments in Nova Scotia, Alberta and Saskatchewan.

Mr. Gallop is responsible for completing biophysical assessments, including flora and fauna surveys, aquatic surveys (wetlands, watercourses and fish surveys), avian surveys, and species at risk evaluations, primarily for clients in the energy sector, mining sector, and commercial development sector. Mr. Gallop has been responsible for the implementation of 5 environmental baseline programs for mining, quarry development and energy sector development projects in Nova Scotia and Saskatchewan in advance of environmental assessment registration.

Selected Project Experience

- Completion of migratory bird surveys for a large scale renewable energy project.
- Completion of ungulate and other wildlife surveys for a variety of Natural Resource projects.
- Completion of environmental baseline surveys for the federal environmental assessment process for proposed development of two gold mines in eastern Nova Scotia in 2016-2018 across 2500 hectares of landscape in Nova Scotia
 - Wetland delineation and functional assessment
 - Fish habitat surveys and electrofishing
 - Rare plant surveys
 - Wildlife surveys
 - Avian surveys
 - Lichen surveys
- Completion of wetland delineation, watercourse identification and vegetation assessments of two large scale developments in Saskatchewan and Nova Scotia in 2015 and 2016.
- Responsible for collecting baseline data for the calibration of the Wetland Ecosystems Services Protocol (WESP) for the Province of Nova Scotia.

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 monitoring. Communicating field survey results and methodologies for Environmental Assessments and other Provincial regulatory applications.

Basin Environmental LTD., - Edmonton, Alberta.

Environmental Technologist

September 2014 – February 2016..

- Utilized the Alberta Wetland Classification system to assess wetlands and the Wetland Rapid Evaluation Tool to determine compensation required for impacts to classified wetlands.
- Aerially interpreted and delineated wetlands.
- Conducted species at risk background searches and field visits.
- Conducted pre-disturbance assessments for oil and gas activities, road improvements and residential developments, including: watercourses/waterbodies, soil profiling, vegetation, wildlife, eco-sites and timber volumes.
- Prepared reports for a variety of assessments, including: wetlands, pre-disturbance, bio-physicals, fish habitats for access road watercourse crossings, EAP/EFR supplements and applications.
- Monitored the water quality of horizontal directional drilling on fish bearing permanent watercourses.
- Assisted surveyors and construction engineers on-site in the design of oil and gas well leases and facilities, pipelines and access roads to ensure compliance with EAP Standards and Guidelines.

Years in Practice

4

Education

Master of
Environmental Science,
Memorial University of
Newfoundland 2015

B.Sc. Major in Biology,
St. Francis Xavier
University 2010

Certifications

- ◆ Certified Environmental Professional in Training, ECO Canada
- ◆ Wetland Plants and Delineation, Fern Hill Institute

Training

- ◆ Landbird Species at Risk in Forested Wetlands Workshop, Jan. 2018
- ◆ Standard First Aid AED CPR "A", St. John Ambulance, Sept. 2015
- ◆ Construction Safety Training System, Sept. 2015
- ◆ Geographic Information System (GIS) Training, ESRI, Feb. 2015
- ◆ WHMIS, AIX Safety, Mar. 2013
- ◆ Green Defensive Driving, Canada Safety Council, July 2012

Experience

McCallum Environmental Ltd., Halifax, NS

Biologist and Intermediate Environmental Scientist

Sept 2015 - Present

- Flora and Fauna field surveys
- Biophysical assessments including species at risk assessments
 - Winter wildlife and birds
- Bird surveys for multiple wind projects – Alberta
 - Spring migratory bird surveys
 - Sharp-tailed Grouse Lek surveys
 - Raptor nest searches
- Watercourse and Wetland identification and assessment
- Wetland Delineation, functions assessments and alteration applications
- Construction Monitoring
 - Avifauna nest searches and buffering for transmission line construction
- Reporting of methodology and results
- Provincial regulatory applications
- GIS

Agriculture and Agri-Food Canada, NL and NS

Research Technician

2011- 2015.

- Led the collection of data in Newfoundland for a national research project
- Surveyed and staked research plots
- Entered and analyzed scientific data
- Conducted quadrat sampling and botanical separation
- Prepared samples for analysis
- Operated specialized laboratory instruments
- Entered and analyzed scientific data
- Supervised and trained laboratory visitors and volunteers
- Assisted research scientists and graduate students in their research
- Applied specialized laboratory procedures and techniques

Atlantic Developments Inc. - Halifax, NS

Office Manager & Assistant to Project Manager

Sept – Dec 2010

- Worked on site during the construction of a condominium complex
- Monitored construction progress
- Gave site tours to contractors and potential unit purchasers
- Assisted the project manager
- Organized and coordinated office operations and procedures



Jeff Bonazza, BSc. MES

Jeffb@mccallumenvironmental.com

- ♦ PADI Open Water certified scuba diver, Nov. 2010
- ♦ MED A1, Canadian Sailing Expeditions Inc. and Transport Canada, May 2008

UNESCO Southwest Nova Biosphere Reserve Association – Middleton, NS

Community Outreach Coordinator

May – Sept. 2010

- Coordinated events and activities
- Developed and delivered educational programs
- Designed website and pamphlets

Years in Practice

3

Education

B.Sc. (Geography),
University of Victoria,
2005-2009.

M.Sc. (Environmental
Science), Memorial
University of
Newfoundland and
Labrador, 2010-2013.

Training

- ◆ Saint John Ambulance
Standard First Aid,
AED, CPR(C), 2017
- ◆ Wildlife Awareness
training – 2015
- ◆ W.H.M.I.S – 2015
- ◆ Geographic Information
System (GIS) Training,
ESRI – 2013
- ◆ Facilitation Skills for
Technical
Professionals,
Dalhousie University –
2017

Summary

Ms. Posluns has been in the environmental consulting profession since 2015. She has worked on both project related and research related field assessments in Nova Scotia.

Ms. Posluns is responsible for completing biophysical assessments, including flora and fauna surveys, avian surveys, aquatic surveys, wetland monitoring and species at risk evaluations, primarily for clients in the energy sector, mining sector, and commercial development sector. Ms. Posluns has been responsible for the management of field data for multiple, large-scale initiatives in Nova Scotia, including a provincial infrastructure project and a mining development.

Selected Project Experience

- Conducted migratory bird surveys for a provincial infrastructure project.
- Completed ungulate and other wildlife surveys for a variety of Natural Resource projects.
- Surveyed environmental baseline data for the federal environmental assessment process for a proposed development of a gold mine in eastern Nova Scotia in 2017.
- Delineated wetlands, completed watercourse identification and vegetation assessments for two large-scale developments in Nova Scotia in 2016 and 2017.
- Collaborated with communities, local resource users, and First Nations to implement solutions.
- Coordinated spatial data organization, performed GIS analysis, and created dynamic maps for a variety of projects.

Experience

McCallum Environmental Ltd., Halifax, Nova Scotia

Environmental Scientist:

June 2017-Present

- Completing biophysical assessments, including flora and fauna surveys, with emphasis on species at risk. Completing wetland and watercourse delineations and assessments and coordinating data management and Geographical Information Systems (GIS). Communicating field survey results and methodologies for Environmental Assessments and other Provincial regulatory applications. Preparing Phase 1 Environmental Site Assessments.

CBCL LTD., Halifax, Nova Scotia

Environmental Scientist

September 2015 – April 2017.

- Created GIS maps for over 20 projects, including six 100-page map books, effectively visualizing contaminated sites, ecologically sensitive habitats, and urban development.
- Aerially interpreted and delineated wetlands.
- Conducted species at risk background searches and field visits.
- Prepared reports for a variety of assessments, including permit applications and Environmental Management Plans.
- Assisted with marine water quality sampling.

OceanCanada Partnership, Halifax, Nova Scotia

Environmental Scientist

September 2015 – April 2017.

- Facilitated community meetings and provided expertise to help a group with local area development planning.
- Conducted interviews and community-wide surveys of a rural fishing village to create a database of local assets.
- Summarized findings of community assets into an accessible written document.
- Lead a marine-monitoring program in an ecologically sensitive bay, coordinating 15 volunteers in fieldwork, identifying and assessing eelgrass health and distribution, sample collection, and data entry.
- Investigated social, ecological, and economic changes within coastal communities to make suggestions on future development.

Saint Mary's University, Halifax, Nova Scotia

Professor of Geography

August 2015 – April 2016.

- Explained technical environmental information clearly and concisely to Canadian and International students, ensuring all students had a supportive learning atmosphere.
- Designed new course material that engaged students and enhanced their learning experience.
- Worked with students one-on-one to solve conflicts.

Regional District of North Okanagan, Vernon, British Columbia

Water Sustainability Coordinator

2013 – 2014.

- Worked under the BC Water Act, and maintained a comprehensive understanding of provincial and local policy, regulations, and bylaws.
- Compiled and analysed large datasets, assessing trends, and informing local policy.
- Determined drought risk using environmental indicators, and communicated with team members to decide on the necessary restriction required for meeting seasonal water level targets.

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

Scientific Name	Common Name	SARA	COSEWIC	NSESA	SRank	Habitat Requirements
<i>Isoetes acadensis</i>	Acadian Quillwort				S3	In water up to depth of 1m, bordering lakes, ponds or along rivers, infrequent but scattered through province.
<i>Vaccinium uliginosum</i>	Alpine Bilberry				S3	Wide tolerance of moisture and fertility, but generally acidic soils in Halifax, Digby & Cape Breton
<i>Elatine americana</i>	American Waterwort				S1	Brackish or salt marshes and flats, lacustrine (in lakes or ponds), riverine (in rivers or streams), shores of rivers or lakes; historical range only.
<i>Polypodium appalachianum</i>	Appalachian Polypody				S3?	Cliffs and rocky slopes, distribution unclear.
<i>Viola sagittata</i>	Arrow-Leaved Violet				S3S4	Sterile woods, clearing and fields, common from Yarmouth to Halifax and Hants Counties.
<i>Viola sagittata var. ovata</i>	Arrow-Leaved Violet				S3S4	Sterile woods, clearing and fields, common from Yarmouth to Halifax and Hants Counties.
<i>Salix serissima</i>	Autumn Willow				S1	Fens (calcium-rich wetlands), meadows and fields, swamps
<i>Fraxinus nigra</i>	Black Ash			Threatened	S1S2	Typical habitat includes poorly drained soils and swampy woods
<i>Polygala sanguinea</i>	Blood Milkwort				S2S3	Prefers acidic or run-out soil as found in fallow fields or brushlands, scattered through central portion of province.
<i>Sanguinaria canadensis</i>	Bloodroot				S3S4	Streamside or on alluvial terraces, in the shade, just above high water. Rare in Kings and Hants counties. Common in Colchester Co.; scattered from Cumberland County to Cape Breton.
<i>Verbena hastata</i>	Blue Vervain				S3	Limited to mucky fertile soils, as along floodplains. Scattered from Queens Co., to Cape Breton. Never common when found, but appears to be secure.
<i>Carex tribuloides</i>	Blunt Broom Sedge				S3?	Found in wet forest soils and swales. Collected from Kings and Queens counties to Cape Breton.
<i>Carex tribuloides var. tribuloides</i>	Blunt Broom Sedge				S3?	Found in wet forest soils and swales.
<i>Galium obtusum ssp. obtusum</i>	Blunt-leaved Bedstraw				S2S3	swamps, swampy grounds, wet areas of prairies, wet woods and thickets, roadside ditches.
<i>Betula pumila var. renifolia</i>	Bog Birch				S1?	Bogs and meadows amongst alders
<i>Betula pumila var. pumila</i>	Bog Birch				S2S3	Bogs and meadows amongst alders
<i>Symphotrichum boreale</i>	Boreal Aster				S2?	Lacustrine gravels, streamsidings and edges of peatlands. Scattered from Yarmouth to Cape Breton and uncommon.
<i>Potentilla canadensis</i>	Canada Cinquefoil				S2S3	Found on dry rock barrens and other open areas in Yarmouth, Halifax, Kings, Shelburne and Hants Co.
<i>Potentilla canadensis var. canadensis</i>	Canada Cinquefoil				S2S3	Found on dry rock barrens and other open areas in Yarmouth, Halifax, Kings, Shelburne and Hants Co.
<i>Lilium canadense</i>	Canada Lily				S2	Meadows, floodplains and streamsidings. Local; from Kings and Cumberland counties eastward to southern Cape Breton.
<i>Lilium canadense ssp. canadense</i>	Canada Lily				S2	Meadows, floodplains and streamsidings.
<i>Piptatherum canadense</i>	Canada Rice Grass				S2	Grows in dry sandy soils. Local and scattered from Shelburne to Halifax and Colchester counties.
<i>Laportea canadensis</i>	Canada Wood Nettle				S3	Limited to fertile loam or alluvium in deciduous forests and within floodplains. Scattered infrequently from Coldbrook, Kings Co. to western Cape Breton. Distinctly northern here.
<i>Polygonum careyi</i>	Carey's Smartweed				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields, shores of rivers or lakes.
<i>Spiranthes casei var. casei</i>	Case's Ladies'-Tresses				S1	Dry to moderately moist sandy soils, deep to shallow, and sand filled crevices of igneous rock, roadsides and pastures.
<i>Spiranthes casei</i>	Case's Ladies'-Tresses				S2	Look for this species in acidic, sandy soils on rock barrens or even roadsides. So far restricted to southwestern counties, Jordan Falls to Pubnico, Belleville and the Annapolis Valley.
<i>Conioselinum chinense</i>	Chinese Hemlock-parsley				S2	Treed swamps, mossy coniferous forest, seepy coastal slopes. Scattered on Digby Neck. Common on Saint Paul Island and infrequent elsewhere.
<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed				S3	Grows in sphagnum peatlands, lacustrine peaty sands and gravels. Frequently seen in Yarmouth and Shelburne counties, becoming scarcer to Cumberland county.
<i>Galium aparine</i>	Common Bedstraw				S2S3	Pastures, fields, ditches and streamsidings. Very common throughout.

<i>Pinguicula vulgaris</i>	Common Butterwort				S1	Grows in moist habitats as on rock ledges and streamsides, especially of basic rocks.
<i>Humulus lupulus var. lupuloides</i>	Common Hop				S1?	Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), forests, shrublands or thickets.
<i>Botrychium lunaria</i>	Common Moonwort				S1	Open slopes. Sand or gravel; shores and meadows. Basic soils. Known from Conrad's Beach, Halifax County and from New Campbellton and Indian Brook in northern Cape Breton.
<i>Equisetum hyemale</i>	Common Scouring-rush				S3S4	Grows in sandy, gravelly soil, on banks or in low areas; often in calcareous regions. Scattered, mostly from Digby County, through the Annapolis Valley, northward to Cape Breton.
<i>Equisetum hyemale var. affine</i>	Common Scouring-rush				S3S4	Grows in sandy, gravelly soil, on banks or in low areas; often in calcareous regions. Scattered, mostly from Digby County, through the Annapolis Valley, northward to Cape Breton.
<i>Carex chordorrhiza</i>	Creeping Sedge				S1	Grows in wetlands: bogs, fens and marshes. It has been recently found in the Amherst area of Cumberland county.
<i>Cardamine pratensis var. angustifolia</i>	Cuckoo Flower				S1	Moist soil as in meadows, damp fields and other low ground. Scattered in the province, frequent along the Annapolis River and even spreading into roadsides ditches, north to Cape Breton.
<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1S2	Anthropogenic (man-made or disturbed habitats), fresh tidal marshes or flats, marshes, swamps.
<i>Ranunculus sceleratus var. sceleratus</i>	Cursed Buttercup				S1S2	Anthropogenic (man-made or disturbed habitats), fresh tidal marshes or flats, marshes, swamps.
<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower				S1S2	Floodplain (river or stream floodplains), forests, shores of rivers or lakes, swamps, wetland margins (edges of wetlands).
<i>Rudbeckia laciniata var. gaspereaui</i>	Cut-Leaved Coneflower				S1S2	Floodplain (river or stream floodplains), forests, shores of rivers or lakes, swamps, wetland margins (edges of wetlands).
<i>Botrychium dissectum</i>	Cut-leaved Moonwort				S3	Generally in sandy, gravelly, grassy or open soils. Frequent in the southwestern counties, scattered eastward to Cape Breton
<i>Dichanthelium clandestinum</i>	Deer-tongue Panic Grass				S3	Open areas of alluvial soil; Occasional from Yarmouth to Guysborough Co.
<i>Hypericum dissimulatum</i>	Disguised St John's-wort				S2S3	Wet mucky soils in lacustrine habitats; Historically collected from Digby to Halifax Co. with a single specimen from each of Pictou and Guysborough counties.
<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S2	Forms large colonies in woodlands and thickets; Only recently discovered in Nova Scotia (1963) and so far known from Queens, Kings, Annapolis, Hants and Halifax counties.
<i>Epilobium strictum</i>	Downy Willowherb				S3	Bogs and other peatlands; Scattered throughout Cape Breton, infrequent elsewhere.
<i>Arabis drummondii</i>	Drummond's Rockcress				S2	Cliff or talus slope.
<i>Juncus dudleyi</i>	Dudley's Rush				S3	A habitat generalist; known from Annapolis, Hants and Lunenburg counties.
<i>Vaccinium caespitosum</i>	Dwarf Bilberry				S3	Cliff or talus slope, disturbed sites, field meadow.
<i>Vaccinium caespitosum var. caespitosum</i>	Dwarf Bilberry				S3	Cliff or talus slope, disturbed sites, field meadow.
<i>Pilea pumila</i>	Dwarf Clearweed				S1	Unusually grows in cool shady habitats as found on forested slopes of maple-beech, in the centre of the Province. So far, only known from West Branch, Pictou Co.; Little River, near Brookfield, Halifax Co.; and along the Herbert River, Hants Co. at Woodville.
<i>Pilea pumila var. pumila</i>	Dwarf Clearweed				S1	Unusually grows in cool shady habitats as found on forested slopes of maple-beech, in the centre of the Province. So far, only known from West Branch, Pictou Co.; Little River, near Brookfield, Halifax Co.; and along the Herbert River, Hants Co. at Woodville.
<i>Equisetum scirpoides</i>	Dwarf Scouring-Rush				S3S4	Wooded banks and mossy slopes. Typical of alkaline habitats and often overlooked. Not often seen in the Atlantic counties. Annapolis county to Cumberland County and northern Cape Breton.
<i>Baccharis halimifolia</i>	Eastern Baccharis		T	Threatened	S1	Anthropogenic (man-made or disturbed habitats), brackish or salt marshes and flats, coastal beaches (sea beaches), marshes.
<i>Sisyrinchium atlanticum</i>	Eastern Blue-Eyed-Grass				S3S4	Found in damp peat, sandy soils that are poorly drained. Common from Yarmouth and Shelburne counties east to Lunenburg Co. Scattered elsewhere.
<i>Geum peckii</i>	Eastern Mountain Avens	E	E	Endangered	S1	Bogs, fens, and shrub swamps. Brier Island; Digby neck.

<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S3S4	Frequents riparian swamps, swales, bogs, sphagnum woods and wet thickets. Found in Digby and Yarmouth Co. and Cumberland Co. Scattered in the southwest though abundant where found.
<i>Solidago latissimifolia</i>	Elliott's Goldenrod				S3S4	Clearings, thickets and bogs, swales and lakeshores. Common in Yarmouth Co., east to Halifax Co.
<i>Panicum dichotomiflorum var. puritana</i>	Fall Panic Grass				S1?	Anthropogenic (man-made or disturbed habitats), shores of rivers or lakes.
<i>Floerkea proserpinacoides</i>	False Mermaidweed		NAR		S2	Limited to ravine slopes beneath deciduous forests, riparian forests. Known from several Cape Breton localities, such as Glenora Falls. Reported from Coldbrook and Sheffield Mills, Kings Co., Truro and Antigonish Co.
<i>Isoetes macrospora</i>	Farwell's Water Milfoil				S2	Ponds and slow-flowing fresh water. Scattered across the mainland.
<i>Carex foenea</i>	Fernald's Hay Sedge				S3?	Preferred habitat is dry and sandy soils as on barrens. Scattered from Yarmouth to northern Cape Breton.
<i>Artemisia campestris</i>	Field Wormwood				S1	Favours natural talus slopes. Collected only once at Lockhart Brook, Salmon River, Victoria Co.
<i>Artemisia campestris ssp. borealis</i>	Field Wormwood				S1	Favours natural talus slopes. Collected only once at Lockhart Brook, Salmon River, Victoria Co.
<i>Artemisia campestris var. borealis</i>	Field Wormwood				S1	Favours natural talus slopes. Collected only once at Lockhart Brook, Salmon River, Victoria Co.
<i>Potamogeton zosteriformis</i>	Flat-stemmed Pondweed				S2S3	Lacustrine (in lakes or ponds), riverine (in rivers or streams).
<i>Stellaria crassifolia</i>	Fleshy Stitchwort				S1	Frequents pond edges and wet seepy slopes.
<i>Stellaria crassifolia var. crassifolia</i>	Fleshy Stitchwort				S1	Frequents pond edges and wet seepy slopes.
<i>Trichostema dichotomum</i>	Forked Bluecurls				S1	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields, sandplains and barrens.
<i>Carex alopecoidea</i>	Foxtail Sedge				S1	Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), forests, marshes.
<i>Dryopteris fragrans</i>	Fragrant Wood Fern				S2	Look for it in dryish cliff overhangs and in crevices along streams of waterfalls. Not common. Scattered along the Cobequids between Earltown and Parrsborough and streamside in northern Cape Breton.
<i>Dryopteris fragrans var. remotiuscula</i>	Fragrant Wood Fern				S2	Look for it in dryish cliff overhangs and in crevices along streams of waterfalls. Not common. Scattered along the Cobequids between Earltown and Parrsborough and streamside in northern Cape Breton.
<i>Potamogeton friesii</i>	Fries' Pondweed				S2	Found in quiet waters of ponds and streams. An uncommon species, found in the Habitant and Canard rivers of Kings Co.; Salmon River, Colchester Co. and at West Mabou Harbour, Inverness Co.
<i>Carex garberi</i>	Garber's Sedge				S1	Found in moist soils on shores in meadows, fens especially in alkaline areas. Recently discovered in Riversdale area of Colchester Co.
<i>Ranunculus gmelinii+</i>	Gmelin's Water Buttercup				S3	Riverine (in rivers or streams), swamps.
<i>Zizia aurea</i>	Golden Alexanders				S1	Meadows, shores, thickets and even wooded swamps. Occasionally reported: Pomquet and South River, Antigonish Co., Upper Musquodoboit, Halifax Co.
<i>Lophiola aurea</i>	Goldencrest	T	SC	Vulnerable	S2	Grows in wet acidic soils on lakeshores and fens. rare and known only in southwestern counties, from Digby Neck around to Lunenburg counties.
<i>Veratrum viride</i>	Green False Hellebore				S1	Open moist meadows. Found once in the meadow along the stream at the Kentville Research Station and to be expected elsewhere. This is possibly native.
<i>Juncus greenei</i>	Greene's Rush				S1S2	Found only on sandy soils and in dune hollows. Frequent where found but known so far only from Shelburne, Halifax, Cumberland and Antigonish counties.
<i>Solidago hispida</i>	Hairy Goldenrod				S1?	Grows in wooded banks and rocky shores. In frequent, occasionally seen from Yarmouth to Colchester counties.
<i>Solidago hispida var. hispida</i>	Hairy Goldenrod				S1?	Grows in wooded banks and rocky shores. In frequent, occasionally seen from Yarmouth to Colchester counties.
<i>Lactuca hirsuta</i>	Hairy Lettuce				S2	Grows in dryish soils in open forest and cut-overs scattered through western NS
<i>Lactuca hirsuta var. sanguinea</i>	Hairy Lettuce				S2	Grows in dryish soils in open forest and cut-overs scattered through western NS
<i>Polygonum arifolium</i>	Halberd-leaved Tearthumb				S2	Rich swamps subject to long duration of inundation; swamps range from alder thickets to black ash stands. Collected from Kings, Annapolis, Colchester, Cumberland and Pictou counties.

<i>Carex haydenii</i>	Hayden's Sedge				S1	Marshes, meadows and fields, shores of rivers or lakes.
<i>Tiarella cordifolia</i>	Heart-leaved Foamflower				S2	Alluvial soils, deciduous forests even stony roadsides. Centered about Colchester and Pictou counties, with a small population near Huntington Point, Kings Co.
<i>Tiarella cordifolia</i> var. <i>cordifolia</i>	Heart-leaved Foamflower				S2	Alluvial soils, deciduous forests even stony roadsides. Centered about Colchester and Pictou counties, with a small population near Huntington Point, Kings Co.
<i>Carex cryptolepis</i>	Hidden-scaled Sedge				S3?	Generally associated with calcareous soils in meadows, fens and streamsides. Northern in Nova Scotia, from Brier Island to Victoria Co. Not known from the Atlantic side.
<i>Agrimonia gryposepala</i>	Hooked Agrimony				S3	Thickets, streamsides, slopes, intervalles, generally in shade. Digby and Cumberland counties to northern Cape Breton. Uncommon on the Atlantic side.
<i>Platanthera hookeri</i>	Hooker's Orchid				S3	Grows in open dry forests of mixed conifers. Scattered in most of the province, local in the southwestern counties. So far absent from the eastern shore.
<i>Cyperus lupulinus</i>	Hop Flatsedge				S1	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields.
<i>Cyperus lupulinus</i> ssp. <i>macilentus</i>	Hop Flatsedge				S1	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields.
<i>Carex lupulina</i>	Hop Sedge				S3	Found in muck soils, in forests, swamps, swales and Frequent seashores and saltmarshes, in sand. Scattered and local from Shelburne to Cumberland Co.
<i>Epilobium hornemannii</i>	Hornemann's Willowherb				S3	Damp areas, along seeps and streams. Northern Cape Breton.
<i>Epilobium hornemannii</i> ssp. <i>hornemannii</i>	Hornemann's Willowherb				S3	Damp areas, along seeps and streams. Northern Cape Breton.
<i>Carex houghtoniana</i>	Houghton's Sedge				S2S3	Grows in sandy soils, along roadsides. Scattered localities from Queens to Colchester County.
<i>Carex grisea</i>	Inflated Narrow-leaved Sedge				S1	Floodplain (river or stream floodplains), forests.
<i>Botrychium lanceolatum</i> var. <i>angustum</i>	Lance-Leaf Grape-Fern				S2S3	Fertile soils on woodland hillsides.
<i>Scrophularia lanceolata</i>	Lance-leaved Figwort				S1	Limited to open forest and thickets, dryish soils. Rare and known only from Harmony, Kings Co.; Boylston, Guysborough Co. and Baddeck, Victoria Co. although only a single locality is reflected in the collections.
<i>Carex lapponica</i>	Lapland Sedge				S1?	Sphagnum bogs, wet, nutrient-poor areas, mostly lowlands
<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	Favours wet meadows and riparian habitats - More often found in north-central Nova Scotia. Infrequent in southwestern NS.
<i>Hypericum majus</i>	Large St John's-wort				S2	Wet or dry open soil. Widely scattered locations. Until recently, only known from Halifax area and Big Baddeck, Victoria County, and thought to be historic.
<i>Botrychium simplex</i>	Least Moonwort				S2S3	Reported from various habitats, usually involving damp or mossy streambanks or lakeshores. Scattered locations from Yarmouth County to Cape Breton: Cedar Lake (Digby-Yarmouth border), West Berlin (Queens Co.), Petpeswick and in Antigonish, Victoria and Inverness counties.
<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	Found in dry, open forest or recent clearings on acidic, gravelly soils. Most frequent after fire - Scattered and not common, from Kejimikujik National Park to Cumberland Co.; northern Cape Breton. Recently collected from Williams Lake area of Halifax Co.
<i>Pyrola minor</i>	Lesser Pyrola				S3	Characteristic of mature coniferous forests. Scattered north from Digby neck to Kentville and east to Cape Breton.
<i>Goodyera repens</i>	Lesser Rattlesnake-plantain				S3	Look for it beneath conifers, with few other plants. Locally distributed but abundant where found. Atlantic counties of Shelburne and Queens, to Guysborough. Local about the head of the Bay of Fundy and in northern Cape Breton.
<i>Carex granularis</i>	Limestone Meadow Sedge				S1	Anthropogenic (man-made or disturbed habitats), meadows and fields, shores of rivers or lakes, wetland margins (edges of wetlands).
<i>Schizaea pusilla</i>	Little Curlygrass Fern				S3	Sphagnum wet areas, upper peaty lakeshores and undrained depressions. Scattered throughout the Atlantic counties and frequent in the northern plateau of Cape Breton.
<i>Liparis loeselii</i>	Loesel's Twayblade				S3S4	Anthropogenic (man-made or disturbed habitats), fens (calcium-rich wetlands), lacustrine (in lakes or ponds), meadows and fields, shores of rivers or lakes.
<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	Freshwaters of ponds and streams. Recently discovered here and known from the East River St. Mary's Antigonish Co.
<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	Damp grassy habitats, in sandy or mucky soils. Locally abundant along the Salmon River at Truro and Kempton, Colchester Co.; along the Musquodoboit and Stewiacke rivers; Isle Haute.

<i>Stellaria longifolia</i> var. <i>longifolia</i>	Long-leaved Starwort				S2	Damp grassy habitats, in sandy or mucky soils. Locally abundant along the Salmon River at Truro and Kemptown, Colchester Co.; along the Musquodoboit and Stewiacke rivers; Isle Haute.
<i>Scirpus longii</i>	Long's Bulrush	SC	SC	Vulnerable	S3	Peat and muck on shores, fens and stillwater meadows. With few stations, although it may be locally abundant in Queens, Shelburne and Yarmouth counties.
<i>Carex laxiflora</i>	Loose-Flowered Sedge				S1	Frequents damp clearings and open rocky forests. Collected from Annapolis to Hants County and Isle Haute.
<i>Carex laxiflora</i> var. <i>laxiflora</i>	Loose-Flowered Sedge				S1	Frequents damp clearings and open rocky forests. Collected from Annapolis to Hants County and Isle Haute.
<i>Cyperus diandrus</i>	Low Flatsedge				S1	Grows along undisturbed shorelines of sand and peaty soils. NS: Known only from Yarmouth Co. and only since 2000 collected from Ellenwood, Third and Bennetts Lakes.
<i>Selaginella selaginoides</i>	Low Spikemoss				S1S2	Grows in moist areas such as bog hummocks and streamsides. Brier Island (Big Meadow) where it is common; west L'Ardoise, Richmond County (rare) and scattered in suitable habitat in northern Cape Breton.
<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S3	Frequents damp shady cliffs and talus, especially on acidic rocks such as granite, basalt and sandstone. Rare and local in Cape Breton. Locally abundant at Big Intervale, Margaree. Few mainland NS locations: scattered in the Cobequids and in Annapolis and Kings counties.
<i>Lyonia ligustrina</i>	Maleberry				S1	Generally found in wet mucky soils. In Nova Scotia, so far known only from Springhaven, Yarmouth Co.
<i>Lyonia ligustrina</i> var. <i>ligustrina</i>	Maleberry				S1	Generally found in wet mucky soils. In Nova Scotia, so far known only from Springhaven, Yarmouth Co.
<i>Campanula aparinoides</i>	Marsh Bellflower				S3	Rare, known from river banks, meadows and ditches. Northern, from Hants and Cumberland counties to Antigonish, with a single Cape Breton station.
<i>Equisetum palustre</i>	Marsh Horsetail				S1	Of wetlands, marshes and swamps. A single collection each from Kings County and Halifax Co.
<i>Pedicularis palustris</i>	Marsh Lousewort				S1	Wet substrates as in marshes or meadows. Rare and local: Bay St. Lawrence, Baleine and Sydney area. Reported from Guysborough Co.
<i>Proserpinaca palustris</i> var. <i>palustris</i>	Marsh Mermaidweed				S1?	Lakeshore fens and streamsides. Var. <i>palustris</i> is known only from Lunenburg and Yarmouth counties although it may be more widespread.
<i>Proserpinaca palustris</i>	Marsh Mermaidweed				S3	Lakeshore fens and streamsides.
<i>Proserpinaca palustris</i> var. <i>crebra</i>	Marsh Mermaidweed				S3	Lakeshore fens and streamsides. Var. <i>crebra</i> is abundant where found from southwestern NS to Cumberland Co. It tends to be less frequent on Cape Breton's Atlantic side.
<i>Hordeum brachyantherum</i>	Meadow Barley				S1	Anthropogenic (man-made or disturbed habitats).
<i>Hordeum brachyantherum</i> ssp. <i>brachyantherum</i>	Meadow Barley				S1	Anthropogenic (man-made or disturbed habitats).
<i>Equisetum pratense</i>	Meadow Horsetail				S3	Uncommon and limited to alluvial thickets, pastures and treed streamsides, including gravelly bars. Known from several streams in Hants, Colchester and Cumberland counties, in addition to Victoria and Inverness Cos.
<i>Salix petiolaris</i>	Meadow Willow				S3	Wet soils as in meadows. Known from the western part of the province, from Digby to Lunenburg Co., east to Cumberland and Colchester counties.
<i>Goodyera oblongifolia</i>	Menzies' Rattlesnake-plantain				S3	Found in deciduous upland forests and ravines. So far known only from northern Cape Breton, where it is scattered, in Victoria and Inverness Counties.
<i>Betula michauxii</i>	Michaux's Dwarf Birch				S2	Limited to peat bogs. Scattered localities from Brier Island, Digby Co., east to Guysborough, Cape Breton and Inverness counties.
<i>Amelanchier nantucketensis</i>	Nantucket Serviceberry				S1	Found in disturbed habitats such as roadsides, fields, sandplains, riparian meadows and barrens. Its NS distribution is limited to Cumberland, Shelburne and Halifax counties. No collection for the Halifax Co. locality.
<i>Trisetum spicatum</i>	Narrow False Oats				S3S4	Grows in rocky soils on outcrops, cliffs, streamsides. Found on Cape Blomidon Cape d'Or and scattered from Halifax and Hants counties to northern Cape Breton.
<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S2	Soils both dry and sandy. Ranges along the northern part of mainland NS from Annapolis to Pictou.

<i>Allium burdickii</i>	Narrow-Leaved Wild Leek				S1?	rich deciduous woodlands, wooded bluffs, wooded areas along rivers and streams, and cemetery prairies
<i>Carex ormostachya</i>	Necklace Spike Sedge				S1	Grows in sandy or gravelly soils in mixed deciduous forest. Known only from one locality: Rockland, Kings Co.
<i>Woodwardia areolata</i>	Netted Chain Fern				S3	Frequents swamps, bogs and above rivers and lakeshores. Local in Shelburne and Yarmouth counties.
<i>Festuca subverticillata</i>	Nodding Fescue				S1	A woodland species of fertile deciduous forested slopes and alluvial soils. Local about Cape Blomidon, Kings Co.; Five Mile River, Hants Co., Economy River, Colchester Co. and southern Cumberland Co.
<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	Sterile soils, swamps and sandy or cobbly lakeshores. Known from Yarmouth and Digby Counties; scattered east to Halifax and Amherst; a single Cape Breton record from George River.
<i>Galium boreale</i>	Northern Bedstraw				S2	A species of edges, forests and fields and other grassy verges. Very local in only a few counties: Kings, Annapolis and Cumberland counties.
<i>Betula borealis</i>	Northern Birch				S2	Bogs and wooded swamps.
<i>Carex gynocrates</i>	Northern Bog Sedge				S1	Wooded swamps and saturated peat elsewhere. Known from two localities, Saint Paul Island and near Lake Ainslie.
<i>Viola nephrophylla</i>	Northern Bog Violet				S2	Cool, mossy sites: bogs, streamsides and wet woods. Rare in Shelburne Co., Colchester and Cumberland counties northward. Generally a northern ranging species within NS.
<i>Sparganium hyperboreum</i>	Northern Burreed				S1S2	Peaty pools. Rare in Cape Breton. On the mainland, collected from Drumhead and New Harbour, Guysborough Co.
<i>Lycopodium complanatum</i>	Northern Clubmoss				S3S4	Open woodlands, thickets, heathland and rocky slopes;
<i>Geocalon lividum</i>	Northern Comandra				S3	Damp sands and other sterile soils, especially in acid or peaty sites. Disjunct sites in Halifax, Kings and Cumberland counties; widespread but local in Cape Breton.
<i>Rubus flagellaris</i>	Northern Dewberry				S1?	Dry fields, openings and edge of forests and fields. Collected from Canso.
<i>Gentianella amarella</i>	Northern Gentian				S1	Turfy soils and damp sands and gravel. So far only known from Pollett Cove and Meat Cove area of Inverness Co. where it was found only in the late 1990s.
<i>Gentianella amarella ssp. acuta</i>	Northern Gentian				S1	Turfy soils and damp sands and gravel. So far only known from Pollett Cove and Meat Cove area of Inverness Co. where it was found only in the late 1990s.
<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S1	Limited to alkaline soils and oak–birch–sugar maple–elm intervalle forests. Very few extant collections: Meander River, Hants Co., where it was found in the 1980s. Records exist from Yarmouth, Kings and Victoria counties. Recently discovered along the South Blair River, Inverness Co.
<i>Thalictrum venulosum</i>	Northern Meadow-rue				S1	Shores of rivers or lakes.
<i>Spiraea septentrionalis</i>	Northern Meadowsweet				S1?	open, moist areas
<i>Galium kamschaticum</i>	Northern Wild Licorice				S3	Fertile deciduous forests and ravines. Associated in the north with fir–birch boreal forest. Known only from Cape Breton.
<i>Potamogeton oblongus</i>	Oblong-leaved Pondweed				S1	Ponds and ephemeral pools. Known from Sable Island where it is abundant. Southwestern collection.
<i>Vaccinium ovalifolium</i>	Oval-leaved Bilberry				S1	Sterile and dry soils in barrens, thickets and coniferous woods
<i>Eleocharis ovata</i>	Ovate Spikerush				S2?	Grows on muddy streamsides, streambeds and lakeshores, often in subsiding water.
<i>Torreyochloa pallida var. pallida</i>	Pale False Manna Grass				S1	Lacustrine (in lakes or ponds), riverine (in rivers or streams), swamps.
<i>Platanthera flava var. herbiola</i>	Pale Green Orchid				S2	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>Lobelia spicata</i>	Pale-Spiked Lobelia				S1	Found in dry fallow soils. Very rare and at risk. Scattered locations: Cape Blomidon, Kings Co.; Linden, Cumberland Co. and reported from Yarmouth Co. Local but may be abundant where found.
<i>Lobelia spicata var. spicata</i>	Pale-Spiked Lobelia				S1	Found in dry fallow soils. Very rare and at risk. Scattered locations: Cape Blomidon, Kings Co.; Linden, Cumberland Co. and reported from Yarmouth Co. Local but may be abundant where found.

<i>Hieracium paniculatum</i>	Panicled Hawkweed				S3	Mixed forest on dryish soils, especially oak. Occasional from Yarmouth east to Kings and Halifax counties. Common about Kentville and at Keji.
<i>Rumex persicarioides</i>	Peach-leaved Dock				S2?	Anthropogenic (man-made or disturbed habitats), brackish or salt marshes and flats, coastal beaches (sea beaches), meadows and fields.
<i>Ranunculus pensylvanicus</i>	Pennsylvania Buttercup				S1	Anthropogenic (man-made or disturbed habitats), marshes, shores of rivers or lakes, swamps.
<i>Carex pensylvanica</i>	Pennsylvania Sedge				S1?	Grows in dry, rocky soils as in dry open woodlands. Scattered from Annapolis and Lunenburg counties to Northern Cape Breton.
<i>Polygonum pensylvanicum</i>	Pennsylvania Smartweed				S3	Frequently seen in roadside ditches, edges of cultivated fields and along dyked marshes. Generally northern, from Annapolis and Queens to Cape Breton counties.
<i>Erigeron philadelphicus</i>	Philadelphia Fleabane				S2	Habitats include fields, meadows and springy slopes. Not common, scattered stations from Digby and Cumberland counties to central Cape Breton.
<i>Erigeron philadelphicus var. philadel</i>	Philadelphia Fleabane				S2	Habitats include fields, meadows and springy slopes. Not common, scattered stations from Digby and Cumberland counties to central Cape Breton.
<i>Coreopsis rosea</i>	Pink Coreopsis	E	E	Endangered	S1	Lacustrine: sand-cobble or peaty lower shorelines of lakes with large seasonal water level fluctuations. One of our rarest species, it is limited to the Tusket River valley in Yarmouth Co.
<i>Carex plantaginea</i>	Plantain-Leaved Sedge				S1	Forests.
<i>Sabatia kennedyana</i>	Plymouth Gentian	T	E	Endangered	S1	Cobbly, and sandy beaches of lakes, streams and savannahs. Local and rare: Tusket River valley in Yarmouth Co.
<i>Toxicodendron vernix</i>	Poison Sumac				S1	Usually found in swampy or marshy habitats. So far as known, limited to Telfer Lake and Apple Tree Lake, both in Queens Co.
<i>Carex hystericina</i>	Porcupine Sedge				S2	Frequents seeps, marshes and shoreline fens. Scattered in Kings and Annapolis Co and in Victoria and Inverness Co.
<i>Carex prairea</i>	Prairie Sedge				S1	Grows in habitats such as cat-tail swamps. A single record is extant from Centreville, Kings Co.
<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S2S3	Only recently distinguished in Nova Scotia from <i>C. demersum</i> ; few collections to date in NS, however, it is reported from marshes from Yarmouth to Cumberland Counties. A plant more typical of the shallows of acidic water bodies than its congener.
<i>Isoetes prototypus</i>	Prototype Quillwort	SC	SC	Vulnerable	S2	This is another deep-water species found in nutrient-poor waters. Only a few localities known in NS: Sutherland's Lake, Cumberland Co.; Economy Lake, Colchester Co.; Pottle Lake, North Sydney and Sandy Lake, Annapolis County.
<i>Saxifraga oppositifolia</i>	Purple Mountain Saxifrage				S1	Rock face and seepage area at our only locality. Found only at Corney Brook gorge to date, in Cape Breton National Park.
<i>Saxifraga oppositifolia ssp. oppositif</i>	Purple Mountain Saxifrage				S1	Rock face and seepage area at our only locality. Found only at Corney Brook gorge to date, in Cape Breton National Park.
<i>Angelica atropurpurea</i>	Purple-stemmed Angelica				S3	Grows in swamps, meadows, in ditches and along streams. Ditches at Quinan, Yarmouth Co. Very abundant in northern Cape Breton and known from Mahoney's Beach area, Antigonish Co.
<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2?	Low grounds and seepy soils. Scattered from Digby to Guysborough counties.
<i>Crataegus submollis</i>	Quebec Hawthorn				S1?	edges of fields and thickets, Antigonish and Lunenburg Co. to Cape Breton
<i>Polygala polygama</i>	Racemed Milkwort				S1	Grows in dry, open soil. Uncommon in Annapolis and Digby counties.
<i>Fraxinus pennsylvanica</i>	Red Ash				S1	Floodplain (river or stream floodplains), forests, shores of rivers or lakes, swamps.
<i>Lachnanthes caroliniana</i>	Redroot	SC	SC	Vulnerable	S2	Shores of rivers or lakes.
<i>Hieracium robinsonii</i>	Robinson's Hawkweed				S2	Found in riparian areas, in cobble, rock crevices and cliffaces. Local. Tusket Islands, Yarmouth Co., Truro area and northern Cape Breton.
<i>Antennaria rosea</i>	Rosy Pussytoes				S1	Dry, open places, meadows, and open woods. It has very recently been confirmed at Cape d'Or.
<i>Antennaria rosea ssp. arida</i>	Rosy Pussytoes				S1	Dry, open places, meadows, and open woods. It has very recently been confirmed at Cape d'Or.
<i>Carex rosea</i>	Rosy Sedge				S3	Grows in dry soils beneath deciduous forests and thickets. Common from Annapolis Co. to northern Cape Breton.

<i>Smilax rotundifolia</i> (Atlantic pop.)	Round-leaved Greenbrier		NAR		S3	Found in thickets, lakeshores and streamsides, forming dense tangles. Somewhat common from Digby to Queens counties, especially close to the coast. Less common inland.
<i>Hepatica nobilis</i>	Round-lobed Hepatica				S1S2	Dry, mixed deciduous forests. Local and rare at Bridgewater, New Minas, Windsor, Pictou, Stewiacke, Antigonish and at a couple of North Mountain sites. Recently discovered along the Cogmagun River, Hants Co. Long known from along the St. Andrews River. Populations at Wolfville and St. Croix appear to be extirpated.
<i>Hepatica nobilis</i> var. <i>obtusata</i>	Round-lobed Hepatica				S1S2	Dry, mixed deciduous forests. Local and rare at Bridgewater, New Minas, Windsor, Pictou, Stewiacke, Antigonish and at a couple of North Mountain sites. Recently discovered along the Cogmagun River, Hants Co. Long known from along the St. Andrews River. Populations at Wolfville and St. Croix appear to be extirpated.
<i>Plantago rugelii</i>	Rugel's Plantain				S2S3	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields.
<i>Plantago rugelii</i> var. <i>rugelii</i>	Rugel's Plantain				S2S3	Anthropogenic (man-made or disturbed habitats), grassland, meadows and fields.
<i>Amelanchier stolonifera</i>	Running Serviceberry				S3?	Frequents sandy, stony areas as on barrens and in boggy depressions. Scattered in southwestern counties. Common across Annapolis and Kings counties and possibly northern Cape Breton.
<i>Salix pellita</i>	Satiny Willow				S2S3	Found in riparian habitats. Scattered from Annapolis and Cumberland counties to Colchester Inverness and Victoria counties.
<i>Carex atratiformis</i>	Scabrous Black Sedge				S2	Moist cliffs, streamsides, and associated rock crevices. Common in northern Cape Breton. Collected from McAlese Brook, Cumberland Co.
<i>Alopecurus aequalis</i>	Short-awned Foxtail				S3	river or stream. Rare and Northern: Kings and Cumberland Counties to central Victoria county.
<i>Alopecurus aequalis</i> var. <i>aequalis</i>	Short-awned Foxtail				S3	river or stream. Rare and Northern: Kings and Cumberland Counties to central Victoria county.
<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S2	bog, swamp. Widely scattered localities in province
<i>Salix sericea</i>	Silky Willow				S2	lake or pond shore, riparian zones. Rare only reported from western NS. Parr Lake and Lake Fanning, Yarmouth Co.; Queens and Lunenburg counties to Halifax County
<i>Acer saccharinum</i>	Silver Maple				S1	near flowing waters and wetlands. Cornwallis River, Kings Co.
<i>Carex argyrantha</i>	Silvery-flowered Sedge				S3S4	Sandy soils in thickets and clearings. Patchy distribution from Annapolis and Cumberland counties to Northern Cape Breton.
<i>Silene antirrhina</i>	Sleepy Catchfly				S1	roadsides, railways, pastures, fields wastegrounds, alluvial woods. Recently found in CFB Greenwood.
<i>Rhynchospora capillacea</i>	Slender Beakrush				S1	bogs, limited to southern end of Lake Ainslie and Baddeck Bay areas of Cape Breton
<i>Eriophorum gracile</i>	Slender Cottongrass				S2	wet peat and inundated shores. Scattered eastward from Annapolis and Halifax counties.
<i>Eriophorum gracile</i> var. <i>gracile</i>	Slender Cottongrass				S2	wet peat and inundated shores. Scattered eastward from Annapolis and Halifax counties.
<i>Dichanthelium xanthophysum</i>	Slender Panic Grass				S1	exposed rock or sand, dry soils. Only collected from Bridgewater area
<i>Piptatherum pungens</i>	Slender Rice Grass				S2	open areas in dry (or occasionally moist), sandy or very rocky, nutrient-poor soils. Openings in coniferous forests. Shelburne and Queens counties
<i>Sparganium natans</i>	Small Burreed				S3	Shallow pools, pond edges and alkaline sink holes. Widely Scattered and infrequently reported from Digby to eastern Cape Breton
<i>Cypripedium parviflorum</i> var. <i>makasinense</i>	Small Yellow Lady's-Slipper				S2	fens, forests, lakeshores, river edges, swamps. Sweet's Corner and Gore, Hants County and Chipman Brook, Kings County
<i>Agalinis paupercula</i>	Small-flowered Agalinis				S1	meadows and fields, shores of rivers or lakes, wetland margins
<i>Boehmeria cylindrica</i>	Small-spike False-nettle				S1	Moist and shady ground, in deciduous woods, swamps, bogs, marshes, wet meadows and ditches. LaHave River from New Germany to Bridgewater, local on the Annapolis River at Kingston and single record from the shubenacadie Wildlife Park.
<i>Alnus serrulata</i>	Smooth Alder				S3	lake or pond shore, Uncommon and local in southwestern NS from Lunenburg Co.
<i>Woodsia glabella</i>	Smooth Cliff Fern				S2	cliff or talus slope, river or stream. Jeffers Brook, Cumberland County. Big Southwest Brook, Lockhart Brook, and on Sky Glen Mountain.
<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	fertile soils in deciduous forests. North Mountain, Annapolis and Kings counties to Cumberland Cobequids. Infrequent in Cape Breton.

<i>Platanthera flava</i> var. <i>flava</i>	Southern Rein Orchid				S2	bog, field meadow, lake or pond shore, lakeshore wetland, river or stream, swamp. Tuskent River, Yarmouth Co., Meander River, Queens Co. and North to Kings and Colchester Co.
<i>Platanthera flava</i>	Southern Rein-Orchid				S2	bog, field meadow, lake or pond shore, lakeshore wetland, river or stream, swamp. Tuskent River, Yarmouth Co., Meander River, Queens Co. and North to Kings and Colchester Co.
<i>Listera australis</i>	Southern Twayblade				S3	Bog, mixed wood forest, swamps. Scattered from Shelburne, to Halifax, to Kings to Cape Breton counties
<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S1	fen and mixed wood forest. Little Harbour, Richmond Co.
<i>Potamogeton pulcher</i>	Spotted Pondweed			Vulnerable	S2S3	aquatic perennial herb that grows in standing water. Yarmouth, Queens and Halifax Counties, reported in Digby Co.
<i>Elymus hystrix</i>	Spreading Wild Rye				S1	wooded lowlands and terraces. Meander River and Five mile River, Hants Co. and East River of Pictou
<i>Elymus hystrix</i> var. <i>bigeloviana</i>	Spreading Wild Rye				S1	wooded lowlands and terraces. Meander River and Five mile River, Hants Co. and East River of Pictou
<i>Halenia deflexa</i> ssp. <i>brentoniana</i>	Spurred Gentian				S1?	forest edge, forests, meadows and fields
<i>Decodon verticillatus</i>	Swamp Loosestrife				S3	lakeshore wetland, river or stream. Rare: Shelburne and Digby counties, Kejimikujik National Park
<i>Asclepias incarnata</i> ssp. <i>pulchra</i>	Swamp Milkweed				S3?	Rocky soils along lakeshores, marshes, streamsides or peatland edges. Infrequently found from Yarmouth to Cape Breton.
<i>Carex tenera</i>	Tender Sedge				S2	wet prairies, swamps, and floodplain woods, vernal pools or dry clearings. Cumberland and Guysborough counties
<i>Najas gracillima</i>	Thread-Like Naiad				S2	riparian, swamp, marsh, lakeshore wetlands, Hants Co west to Queens County
<i>Veronica serpyllifolia</i> ssp. <i>humifusa</i>	Thyme-Leaved Speedwell				S2S3	Moist soils, fields and roadsides. Common Throughout
<i>Arabis glabra</i>	Tower Mustard				S1	Drier sites. Lunenburg Co., the Forties,; Tupper Brook Trail, Coldbrook, Kings Co.
<i>Botrychium lanceolatum</i>	Triangle Moonwort				S2S3	fertile soils on wooded hillsides Kentville Ravine, Colchester, Cumberland and a few western Cape Breton sites
<i>Eleocharis tuberculosa</i>	Tuberclcd Spike-rush	SC	SC	Vulnerable	S2	Sandy or peaty lake margins. Only found on Harper's Lake, Gold Lake, Western, Mill, Barrington and Great Pubnico Lakes. Also along the Tuskent River. Little Ten Mile Lake all in Queens Co.
<i>Panicum tuckermanii</i>	Tuckerman's Panic Grass				S3S4	meadows and fields, shores of rivers and lakes
<i>Carex tuckermanii</i>	Tuckerman's Sedge				S2	vernal pools near streams. Uncommon; Sweets Corner, Hants Co, and Wallace ad Pugwash rivers, Cumberland Co.
<i>Equisetum variegatum</i>	Variiegated Horsetail				S3	wetlands or wet seeps. Wide ranging in NS, with disjunct localities: Halifax County, Cumberland Co., Victoria Co.
<i>Equisetum variegatum</i> var. <i>variegatum</i>	Variiegated Horsetail				S3	wetlands or wet seeps. Wide ranging in NS, with disjunct localities: Halifax County, Cumberland Co., Victoria Co.
<i>Equisetum variegatum</i> var. <i>variegatum</i>	Variiegated Horsetail				S3	wetlands or wet seeps. Wide ranging in NS, with disjunct localities: Halifax County, Cumberland Co., Victoria Co.
<i>Megalodonta beckii</i>	Water Beggarticks				S3	aquatic, river or stream, throughout but more abundant from Pictou northward
<i>Polygonum amphibium</i> var. <i>emersum</i>	Water Smartweed				S3?	shallow waters of ponds, lakes and slow flowing streams. Annapolis and Cumerland counties north
<i>Symphotrichum undulatum</i>	Wavy-leaved Aster				S2	edges of fields and forests. Lunenburg Co. Queens, Hants, Kings and Halifax counties
<i>Malaxis brachypoda</i>	White Adder's-Mouth				S1	moss cushions and mossy cliff edges. Rare in Cumberland Co., Colchester Co. and Guysborough Co.
<i>Trillium grandiflorum</i>	White Trillium				S1	Forests, talus and rocky slopes. Historically known from Centreville, Kings Co. and Truro. (unknown whether sites are still extant)
<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S3?	deep, clear lakes, in up to 6 m of water, Kings Co. to Cape Breton
<i>Carex peckii</i>	White-Tinged Sedge				S2?	Fry or mesic slopes, mixed deciduous forests, rocky outcrops, old quarries. King's Co., Rhodes Co., Lunenburg Co. Halifax and the Pennants area.
<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife				S1	Disturbed habitat, grassland, woodlands
<i>Carex wiegandii</i>	Wiegand's Sedge				S3	Treed bogs, bogs, conifer and alder thickets. Cape Breton Island, Shelburne Co.
<i>Elymus wiegandii</i>	Wiegand's Wild Rye				S1	field meadow, river or stream. Northumberland plains east to Sydney
<i>Ribes americanum</i>	Wild Black Currant				S1	Shady slopes, bottomland thickets, fertile soils. Truro and Windsor area

<i>Vallisneria americana</i>	Wild Celery				S2	Ponds, lakes, and quiet streams at depths of 1 to 4 m. Colchester Co., Halifax Co., Cumberland Co., Reported from Northern Cape Breton
<i>Allium schoenoprasum</i>	Wild Chives				S2	disturbed habitats, floodplain, meadows and fields, ridges or ledges, shores of rivers and lakes.
<i>Allium schoenoprasum var. sibiricum</i>	Wild Chives				S2	disturbed habitats, floodplain, meadows and fields, ridges or ledges, shores of rivers and lakes.
<i>Cynoglossum virginianum</i>	Wild Comfrey				S1	hardwood forest, dry or gypsum soils. West of Kentville and around Windsor
<i>Cynoglossum virginianum var. boreale</i>	Wild Comfrey				S1	hardwood forest, dry or gypsum soils. West of Kentville and around Windsor
<i>Allium tricoccum</i>	Wild Leek				S1	hardwood forest, intervale
<i>Anemone quinquefolia</i>	Wood Anemone				S2	terraces, intervale, river or stream. Rare and Localized populations north of Bridgetown and Paradise, Annapolis County; Kingston, Kings Co.; Middle Stewiacke, Colchester Co.; Cumberland Co, Guysborough Co and southern Victoria Co.
<i>Anemone quinquefolia var. quinquefolia</i>	Wood Anemone				S2	terraces, intervale, river or stream. Rare and Localized populations north of Bridgetown and Paradise, Annapolis County; Kingston, Kings Co.; Middle Stewiacke, Colchester Co.; Cumberland Co, Guysborough Co and southern Victoria Co.
<i>Fragaria vesca</i>	Woodland Strawberry				S3S4	shady forests and ravines. Brier Island to Kings and Cumberland counties. To northern Cape Breton
<i>Fragaria vesca ssp. americana</i>	Woodland Strawberry				S3S4	shady forests and ravines. Brier Island to Kings and Cumberland counties. To northern Cape Breton
<i>Juncus subcaudatus</i>	Woods-Rush				S3	Conifer woods and spruce swamps, where substrate is soggy. Yarmouth to Kings and Halifax Counties. Richmond County
<i>Juncus subcaudatus var. planisepalus</i>	Woods-Rush				S3	Conifer woods and spruce swamps, where substrate is soggy. Yarmouth to Kings and Halifax Counties. Richmond County
<i>Dichanthelium acuminatum var. lindleyi</i>	Woolly Panic Grass				S1?	Open sites and sandy soils. Widespread and common
<i>Carex pellita</i>	Woolly Sedge				S1	Wet soils in fields, meadows and marshes, especially calcareous regions under successional conditions. Pictou Co.
<i>Bartonia virginica</i>	Yellow Bartonia				S3	Dry barrens, sandy or peaty soils, bogs, lakeshores. Common in southwestern counties becoming scarcer east to Annapolis and Halifax; St. Peter's area of Cape Breton
<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S3	barrens, disturbed sites, field meadow. Western half of Province, northwest to Hants County
<i>Cypripedium parviflorum</i>	Yellow Lady's-slipper				S2S3	Occasionally under mixed deciduous trees
<i>Eleocharis olivacea</i>	Yellow Spikerush				S2S3	Mucky peat as on bog margins, and sandy lakeshores. Southwest: Yarmouth to Digby and Lunenburg counties, with Cumberland and Antigonish collections
<i>Eleocharis olivacea var. olivacea</i>	Yellow Spikerush				S2S3	Mucky peat as on bog margins, and sandy lakeshores. Southwest: Yarmouth to Digby and Lunenburg counties, with Cumberland and Antigonish collections
<i>Utricularia ochroleuca</i>	Yellowish-white Bladderwort				S1	rooted free floating plant
<i>Lindernia dubia</i>	Yellow-seeded False Pimperel				S3	Riparian, muddy streambanks, drained ponds, Kings and Lunenburg counties north to Northumberland Strait
<i>Lindernia dubia var. dubia</i>	Yellow-seeded False Pimperel				S3	Riparian, muddy streambanks, drained ponds, Kings and Lunenburg counties north to Northumberland Strait

Scientific Name	Common Name	SARA	COSEWIC	NSESA	SRank	Habitat Requirements
<i>Aeshna clepsydra</i>	Mottled Darner				S3	
<i>Aeshna constricta</i>	Lance-Tipped Darner				S3	
<i>Boyeria grafiana</i>	Ocellated Darner				S3	Prefers swiftly flowing rocky forest streams and rivers; also rocky-shored lakes.
<i>Gomphaeschna furcillata</i>	Harlequin Darner				S3	pond breeding- range 3km from pond
<i>Epiheca princeps</i>	Prince Baskettail				S2	pond breeding- range 3km from pond
<i>Neurocordulia michaeli</i>	Broadtailed Shadowdragon				S1	Clean medium to large forested rivers (Dunkle 2000).
<i>Somatochlora albicincta</i>	Ringed Emerald				S1	pond breeding- range 3km from pond
<i>Somatochlora brevicincta</i>	Quebec Emerald				S1	Pools in sphagnum bogs
<i>Somatochlora forcipata</i>	Forcipate Emerald				S2	
<i>Somatochlora franklini</i>	Delicate Emerald				S1	
<i>Somatochlora kennedyi</i>	Kennedy's Emerald				S1S2	
<i>Somatochlora septentrionalis</i>	Muskeg Emerald				S2	pond breeding- range 3km from pond
<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald				S3	river- breeding dragonfly. 5 km range
<i>Somatochlora williamsoni</i>	Williamson's Emerald				S1	pond breeding- range 3km from pond
<i>Williamsonia fletcheri</i>	Ebony Boghaunter				S1	Lentic. Habitat is bogs and fens. The microhabitat (sub-EO) is water-suspended or water-saturated SPHAGNUM ("quaking bog" and "moss lawn") whether or not associated with open water.
<i>Gomphus descriptus</i>	Harpoon Clubtail				S2	river- breeding dragonfly. 5 km range
<i>Gomphus ventricosus</i>	Skillet Clubtail	E	E		S1	In the Northeast, the larvae inhabit large rivers where they burrow in the soft mud of deep pools
<i>Lanthus parvulus</i>	Northern Pygmy Clubtail				S3	Lotic. Overall habitat is clear streams and brooks with strong current over clean gravel, cobbles or bedrock, on comparatively unproductive soils ("trout stream"). Landform required to promote a strong current in small running waters generally has moderate to considerable relief, from hills to mountains. The microhabitat (sub-EO) is areas proximal to surface-breaking structure such as cobbles, boulders or deadwood in full current and proximal to sun-lit marginal vegetation
<i>Ophiogomphus aspersus</i>	Brook Snaketail				S1	Even minor increases in the silt or mud content in streams can alter dissolved oxygen levels and harm or kill snaketail larvae. Like most odonates, snaketails also need undisturbed fields and wooded uplands adjacent to breeding waters. It is here that critical foraging and breeding occurs. This species inhabits clean, relatively quiet or slow moving streams with an abundance of sandy sediments.
<i>Ophiogomphus carolus</i>	Riffle Snaketail				S3	
<i>Ophiogomphus mainensis</i>	Maine Snaketail				S1	streams and small rivers. May through July - dragonfly
<i>Ophiogomphus rupinsulensis</i>	Rusty Snaketail				S1S2	Inhabits flowing clear streams and rivers in the northeastern third of the U.S., and parts of southeast Canada-- dragonfly
<i>Stylurus scudderi</i>	Zebra Clubtail				S1S2	Clean rivers and streams with sand or sand and cobble bottoms and moderate current in wooded landscape; usually much gravel and at least scattered rocks.

<i>Leucorrhinia patricia</i>	Canada Whiteface				S1
<i>Nannothemis bella</i>	Elfin Skimmer				S3
<i>Pantala hymenaea</i>	Spot-Winged Glider				S2B
<i>Sympetrum danae</i>	Black Meadowhawk				S3
<i>Tramea carolina</i>	Carolina Saddlebags				S1B
<i>Clubiona littoralis</i>	a Leafcurling Sac Spider				S2S3
<i>Clubiona saltitans</i>	a Leafcurling Sac Spider				S2S3
<i>Ebo pepinensis</i>	a Running Crab Spider				S1S2
<i>Acupalpus nanellus</i>	a Ground Beetle				S1S2
<i>Agonum anchomenoides</i>	a Ground Beetle				S2S3
<i>Agonum crenistriatum</i>	a Ground Beetle				S2S3
<i>Agonum darlingtoni</i>	a Ground Beetle				S2S3
<i>Agonum deceptivum</i>	a Ground Beetle				S1S2
<i>Agonum octopunctatum</i>	a Ground Beetle				S1S2
<i>Agonum picicornoides</i>	a Ground Beetle				S1S2
<i>Agonum propinquum</i>	a Ground Beetle				S2S3
<i>Amara convexa</i>	a Ground Beetle				S1S2
<i>Amara flebilis</i>	a Ground Beetle				S1S2
<i>Amara gibba</i>	a Ground Beetle				S1S2
<i>Amara lacustris</i>	a Ground Beetle				S1S2
<i>Amara littoralis</i>	a Ground Beetle				S2S3
<i>Amara pennsylvanica</i>	a Ground Beetle				S2S3
<i>Amara rubrica</i>	a Ground Beetle				S1S2
<i>Anisodactylus rusticus</i>	a Ground Beetle				S2S3
<i>Apristus latens</i>	a Ground Beetle				S1S2
<i>Badister grandiceps</i>	a Ground Beetle				S1S2
<i>Badister neopulchellus</i>	a Ground Beetle				S2S3
<i>Badister obtusus</i>	a Ground Beetle				S2S3
<i>Badister ocularis</i>	a Ground Beetle				S1S2
<i>Bembidion cheyennense</i>	a Ground Beetle				S2S3
<i>Bembidion concolor</i>	a Ground Beetle				S1S2
<i>Bembidion forttestriatum</i>	a Ground Beetle				S2S3
<i>Bembidion graciliforme</i>	a Ground Beetle				S1S2
<i>Bembidion grapii</i>	a Ground Beetle				S1S2
<i>Bembidion honestum</i>	a Ground Beetle				S2S3
<i>Bembidion immaturum</i>	a Ground Beetle				S2S3
<i>Bembidion mutatum</i>	a Ground Beetle				S2S3
<i>Bembidion nigripes</i>	a Ground Beetle				S1S2
<i>Bembidion obscurellum</i>	a Ground Beetle				S2S3
<i>Bembidion occultator</i>	a Ground Beetle				S2S3
<i>Bembidion petrosum</i>	a Ground Beetle				S2S3
<i>Bembidion planatum</i>	a Ground Beetle				S1S2
<i>Bembidion punctatoatriatum</i>	a Ground Beetle				S1S2
<i>Bembidion quadratulum</i>	a Ground Beetle				S2S3
<i>Bembidion rapidum</i>	a Ground Beetle				S1S2
<i>Bembidion rolandi</i>	a Ground Beetle				S1S2
<i>Bembidion sejunctum</i>	a Ground Beetle				S2S3
<i>Bembidion semicinctum</i>	a Borer Beetle				S2S3
<i>Bembidion sulcipenne</i>	a Ground Beetle				S1S2

<i>Bembidion wingatei</i>	a Ground Beetle				S2S3	
<i>Blethisa hudsonica</i>	a Ground Beetle				S1S2	
<i>Blethisa julii</i>	a Ground Beetle				S1S2	
<i>Blethisa quadricollis</i>	a Ground Beetle				S2S3	
<i>Bradycellus congener</i>	a Ground Beetle				S1S2	
<i>Bradycellus semipubescens</i>	a Ground Beetle				S2S3	
<i>Carabus maeander</i>	a Ground Beetle				S2S3	
<i>Carabus serratus</i>	a Ground Beetle				S2S3	
<i>Chlaenius alternatus</i>	a Ground Beetle				S1S2	
<i>Chlaenius tricolor</i>	a Ground Beetle				S2S3	
<i>Clivina americana</i>	a Ground Beetle				S1S2	
<i>Cymindis borealis</i>	a Ground Beetle				S2S3	
<i>Cymindis neglecta</i>	a Ground Beetle				S2S3	
<i>Diplocheila striatopunctata</i>	a Ground Beetle				S1S2	
<i>Dyschirius sellatus</i>	a Ground Beetle				S1S2	
<i>Elaphropus anceps</i>	a Ground Beetle				S2S3	
<i>Elaphropus granarius</i>	a Ground Beetle				S2S3	
<i>Elaphropus saturatus</i>	a Ground Beetle				S1S2	
<i>Elaphropus vernicatus</i>	a Ground Beetle				S2S3	
<i>Elaphropus vivax</i>	a Ground Beetle				S1S2	
<i>Elaphropus xanthopus</i>	a Ground Beetle				S2S3	
<i>Elaphrus californicus</i>	a Ground Beetle				S2S3	
<i>Elaphrus olivaceus</i>	a Ground Beetle				S2S3	
<i>Gastrellarius honestus</i>	a Ground Beetle				S2S3	
<i>Harpalus caliginosus</i>	a Ground Beetle				S1S2	
<i>Harpalus compar</i>	a Ground Beetle				S1S2	
<i>Harpalus fuscipalpis</i>	a Ground Beetle				S1S2	
<i>Harpalus indigens</i>	a Ground Beetle				S2S3	
<i>Harpalus laevipes</i>	a Ground Beetle				S1S2	
<i>Harpalus laticeps</i>	a Ground Beetle				S2S3	
<i>Harpalus lewisii</i>	a Ground Beetle				S1S2	
<i>Harpalus nigratarsis</i>	a Ground Beetle				S1S2	
<i>Lachnocrepis parallela</i>	a Ground Beetle				S1S2	
<i>Lebia moesta</i>	a Ground Beetle				S2S3	
<i>Lebia pumila</i>	a Ground Beetle				S2S3	
<i>Lebia solea</i>	a Ground Beetle				S1S2	
<i>Lebia tricolor</i>	a Ground Beetle				S2S3	
<i>Lebia vittata</i>	a Ground Beetle				S2S3	
<i>Microlestes linearis</i>	a Ground Beetle				S2S3	
<i>Mioptachys flavicauda</i>	a Ground Beetle				S1S2	
<i>Miscodera arctica</i>	a Ground Beetle				S2S3	
<i>Nebria pallipes</i>	a Ground Beetle				S1S2	
<i>Notiophilus semistriatus</i>	a Ground Beetle				S1S2	
<i>Olisthopus parmatus</i>	a Ground Beetle				S2S3	
<i>Omophron labiatum</i>	a Ground Beetle				S1S2	
<i>Omophron tessellatum</i>	a Ground Beetle				S2S3	
<i>Oxypselaphus pusillus</i>	a Ground Beetle				S2S3	
<i>Platynus cincticollis</i>	a Ground Beetle				S1S2	
<i>Platynus indecens</i>	a Ground Beetle				S1S2	

<i>Polyderis laevis</i>	a Ground Beetle				S1S2	
<i>Pterostichus commutabilis</i>	a Ground Beetle				S2S3	
<i>Pterostichus corvinus</i>	a Ground Beetle				S1S2	
<i>Pterostichus punctatissimus</i>	a Ground Beetle				S1S2	
<i>Scaphinotus bilobus</i>	a Ground Beetle				S1S2	
<i>Scaphinotus viduus</i>	a Ground Beetle				S1S2	
<i>Selenophorus gagatinus</i>	a Ground Beetle				S1S2	
<i>Sericoda obsoleta</i>	a Ground Beetle				S2S3	
<i>Sericoda quadripunctata</i>	a Ground Beetle				S1S2	
<i>Sphaeroderus nitidicollis</i>	a Ground Beetle				S2S3	
<i>Stenolophus humidus</i>	a Ground Beetle				S1S2	
<i>Trechus crassiscapus</i>	a Ground Beetle				S1S2	
<i>Cicindela formosa</i>	Big Sand Tiger Beetle				S1S2	
<i>Cicindela marginata</i>	Margined Tiger Beetle				S1S2	
<i>Coccinella transversoguttata</i>	Transverse Ladybird Beetle				S1S2	
<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle				S1S2	
<i>Diomus amabilis</i>	a Ladybird beetle				S2S3	
<i>Naemia seriata</i>	a Ladybird beetle				S2S3	
<i>Amblyscirtes hegon</i>	Pepper and Salt Skipper				S2	Found on the edges of forests and streams. Larvae found feeding on a variety of grass species.
<i>Amblyscirtes vialis</i>	Common Roadside-Skipper				S2	Found in trails, roads in wooded areas and often near streams. Larvae are found feeding off of a variety of grass species.
<i>Erynnis juvenalis</i>	Juvenal's Duskywing				S2S3	
<i>Hesperia comma</i>	Common Branded Skipper				S3	
<i>Hesperia comma laurentina</i>	Laurentian Skipper				S3	
<i>Thorybes pylades</i>	Northern Cloudywing				S2	A variety of brushy or wooded habitats with legumes, including some non-native ones. Not as limited to dry sites as T. BATHYLLUS but they often co-occur
<i>Callophrys augustinus helenae</i>	Brown Elfin				S3	
<i>Callophrys henrici</i>	Henry's Elfin				S2	
<i>Callophrys henrici henrici</i>	Henry's Elfin				S2	
<i>Callophrys lanoraieensis</i>	Bog Elfin				S1S2	
<i>Callophrys niphon</i>	Eastern Pine Elfin				S2	
<i>Callophrys niphon clarki</i>	Eastern Pine Elfin				S2	
<i>Callophrys polios</i>	Hoary Elfin				S3S4	
<i>Callophrys polios polios</i>	Hoary Elfin				S3S4	
<i>Erora laeta</i>	Early Hairstreak				S1	habitats are always in hardwood forests or hardwood-northern conifer mixed forests, although like most hairstreaks a few adults sometimes turn up on flowers away from the woods--at least southward. Beech-maple forests seem most typical, but more mixed types can also have populations. Most habitats contain a lot of beech, but collections have been reported where beech was not present in the immediate area (Sullivan, 1971, Allen, 1997), often single individuals on flowers. Nearly all records are from hilly or mountainous regions.
<i>Feniseca tarquinius</i>	Harvester				S3S4	
<i>Lycaena dorcas</i>	Dorcas Copper				S1	

<i>Lycaena dospassosi</i>	Salt Marsh Copper				S2	
<i>Lycaena hyllus</i>	Bronze Copper				S1	
<i>Plebejus saepiolus</i>	Greenish Blue				S1	
<i>Plebejus saepiolus amica</i>	a Greenish Blue				S1	
<i>Satyrium acadica</i>	Acadian Hairstreak				S1	
<i>Satyrium acadica acadica</i>	Acadian Hairstreak				S1	
<i>Satyrium calanus</i>	Banded Hairstreak				S2	
<i>Satyrium calanus falacer</i>	Banded Hairstreak				S2	
<i>Satyrium liparops</i>	Striped Hairstreak				S3	Found in deciduous forest edges, gardens and roadsides. Larvae found feeding off of members of the Rosaceae family such as plum and cherries (<i>Prunus</i> spp.). Occurrences with Oak (<i>Quercus</i> spp.), Willow (<i>Salix</i> spp.) and Blueberry (<i>Vaccinium</i> spp.).
<i>Satyrium liparops strigosum</i>	Striped Hairstreak				S3	
<i>Strymon melinus</i>	Grey Hairstreak				S2	
<i>Papaipema sp. 6</i>	Sable Island Papaipema				S1?	
<i>Aglais milberti</i>	Milbert's Tortoiseshell				S2	
<i>Aglais milberti milberti</i>	Milbert's Tortoise Shell				S2	
<i>Boloria chariclea</i>	Arctic Fritillary				S2	Cool moist meadows north and westward; south and eastward boreal woodlands and bogs (Layberry et al., 1998). Near and above timberline in New Hampshire but usually below in other mountains. Habitats vary by subspecies
<i>Boloria chariclea grandis</i>	Purple Lesser Fritillary				S2	
<i>Chlosyne nycteis</i>	Silvery Checkerspot				S2	
<i>Chlosyne nycteis nycteis</i>	Silvery Checkerspot				S2	
<i>Danaus plexippus and var. plexippus</i>	Monarch	SC	SC		S2B	Almost anywhere during the spring (northward) migration; near the larval foodplants during the breeding season; in the fall commonly near the coast, often in large numbers, all heading south. Larvae are found feeding on the following Milkweed species: Common Milkweed (<i>Asclepias syriaca</i>) and Swamp Milkweed (<i>A. incarnata</i>), neither of which are abundant plants in Nova Scotia. Butterfly surveys for monarchs should be conducted in areas with potential to support milkweed species in mid to late summer and should be conducted by someone familiar with milkweed species.
<i>Euphydryas phaeton</i>	Baltimore Checkerspot				S3	Found in fresh-water marshes, wet roadsides and meadows. Larvae found feeding on Turtlehead (<i>Chelone glabra</i>) and has been reported to feed on beardtongue (<i>Penstemon digitalis</i>).
<i>Euphydryas phaeton phaeton</i>	Baltimore Checkerspot				S3	
<i>Lethe anthedon</i>	Northern Pearly-Eye				S3	Found in moist and dominated by graminoids in the herbaceous layer of forests. Larvae feed off of woodland grasses such as Bearded Shortgrass (<i>Brachyelytrum erectum</i>) and False Melic Grass (<i>Schizachne purpurascens</i>).
<i>Megisto cymela</i>	Little Wood-satyr				S3S4	

<i>Nymphalis l-album</i>	Compton Tortoiseshell				S1S2	
<i>Nymphalis l-album j-album</i>	Compton Tortoiseshell				S1S2	
<i>Oeneis jutta</i>	Jutta Arctic				S1	Usually black spruce bogs, moist taiga, moist tundra; dry lodgepole pine woodland from Colorado north to Alberta and British Columbia. Usually very near and often perching on trunks of conifers
<i>Oeneis jutta ascerta</i>	Jutta Arctic				S1	
<i>Polygonia comma</i>	Eastern Comma				S2	
<i>Polygonia faunus</i>	Green Comma				S3	
<i>Polygonia faunus faunus</i>	Green Comma				S3	
<i>Polygonia gracilis</i>	Hoary Comma				S1	A boreal forest species. Eastward most likely where currants (Ribes) are common and not south of (or below) regions where spruce and fir are common. Westward apparently mostly montane coniferous forests often near streams. At least in the west adults wander to other habitats.
<i>Polygonia gracilis gracilis</i>	Hoary Comma				S1	
<i>Polygonia interrogationis</i>	Question Mark				S3B	Usually found near woodland linear disturbances such as trail and roads as well as in wood city parks. Larvae found feeding off of Nettles (urtica sp.), Elms and Hops (humulus sp.).
<i>Polygonia satyrus</i>	Satyr Comma				S1	Apparently much like P. COMMA generally near trees but probably can breed in almost any setting with nettles. It is primarily a boreal forest and woodland species often near streams
<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3S4	
<i>Speyeria aphrodite winni</i>	Aphrodite Fritillary				S3S4	
<i>Papilio brevicauda</i>	Short-tailed Swallowtail				S1S2	Within its limited range it can be found in a variety of habitats. Some of these such as gardens are mainly nectaring areas for adults but apparently at least in Newfoundland almost any kind of open habitat with suitable umbellifers can be breeding habitat. Most often seen in rocky coastal situations such as sea cliffs, rocky beaches, headlands etc. Also occurs occasionally in inland meadows and near or above treeline such as on the upper slopes of Mont-Albert.
<i>Papilio brevicauda bretonensis</i>	Short-tailed Swallowtail				S1S2	
<i>Pieris oleracea</i>	Mustard White				S2	Found in deciduous woods and bogs. Larvae feed off of various plants belonging to the Brassicaceae (mustard) family.
<i>Pieris oleracea oleracea</i>	Eastern Veined White				S2	
<i>Aedes aurifer</i>	a Mosquito				S2S3	
<i>Aedes dorsalis</i>	a Mosquito				S2S3	
<i>Aedes euedes</i>	a Mosquito				S2S3	
<i>Aedes implicatus</i>	a Mosquito				S2S3	
<i>Aedes riparius</i>	a Mosquito				S2S3	
<i>Culiseta impatiens</i>	a Mosquito				S2S3	
<i>Simulium rothfelsi</i>	Rothfel's Black Fly				S2S3	

<i>Alasmidonta undulata</i>	Triangle Floater				S2S3	Frequently found in stream and rivers in sand and gravel substrates.
<i>Alasmidonta varicosa</i>	Brook Floater	SC	SC	Threatened	S1S2	Flowing rivers of creeks with stable sand or gravel substrate. Confirmed in the following watersheds: Salmon (Guysborough County), St. Marys, Wallace, French River (Mattatall Lake), Gays, Annapolis and LaHave Rivers
<i>Lampsilis radiata</i>	Eastern Lampmussel				S2	This species inhabits a variety of aquatic habitats, including small streams, large rivers, ponds, and lakes. It is found on a wide variety of substrate types, but prefers sand or gravel
<i>Strophitus undulatus</i>	Creeper				S1	This species is a habitat generalist, with a wide distribution. It is usually found in streams and rivers in a range of flow conditions (rarely in high-gradient streams of mountainous regions) but can tolerate lakes and ponds, particularly in outlets.
<i>Amphiagrion saucium</i>	Eastern Red Damselfly				S3	
<i>Coenagrion interrogatum</i>	Subarctic Bluet				S1	
<i>Enallagma signatum</i>	Orange Bluet				S1	
<i>Enallagma vesperum</i>	Vesper Bluet				S2S3	
<i>Epeoloides pilosula</i>	Macropis Cuckoo Bee		E	Endangered	S1	This species is a habitat specialist, requiring both a suitable host (Macropis bees) and their host's foodplant. The foodplant requires moist habitat and the host bee requires sunny, sandy slopes for its nest site. Historically in Canada, this species was known from six sites across five provinces. Despite recent increases in bee surveying activity nationwide, it has been found in Canada only once in the past fifty years and has not been seen again
<i>Margaritifera margaritifera</i>	Eastern Pearlshell				S2	Found in streams and small rivers that support trout or salmon populations and exists in a variety of substrate. Wallace River, Salmon River (Guysborough County), North and East Branch St. Mary's River.

Common name	pop.	SARA	COSEWIC	NSESA	SRank	Habitat Requirements
<i>Salmo salar</i>	Atlantic Salmon - Southern Uplands Population		E		S2	Found in freshwater rivers and streams that are clear, cool, and well oxygenated, with gravel, cobble, or boulder bottoms.
<i>Rhinichthys atratulus</i>	Blacknose Dace				S3	The blacknose dace is common in cool, clear, gravel bottom rivers and streams, however it can survive in slow moving or stagnant waters.
<i>Culaea inconstans</i>	Brook Stickleback				S3	This species generally occupies cool, clear, heavily weeded, spring-fed creeks, small rivers, lakes, and ponds, usually in shallow, quiet to flowing pools and backwaters over sand or mud. Sometimes it burrows into soft bottoms. Occasionally this fish can be found in brackish water. In a lake in Manitoba, adults were most abundant at the outer margin of emergent vegetation (Moodie 1986). Eggs are deposited in a nest made of plant material by the male just above the bottom in shallow water
<i>Perimyotis subflavus</i>	Eastern Pipistrelle	E	E	Endangered	S1	Prefers partly open country with large trees and woodland edges. Avoids deep woods and open fields. Probably roosts in the summer in tree foliage and occasionally in buildings; may use cave as night roost between foraging forays. Usually hibernates in caves and mines with high humidity. Generally, maternity colonies utilize manmade structures or tree cavities; often in open sites that would not be tolerated by most other bats
<i>Lasiurus borealis</i>	Eastern Red Bat				S1	The red bat lives in forests, forest edges and hedgerows. It roosts among foliage, usually in deciduous trees, but it will sometimes roost in coniferous trees.
<i>Pekania pennanti</i>	Fisher				S2	Fishers inhabit upland and lowland forests, including coniferous, mixed, and deciduous forests. They occur primarily in dense coniferous or mixed forests, including early successional forest with dense overhead cover. Fishers commonly use hardwood stands in summer but prefer coniferous or mixed forests in winter. They generally avoid areas with little forest cover or significant human disturbance. Cape Breton Population is provincially endangered.
<i>Hemidactylium scutatum</i>	Four-toed Salamander		NAR		S3	The habitat of the four-toed salamander is moist mossy woods, particularly in peat moss. Peat bogs or mossy areas bordering streams are good breeding sites. Adults lay eggs deep between the moss plants. The little larvae live in the water for a short while, then move to live on land. The four-toed salamander is the least common salamander species in Nova Scotia, and most reports are from the south central part of the province.
<i>Lasiurus cinereus</i>	Hoary Bat				S1	Hoary bats are thought to be rare in Nova Scotia. Insectivorous, migratory. Poorly known. Authorities disagree as to the bat's preference for coniferous versus broadleaf trees. Hoary bats are thought to prefer trees at the edge of clearings, but have been found in trees in heavy forests, open wooded glades, and shade trees along urban streets and in city parks.
<i>Osmerus mordax (landlocked)</i>	Landlocked Rainbow Smelt				S3	Landlocked populations of rainbow smelt occur in freshwater lakes and ponds throughout the Atlantic region.
<i>Myotis lucifugus</i>	Little Brown Myotis	E	E	Endangered	S1	For <i>Myotis lucifugus</i> , the maternity colonies often exist in warm sites that facilitate pup growth rates, such as attics of buildings and under bridges, in rock crevices, or in cavities of canopy trees in forests. Males roost during daytime in a wide variety of structures, including buildings and bridges (mainly <i>M. lucifugus</i>), rock crevices, behind flaking bark, and within tree cavities, often at many different sites during the summer. <i>Myotis</i> species generally roost in tall, large-diameter snags that are in the early to middle stages of decay and located in open areas within mature-overmature forest. <i>Myotis lucifugus</i> congregates in caves and abandoned mines used for hibernation through the winter. About 16 hibernation sites are known in Nova Scotia.
<i>Sorex maritimensis</i>	Maritime Shrew				S3	The maritime shrew is most often found in marshes and wet meadows. It is only found in two provinces in Canada: New Brunswick and Nova Scotia.

<i>Alces americanus</i>	Moose			Endangered	S1	Moose are herbivores who live in boreal and mixed-wood forests. They are often found where there is an abundance of food (twigs, stems, and foliage of young deciduous trees and shrubs). In spring, islands and peninsulas are often used by cows when giving birth. In summer, access to wetlands (and aquatic vegetation) is important.
<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	E	E	Endangered	S1	The Northern Long-eared Bat (<i>Myotis septentrionalis</i>) is found in many regions of Canada. Although there are numerous records of its presence in eastern Canada and the United States, it has only been recorded sporadically in the west. This particular type of bat has two habitats: a winter hibernation habitat as well as a summer roosting and foraging habitat. The Northern Long-eared Bat hibernates in caves or abandoned mines during the cold winter months. During the summer months the Bats commonly use crevices behind peeling bark or cavities in partially-decayed trees as summer day roosts. Within thick forests, summer activity may be focused along watercourses and small ponds
<i>Margariscus margarita</i>	Pearl Dace				S2	Cool, clear headwater streams in the south, bog drainage streams, ponds and small lakes in the north, and in stained, peaty waters of beaver ponds" (Scott and Crossman 1973). Usually over sand or gravel (Page and Burr 1991). Spawns in clear water over sand or gravel in weak or moderate current (Scott and Crossman 1973).
<i>Microtus chrotorrhinus</i>	Rock Vole				S2	Optimal habitat for the rock vole is ferns/mossy debris near flowing water in coniferous forests. It also occupies deciduous forest/spruce clearcuts (mainly recent cuts), forest ecotones, grassy balds near forest, and sterile-looking rocky road fills. Occupies shallow burrows and runways. Nests probably are placed under logs or in similar protected sites. They are made of moss with a lining of grass and have multiple entrance tunnels. Breeding season is from March to mid-October.
<i>Lasionycteris noctivagans</i>	Silver-haired Bat				S1	Scarce in eastern Canada. During the summer months, silver-haired bats are found in forested habitats, particularly coniferous woodlands, adjacent to aquatic habitats like ponds, lakes and streams. Both sexes fly south between the middle of August and early October.
<i>Chelydra serpentina</i>	Snapping Turtle	SC	SC	Vulnerable	S3	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
<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3S4	The southern bog lemming is rarely found in bogs in Nova Scotia; generally rare and very local in forest habitats, especially rocky ones, except on periphery of Cape Breton Highlands where it is fairly common on forested talus slopes.
<i>Glaucomys volans</i>	Southern Flying Squirrel		NAR		S2S3	Southern Flying Squirrels inhabit hardwood forests in eastern North America. Dead hollow trees are used as den sites.
<i>Glyptemys insculpta</i>	Wood Turtle	T	T	Threatened	S2	Habitat destruction and fragmentation due to intense development and accompanying stream alterations are serious problems in the southeastern portion of the Wood Turtle's range. protection of wooded stream corridors, nesting, feeding, basking, and overwintering sites, and an upland buffer would be necessary to include in preserve design Lives along permanent streams during much of each year, but in summer may roam widely overland and can be found in a variety of terrestrial habitats adjacent to streams, from deciduous woods, cultivated fields, and woodland bogs, to marshy pastures. Use of woodland bogs and marshy fields is most common in the northern part of the range
<i>Puma concolor pop. 1</i>	Cougar - Eastern pop.	DD	DD		SH	Dense hardwood forests of eastern Canada
<i>Anguilla rostrata</i>	American Eel		T		S5	move from salt water into fresh water when quite young and spend their adult life in fresh water returning to spawn in tropical oceans up to several decades later. Widely distributed in freshwaters, estuaries and coastal marine waters connected to the Atlantic Ocean. Although small streams may be critical to the persistence of eels in a watershed, they may use these streams only once or twice a year, while moving to and from more preferred habitats.

<i>Thamnophis sauritus septentrionalis</i>	Ribbonsnake - Eastern Atlantic pop.	T	T		SNR	Eastern Ribbonsnakes are found in a variety of wetland habitats with both flowing and standing water such as marshes, bogs, fens, ponds, lake shorelines and wet meadows.
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family	Scientific Name	Common Name	SARA	COSEWIC	NESA	SRank	Habitat Requirements
Ardeidae	<i>Botaurus lentiginosus</i>	American Bittern				S3S4B	Preferred habitats of the American Bittern include freshwater wetlands with tall emergent vegetation. In Nova Scotia, it occurs widely in most regions, but is scarce on the Atlantic slope and Cape Breton Island, where marshes are few and relatively infertile.
Rallidae	<i>Fulica americana</i>	American Coot		NAR		S1B	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 Nova Scotia have been in the New Brunswick-Nova Scotia border region, with a single record in northern Nova Scotia.
FALCONIDAE	<i>Falco sparverius</i>	American Kestrel				S3B	American Kestrels favor open areas with short ground vegetation and sparse trees. Observed in meadows, grasslands, deserts, parks, farm fields, cities, and suburbs. The southeastern U.S. form breeds in unusual longleaf pine sandhill habitat. When breeding, kestrels need access to at least a few trees or structures that provide appropriate nesting cavities. American Kestrels are attracted to many habitats modified by humans, including pastures and parkland, and are often found near areas of human activity including towns and cities.
TURDIDAE	<i>Turdus migratorius</i>	American Robin				S5B,S3N	American Robins are common across the continent in gardens, parks, yards, golf courses, fields, pastures, tundra, as well as deciduous woodlands, pine forests, shrublands, and forests regenerating after fires or logging.
Picidae	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S1?	The American Three-toed Woodpecker is the most northerly woodpecker species; it breeds in boreal coniferous forests nearly to the arctic tree-line. Breeding of this species in Nova Scotia is limited to Cape Breton Island.
Icteridae	<i>Icterus galbula</i>	Baltimore Oriole				S2S3B	The Baltimore Oriole is an adaptable species (found breeding in diverse habitats), but typically favors woodland edge (especially riparian) and open areas with scattered trees; strong preference for deciduous over coniferous trees. During spring and fall migration, it is found in variety of habitats, but generally favors open woodlands, woodland margins, hedgerows, and urban parks.
Hirundinidae	<i>Riparia riparia</i>	Bank Swallow		T		S2S3B	The Bank Swallow breeds wherever suitable nesting sites in banks and cliffs are available. Nesting colonies are usually found near open areas, and often close to water. Bank Swallows will also nest in artificial banks, such as road cuttings and gravel pits. Found in all regions of the Maritimes, but scarce in many inland forested areas.
Anatidae	<i>Bucephala islandica (Eastern pop.)</i>	Barrow's Goldeneye - Eastern pop.	SC	SC		S1N	During the breeding period, Barrow's Goldeneye use small lakes (< 15 ha) located at high altitudes (> 500 m) in areas characterized by rugged terrain for mating and rearing their young. They prefer fishless lakes and lakes at the head of watershed. They seldom make their nests near water and their breeding range is restricted to areas with suitable nest sites, thus nest cavities in dead or dying trees, including conifers, and deciduous trees. In the winter, it is closely associated with large rocky intertidal areas that support dense populations of brown algae. During moulting they congregate in areas similar to those they use in the winter.
Parulidae	<i>Dendroica castanea</i>	Bay-breasted Warbler				S3S4B	The Bay-breasted Warbler is one of the less widespread warblers, breeding in a narrow band across the closed boreal forests from northeast British Columbia to western Newfoundland, and south just into the U.S.A. Although during migrations and while foraging it is often seen in mixed stands, this bird nests only in conifers. Reaching highest densities in Balsam Fir forest infested with spruce budworm.
Turdidae	<i>Catharus bicknelli</i>	Bicknell's Thrush	T	T	Endangered	S1S2B	The Bicknell's Thrush is a habitat specialist, generally associated with undisturbed dense habitat or disturbed areas undergoing vigorous succession (mid-successional) of Balsam Fir-dominated habitat and high stem densities (>10,000-15,000 stems/ha). In Nova Scotia, the Bicknell's Thrush occupies coastal maritime spruce-fir forests; breeding in the Northern Highlands of Cape Breton Island as well as nearby St. Paul and Scaterie Islands. During spring and fall migration, it is reported as being a habitat generalist.

Picidae	<i>Picoides arcticus</i>	Black-backed Woodpecker				S3S4	In the Maritimes, the Black-backed Woodpecker is widely but thinly distributed in conifer forests throughout, becoming more common farther north. The Black-backed Woodpecker is very local in southwest Nova Scotia. These birds forage on trees damaged by forest insects, especially bark beetles, and their characteristic flaking-off of bark fragments in search of food can be an aid in detecting them. Nests here are often in quite open situations, such as cut-over areas, open jack pine stands, and the edges of woodland gardens.
Cuculidae	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B	In the northern parts of its range, the black-billed cuckoo's numbers vary greatly from year to year in response to outbreaks of both the forest and orchard species of tent caterpillars, on which it feeds. It is associated with open woodland and forest edge and nests in small trees and tall shrubs.
Ardeidae	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1B	The few colonies of black-crowned night-herons in the Maritimes represent easterly outliers of a more continuous range along the Atlantic coast and in the St. Lawrence Valley. Except near Edmundston, all known breeding here is coastal, usually on islands and often with Great Blue Herons, the only common colonial heron in the Maritimes. Most colonies are in spruce or fir, the common trees in coastal areas.
Laridae	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S3N	Breeds along lakes, rivers, bogs, moors, grasslands, swamps, and coastal marshes. In winter, found primarily along seacoasts, estuaries, and bays.
Parulidae	<i>Dendroica striata</i>	Blackpoll Warbler				S3S4B	In the Maritimes, the blackpoll warbler breeds mainly in cool, damp spruce forests. During spring and fall migration, it uses a variety of habitats, although often partial to spruces, even when they are only a small component of the habitat.
Anatidae	<i>Anas discors</i>	Blue-winged Teal				S3S4B	The Blue-winged Teal is a bird of open, fertile marshes, including brackish areas around estuaries; scarcity of such habitats is reflected in its discontinuous range away from the coasts in the Maritimes, except in Prince Edward Island. It was virtually lacking from many upland regions of both New Brunswick and Nova Scotia.
Icteridae	<i>Dolichonyx oryzivorus</i>	Bobolinks		T	Vulnerable	S3S4B	The distribution of bobolinks in the Maritimes, expectably in a largely forested region, is patchy; they were not found in large areas of north and central New Brunswick, nor in parts of southwest and eastern mainland Nova Scotia, nor in the Cape Breton Highlands. Preferred habitat is lush meadows and open habitats.
Paridae	<i>Poecile hudsonica</i>	Boreal Chickadee				S3	The Boreal chickadee prefers conifer, and especially spruce, forests all across the northern regions of Canada. Boreal Chickadees are found in all parts of the Maritimes. Most are residents, but some wander after breeding season.
Strigidae	<i>Aegolius funereus</i>	Boreal Owl		NAR		S2?B	The Boreal owl breeds across the boreal forests of North America and Eurasia, and nests in woodpecker holes and other tree cavities. In Nova Scotia, the only breeding records are from Cape Breton island.
Mimidae	<i>Toxostoma rufum</i>	Brown Thrasher				S1B	The brown thrasher frequents shrubbery, thickets, and wood-edges rather than forest. No confirmed reports of breeding exist for Nova Scotia.
Icteridae	<i>Molothrus ater</i>	Brown-headed Cowbird				S2B	The brown-headed cowbird mainly breeds in settled areas, this species is widespread in the Maritimes, but is virtually absent in the forested regions of northern and central New Brunswick and eastern Nova Scotia. Farming areas in southern New Brunswick, central Nova Scotia, and central Prince Edward Island had more continuous Cowbird distribution than elsewhere. Species most frequently parasitized in the Maritimes, relative to the numbers of their nests found, were Veery, Solitary and Red-eyed Vireos; Chestnut-sided, Magnolia, Yellow-rumped, and Blackand- White Warblers; and American Redstart.

Anatidae	<i>Bucephala albeola</i>	Bufflehead				S3S4N	Bufflehead breed near ponds and lakes in boreal forest and aspen parkland of Canada and Alaska, with isolated populations in the western United States. The Bufflehead's breeding range is limited by the distribution of Northern Flickers, which are their main source of nesting cavities. Bufflehead are North America's smallest diving duck; they benefit by using old flicker nests that larger ducks such as goldeneyes and mergansers cannot fit into. In winter they occur mainly near the coast (although they can be found in smaller numbers inland). They use shallow, sheltered coves, harbors, estuaries, or beaches, avoiding open coastlines. Inland, they use ponds, lakes, impoundments, or bays along slow-moving rivers. During spring migration they spend time on major rivers or valley lakes, often in the first spots to become free of ice.
Parulidae	<i>Wilsonia canadensis</i>	Canada Warbler	T	T	Endangered	S3S4B	In Nova Scotia, the Canada warbler has only been found sparsely on Cape Breton Island and in the extreme southwest of the province. They are less predictable from habitat than most warblers, they are usually found in dense understory vegetation of mature to mid-aged mixed forest, most closely associated with broad-leaved trees and shrubs, but with conifers usually present too.
Parulidae	<i>Dendroica tigrina</i>	Cape May Warbler				S2B	In summer, the Cape May warbler is found in northern conifer forests. One of several warbler species that attain high densities during spruce budworm outbreaks, but is more usual in mature spruces than in balsam fir stands. Activity is mostly at the tops of tall spruces. Rarely observed in the southwest of Nova Scotia due to unsuitable habitat.
Apodidae	<i>Chaetura pelagica</i>	Chimney Swift	T	T	Endangered	S2B,S1M	The chimney swift is most often seen on the wing and while entering their nesting places; these are often in chimneys or old cabins in the forest, but most swifts originally nested, and still nest in hollow trees.
Hirundinidae	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B	Cliff swallows are sparse in Nova Scotia, especially farther east and towards the Atlantic coast, where the humid climate may make the mud nests less stable than in drier areas. Historically they inhabited open canyons, foothills, escarpments, and river valleys that offered a vertical cliff face with a horizontal overhang for nest attachment. With the present use of artificial nesting structures such as bridges and buildings, the species is now found in a wide variety of habitats: grasslands, towns, broken forest, riparian edge. Avoids heavy forest, desert, and alpine areas. Most colony sites are located near open fields or pastures where the birds forage, and a water source is often nearby. Proximity to mud source (for nest-building) is often cited as a breeding-habitat requirement, although some colonies are located several kilometers from the nearest mud supply.
Anatidae	<i>Bucephala clangula</i>	Common Goldeneye				S2B,S5N	The common goldeneye breeds in the boreal forest. A tree cavity nester, it breeds only in wooded areas, sometimes in nest boxes. No breeding records for mainland Nova Scotia, but breeding has been observed in the valleys of northern Cape Breton Island.
Caprimulgidae	<i>Chordeiles minor</i>	Common Nighthawk	T	T	Threatened	S2S3B	Common nighthawks nest on sparsely vegetated or bare ground in open "wastelands" such as pine barrens, forest cut-overs, or burns, and secondarily on flat roofs of buildings.
Laridae	<i>Sterna hirundo</i>	Common Tern		NAR		S3B	The range of the common tern includes inland as well as coastal areas, where shallow waters for fishing occur near sandy or gravelly shores for nesting; it does not forage far out to sea.
Accipitridae	<i>Accipiter cooperii</i>	Cooper's Hawk		NAR		S1?B	The Cooper's hawk is a bird of broad-leaved and mixed woodlands, often hunting along wood-edges in settled areas.
Turdidae	<i>Sialia sialis</i>	Eastern Bluebird		NAR		S3B	The Eastern bluebird nests in woodpecker holes, as well as nest-boxes. They forage in open areas of low vegetation with scattered trees for nesting.

Tyrannidae	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3B	In its breeding range, the eastern kingbird uses open environments; usually breeds in fields with scattered shrubs and trees, orchards, along shelterbelts, and especially along woodland edges in forested regions. A “savannah species”, but given suitable nest sites and perches, will nest in many other habitats—e.g., desert riparian, quaking aspen (<i>Populus tremuloides</i>) parkland, recently burned forest, beaver ponds, golf courses and forested river valleys, and urban environments with tall trees and scattered open spaces. Also appears drawn to water; often nests densely in trees that overhang water or in dead, standing snags surrounded by water.
Tyrannidae	<i>Contopus virens</i>	Eastern Wood-Pewee		SC	Vulnerable	S3S4B	The eastern wood-peewee is a bird of openings and edges more than of closed forest, in the Maritimes, and they readily use well-spaced shade trees in rural and urban settlements. Associated with broad-leaved trees.
Fringillidae	<i>Coccothraustes vespertinus</i>	Evening Grosbeak				S3S4B,S3N	Evening Grosbeaks breed in mature and second-growth coniferous forests of northern North America and the Rocky Mountains, including spruce-fir, pine-oak, pinyon-juniper, and aspen forests. Less commonly, they nest in deciduous woodlands, parks, and orchards. They breed as far south as Mexico at 5,000–10,000 feet of elevation in pine and pine-oak woodlands. In winter Evening Grosbeaks live in coniferous forest and deciduous forest as well as in urban and suburban areas. When wintering in urban environments they are most abundant in small woodlots near bird feeders.
Emberizidae	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B	The fox sparrow is often associated with dense damp shrubbery of alders and other small broad-leaved trees in its inland range. On Nova Scotia's outer coasts, they will also frequent stunted spruces and shrubby bogs.
Anatidae	<i>Anas strepera</i>	Gadwall				S2B	In Canada, the Gadwall prefers brush habitat dominated by woody vegetation. Seasonal and semipermanent wetlands with vegetation-water ratios near 1:1 are important as habitat for nesting pairs. Stock ponds also may provide nesting habitat when natural wetlands are limited. In areas with intensive agriculture, uses untilled upland habitat almost exclusively. In terms of preferred brood habitat, emergent vegetation provides escape cover, and open water with submerged vegetation provides food for ducklings. During molting, they use large marshes or lakes with heavily vegetated margins, which provide abundant food, dense cover for concealment, resting areas, and isolation from disturbance. During spring and fall migration, they use large and small reservoirs, beaver ponds, farm ponds, and coastal marshes providing abundant food.
Mimidae	<i>Dumetella carolinensis</i>	Gray Catbird				S3B	The gray catbird inhabits shrubbery in both upland and river-edge situations, mostly in areas where tree cover is of broad-leaved species. The Maritimes are at the northeast edge of its range, and catbirds are nearly absent in upland areas of northern New Brunswick, in Prince Edward Island and Cape Breton Island, as well as in regions with extensive conifer forest cover.
Corvidae	<i>Perisoreus canadensis</i>	Gray Jay				S3	Winters in the understory of tropical forests.
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant				S2S3	On migration it uses wooded sites with a thick understory.
Tyrannidae	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S1B	A bird of the eastern broad-leaved region. Nests in tree cavities and nest boxes. Sparse breeding records in southwestern Nova Scotia.
Scolopacidae	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S3B,S3S4M	During migration, the greater yellowlegs is a familiar sight in salt marshes and around ponds and rivers, but their breeding habitat is very different. Yellowlegs breed in wooded bogs and muskegs across the boreal forest from northern British Columbia and Mackenzie to Labrador, Newfoundland and eastern Nova Scotia.
Cardinalidae	<i>Passerina cyanea</i>	Indigo Bunting				S1?B	The indigo bunting breeds through much of the eastern temperate broad-leaved forest region. This is a bird of forest-edges, thickets, and shrubbery rather than woodland. A few breeding records exist in southwest Nova Scotia.
SCOLOPACIDAE	<i>Tringa flavipes</i>	Lesser Yellowlegs				S3M	Breeds in open boreal forest with scattered shallow wetlands. Winters in wide variety of shallow fresh and saltwater habitats.
Strigidae	<i>Asio otus</i>	Long-eared Owl				S2S3	The long-eared owl frequents woodlands large or small, dense or open, conifer or broad-leaved, at all seasons, but it also forages over open areas.

Troglodytidae	<i>Cistothorus palustris</i>	Marsh Wren				S1B	Though it uses salt-marsh further south, the marsh wren is strictly a bird of freshwater marshes in Canada.
	<i>Ammodramus nelsoni</i>	Nelson's Sparrow				S3S4B	Freshwater marshes and wet meadows in interior and brackish marshes along coast; in winter in salt and brackish marshes.
Accipitridae	<i>Accipiter gentilis</i>	Northern Goshawk		NAR		S3S4	Though it is more generally found in the boreal forest region, likely because less often disturbed there, the Northern goshawk is also widespread in more temperate habitats. It nests in most forest types found throughout its geographic range. In eastern deciduous forests, Goshawks prefer nesting in mature, mixed hardwood-hemlock stands of birch (<i>Betula</i> sp.), beech (<i>Fagus</i> sp.), maple (<i>Acer</i> sp.), and eastern hemlock. Found scattered throughout the forests of the Maritimes. Hunts in diverse habitats ranging from open-sage steppes to dense forests, including riparian areas.
ACCIPITRIDAE	<i>Circus cyaneus</i>	Northern Harrier				S3S4B	Northern Harriers breed in freshwater and brackish marsh, lightly grazed meadows, old fields, tundra, dry upland prairies, drained marshlands, and riparian woodlands. They are common in large, undisturbed tracts of wetland and grasslands with low, thick vegetation.
Mimidae	<i>Mimus polyglottos</i>	Northern Mockingbird				S1B	The Northern mockingbird uses open habitats with scattered shrubs and small trees. In the East, typical habitats are parkland, cultivated lands, and early successional habitat at low elevations. Throughout its range found in suburban and urban habitats such as gardens and cemeteries, especially favoring mowed lawns adjacent to bare areas (e.g. concrete, asphalt, and sidewalks) with access to shrubs or hedges for cover and nesting. Absent from the interior of all forested habitat but frequents forest edge. Found in the same habitat year-round.
Anatidae	<i>Anas acuta</i>	Northern Pintail				S1B	The Northern pintail typically nests in open country with shallow, seasonal, or intermittent wetlands and low vegetation. Adults with broods use shallow seasonal and semipermanent wetlands with abundant emergent cover (e.g., sedge, cattail, bulrush). Interspersion of emergent vegetation with open water provides food resources and escape cover. Postbreeding males are commonly found on large, shallow marshes with extensive emergent and submersed vegetation that provide abundant cover and food and minimal human disturbance. No direct information on habitats used by females following nesting. During spring and fall migration, uses shallow wetlands and flooded agriculture when not frozen, larger lakes and reservoirs, and various estuarine and riverine wetlands.
Anatidae	<i>Anas clypeata</i>	Northern Shoveler				S2B	Within its breeding range, the Northern shoveler prefers margins of open, shallow wetlands, usually with submergent vegetation in tall-grass and short-grass prairie, sagebrush, and aspen (<i>Populus</i>) parkland, with nearby grasslands or rangelands for nesting. During spring and fall migration, uses small wetlands, especially palustrine mud wetlands. Large, shallow ponds often used during migration and staging, as well.
Tyrannidae	<i>Contopus cooperi</i>	Olive-sided Flycatcher	T	T	Threatened	S3B	The olive-sided flycatcher is found in open woodlands and other places where scattered trees remain after cutting or fire in forested regions. Found throughout the Maritimes, but not abundantly.
Falconidae	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	SC	SC	Vulnerable	S1B,SNAM	Peregrine falcons breed from Alaska and the Canadian arctic south locally through the mountainous west, and sparingly in the east. Spends winters on coasts north to British Columbia, along the east coast of the US and along the Gulf Coast. Preferred habitats include tundra, savannas, coasts, mountains, and tall buildings.
Vireonidae	<i>Vireo philadelphicus</i>	Philadelphia Vireo				S2?B	This Philadelphia vireo is found mainly in broad-leaved trees, in pure or mixed woods, but it sings and forages more often in young stands and in the sub-canopy. Breeding has never been proven in Nova Scotia.
Fringillidae	<i>Pinicola enucleator</i>	Pine Grosbeak				S2S3B,S5N	In the Maritimes, the pine grosbeak approaches the southern limit of its range, they are found generally in Nova Scotia. In general they avoid warmer, hardwood-dominated regions.

Fringillidae	<i>Carduelis pinus</i>	Pine Siskin				S2S3	The pine siskin is primarily found in open coniferous forests. Also breeds in ornamental conifers in parks, cemeteries, and the like, and in mixed coniferous-deciduous and even deciduous tree associations. May forage in trees, shrubs, and grassy areas.
		Pine Warbler				S1B	
FRINGILLIDAE	<i>Haemorhous purpureus</i>	Purple Finch				S4S5B,S3S4N	Purple finches are mostly found in moist, cool conifer forests. They are also found in mixed forests along streams and in tree-lined suburbs.
FRINGILLIDAE	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	Red Crossbills are found in mature coniferous forests.
Scolopacidae	<i>Phalaropus fulicarius</i>	Red Phalarope				S2S3M	The red phalarope does not breed in Nova Scotia. Spring migration in offshore waters, probably in association with oceanic fronts. Near breeding grounds, associated with leads in ice or edge of pack ice, where prey abundant. May use littoral waters during storms. Fall migration preceded by onshore movement toward ocean. Females gather in loose flocks on fresh-water ponds, gradually moving seaward. Form larger flocks in brackish ponds near coast, and in littoral waters. Males, then juveniles, follow same pattern. Southbound migration using similar habitats as northbound, often well offshore, associated with main currents.
SITTIDAE	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	Red-breasted nuthatches live mainly in deciduous woods and in coniferous forests.
Scolopacidae	<i>Phalaropus lobatus</i>	Red-necked Phalarope		SC		S2S3M	Red-necked phalaropes typically nest in vegetation containing sedge. Distance to water varies, but sometimes builds thick nest bowl in sedge above standing water; rarely in dry tussocks >20 m from water. In the Maritimes, this species would be observed as a migrant coastally and offshore as they move towards their breeding grounds in the Nearctic.
Cardinalidae	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak				S2S3B	Rose-breasted grosbeaks use a wide variety of habitats, including deciduous and mixed wooded uplands and lowlands; often at shrubby ecotones at the edge of woods at streams, ponds, marshes, roads, or pastures. Also commonly uses second-growth woodlands and well-vegetated suburban areas, parks, gardens, and orchards. Exhibits a preference for mesic woodlands, swamp forests, riparian corridors; avoids dry oak (<i>Quercus</i> spp.) woodlands. Uses a wide variety of habitats during spring and fall migration.
	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	Ruby-crowned Kinglets prefer spruce-fir forests, however they also live in mixed wood forests, isolated trees in meadows, coniferous and deciduous forests, mountain-shrub habitat, and floodplain forests of oak, pine, spruce or aspen.
	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B	They nest in marshes adjacent to lakes and ponds, primarily in the Prairie Potholes region. In migration, they flock to large rivers, ponds, and lakes, and also gather in coastal estuaries, frequently mixing with other diving ducks such as Bufflehead and goldeneyes.
Icteridae	<i>Euphagus carolinus</i>	Rusty Blackbird	SC	SC	Endangered	S2B	Rusty blackbirds use wet coniferous and mixed forests from northern edge of tundra southward to beginning of deciduous forests and grasslands. Frequents fens, alder (<i>Alnus</i>)–willow (<i>Salix</i>) bogs, muskegs, beaver ponds, and other openings in the forest such as swampy shores along lakes and streams. Exceptionally, on Cape Breton Island, Nova Scotia, drier sites such as pasture edges are used. During spring and fall migration, it forages in stubble, pasture, plowed fields, and edges of swamps. Fall migrants also frequent wooded areas, particularly for roosting. Occasionally roosts on the ground in open fields.
Thraupidae	<i>Piranga olivacea</i>	Scarlet Tanager				S2B	The scarlet tanager inhabits a wide variety of deciduous and mixed deciduous-coniferous forest types. Prefers mature forest, especially where oaks (<i>Quercus</i> spp.) are common, but may occur in young successional woodlands. Occasionally occurs in extensive plantings of shade trees in suburban areas, parks, and cemeteries.
Strigidae	<i>Asio flammeus</i>	Short-eared Owl	SC	SC		S1S2B	In the Maritimes, the short-eared owl has bred in dyked wet meadows and marshes, and in coastal bogs and grasslands. Also known to nest in agricultural areas. They are associated with open country supporting cyclic small mammals (i.e. voles and lemmings).

TURDIDAE	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	Swainson's Thrush are predominately found in closed-canopy forests. Breeding habitat includes deciduous and coniferous forests.
Parulidae	<i>Vermivora peregrina</i>	Tennessee Warbler				S3S4B	In its breeding range, the Tennessee warbler is associated with Boreal zone in deciduous, mixed, and coniferous forests from near sea level to 450 m. Associated with open areas that contain grasses, dense shrubs, and scattered clumps of young deciduous trees.
Cathartidae	<i>Cathartes aura</i>	Turkey Vulture				S2S3B	Preferred habitat of the turkey vulture in eastern North America includes mixed farmland and forest, which provides best opportunity for foraging on both wild and domestic carrion. For nesting, prefers forested or partly forested areas with nest sites (rock outcrops, fallen trees, abandoned buildings) isolated from human and perhaps other mammalian disturbance. For communal roosting, prefers stands of large trees free from human disturbance. Also preferred are hilly areas that provide deflective updrafts for flight, especially in North, where thermals may be weak and unpredictable. Avoids extensive areas of row-crop farmland. The preferred features are best attained in swampy areas or hilly, often unglaciated uplands with low-input agriculture
	<i>Catharus fuscescens</i>	Veery				S3S4B	Veeries breed in rich deciduous woodland and forest with well-developed understory across northern North America. Wintering birds select the same habitat structure in the tropics. On migration, you might encounter the species in nearly any woodlot or other treed habitat.
Emberizidae	<i>Pooecetes gramineus</i>	Vesper Sparrow				S2B	The vesper sparrow is considered a moderate habitat generalist, breeding in dry, open habitats with short, sparse, and patchy herbaceous vegetation; some bare ground; and low to moderate shrub or tall forb cover. Generally avoids wet areas with tall, dense vegetation. Occupies a broad range of grassland habitat types, including native prairie, semidesert grasslands, montane and desert shrublands, sagebrush steppe, montane meadows, old fields, pastures, haylands, reclaimed surface mines, weedy fencelines, croplands, weedy roadsides, and woodland edges with scattered trees and shrubs. Probably requires song perches, such as fences, shrubs, crop residue, tall weeds, woodlands bordering fields. During spring and fall migration, it uses Pastures and weeds bordering cultivated fields and roadsides, hedgerows, and barren to overgrown fields. Throughout much of range, commonly found near grassy or weedy ditches and fencerows, since fields are still barren upon arrival in early spring.
Rallidae	<i>Rallus limicola</i>	Virginia Rail				S2S3B	The Virginia rail breeds predominantly in freshwater wetlands, but nests have been reported in salt marshes. Uses drier areas of marsh than Sora. Inhabits stands of robust emergent vegetation (e.g., cattails [<i>Typha</i>] and bulrush [<i>Dwightia</i>]) within freshwater and brackish marshes and wetlands, and occasionally coastal salt marshes. Prefers freshwater marshes in early stages of succession. Shallow water, emergent cover, and substrate with high invertebrate abundance are thought to be the most important features of Virginia Rail habitat. Needs standing water, moist-soil, or mudflats for foraging; avoids dry stands of emergents. A moderate cover:water ratio within wetlands is important; Virginia Rails are often absent from wetlands lacking adequate shallow-water pools or mudflats. An equal mixture of emergent vegetation and flooded openings increases macroinvertebrate production. During spring and fall migration, migrating birds require a variety of water depths, robust vegetative cover, and short-stemmed seed-producing plants. Optimal wetland habitat for migrants includes a diversity of plant species with annuals predominating.

Vireonidae	<i>Vireo gilvus</i>	Warbling Vireo				S1B	Throughout range, shows a strong association with mature mixed deciduous woodlands especially along streams, ponds, marshes, and lakes but sometimes in upland areas away from water. Also found in young deciduous stands that emerge after a clear-cut. Other habitats include urban parks and gardens, orchards, farm fencerows, campgrounds, deciduous patches in pine forests, mixed hardwood forests, and, rarely, pure coniferous forests. During spring and fall migration, it appears to use a wide variety of forested (similar to breeding) and shrubby habitats and can be found in trees of urban areas.
Caprimulgidae	<i>Caprimulgus vociferus</i>	Whip-Poor-Will	T	T	Threatened	S1?B	In its breeding range, the whip-poor-will uses dry deciduous or mixed forests with little or no underbrush throughout most of its range. Degree of openness in forest understory appears to be more important than forest composition. In Nova Scotia, most records are from the south-central part of the province. There is little information available about their habitat usage during spring and fall migration.
Tyrannidae	<i>Empidonax traillii</i>	Willow Flycatcher				S2B	In general, the willow flycatcher prefers moist, shrubby areas, often with standing or running water. During spring and fall migration, it uses areas similar to its breeding habitat.
Scolopacidae	<i>Gallinago delicata</i>	Wilson's Snipe				S3B	The Wilson's snipe breeds in sedge bogs, fens, willow (<i>Salix</i> spp.) and alder (<i>Alnus</i> spp.) swamps, and marshy edges of ponds, rivers, and brooks. Requires soft organic soil rich in food organisms just below surface, with clumps of vegetation offering both cover and good view of approaching predators. Avoids marshes with tall, dense vegetation (cattails [<i>Typha</i>], reeds [<i>Phragmites</i>], etc.). In Canada, they use four primary types of breeding habitat: sedge bogs, fens, swamps, and pond and river edges. During spring and fall migration, they use marshes (including cattails), swamps, wet meadows, wet pastures, wet fallow fields, and marshy edges of streams and ditches. As during the breeding season, they require wet organic soils rich in food with clumps of cover.
Parulidae	<i>Wilsonia pusilla</i>	Wilson's Warbler				S3B	Western montane, northern, and northeastern populations of Wilson's warbler are restricted to mesic shrub thickets of riparian habitats, edges of beaver ponds, lakes, bogs, and overgrown clear-cuts of montane and boreal zone; may reach into alpine zone. During spring and fall migration, occurs in most deciduous shrub habitats, but primarily riparian shrub understory. Also found in most other woodlands, suburban habitats, agricultural areas, desert scrub, and montane forests.
Turdidae	<i>Hylocichla mustelina</i>	Wood Thrush		T		SUB	The wood thrush breeds in the interior and edges of deciduous and mixed forests, especially well-developed, upland, mesic ones. Key elements of breeding sites include: trees >16 m in height, high variety of deciduous tree species, moderate subcanopy and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter. Habitat use during spring and fall migration is poorly documented, in fall probably uses second-growth and forest-edge habitats with fruit. No data for spring transients to suggest deviation from breeding season habitats.
Tyrannidae	<i>Empidonax flaviventris</i>	Yellow-bellied flycatcher				S3S4B	The yellow-bellied flycatcher is a characteristic breeding bird of Canadian boreal conifer forests and peatlands. It nests in typically cool, moist conifer or mixed forests, bogs, swamps, and muskegs; landscapes often flat or poorly drained. Breeding habitat is usually well stratified, with open canopy, saplings and seedlings, shrubs, and abundant, thick moss cover. Shade is provided by conifer trees and saplings, as well as layers of shrubs, ferns, and herbs; undergrowth is usually dense.

Scientific Name	Common Name	SARA	COSEWIC	NSESA	SRank	Type
<i>Anzia colpodes</i>	Black-foam Lichen				S3?	This species occurs on the bark of hardwoods, and more rarely conifers, in humid forested habitats throughout temperate eastern North America.
<i>Cavernularia hultenii</i>	Powdered Honeycomb Lichen				S1S2	Grows on bark and wood, mainly conifers, in moist conifer forests at low to medium elevations
<i>Cladina stygia</i>	Black-footed Reindeer Lichen				S2S3	Most frequent in peatlands, particularly treeless bogs
<i>Cladonia coccifera</i>	Eastern Boreal Pixie-cup Lichen				S2S3	Humus-rich soils, occasionally on wood, in mountain woodlands
<i>Cladonia pocillum</i>	Rosette Pixie-cup Lichen				S2S3	Thin soil or duff, sometimes over pebbles or muscicolous; calciphilous, mostly cold to temperate arid regions
<i>Cladonia wainioi</i>	False Reindeer Lichen				S2S3	Terricolous or bryophytic (over rocks and in heath at low and high elevations); growing sun-exposed; substrate non-calciferous.
<i>Collema furfuraceum</i>	Blistered Tarpaper Lichen				S3?	On bark of hardwood and sometimes coniferous trees, especially in old forests
<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2S3	
<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S2S3	
<i>Degelia plumbea</i>	Blue Felt Lichen		SC	Vulnerable	S2	Mature forests within varying moisture regimes. Typically located in hardwood stands, with Red maple, Sugar maple, or Yellow Birch.
<i>Dermatocarpon miniatum</i>	Common Stippleback Lichen				S1?	Common on rock in dry places.
<i>Ephebe lanata</i>	Waterside Rockshag Lichen				S2S3	on wet stones in brooks, along lakeshores and on maritime rocks in the salt spray zone.
<i>Erioderma mollissimum</i>	Graceful Felt Lichen	E	E	Endangere	S1S2	mature to over mature Balsam Fir trees in open softwood forests with little to no regenerating understory. Typically though not necessarily found in or near wetlands or wetland margins
<i>Erioderma pedicellatum (Atlantic pop.)</i>	Boreal Felt Lichen - Atlantic pop.	E	E	Endangere	S1S2	mature to over mature Balsam Fir trees in open softwood forests with little to no regenerating understory. Typically though not necessarily found in or near wetlands or wetland margins
<i>Evernia prunastri</i>	Valley Oakmoss Lichen				S2S3	Usually on trees but sometimes ground dwelling
<i>Everniastrum catawbiense</i>	Powder-tipped Antler Lichen				S1S2	on branches and twigs of deciduous shrubs and conifer trees
<i>Fuscopannaria leucosticta</i>	Rimmed Shingles Lichen				S1S2	on bark or occasionally rocks often among mosses
<i>Fuscopannaria praetermissa</i>	Moss Shingles Lichen				S1?	On mossy tree bases, occasionally on moist soil or damp rocks
<i>Heterodermia squamulosa</i>	Scaly Fringe Lichen				S2S3	on trees, especially mossy tree bases in hardwood forests
<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S2S3	This lichen species is widespread and grows on the bases of hardwoods and occasionally on rocks in moist woods.
<i>Leptogium dactylinum</i>	Brown-buttoned Jellyskin Lichen				S1?	
<i>Leptogium lichenoides</i>	Tattered Jellyskin Lichen				S1S2	Grows on mossy rock
<i>Leptogium milligranum</i>	Stretched Jellyskin Lichen				S2S3	On bark especially on oaks and on wood

<i>Leptogium subtile</i>	Appressed Jellyskin Lichen				S1S3	
<i>Leptogium teretiusculum</i>	Beaded Jellyskin Lichen				S2S3	
<i>Massalongia carnosa</i>	Rockmoss Rosette Lichen				S1?	Grows on mosses or mossy rocks
<i>Nephroma bellum</i>	Naked Kidney Lichen				S3?	On branches and twigs of trees especially conifers, and also on mossy rocks in humid forests
<i>Pannaria lurida</i>	Veined Shingle Lichen				S1?	<i>Pannaria lurida</i> may be found on bark and the bases of trees in the open woods and roadsides
<i>Parmeliella parvula</i>	Poor-man's Shingles Lichen				S1?	
<i>Parmelinopsis horrescens</i>	Hairy-spined Shield Lichen				S1?	On bark of all kinds especially in deciduous forests
<i>Parmelinopsis minarum</i>	Hairless-spined Shield Lichen				S2S3	On trees and sometimes rocks in deciduous forests
<i>Parmeliopsis ambigua</i>	Green Starburst Lichen				S2S3	Grows on conifer stumps, logs and bark in full sun.
<i>Parmotrema reticulatum</i>	Netted Ruffle Lichen				S2S3	
<i>Peltigera collina</i>	Tree Pelt Lichen				S2S3	Most common on tree trunks and branches, especially among mosses, less frequently on mossy rocks, rarely on soil
<i>Peltigera lepidophora</i>	Scaly Pelt Lichen				S1S2	
<i>Physcia subtilis</i>	Slender Rosette Lichen				S2S3	
<i>Physconia deterosa</i>	Bottlebrush Frost Lichen				S2S3	On bark and wood; occasionally on rock
<i>Physconia perisidiosa</i>	Crescent Frost Lichen				S2S3	On bark less frequently on rock or soil
<i>Pseudevernia consocians</i>	Common Antler Lichen				S1?	Grows on conifers in forest. (pg. 134)
<i>Psoroma hypnorum</i>	Green moss-shingle Lichen				S1?	Among mosses on soil, wood, peat, rock and sometimes bark.
<i>Punctelia appalachensis</i>	Appalachian Speckleback Lichen				S2S3	
<i>Ramalina thrausta</i>	Angelhair Ramalina Lichen				S2S3	
<i>Santessonella crossophylla</i>	Sparrow Down Lichen				S1?	
<i>Sclerophora peronella</i> (Nova Scotia pop.)	Frosted Glass-whiskers Lichen - Nova Scotia pop.	SC	SC		S1?	2 known locations in Cape Breton NS. Tiny lichen stubble lichen, wood and bark of older trees in old growth forests. Stable humidity, minimal temperature fluctuations, and intermediate light.
<i>Sticta fuliginosa</i>	Peppered Moon Lichen				S3?	Grows on mossy bark
<i>Sticta limbata</i>	Powdered Moon Lichen				S1S2	A foliose lichen; thallus light brown, loosely attached, 4-10 cm broad; upper surface plane to somewhat ridged; lower surface buff, short-tomentose, cyphellae inconspicuous; apothecia lacking. Habitat Comments: Grows on bark or over mosses on trees. Grows on <i>Fagus</i> in high-elevation deciduous forests; also rare at lower elevations
<i>Usnea cavernosa</i>	Pitted Beard Lichen				S2S3	
<i>Usnea ceratina</i>	Warty Beard Lichen				S2S3	
<i>Usnea flammea</i>	Coastal Bushy Beard Lichen				S2S3	On deciduous trees
<i>Usnea flavocardia</i>	Blood-splattered Beard Lichen				S2S3	
<i>Usnea mutabilis</i>	Bloody Beard Lichen				S2S3	
<i>Usnea rubicunda</i>	Red Beard Lichen				S2S3	
<i>Usnea scabrata</i>	Straw Beard Lichen				S2S3	
<i>Usnea substerilis</i>	Embossed Beard Lichen				S1S2	
<i>Usnocetraria oakesiana</i>	Yellow Band Lichen				S1S2	
<i>Vahlia saubinetii</i>	Pink-eyed Shingle Lichen				S1?	
<i>Xanthoparmelia mougeotii</i>	Powdered Rock-shield Lichen				S1SE	

Scientific Name	Common Name	SARA	COSEWIC	NSESA	SRank
<i>Aloina brevirostris</i>	Short-Beaked Rigid Screw Moss				S1
<i>Aloina rigida</i>	Aloe-Like Rigid Screw Moss				S1
<i>Anacamptodon splachnoides</i>	a Moss				S2?
<i>Anomobryum filiforme</i>	a moss				S1
<i>Anomodon rugelii</i>	Rugel's Anomodon Moss				S2S3
<i>Anomodon tristis</i>	a Moss				S2?
<i>Anomodon viticulosus</i>	a Moss				S2?
<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S2?
<i>Aulacomnium heterostichum</i>	One-sided Groove Moss				S2?
<i>Bartramia ithyphylla</i>	Straight-leaved Apple Moss				S2?
<i>Brachythecium digastrum</i>	a Moss				S2?
<i>Brachythecium turgidum</i>	Thick Ragged Moss				S2?
<i>Bruchia flexuosa</i>	a Moss				S1
<i>Bryohaplocladium microphyllum</i>	Tiny-leaved Haplocladium Moss				S1
<i>Bryohaplocladium virginianum</i>	Virginia Haplocladium Moss				S2?
<i>Bryum algovicum</i>	a Moss				S2?
<i>Bryum uliginosum</i>	a Moss				S2?
<i>Buxbaumia minakatae</i>	Hump-Backed Elves				S2?
<i>Calliergon giganteum</i>	Giant Spear Moss				S2S3
<i>Campylostelium saxicola</i>	a Moss				S2?
<i>Cirriphyllum piliferum</i>	Hair-pointed Moss				S2?
<i>Climacium americanum</i>	American Tree Moss				S2?
<i>Conardia compacta</i>	Coast Creeping Moss				S2?
<i>Cyrto-hypnum minutulum</i>	Tiny Cedar Moss				S2?
<i>Cyrtomnium hymenophylloides</i>	Short-pointed Lantern Moss				S2?
<i>Dicranodontium denudatum</i>	Beaked Bow Moss				S2?
<i>Dicranoweisia crispula</i>	Mountain Thatch Moss				S2?
<i>Dicranum elongatum</i>	Long-forked Broom Moss				S2?
<i>Dicranum groenlandicum</i>	Mountain Broom Moss				S2?
<i>Didymodon ferrugineus</i>	a moss				S2?
<i>Didymodon rigidulus</i>	Rigid Screw Moss				S2S3
<i>Ditrichum rhynchostegium</i>	a Moss				S2?
<i>Drepanocladus capillifolius</i>	Hair Hook Moss				S2

<i>Drummondia prorepens</i>	a Moss				S2?
<i>Entodon concinnus</i>	Lime Entodon Moss				S2?
<i>Ephemerum serratum</i>	a Moss				S2S3
<i>Eurhynchium hians</i>	Light Beaked Moss				S2?
<i>Fissidens bushii</i>	Bush's Pocket Moss				S2?
<i>Fissidens exilis</i>	Pygmy Pocket Moss	SC	SC		S1?
<i>Fissidens taxifolius</i>	Yew-leaved Pocket Moss				S2?
<i>Fontinalis sullivantii</i>	a Moss				S2?
<i>Grimmia anodon</i>	Toothless Grimmia Moss				S2?
<i>Grimmia anomala</i>	Mountain Forest Grimmia				S2?
<i>Grimmia laevigata</i>	a Moss				S2?
<i>Grimmia olneyi</i>	a Moss				S2?
<i>Grimmia pilifera</i>	a Moss				S2?
<i>Gyroweisia tenuis</i>	a Moss				S1?
<i>Hamatocaulis vernicosus</i>	a Moss				S2?
<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss				S2?
<i>Hygrohypnum bestii</i>	Best's Brook Moss				S2?
<i>Hygrohypnum luridum</i>	Drab Brook Moss				S2S3
<i>Hygrohypnum montanum</i>	a Moss				S2?
<i>Hygrohypnum smithii</i>	Smith's Brook Moss				S2?
<i>Hylocomiastrum pyrenaicum</i>	a Feather Moss				S2S3
<i>Hypnum pratense</i>	Meadow Plait Moss				S2?
<i>Kiaeria blyttii</i>	Blytt's Fork Moss				S2?
<i>Kiaeria starkei</i>	Starke's Fork Moss				S2?
<i>Leucodon andrewsianus</i>	a Moss				S2S3
<i>Limprichtia revolvens</i>	a Moss				S2S3
<i>Meesia uliginosa</i>	Revolvute Cold Moss				S2?
<i>Mnium thomsonii</i>	Thomson's Leafy Moss				S2?
<i>Myurella julacea</i>	Small Mouse-tail Moss				S2S3
<i>Orthothecium strictum</i>	Shiny Erect-capsule Moss				S2?
<i>Orthotrichum anomalum</i>	Anomalous Bristle Moss				S2S3
<i>Orthotrichum pallens</i>	Pale Bristle Moss				S1
<i>Paludella squarrosa</i>	Tufted Fen Moss				S2?
<i>Palustriella falcata</i>	a Moss				S1S2

<i>Physcomitrium collenchymatum</i>	a Moss				S2?
<i>Physcomitrium immersum</i>	a Moss				S2?
<i>Plagiobryum zieri</i>	a Moss				S2?
<i>Plagiomnium ellipticum</i>	Marsh Leafy Moss				S1?
<i>Plagiothecium latebricola</i>	Alder Silk Moss				S2?
<i>Platydictya confervoides</i>	a Moss				S2?
<i>Platydictya jungermannioides</i>	False Willow Moss				S2?
<i>Platydictya subtilis</i>	Bark Willow Moss				S2S3
<i>Platylorella lescurii</i>	a Moss				S2?
<i>Pleuridium subulatum</i>	a Moss				S2S3
<i>Pohlia melanodon</i>	a Moss				S1
<i>Pseudoleskea patens</i>	Patent Leskea Moss				S2?
<i>Pseudoleskea stenophylla</i>	Narrow-leaved Leskea Moss				S2?
<i>Pseudotaxiphyllum distichaceum</i>	a Moss				S2?
<i>Rauella scita</i>	Smaller Fern Moss				S2?
<i>Rhytidium rugosum</i>	Wrinkle-leaved Moss				S2?
<i>Saelania glaucescens</i>	Blue Dew Moss				S2?
<i>Sanionia orthothecioides</i>	Coastal Hook Moss				S1
<i>Schistidium trichodon</i>	a Moss				S2?
<i>Schistostega pennata</i>	Luminous Moss				S2?
<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss				S2?
<i>Seligeria calcarea</i>	Chalk Brittle Moss				S2?
<i>Seligeria campylopoda</i>	a Moss				S2?
<i>Seligeria diversifolia</i>	a Moss				S1
<i>Seligeria donniana</i>	Donian Beardless Moss				S2?
<i>Seligeria recurvata</i>	a Moss				S2?
<i>Seligeria tristichoides</i>	a Moss				S2?
<i>Sematophyllum demissum</i>	a Moss				S2?
<i>Sematophyllum marylandicum</i>	a Moss				S2?
<i>Sphagnum riparium</i>	Streamside Peat Moss				S2S3
<i>Sphagnum subnitens</i>	Lustrous Peat Moss				S2?
<i>Sphagnum teres</i>	Rigid Peat Moss				S2S3
<i>Sphagnum warnstorffii</i>	Warnstorff's Peat Moss				S2S3
<i>Sphagnum wulfianum</i>	Wulf's Peat Moss				S2S3

<i>Splachnum pennsylvanicum</i>	Southern Dung Moss				S2?
<i>Splachnum rubrum</i>	Red Collar Moss				S2S3
<i>Syntrichia papillosa</i>	a Moss				S2?
<i>Syntrichia ruralis</i>	a Moss				S2?
<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S2S3
<i>Tetrodontium brownianum</i>	Little Georgia				S2?
<i>Thamnobryum alleghaniense</i>	a Moss				S2?
<i>Thelia hirtella</i>	a Moss				S2?
<i>Timmia megapolitana</i>	Metropolitan Timmia Moss				S2?
<i>Timmia norvegica</i>	a moss				S2?
<i>Tortella fragilis</i>	Fragile Twisted Moss				S2S3
<i>Tortula acaulon</i>	Cuspidate Earth Moss				S2?
<i>Tortula mucronifolia</i>	Mucronate Screw Moss				S2?
<i>Tortula truncata</i>	a Moss				S2S3
<i>Ulota curvifolia</i>	a Moss				S2?
<i>Ulota drummondii</i>	a Moss				S2?
<i>Weissia muhlenbergiana</i>	a Moss				S2?
<i>Zygodon conoideus</i>	a Moss				S2?

Scientific Name	Common Name	SARA	COSEWIC	NESA	SRank
<i>Pinus banksiana</i> / <i>Gaylussacia baccata</i> - <i>Empetrum nigrum</i> / <i>Cladina rangiferina</i> Woodland	Jack Pine / Black Huckleberry - Pink Crowberry / Gray Reindeer Lichen Woodland				S1
<i>Tsuga canadensis</i> - <i>Pinus strobus</i> / <i>Mitchella repens</i> Forest	Eastern Hemlock - Eastern White Pine / Partridgeberry Forest				S1
<i>Tsuga canadensis</i> / <i>Cornus rugosa</i> / <i>Prenanthes altissima</i> - <i>Polystichum acrostichoides</i> Forest	Eastern Hemlock / (Round-leaved Dogwood) / Tall Rattlesnakeroot - Christmas Fern Forest				S1
<i>Abies balsamea</i> / <i>Cornus canadensis</i> / <i>Pleurozium schreberi</i> Forest	Balsam Fir / Bunchberry / Schreber's Feathermoss Forest				S2
<i>Acer saccharum</i> - <i>Fraxinus americana</i> - <i>Ostrya virginiana</i> / <i>Carex plantaginea</i> (<i>Adiantum pedatum</i>) Forest	Sugar Maple - White Ash - Ironwood / Plantain-Leaved Sedge (Northern Maidenhair Fern) Forest				S2
<i>Fagus grandifolia</i> - <i>Picea rubens</i> / <i>Viburnum lantanoides</i> / <i>Trillium undulatum</i> - <i>Medeola virginiana</i> Forest	American Beech - Red Spruce / Hobblebush / Painted Trillium - Indian Cucumber Root Forest				S2
<i>Fraxinus nigra</i> - <i>Acer saccharum</i> / <i>Ranunculus recurvatus</i> - <i>Asarum canadense</i> Forest	Black Ash - Sugar Maple / Hooked Buttercup - Canada Wild Ginger Forest				S2
<i>Picea glauca</i> / <i>Alnus incana</i> ssp. <i>rugosa</i> / <i>Athyrium filix-femina</i> / <i>Mniun</i> spp. - <i>Sphagnum</i> spp. Forest - Woodland	White Spruce / Speckled Alder / Common Lady Fern / Calcareous Moss - Sphagnum Forest - Woodland				S2
<i>Populus grandidentata</i> - <i>Quercus rubra</i> / <i>Gaultheria procumbens</i> - <i>Mitchella repens</i> Forest	Large-toothed Aspen - Northern Red Oak / Eastern Teaberry - Partridgeberry Forest				S2
<i>Quercus macrocarpa</i> - <i>Acer rubrum</i> / <i>Onoclea sensibilis</i> - <i>Carex arcta</i> Forest	Bur Oak - Red Maple / Sensitive Fern - Northern Clustered Sedge Forest				S2
<i>Quercus rubra</i> - <i>Acer rubrum</i> / <i>Kalmia angustifolia</i> / <i>Pteridium aquilinum</i> Forest	Northern Red Oak - Red Maple / Sheep Laurel / Bracken Fern Forest				S2
<i>Quercus rubra</i> - <i>Acer saccharum</i> / <i>Streptopus lanceolatus</i> - <i>Polygonatum pubescens</i> Forest	Northern Red Oak - Sugar Maple / Rosy Twistedstalk - Hairy Solomon's Seal Forest				S2
<i>Quercus rubra</i> - <i>Pinus strobus</i> / <i>Pteridium aquilinum</i> / <i>Hypnum impanens</i> Forest	Northern Red Oak - Eastern White Pine / Bracken Fern / Hypnum Moss Forest				S2
<i>Thuja occidentalis</i> - <i>Picea mariana</i> / <i>Gaultheria hispida</i> - <i>Rubus pubescens</i> Forest	Eastern White Cedar - Black Spruce / Creeping Snowberry - Dwarf Red Raspberry Forest				S2
<i>Tsuga canadensis</i> - <i>Picea rubens</i> / <i>Pleurozium schreberi</i> Forest	Eastern Hemlock - Red Spruce / Schreber's Feathermoss Forest				S2
<i>Abies balsamea</i> - <i>Thuja occidentalis</i> / <i>Ribes lacustre</i> / <i>Galium triflorum</i> - <i>Mitella nuda</i> Forest	Balsam Fir - Eastern White Cedar / Bristly Black Currant / Three-flowered Bedstraw - Naked Bishop's-Cap Forest				S3
<i>Abies balsamea</i> / <i>Osmunda cinnamomea</i> / <i>Sphagnum</i> spp. Forest - Woodland	Balsam Fir / Cinnamon Fern / Sphagnum Forest - Woodland				S3
<i>Acer saccharinum</i> / <i>Laportea canadensis</i> - <i>Matteuccia struthiopteris</i> Forest	Silver Maple / Canada Wood Nettle - Ostrich Fern Forest				S3
<i>Acer saccharinum</i> / <i>Onoclea sensibilis</i> - <i>Lysimachia terrestris</i> Forest	Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest				S3
<i>Acer saccharum</i> - <i>Betula papyrifera</i> / <i>Dryopteris intermedia</i> (<i>Lycopodium dendroideum</i>) Forest	Sugar Maple - Paper Birch / Evergreen Wood Fern (Round-branched Tree-clubmoss) Forest				S3
<i>Acer saccharum</i> - <i>Fraxinus americana</i> / <i>Gymnocarpium dryopteris</i> - <i>Deparia acrostichoides</i> Forest	Sugar Maple - White Ash / Common Oak Fern - Silvery Glade Fern Forest				S3
<i>Acer saccharum</i> - <i>Fraxinus americana</i> / <i>Matteuccia struthiopteris</i> - <i>Solidago flexicaulis</i> - <i>Trillium cernuum</i> Forest	Sugar Maple - White Ash / Ostrich Fern - Zigzag Goldenrod - Nodding Trillium Forest				S3
<i>Acer saccharum</i> - <i>Picea rubens</i> / <i>Viburnum lantanoides</i> / <i>Trillium undulatum</i> - <i>Oxalis montana</i> Forest	Sugar Maple - Red Spruce / Hobblebush / Painted Trillium - Common Wood Sorrel Forest				S3
<i>Betula papyrifera</i> - <i>Picea rubens</i> / <i>Cornus canadensis</i> / <i>Dicranum polysetum</i> Forest	Paper Birch - Red Spruce / Bunchberry / Waxleaf Moss Forest				S3
<i>Fagus grandifolia</i> - <i>Acer rubrum</i> (<i>Betula papyrifera</i>) / <i>Aralia nudicaulis</i> Forest	American Beech - Red Maple (Paper Birch) / Wild Sarsaparilla Forest				S3
<i>Fagus grandifolia</i> - <i>Acer saccharum</i> / <i>Dryopteris intermedia</i> Forest	American Beech - Sugar Maple / Evergreen Wood Fern Forest				S3
<i>Fagus grandifolia</i> - <i>Acer saccharum</i> / <i>Streptopus lanceolatus</i> - <i>Rubus pubescens</i> Forest	American Beech - Sugar Maple / Rosy Twistedstalk - Dwarf Red Raspberry Forest				S3
<i>Fraxinus americana</i> - <i>Quercus rubra</i> / <i>Dryopteris marginalis</i> - <i>Geranium robertianum</i> Woodland	White Ash - Northern Red Oak / Marginal Wood Fern - Herb Robert Woodland				S3
<i>Larix laricina</i> - <i>Thuja occidentalis</i> / <i>Cornus sericea</i> ssp. <i>sericea</i> / <i>Mitella nuda</i> / <i>Sphagnum</i> spp. Forest	Tamarack - Eastern White Cedar / Red Osier Dogwood / Naked Bishop's-Cap / Sphagnum Forest				S3
<i>Larix laricina</i> / <i>Trientalis borealis</i> / <i>Pleurozium schreberi</i> Forest	Tamarack / Northern Starflower / Schreber's Feathermoss Forest				S3
<i>Picea glauca</i> - <i>Thuja occidentalis</i> / <i>Acer spicatum</i> / <i>Mitella nuda</i> - <i>Actaea rubra</i> Forest	White Spruce - Eastern White Cedar / Mountain Maple / Naked Bishop's-Cap - Red Baneberry Forest				S3
<i>Picea glauca</i> / (<i>Alnus viridis</i> ssp. <i>crispata</i>) / <i>Oclemena acuminata</i> / <i>Pleurozium schreberi</i> Woodland	White Spruce / (Green Alder) / Whorled Wood Aster / Schreber's Feathermoss Woodland				S3
<i>Picea glauca</i> / <i>Corylus cornuta</i> - <i>Fraxinus americana</i> / <i>Rhytidolepis triquetrus</i> Forest	White Spruce / Beaked Hazel - White Ash / Rough Goose Neck Moss Forest				S3
<i>Picea glauca</i> / <i>Corylus cornuta</i> / <i>Galium triflorum</i> - <i>Rubus pubescens</i> Forest	White Spruce / Beaked Hazel / Three-flowered Bedstraw - Dwarf Red Raspberry Forest				S3
<i>Picea glauca</i> / <i>Morella pensylvanica</i> / <i>Ammophila breviligulata</i> Woodland	White Spruce / Northern Bayberry / American Beach Grass Woodland				S3
<i>Picea glauca</i> / <i>Sorbus americana</i> / <i>Oxalis montana</i> - <i>Dryopteris intermedia</i> Forest	White Spruce / American Mountain Ash / Common Wood Sorrel - Evergreen Wood Fern Forest				S3
<i>Picea mariana</i> - <i>Abies balsamea</i> / <i>Maianthemum canadense</i> / <i>Pleurozium schreberi</i> Forest	Black Spruce - Balsam Fir / Wild Lily-of-the-Valley / Schreber's Feathermoss Forest				S3
<i>Picea mariana</i> - <i>Pinus strobus</i> (<i>P. resinosa</i>) / <i>Rhododendron canadense</i> / <i>Sphagnum</i> spp. Forest - Woodland	Black Spruce - Eastern White Pine (Red Pine) / Rhodora / Sphagnum Forest - Woodland				S3
<i>Picea mariana</i> - <i>Populus tremuloides</i> / <i>Linnaea borealis</i> ssp. <i>americana</i> - <i>Aralia nudicaulis</i> Forest	Black Spruce - Trembling Aspen / Twinflower - Wild Sarsaparilla Forest				S3
<i>Picea mariana</i> - <i>Thuja occidentalis</i> / <i>Linnaea borealis</i> ssp. <i>americana</i> - <i>Aralia nudicaulis</i> / <i>Pleurozium schreberi</i> Forest	Black Spruce - Eastern White Cedar / Twinflower - Wild Sarsaparilla / Schreber's Feathermoss Forest				S3
<i>Picea mariana</i> (<i>Pinus strobus</i> - <i>P. resinosa</i>) / <i>Viburnum nudum</i> / <i>Cornus canadensis</i> / <i>Cladina</i> spp. Woodland	Black Spruce (Eastern White Pine - Red Pine) / Northern Wild Raisin / Bunchberry / Reindeer Lichen Woodland				S3
<i>Picea rubens</i> - <i>Picea glauca</i> / <i>Sorbus americana</i> / <i>Dryopteris intermedia</i> / <i>Pleurozium schreberi</i> - <i>Ptilium crista-castrensis</i> Forest	Red Spruce - White Spruce / American Mountain Ash / Evergreen Wood Fern / Schreber's Feathermoss - Knights Plume Moss Forest				S3
<i>Picea rubens</i> - <i>Thuja occidentalis</i> / <i>Nemopanthus mucronatus</i> / <i>Linnaea borealis</i> - <i>Trillium undulatum</i> Forest	Red Spruce - Eastern White Cedar / Mountain Holly / Twinflower - Painted Trillium Forest				S3
<i>Picea rubens</i> / <i>Alnus incana</i> ssp. <i>rugosa</i> / <i>Osmunda cinnamomea</i> - <i>Rubus pubescens</i> / <i>Sphagnum</i> spp. Forest	Red Spruce / Speckled Alder / Cinnamon Fern - Dwarf Red Raspberry / Sphagnum Forest				S3
<i>Picea</i> spp. / <i>Ledum groenlandicum</i> / <i>Vaccinium vitis-idaea</i> / <i>Polygonum virginianum</i> Woodland	Spruce / Common Labrador Tea / Mountain Cranberry / Virginia Knotweed Woodland				S3
<i>Pinus banksiana</i> / <i>Kalmia angustifolia</i> - <i>Rhododendron canadense</i> / <i>Cladina</i> spp. Woodland	Jack Pine / Sheep Laurel - Rhodora / Reindeer Lichen Woodland				S3
<i>Pinus resinosa</i> / <i>Vaccinium myrtilloides</i> / <i>Pteridium aquilinum</i> - <i>Gaultheria procumbens</i> / <i>Pleurozium schreberi</i> Forest	Red Pine / Velvet-leaved Blueberry / Bracken Fern - Eastern Teaberry / Schreber's Feathermoss Forest				S3
<i>Pinus</i> spp. / <i>Morella pensylvanica</i> / <i>Arctostaphylos uva-ursi</i> / <i>Cladina</i> spp. Woodland	Pine / Northern Bayberry / Common Bearberry / Reindeer Lichen Woodland				S3
<i>Populus balsamifera</i> - <i>Fraxinus americana</i> / <i>Matteuccia struthiopteris</i> - <i>Heracleum maximum</i> Forest	Balsam Poplar - White Ash / Ostrich Fern - Common Cow Parsnip Forest				S3
<i>Populus balsamifera</i> - <i>Fraxinus nigra</i> / <i>Matteuccia struthiopteris</i> - <i>Veratrum viride</i> Forest	Balsam Poplar - Black Ash / Ostrich Fern - Green False Hellebore Forest				S3
<i>Populus grandidentata</i> - <i>Picea rubens</i> / <i>Viburnum nudum</i> / <i>Pteridium aquilinum</i> Forest	Large-toothed Aspen - Red Spruce / Northern Wild Raisin / Bracken Fern Forest				S3
<i>Populus tremuloides</i> / <i>Viburnum nudum</i> - <i>Alnus incana</i> ssp. <i>rugosa</i> / <i>Rubus pubescens</i> / <i>Sphagnum</i> spp. Forest	Trembling Aspen / Northern Wild Raisin - Speckled Alder / Dwarf Red Raspberry / Sphagnum Forest				S3
<i>Prunus serotina</i> / <i>Onoclea sensibilis</i> - <i>Solidago rugosa</i> Forest	Black Cherry / Sensitive Fern - Rough-stemmed Goldenrod Forest				S3
<i>Quercus rubra</i> / <i>Phytolacca floribunda</i> / <i>Ammophila breviligulata</i> - <i>Solidago sempervirens</i> Woodland	Northern Red Oak / Red Chokeberry / American Beach Grass - Seaside Goldenrod Woodland				S3
<i>Thuja occidentalis</i> - <i>Abies balsamea</i> / <i>Lonicera canadensis</i> / <i>Osmunda cinnamomea</i> / <i>Hylacomium splendens</i> Forest	Eastern White Cedar - Balsam Fir / Canada Fly Honeysuckle / Cinnamon Fern / Stairstep Moss Forest				S3
<i>Thuja occidentalis</i> - <i>Picea glauca</i> / <i>Mitella nuda</i> - <i>Athyrium filix-femina</i> / <i>Mniun</i> spp. Forest	Eastern White Cedar - White Spruce / Naked Bishop's-Cap - Common Lady Fern / Calcareous Moss Forest				S3
<i>Thuja occidentalis</i> - <i>Tsuga canadensis</i> / <i>Corylus cornuta</i> / <i>Osmunda cinnamomea</i> Forest	Eastern White Cedar - Eastern Hemlock / Beaked Hazel / Cinnamon Fern Forest				S3
<i>Thuja occidentalis</i> / <i>Alnus incana</i> ssp. <i>rugosa</i> / <i>Calamagrostis canadensis</i> - <i>Carex</i> spp. / <i>Sphagnum</i> spp. Forest-Woodland	Eastern White Cedar / Speckled Alder / Bluejoint Reed Grass - <i>Carex</i> spp. / Sphagnum Forest-Woodland				S3
<i>Thuja occidentalis</i> / <i>Linnaea borealis</i> Forest	Eastern White Cedar / Twinflower Forest				S3
<i>Thuja occidentalis</i> / <i>Vaccinium vitis-idaea</i> / <i>Cladina mitis</i> - <i>Polytrichum juniperinum</i> Woodland	Eastern White Cedar / Mountain Cranberry / Green Reindeer Lichen - Juniper Moss Woodland				S3
<i>Thuja occidentalis</i> / <i>Viburnum nudum</i> / <i>Osmunda cinnamomea</i> / <i>Sphagnum</i> spp. Forest	Eastern White Cedar / Northern Wild Raisin / Cinnamon Fern / Sphagnum Forest				S3
<i>Tsuga canadensis</i> - <i>Acer rubrum</i> - <i>Betula alleghaniensis</i> / <i>Dryopteris intermedia</i> Forest	Eastern Hemlock - Red Maple - Yellow Birch / Evergreen Wood Fern Forest				S3
<i>Tsuga canadensis</i> - <i>Acer saccharum</i> / <i>Acer pensylvanicum</i> / <i>Streptopus lanceolatus</i> - <i>Medeola virginiana</i> Forest	Eastern Hemlock - Sugar Maple / Striped Maple / Rosy Twistedstalk - Indian Cucumber Root Forest				S3
<i>Acer saccharum</i> - <i>Fraxinus americana</i> / <i>Polystichum acrostichoides</i> Forest	Sugar Maple - White Ash / Christmas Fern Forest				S3S4
<i>Pinus banksiana</i> - <i>Picea mariana</i> / <i>Rhododendron canadense</i> / <i>Sphagnum</i> spp. Forest - Woodland	Jack Pine - Black Spruce / Rhodora / Sphagnum Forest - Woodland				S3S4



**Communities,
Culture & Heritage**

1741 Brunswick Street
3rd Floor
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Halifax, NS
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OCT 11 2017

11141046
COR

October 3, 2017

Amanda Facey
GHD
45 Akerley Blvd.
Dartmouth, NS B3B 1J7

Dear Ms. Facey:

**RE: Environmental Screening 17-09-11
Sheet Harbour Quarry**

Further to your request of September 11th, 2017 staff at Communities, Culture and Heritage has reviewed their files for reference to the presence of natural and heritage resources in the study area. Please be aware that the information is not comprehensive, and may include varying degrees of accuracy with respect to the precise location and condition of natural resources.

It should be noted that the amount and degree of disturbance from previous developments could have a significant role in establishing the presence, absence or condition of natural and heritage resources in this area.

Archaeology

There are no recorded terrestrial archaeological sites for the study area. However, there are marine archaeological sites nearby in Sheet Harbor. The study area also intersects with a waterbody and a watercourse. Historic maps also indicate settlement nearby.

An archaeological resource impact assessment is recommended for the study area.

Botany

The following plant species-at-risk are known from the project area or adjacent areas to Sheet Harbour and should be considered prior to any development.

The presence/absence of these species should be noted during any field assessment report. It is recommended that onsite determination be done during the growing season when the plants can be identified with some certainty.

This region of the province has been little-studied with respect to vascular plants. Absence on this list does not state absence in the field, rather that the Nova Scotia Museum does not have records of species-at-risk here.

A. Facey
October 3, 2017
page 2

The colour status is that assigned by DNR.

Betula michauxii (provincially Yellow-listed)
Geocaulon lividum (provincially Yellow-listed)
Senecio pseudoarnica (provincially Yellow-listed)

Zoology

The Nova Scotia Museum has no records of species with conservation concern for the footprinted site, access corridor or for the immediate area noted. This includes any record of bat hibernacula or swarming areas (considering the current issues related to White Nose Syndrome). The only species with potential concern are the following bird species for whom there are nesting or potential nesting reports in the general area:

Canada Warbler
Boreal Chickadee
Golden Crowned Kinglet
Ruby Crowned Kinglet
Gray Jay
Barn Swallow
Tree Swallow
Common Nighthawk
Common Loon
Common Tern

There are other breeding bird species with conservation status in the vicinity, however their habitat use would preclude them from being found in the area.

As well, there are records for the uncommon Four-toed Salamander (*Hemidactylium scutatum*) in the area, although they do not have any specific conservation status.

If you have any questions, please contact me at 424-6475.

Sincerely,



Sean Weseloh-McKeane
Coordinator, Special Places

Enclosure

DATA REPORT 5913: Mushaboom, NS

Prepared 23 August 2017
by J. Churchill, Data Manager

CONTENTS OF REPORT

1.0 Preface

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

2.0 Rare and Endangered Species

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

3.0 Special Areas

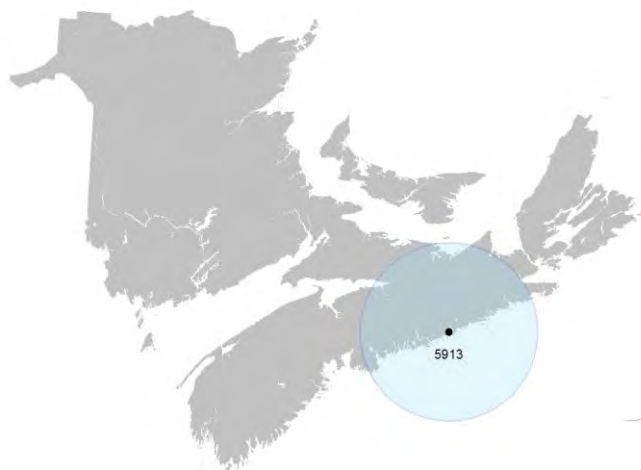
- 3.1 Managed Areas
- 3.2 Significant Areas
- Map 3: Special Areas

4.0 Rare Species Lists

- 4.1 Fauna
- 4.2 Flora
- 4.3 Location Sensitive Species
- 4.4 Source Bibliography

5.0 Rare Species within 100 km

- 5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

Filename	Contents
MushaboomNS_5913ob.xls	All Rare and legally protected <i>Flora and Fauna</i> in your study area
MushaboomNS_5913ob100km.xls	A list of Rare and legally protected <i>Flora and Fauna</i> within 100 km of your study area
MushaboomNS_5913ma.xls	All <i>Managed Areas</i> in your study area
MushaboomNS_5913sa.xls	All <i>Significant Natural Areas</i> in your study area
MushaboomNS_5913wf.xls	Rare and common <i>Waterfowl</i> in your study area (CWS database)
MushaboomNS_5913bc.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

Tel: (506) 364-2660

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Plant Communities

Sarah Robinson, Community Ecologist

Tel: (506) 364-2664

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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
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
(902) 893-5630
Kimberly.George@novascotia.ca

Eastern: Mark Pulsifer
(902) 863-7523
Mark.Pulsifer@novascotia.ca

Eastern: Donald Anderson
(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

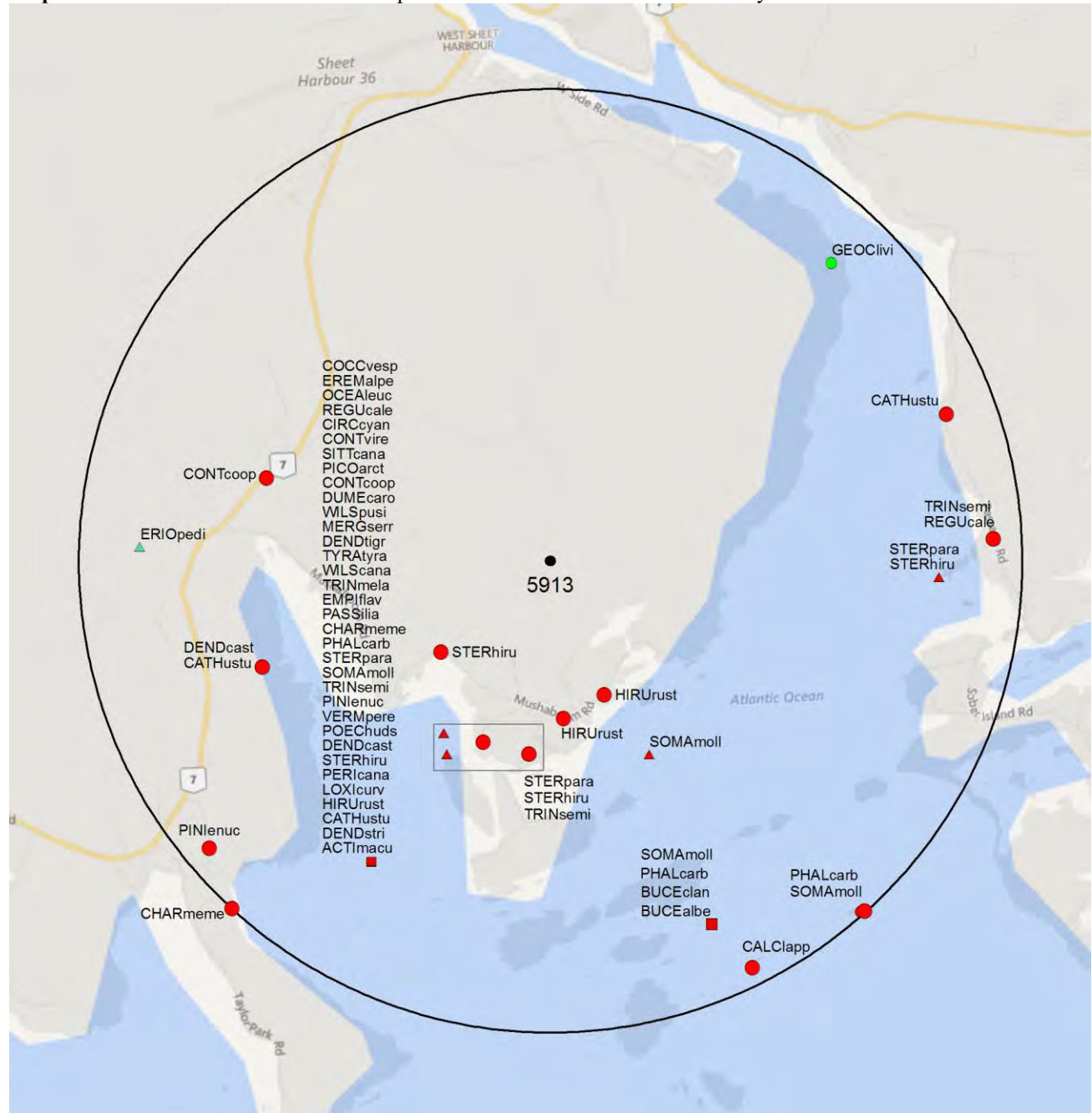
2.1 FLORA

The study area contains 1 record of 1 vascular, 2 records of 1 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 151 records of 37 vertebrate, no records of invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

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



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

- HIGHER TAXON**
- vertebrate fauna
 - invertebrate fauna
 - vascular flora
 - nonvascular flora

3.0 SPECIAL AREAS

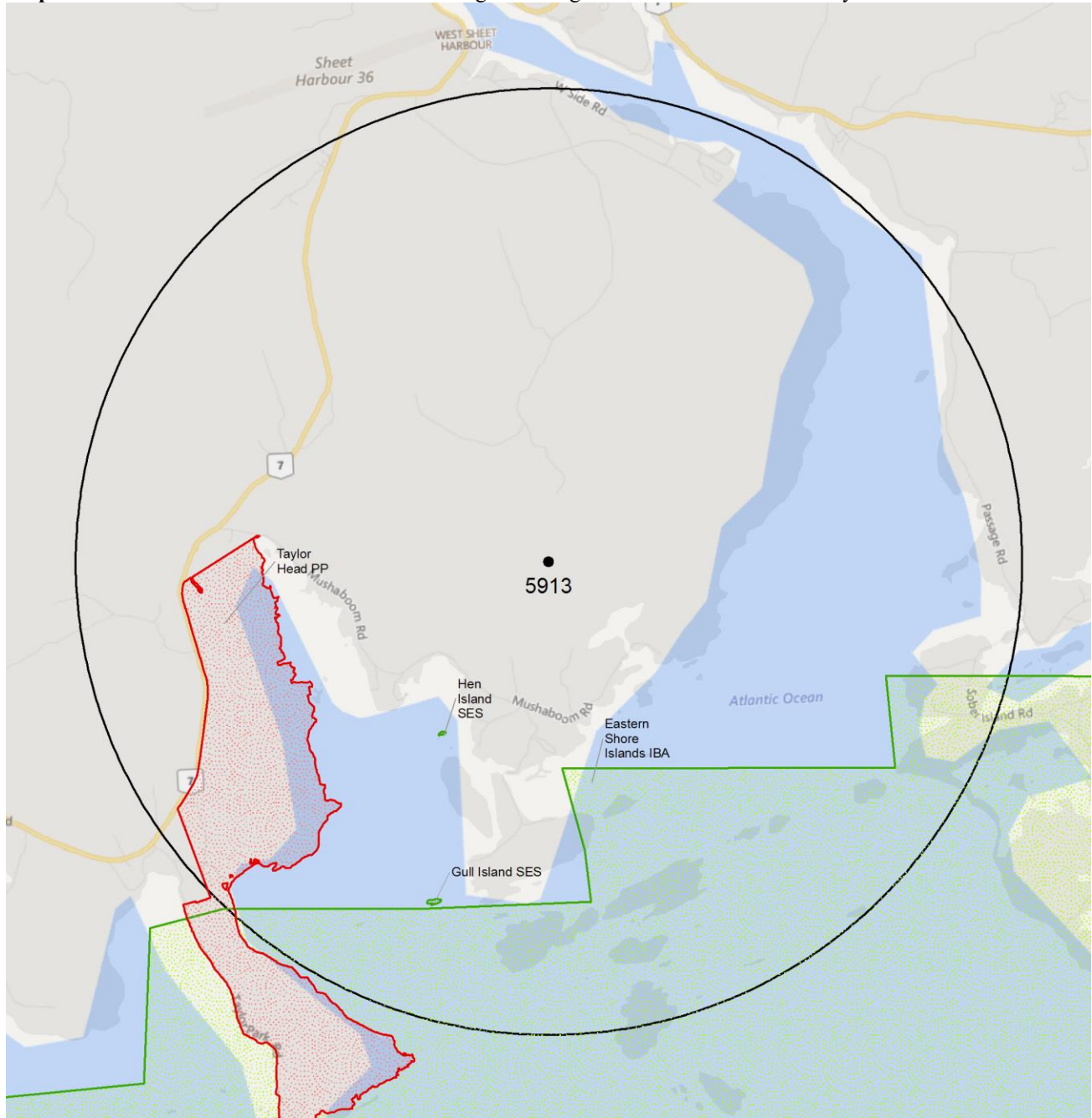
3.1 MANAGED AREAS

The GIS scan identified 1 managed area in the vicinity of the study area (Map 3 and attached file: *ma*.xls)

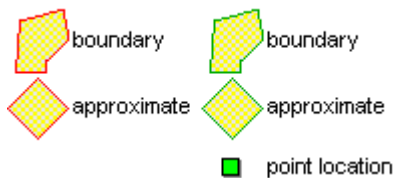
3.2 SIGNIFICANT AREAS

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

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



MANAGED AREAS SIGNIFICANT AREAS



4.0 RARE SPECIES LISTS

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

4.1 FLORA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	1 At Risk	2	4.4 \pm 0.0
P	<i>Geocaulon lividum</i>	Northern Comandra				S3	4 Secure	1	4.3 \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 <i>melodus</i> ssp	Endangered	Endangered	Endangered	S1B	1 At Risk	4	3.7 \pm 7.0
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S2B	1 At Risk	5	3.1 \pm 0.0
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened		Endangered	S2S3B	1 At Risk	5	1.5 \pm 0.0
A	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	1	3.7 \pm 7.0
A	<i>Contopus virens</i>	Eastern Wood-Pewee			Vulnerable	S3S4B	3 Sensitive	2	3.7 \pm 7.0
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern			S3S4B,S3N	4 Secure	1	3.7 \pm 7.0
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B	3 Sensitive	11	1.5 \pm 0.0
A	<i>Circus cyaneus</i>	Northern Harrier	Not At Risk			S3S4B	4 Secure	3	3.7 \pm 7.0
A	<i>Dendroica tigrina</i>	Cape May Warbler				S2B	3 Sensitive	2	3.7 \pm 7.0
A	<i>Bucephala clangula</i>	Common Goldeneye				S2B,S5N	4 Secure	2	4.2 \pm 11.0
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2S3	3 Sensitive	5	3.7 \pm 7.0
A	<i>Tringa semipalmata</i>	Willet				S2S3B	2 May Be At Risk	11	2.1 \pm 0.0
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	4	3.7 \pm 7.0
A	<i>Perisoreus canadensis</i>	Gray Jay				S3	3 Sensitive	6	3.7 \pm 7.0
A	<i>Poecile hudsonica</i>	Boreal Chickadee				S3	3 Sensitive	6	3.7 \pm 7.0
A	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	4 Secure	1	3.7 \pm 7.0
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S3?N	4 Secure	1	4.8 \pm 0.0
A	<i>Sterna paradisaea</i>	Arctic Tern				S3B	2 May Be At Risk	5	2.1 \pm 0.0
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3B	3 Sensitive	1	3.7 \pm 7.0
A	<i>Dumetella carolinensis</i>	Gray Catbird				S3B	2 May Be At Risk	3	3.7 \pm 7.0
A	<i>Wilsonia pusilla</i>	Wilson's Warbler				S3B	3 Sensitive	1	3.7 \pm 7.0
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S3B,S3S4M	3 Sensitive	2	3.7 \pm 7.0
A	<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel				S3B,S5M	4 Secure	1	3.7 \pm 7.0
A	<i>Somateria mollissima</i>	Common Eider				S3S4	4 Secure	14	2.3 \pm 0.0
A	<i>Picoides arcticus</i>	Black-backed Woodpecker				S3S4	3 Sensitive	2	3.7 \pm 7.0
A	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	4 Secure	2	3.7 \pm 7.0
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B	3 Sensitive	4	3.7 \pm 7.0
A	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	6	3.7 \pm 7.0
A	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	3 Sensitive	7	3.7 \pm 7.0
A	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	4 Secure	11	3.3 \pm 0.0
A	<i>Vermivora peregrina</i>	Tennessee Warbler				S3S4B	3 Sensitive	2	3.7 \pm 7.0
A	<i>Dendroica castanea</i>	Bay-breasted Warbler				S3S4B	3 Sensitive	6	3.3 \pm 0.0
A	<i>Dendroica striata</i>	Blackpoll Warbler				S3S4B	3 Sensitive	7	3.7 \pm 7.0
A	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B	4 Secure	3	3.7 \pm 7.0
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3S4B,S5N	4 Secure	2	3.7 \pm 7.0
A	<i>Bucephala albeola</i>	Bufflehead				S3S4N	4 Secure	1	4.2 \pm 11.0
A	<i>Eremophila alpestris</i>	Horned Lark				SHB,S4S5N	4 Secure	1	3.7 \pm 7.0

4.3 LOCATION SENSITIVE SPECIES

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

Nova Scotia

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Fraxinus nigra</i>	Black Ash		Threatened	No
<i>Emydoidea blandingii</i>	Blanding's Turtle - Nova Scotia pop.	Endangered	Vulnerable	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	No
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Vulnerable	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 NS Endangered Species Act.

4.4 SOURCE BIBLIOGRAPHY

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

# recs	CITATION
104	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
24	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
11	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
6	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database.
6	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
3	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
2	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
2	Benjamin, L.K. (compiler) 2012. Significant Habitat & Species Database. NS Dept of Natural Resources.
1	Bird Studies Canada & Nature Canada. 2004-10. Important Bird Areas of Canada Database. Bird Studies Canada, Port Rowan ON, 62 objects.
1	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
1	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
1	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
1	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	Staff, DNR 2007. Restricted & Limited Use Land Database (RLUL).

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 17397 records of 129 vertebrate and 715 records of 50 invertebrate fauna; 3015 records of 240 vascular, 830 records of 56 nonvascular flora (attached: *ob100km.xls).

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

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	25	36.5 \pm 0.0	NS
A	<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	3	36.8 \pm 0.0	NS
A	<i>Perimyotis subflavus</i>	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	1 At Risk	4	73.4 \pm 0.0	NS
A	<i>Salmo salar pop. 1</i>	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered		S1	2 May Be At Risk	14	61.1 \pm 0.0	NS
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	1 At Risk	535	3.7 \pm 7.0	NS
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1B	1 At Risk	56	8.1 \pm 0.0	NS
A	<i>Morone saxatilis pop. 2</i>	Striped Bass- Bay of Fundy pop.	Endangered			S1B	2 May Be At Risk	2	72.7 \pm 0.0	NS
A	<i>Calidris canutus rufa</i>	Red Knot rufa ssp	Endangered		Endangered	S2M	1 At Risk	77	51.9 \pm 0.0	NS
A	<i>Colinus virginianus</i>	Northern Bobwhite	Endangered	Endangered				1	64.8 \pm 0.0	NS
A	<i>Caprimulgus vociferus</i>	Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	1 At Risk	10	54.7 \pm 7.0	NS
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2	3 Sensitive	185	35.2 \pm 1.0	NS
A	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	Threatened			S2	2 May Be At Risk	2	72.7 \pm 0.0	NS
A	<i>Anguilla rostrata</i>	American Eel	Threatened			S2	4 Secure	5	56.8 \pm 0.0	NS
A	<i>Chordeiles minor</i>	Common Nighthawk	Threatened	Threatened	Threatened	S2B	1 At Risk	291	7.2 \pm 7.0	NS
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S2B	1 At Risk	630	3.1 \pm 0.0	NS
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	S2B, S1M	1 At Risk	184	12.4 \pm 7.0	NS
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened		Endangered	S2S3B	1 At Risk	583	1.5 \pm 0.0	NS
A	<i>Riparia riparia</i>	Bank Swallow	Threatened			S2S3B	2 May Be At Risk	179	12.4 \pm 7.0	NS
A	<i>Wilsonia canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	556	3.7 \pm 7.0	NS
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened		Vulnerable	S3S4B	3 Sensitive	272	45.3 \pm 7.0	NS
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened			SUB	5 Undetermined	31	32.8 \pm 7.0	NS
A	<i>Passerculus sandwichensis princeps</i>	Savannah Sparrow princeps ssp	Special Concern	Special Concern		S1B	3 Sensitive	3	7.6 \pm 0.0	NS
A	<i>Bucephala islandica (Eastern pop.)</i>	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	1 At Risk	1	93.6 \pm 0.0	NS
A	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern		S1S2B	2 May Be At Risk	8	77.3 \pm 7.0	NS
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	2 May Be At Risk	205	8.2 \pm 0.0	NS
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	1 At Risk	28	9.4 \pm 0.0	NS
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern			S2S3M	3 Sensitive	3	74.2 \pm 0.0	NS
A	<i>Morone saxatilis pop. 1</i>	Striped Bass- Southern Gulf of St Lawrence pop.	Special Concern			S2S3N	2 May Be At Risk	1	98.0 \pm 1.0	NS
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	3 Sensitive	61	32.2 \pm 10.0	NS
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern		Vulnerable	S3S4B	3 Sensitive	378	3.7 \pm 7.0	NS
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern			S3S4B, S3N	4 Secure	274	3.7 \pm 7.0	NS
A	<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper	Special Concern			SNA	8 Accidental	2	64.0 \pm 0.0	NS
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1?B	5 Undetermined	4	79.2 \pm 0.0	NS
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1B	5 Undetermined	6	89.9 \pm 7.0	NS
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S2?B	5 Undetermined	11	52.5 \pm 7.0	NS
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk			S2S3		1	39.9 \pm 100.0	NS
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk			S3	4 Secure	19	37.2 \pm 5.0	NS
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B	3 Sensitive	200	1.5 \pm 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Sialia sialis</i>	Eastern Bluebird	Not At Risk			S3B	3 Sensitive	36	45.3 ± 7.0	NS
A	<i>Accipiter gentilis</i>	Northern Goshawk	Not At Risk			S3S4	4 Secure	71	12.4 ± 7.0	NS
A	<i>Circus cyaneus</i>	Northern Harrier	Not At Risk			S3S4B	4 Secure	240	3.7 ± 7.0	NS
A	<i>Ammodramus nelsoni</i>	Nelson's Sparrow	Not At Risk			S3S4B	4 Secure	87	18.6 ± 0.0	NS
A	<i>Alces americanus</i>	Moose			Endangered	S1	1 At Risk	28	22.5 ± 0.0	NS
A	<i>Salmo salar</i>	Atlantic Salmon				S1	2 May Be At Risk	64	8.1 ± 0.0	NS
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S1?	5 Undetermined	4	41.6 ± 7.0	NS
A	<i>Passerina cyanea</i>	Indigo Bunting				S1?B	5 Undetermined	9	41.6 ± 7.0	NS
A	<i>Anas acuta</i>	Northern Pintail				S1B	2 May Be At Risk	10	41.6 ± 7.0	NS
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B	4 Secure	2	85.8 ± 7.0	NS
A	<i>Gallinula chloropus</i>	Common Moorhen				S1B	5 Undetermined	1	96.5 ± 7.0	NS
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S1B	2 May Be At Risk	9	80.0 ± 7.0	NS
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S1B	4 Secure	20	63.9 ± 7.0	NS
A	<i>Toxostoma rufum</i>	Brown Thrasher				S1B	5 Undetermined	7	77.8 ± 7.0	NS
A	<i>Vireo gilvus</i>	Warbling Vireo				S1B	5 Undetermined	9	28.9 ± 0.0	NS
A	<i>Dendroica pinus</i>	Pine Warbler				S1B	5 Undetermined	6	78.5 ± 0.0	NS
A	<i>Calidris minutilla</i>	Least Sandpiper				S1B,S3M	4 Secure	183	52.7 ± 0.0	NS
A	<i>Charadrius semipalmatus</i>	Semipalmated Plover				S1B,S3S4M	4 Secure	297	9.5 ± 0.0	NS
A	<i>Lasiurus cinereus</i>	Hoary Bat				S1S2B, S1M	2 May Be At Risk	2	66.9 ± 0.0	NS
A	<i>Pluvialis dominica</i>	American Golden-Plover				S1S2M	3 Sensitive	30	59.7 ± 0.0	NS
A	<i>Limosa haemastica</i>	Hudsonian Godwit				S1S2M	3 Sensitive	24	64.0 ± 0.0	NS
A	<i>Vireo philadelphicus</i>	Philadelphia Vireo				S2?B	5 Undetermined	26	17.0 ± 7.0	NS
A	<i>Anas clypeata</i>	Northern Shoveler				S2B	2 May Be At Risk	5	61.7 ± 0.0	NS
A	<i>Anas strepera</i>	Gadwall				S2B	2 May Be At Risk	17	34.6 ± 7.0	NS
A	<i>Empidonax traillii</i>	Willow Flycatcher				S2B	3 Sensitive	16	41.6 ± 7.0	NS
A	<i>Dendroica tigrina</i>	Cape May Warbler				S2B	3 Sensitive	87	3.7 ± 7.0	NS
A	<i>Piranga olivacea</i>	Scarlet Tanager				S2B	5 Undetermined	11	55.9 ± 7.0	NS
A	<i>Pooecetes gramineus</i>	Vesper Sparrow				S2B	2 May Be At Risk	15	66.9 ± 7.0	NS
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S2B	4 Secure	61	10.5 ± 7.0	NS
A	<i>Bucephala clangula</i>	Common Goldeneye				S2B,S5N	4 Secure	98	4.2 ± 11.0	NS
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2S3	3 Sensitive	51	3.7 ± 7.0	NS
A	<i>Asio otus</i>	Long-eared Owl				S2S3	2 May Be At Risk	19	32.2 ± 7.0	NS
A	<i>Carduelis pinus</i>	Pine Siskin				S2S3	3 Sensitive	255	7.2 ± 7.0	NS
A	<i>Cathartes aura</i>	Turkey Vulture				S2S3B	3 Sensitive	8	64.8 ± 0.0	NS
A	<i>Rallus limicola</i>	Virginia Rail				S2S3B	5 Undetermined	18	66.2 ± 7.0	NS
A	<i>Tringa semipalmata</i>	Willet				S2S3B	2 May Be At Risk	418	2.1 ± 0.0	NS
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B	2 May Be At Risk	144	12.4 ± 7.0	NS
A	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak				S2S3B	3 Sensitive	218	7.2 ± 7.0	NS
A	<i>Icterus galbula</i>	Baltimore Oriole				S2S3B	2 May Be At Risk	37	18.7 ± 7.0	NS
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	96	3.7 ± 7.0	NS
A	<i>Numenius phaeopus hudsonicus</i>	Hudsonian Whimbrel				S2S3M	3 Sensitive	48	23.2 ± 0.0	NS
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S2S3M	4 Secure	48	64.0 ± 0.0	NS
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S2S3M	3 Sensitive	1	78.9 ± 0.0	NS
A	<i>Perisoreus canadensis</i>	Gray Jay				S3	3 Sensitive	355	3.7 ± 7.0	NS
A	<i>Poecile hudsonica</i>	Boreal Chickadee				S3	3 Sensitive	506	3.7 ± 7.0	NS
A	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	4 Secure	535	3.7 ± 7.0	NS
A	<i>Alosa pseudoharengus</i>	Alewife				S3	3 Sensitive	20	16.3 ± 0.0	NS
A	<i>Salvelinus fontinalis</i>	Brook Trout				S3	3 Sensitive	33	5.7 ± 0.0	NS
A	<i>Salvelinus namaycush</i>	Lake Trout				S3	3 Sensitive	2	38.7 ± 0.0	NS
A	<i>Calidris maritima</i>	Purple Sandpiper				S3?N	3 Sensitive	27	19.6 ± 0.0	NS
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S3?N	4 Secure	1	4.8 ± 0.0	NS
A	<i>Falco sparverius</i>	American Kestrel				S3B	4 Secure	246	7.2 ± 7.0	NS
A	<i>Charadrius vociferus</i>	Killdeer				S3B	3 Sensitive	287	10.5 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3B	3 Sensitive	330	7.2 ± 7.0	NS
A	<i>Sterna paradisaea</i>	Arctic Tern				S3B	2 May Be At Risk	53	2.1 ± 0.0	NS
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B	2 May Be At Risk	60	7.2 ± 7.0	NS
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3B	3 Sensitive	135	3.7 ± 7.0	NS
A	<i>Dumetella carolinensis</i>	Gray Catbird				S3B	2 May Be At Risk	257	3.7 ± 7.0	NS
A	<i>Wilsonia pusilla</i>	Wilson's Warbler				S3B	3 Sensitive	66	3.7 ± 7.0	NS
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S3B,S3S4M	3 Sensitive	389	3.7 ± 7.0	NS
A	<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel				S3B,S5M	4 Secure	60	3.7 ± 7.0	NS
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S3B,S5N	3 Sensitive	1	98.5 ± 0.0	NS
A	<i>Fratercula arctica</i>	Atlantic Puffin				S3B,S5N	3 Sensitive	2	18.2 ± 7.0	NS
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3M	4 Secure	281	31.0 ± 0.0	NS
A	<i>Tringa flavipes</i>	Lesser Yellowlegs				S3M	4 Secure	229	35.8 ± 0.0	NS
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	4 Secure	119	59.7 ± 0.0	NS
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3M	3 Sensitive	278	51.9 ± 0.0	NS
A	<i>Calidris fuscicollis</i>	White-rumped Sandpiper				S3M	4 Secure	100	51.9 ± 0.0	NS
A	<i>Limnodromus griseus</i>	Short-billed Dowitcher				S3M	4 Secure	165	51.9 ± 0.0	NS
A	<i>Calidris alba</i>	Sanderling				S3M,S2N	4 Secure	144	51.9 ± 0.0	NS
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S3N	4 Secure	1	53.7 ± 7.0	NS
A	<i>Somateria mollissima</i>	Common Eider				S3S4	4 Secure	442	2.3 ± 0.0	NS
A	<i>Picoides arcticus</i>	Black-backed Woodpecker				S3S4	3 Sensitive	122	3.7 ± 7.0	NS
A	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	4 Secure	110	3.7 ± 7.0	NS
A	<i>Botaurus lentiginosus</i>	American Bittern				S3S4B	3 Sensitive	193	7.2 ± 7.0	NS
A	<i>Anas discors</i>	Blue-winged Teal				S3S4B	2 May Be At Risk	70	17.0 ± 7.0	NS
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B	3 Sensitive	431	3.7 ± 7.0	NS
A	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	500	3.7 ± 7.0	NS
A	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	3 Sensitive	1158	3.7 ± 7.0	NS
A	<i>Catharus fuscescens</i>	Veery				S3S4B	4 Secure	254	17.0 ± 7.0	NS
A	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	4 Secure	908	3.3 ± 0.0	NS
A	<i>Vermivora peregrina</i>	Tennessee Warbler				S3S4B	3 Sensitive	231	3.7 ± 7.0	NS
A	<i>Dendroica castanea</i>	Bay-breasted Warbler				S3S4B	3 Sensitive	339	3.3 ± 0.0	NS
A	<i>Dendroica striata</i>	Blackpoll Warbler				S3S4B	3 Sensitive	94	3.7 ± 7.0	NS
A	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B	4 Secure	72	3.7 ± 7.0	NS
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3S4B,S5N	4 Secure	65	3.7 ± 7.0	NS
A	<i>Bucephala albeola</i>	Bufflehead				S3S4N	4 Secure	30	4.2 ± 11.0	NS
A	<i>Leucophaeus atricilla</i>	Laughing Gull				SHB	4 Secure	1	32.2 ± 0.0	NS
A	<i>Progne subis</i>	Purple Martin				SHB	2 May Be At Risk	3	41.6 ± 7.0	NS
A	<i>Eremophila alpestris</i>	Horned Lark				SHB,S4S5N	4 Secure	4	3.7 ± 7.0	NS
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	4 Secure	2	22.8 ± 0.0	NS
I	<i>Gomphus ventricosus</i>	Skillet Clubtail	Endangered			S1	2 May Be At Risk	1	79.5 ± 0.0	NS
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern		S2B	3 Sensitive	55	17.6 ± 0.0	NS
I	<i>Alasmidonta varicosa</i>	Brook Floater	Special Concern		Threatened	S1S2	3 Sensitive	11	62.1 ± 0.0	NS
I	<i>Satyrium acadica</i>	Acadian Hairstreak				S1	5 Undetermined	7	92.0 ± 1.0	NS
I	<i>Neurocordulia michaeli</i>	Broadtailed Shadowdragon				S1	26	46.7 ± 0.0	NS	
I	<i>Somatochlora brevicincta</i>	Quebec Emerald				S1	2 May Be At Risk	1	63.9 ± 0.0	NS
I	<i>Polygonia comma</i>	Eastern Comma				S1?	1 At Risk	8	87.9 ± 1.0	NS
I	<i>Polygonia satyrus</i>	Satyr Comma				S1?	3 Sensitive	2	91.0 ± 1.0	NS
I	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S1S2	4 Secure	9	80.3 ± 1.0	NS
I	<i>Somatochlora kennedyi</i>	Kennedy's Emerald				S1S2	2 May Be At Risk	2	81.0 ± 1.0	NS
I	<i>Coenagrion resolutum</i>	Taiga Bluet				S1S2	2 May Be At Risk	2	84.8 ± 1.0	NS
I	<i>Stylurus scudderi</i>	Zebra Clubtail				S1S2	2 May Be At Risk	4	59.5 ± 0.0	NS
I	<i>Lycaena hyllus</i>	Bronze Copper				S2	4 Secure	2	83.6 ± 1.0	NS
I	<i>Lycaena dospassosi</i>	Salt Marsh Copper				S2	1 At Risk	1	98.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
I	<i>Satyrium calanus</i>	Banded Hairstreak				S2	5 Undetermined	9	85.2 ± 5.0	NS
I	<i>Satyrium calanus falacer</i>	Banded Hairstreak				S2	1 At Risk	2	89.9 ± 0.0	NS
I	<i>Aglais milberti</i>	Milbert's Tortoiseshell				S2	4 Secure	7	73.2 ± 1.0	NS
I	<i>Epithea princeps</i>	Prince Baskettail				S2	3 Sensitive	7	82.2 ± 0.0	NS
I	<i>Enallagma signatum</i>	Orange Bluet				S2	2 May Be At Risk	3	85.8 ± 0.0	NS
I	<i>Margaritifera margaritifera</i>	Eastern Pearlshell				S2	3 Sensitive	103	30.8 ± 0.0	NS
I	<i>Pantala hymenaea</i>	Spot-Winged Glider				S2?B	3 Sensitive	7	50.1 ± 1.0	NS
I	<i>Thorybes pylades</i>	Northern Cloudywing				S2S3	3 Sensitive	13	56.3 ± 0.0	NS
I	<i>Amblyscirtes hegon</i>	Pepper and Salt Skipper				S2S3	4 Secure	22	43.1 ± 0.0	NS
I	<i>Satyrium liparops</i>	Striped Hairstreak				S2S3	5 Undetermined	5	47.5 ± 0.0	NS
I	<i>Satyrium liparops strigosum</i>	Striped Hairstreak				S2S3	3 Sensitive	2	89.9 ± 0.0	NS
I	<i>Euphydryas phaeton</i>	Baltimore Checkerspot				S2S3	4 Secure	14	6.1 ± 0.0	NS
I	<i>Ophiogomphus mainensis</i>	Maine Snaketail				S2S3	2 May Be At Risk	14	46.7 ± 0.0	NS
I	<i>Ophiogomphus rupinsulensis</i>	Rusty Snaketail				S2S3	2 May Be At Risk	55	47.5 ± 0.0	NS
I	<i>Somatochlora forcipata</i>	Forcinate Emerald				S2S3	2 May Be At Risk	3	81.0 ± 1.0	NS
I	<i>Alasmidonta undulata</i>	Triangle Floater				S2S3	4 Secure	23	43.8 ± 0.0	NS
I	<i>Callophrys henrici</i>	Henry's Elfin				S3	4 Secure	14	49.1 ± 0.0	NS
I	<i>Callophrys lanoraieensis</i>	Bog Elfin				S3	2 May Be At Risk	3	54.2 ± 0.0	NS
I	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	4 Secure	5	75.5 ± 100.0	NS
I	<i>Polygonia faunus</i>	Green Comma				S3	4 Secure	13	48.8 ± 0.0	NS
I	<i>Oeneis jutta</i>	Jutta Arctic				S3	2 May Be At Risk	2	66.4 ± 0.0	NS
I	<i>Aeshna clepsydra</i>	Mottled Darner				S3	4 Secure	12	33.6 ± 1.0	NS
I	<i>Aeshna constricta</i>	Lance-Tipped Darner				S3	4 Secure	12	49.7 ± 1.0	NS
I	<i>Boyeria grafiana</i>	Ocellated Darner				S3	3 Sensitive	7	28.8 ± 1.0	NS
I	<i>Gomphaeschna furcillata</i>	Harlequin Darner				S3	3 Sensitive	2	85.5 ± 1.0	NS
I	<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald				S3	4 Secure	6	60.5 ± 1.0	NS
I	<i>Nannothemis bella</i>	Elfin Skimmer				S3	4 Secure	7	64.1 ± 0.0	NS
I	<i>Sympetrum danae</i>	Black Meadowhawk				S3	3 Sensitive	4	66.7 ± 1.0	NS
I	<i>Enallagma vernale</i>	Vernal Bluet				S3	5 Undetermined	2	60.0 ± 0.0	NS
I	<i>Amphiagrion saucium</i>	Eastern Red Damsel				S3	4 Secure	2	70.4 ± 0.0	NS
I	<i>Polygonia interrogationis</i>	Question Mark				S3B	4 Secure	93	6.8 ± 0.0	NS
I	<i>Erynnis juvenalis</i>	Juvenal's Duskywing				S3S4	4 Secure	31	82.6 ± 2.0	NS
I	<i>Amblyscirtes vialis</i>	Common Roadside-Skipper				S3S4	4 Secure	7	12.5 ± 0.0	NS
I	<i>Polygonia progne</i>	Grey Comma				S3S4	4 Secure	18	31.8 ± 10.0	NS
I	<i>Lanthus parvulus</i>	Northern Pygmy Clubtail				S3S4	4 Secure	29	47.7 ± 0.0	NS
I	<i>Lampsilis radiata</i>	Eastern Lampmussel				S3S4	3 Sensitive	26	53.5 ± 0.0	NS
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	1 At Risk	364	4.4 ± 0.0	NS
N	<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered		Endangered	S1S2	2 May Be At Risk	12	20.0 ± 0.0	NS
N	<i>Peltigera hydrothyria</i>	Eastern Waterfan	Threatened			S1	2 May Be At Risk	1	35.4 ± 1.0	NS
N	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened			S3	3 Sensitive	2	29.5 ± 0.0	NS
N	<i>Sclerophora peronella</i> (Nova Scotia pop.)	Frosted Glass-whiskers Lichen - Nova Scotia pop.	Special Concern	Special Concern		S1?		12	18.4 ± 0.0	NS
N	<i>Degelia plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	4 Secure	32	9.7 ± 0.0	NS
N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk			S2S3	3 Sensitive	6	38.0 ± 0.0	NS
N	<i>Tortula obtusifolia</i>	a Moss				S1?	5 Undetermined	2	79.3 ± 2.0	NS
N	<i>Lichina confinis</i>	Marine Seaweed Lichen				S1?	6 Not Assessed	2	9.8 ± 2.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	<i>Parmeliella parvula</i>	Poor-man's Shingles Lichen				S1?	2 May Be At Risk	1	70.3 ± 0.0	NS
N	<i>Sematophyllum demissum</i>	a Moss				S1S2	3 Sensitive	1	85.5 ± 2.0	NS
N	<i>Sphagnum platyphyllum</i>	Flat-leaved Peat Moss				S1S2		2	82.1 ± 3.0	NS
N	<i>Cyrtio-hypnum minutulum</i>	Tiny Cedar Moss				S1S2	3 Sensitive	1	33.5 ± 0.0	NS
N	<i>Bryohaplocladium microphyllum</i>	Tiny-leaved Haplocladium Moss				S1S2		1	91.3 ± 5.0	NS
N	<i>Anacamptodon splachnoides</i>	a Moss				S2?	3 Sensitive	1	88.5 ± 30.0	NS
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S2?	3 Sensitive	2	80.9 ± 2.0	NS
N	<i>Campyllum polygamum</i>	a Moss				S2?	5 Undetermined	1	85.5 ± 2.0	NS
N	<i>Ditrichum rhynchostegium</i>	a Moss				S2?	3 Sensitive	1	94.0 ± 1.0	NS
N	<i>Kiaeria starkei</i>	Starke's Fork Moss				S2?	3 Sensitive	1	43.7 ± 10.0	NS
N	<i>Philonotis marchica</i>	a Moss				S2?	5 Undetermined	2	77.4 ± 0.0	NS
N	<i>Sematophyllum marylandicum</i>	a Moss				S2?	3 Sensitive	2	84.1 ± 6.0	NS
N	<i>Sphagnum subnitens</i>	Lustrous Peat Moss				S2?	3 Sensitive	1	31.7 ± 2.0	NS
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S2?	3 Sensitive	1	31.7 ± 2.0	NS
N	<i>Cyrtomnium hymenophylloides</i>	Short-pointed Lantern Moss				S2?	3 Sensitive	1	85.6 ± 5.0	NS
N	<i>Leptogium teretiusculum</i>	Beaded Jellyskin Lichen				S2?	3 Sensitive	2	62.1 ± 0.0	NS
N	<i>Peltigera collina</i>	Tree Pelt Lichen				S2?	3 Sensitive	3	30.4 ± 5.0	NS
N	<i>Eurhynchium hians</i>	Light Beaked Moss				S2S3	3 Sensitive	2	55.4 ± 25.0	NS
N	<i>Tortula truncata</i>	a Moss				S2S3	3 Sensitive	1	62.2 ± 300.0	NS
N	<i>Fuscopannaria leucosticta</i>	Rimmed Shingles Lichen				S2S3	2 May Be At Risk	4	18.5 ± 0.0	NS
N	<i>Leptogium tenuissimum</i>	Birdnest Jellyskin Lichen				S2S3	6 Not Assessed	1	78.7 ± 0.0	NS
N	<i>Usnea flammea</i>	Coastal Bushy Beard Lichen				S2S3	3 Sensitive	1	92.5 ± 1.0	NS
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	3 Sensitive	3	36.8 ± 0.0	NS
N	<i>Sticta fuliginosa</i>	Peppered Moon Lichen				S3	3 Sensitive	11	20.8 ± 0.0	NS
N	<i>Leptogium subtile</i>	Appressed Jellyskin Lichen				S3	3 Sensitive	1	22.4 ± 0.0	NS
N	<i>Fuscopannaria ahlneri</i>	Corrugated Shingles Lichen				S3	4 Secure	29	23.5 ± 0.0	NS
N	<i>Heterodermia speciosa</i>	Powdered Fringe Lichen				S3	4 Secure	2	57.2 ± 0.0	NS
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S3	3 Sensitive	15	22.7 ± 0.0	NS
N	<i>Nephroma bellum</i>	Naked Kidney Lichen				S3	3 Sensitive	1	58.0 ± 0.0	NS
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen				S3	4 Secure	34	18.2 ± 0.0	NS
N	<i>Anomodon tristis</i>	a Moss				S3?	3 Sensitive	2	34.5 ± 15.0	NS
N	<i>Helodium blandowii</i>	Wetland-plume Moss				S3?	4 Secure	2	79.6 ± 7.0	NS
N	<i>Cladina stygia</i>	Black-footed Reindeer Lichen				S3?	3 Sensitive	3	26.0 ± 0.0	NS
N	<i>Dichelyma capillaceum</i>	Hairlike Dichelyma Moss				S3S4	4 Secure	1	87.8 ± 3.0	NS
N	<i>Schistidium agassizii</i>	Elf Bloom Moss				S3S4	4 Secure	1	53.9 ± 3.0	NS
N	<i>Hylocomiastrum pyrenaicum</i>	a Feather Moss				S3S4	3 Sensitive	1	88.3 ± 0.0	NS
N	<i>Arctoparmelia incurva</i>	Finger Ring Lichen				S3S4	4 Secure	1	92.5 ± 1.0	NS
N	<i>Hypogymnia vittata</i>	Slender Monk's Hood Lichen				S3S4	4 Secure	12	91.7 ± 0.0	NS
N	<i>Leptogium saturninum</i>	Bearded Jellyskin Lichen				S3S4	5 Undetermined	1	62.1 ± 0.0	NS
N	<i>Parmeliopsis hyperopta</i>	Gray Starburst Lichen				S3S4	5 Undetermined	1	89.5 ± 1.0	NS
N	<i>Physconia detersa</i>	Bottlebrush Frost Lichen				S3S4	3 Sensitive	1	29.5 ± 0.0	NS
N	<i>Sphaerophorus fragilis</i>	Fragile Coral Lichen				S3S4	4 Secure	1	92.5 ± 1.0	NS
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S3S4	4 Secure	222	13.5 ± 0.0	NS

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N	<i>Physcia caesia</i>	Blue-gray Rosette Lichen				S3S4	5 Undetermined	1	92.5 ± 1.0	NS
N	<i>Physcia tenella</i>	Fringed Rosette Lichen				S3S4	6 Not Assessed	1	92.5 ± 1.0	NS
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen				S3S4	4 Secure	6	29.5 ± 0.0	NS
N	<i>Heterodermia neglecta</i>	Fringe Lichen				S3S4	4 Secure	11	24.1 ± 0.0	NS
P	<i>Liatris spicata</i>	Dense Blazing Star	Threatened	Threatened		SNA		1	86.1 ± 0.0	NS
P	<i>Bartonia paniculata</i>	Branched Bartonia	Threatened	Threatened		SNA		1	43.0 ± 10.0	NS
P	<i>Clethra alnifolia</i>	Coast Pepper-Bush	Special Concern	Special Concern	Vulnerable	S1	1 At Risk	2	83.9 ± 0.0	NS
P	<i>Floerkea proserpinacoides</i>	False Mermaidweed	Not At Risk			S2	3 Sensitive	3	77.1 ± 7.0	NS
P	<i>Thuja occidentalis</i>	Eastern White Cedar			Vulnerable	S1	1 At Risk	6	80.0 ± 0.0	NS
P	<i>Sanicula odorata</i>	Clustered Sanicle				S1	2 May Be At Risk	4	77.0 ± 0.0	NS
P	<i>Zizia aurea</i>	Golden Alexanders				S1	2 May Be At Risk	41	44.7 ± 1.0	NS
P	<i>Antennaria parlinii</i>	a Pussytoes				S1	2 May Be At Risk	2	95.9 ± 7.0	NS
P	<i>Bidens hyperborea</i>	Estuary Beggarticks				S1	2 May Be At Risk	1	99.6 ± 1.0	NS
P	<i>Ageratina altissima</i>	White Snakeroot				S1	2 May Be At Risk	1	99.3 ± 7.0	NS
P	<i>Cochlearia tridactylites</i>	Limestone Scurvy-grass				S1	2 May Be At Risk	8	26.4 ± 0.0	NS
P	<i>Lobelia spicata</i>	Pale-Spiked Lobelia				S1	2 May Be At Risk	1	99.8 ± 7.0	NS
P	<i>Hudsonia tomentosa</i>	Woolly Beach-heath				S1	2 May Be At Risk	5	86.9 ± 7.0	NS
P	<i>Desmodium canadense</i>	Canada Tick-trefoil				S1	2 May Be At Risk	20	71.8 ± 0.0	NS
P	<i>Ribes americanum</i>	Wild Black Currant				S1	5 Undetermined	2	81.5 ± 5.0	NS
P	<i>Polygala polygama</i>	Racemed Milkwort				S1	5 Undetermined	1	87.4 ± 1.0	NS
P	<i>Polygonum careyi</i>	Carey's Smartweed				S1	5 Undetermined	1	64.5 ± 3.0	NS
P	<i>Montia fontana</i>	Water Blinks				S1	2 May Be At Risk	1	88.5 ± 1.0	NS
P	<i>Salix myrtillifolia</i>	Blueberry Willow				S1	2 May Be At Risk	1	53.6 ± 0.0	NS
P	<i>Salix serissima</i>	Autumn Willow				S1	2 May Be At Risk	2	53.3 ± 0.0	NS
P	<i>Agalinis paupercula</i> var. <i>borealis</i>	Small-flowered Agalinis				S1		1	83.0 ± 0.0	NS
P	<i>Dirca palustris</i>	Eastern Leatherwood				S1	2 May Be At Risk	5	75.0 ± 1.0	NS
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle				S1	2 May Be At Risk	2	74.3 ± 0.0	NS
P	<i>Pilea pumila</i>	Dwarf Clearweed				S1	2 May Be At Risk	3	71.0 ± 0.0	NS
P	<i>Carex garberi</i>	Garber's Sedge				S1	2 May Be At Risk	4	74.3 ± 0.0	NS
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S1	2 May Be At Risk	2	53.5 ± 0.0	NS
P	<i>Carex haydenii</i>	Hayden's Sedge				S1	2 May Be At Risk	2	82.9 ± 1.0	NS
P	<i>Carex pellita</i>	Woolly Sedge				S1	2 May Be At Risk	9	41.8 ± 10.0	NS
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge				S1	2 May Be At Risk	3	55.1 ± 0.0	NS
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S1	2 May Be At Risk	1	97.4 ± 1.0	NS
P	<i>Carex viridula</i> var. <i>saxillitoralis</i>	Greenish Sedge				S1	2 May Be At Risk	4	11.8 ± 0.0	NS
P	<i>Carex grisea</i>	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	6	94.9 ± 0.0	NS
P	<i>Cyperus lupulinus</i> ssp. <i>macilentus</i>	Hop Flatsedge				S1	2 May Be At Risk	3	91.4 ± 0.0	NS
P	<i>Iris prismatica</i>	Slender Blue Flag				S1	2 May Be At Risk	2	60.3 ± 7.0	NS
P	<i>Juncus vaseyi</i>	Vasey Rush				S1	2 May Be At Risk	1	74.8 ± 0.0	NS
P	<i>Allium tricoccum</i>	Wild Leek				S1	2 May Be At Risk	8	79.0 ± 0.0	NS
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S1	2 May Be At Risk	28	53.7 ± 0.0	NS
P	<i>Elymus wiegandii</i>	Wiegand's Wild Rye				S1	2 May Be At Risk	12	54.9 ± 0.0	NS
P	<i>Elymus hystrix</i> var. <i>bigeloviana</i>	Spreading Wild Rye				S1	2 May Be At Risk	4	62.3 ± 1.0	NS
P	<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	2 May Be At Risk	1	44.6 ± 5.0	NS
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S1	2 May Be At Risk	1	83.2 ± 1.0	NS
P	<i>Botrychium lunaria</i>	Common Moonwort				S1	2 May Be At Risk	3	69.4 ± 2.0	NS
P	<i>Solidago hispida</i>	Hairy Goldenrod				S1?	2 May Be At Risk	2	37.0 ± 7.0	NS
P	<i>Crataegus robinsonii</i>	Robinson's Hawthorn				S1?	5 Undetermined	3	81.5 ± 5.0	NS
P	<i>Carex pensylvanica</i>	Pennsylvania Sedge				S1?	2 May Be At Risk	1	78.7 ± 0.0	NS
P	<i>Dichanthelium</i>	Woolly Panic Grass				S1?	5 Undetermined	1	78.8 ± 0.0	NS

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P	<i>acuminatum</i> var. <i>lindheimeri</i>									
P	<i>Fraxinus nigra</i>	Black Ash			Threatened	S1S2	1 At Risk	84	53.1 ± 0.0	NS
P	<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower				S1S2	2 May Be At Risk	7	61.7 ± 0.0	NS
P	<i>Proserpinaca intermedia</i>	Intermediate Mermaidweed				S1S2	2 May Be At Risk	1	62.2 ± 0.0	NS
P	<i>Anemone virginiana</i> var. <i>alba</i>	Virginia Anemone				S1S2	3 Sensitive	5	77.5 ± 5.0	NS
P	<i>Hepatica nobilis</i> var. <i>obtusata</i>	Round-lobed Hepatica				S1S2	2 May Be At Risk	20	55.1 ± 1.0	NS
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1S2	2 May Be At Risk	20	79.6 ± 0.0	NS
P	<i>Gratiola neglecta</i>	Clammy Hedge-Hyssop				S1S2	3 Sensitive	5	61.9 ± 0.0	NS
P	<i>Carex livida</i> var. <i>radicalis</i>	Livid Sedge				S1S2	2 May Be At Risk	11	43.7 ± 0.0	NS
P	<i>Juncus greenei</i>	Greene's Rush				S1S2	2 May Be At Risk	3	87.4 ± 10.0	NS
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S1S2	5 Undetermined	1	81.8 ± 10.0	NS
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S1S2	2 May Be At Risk	19	54.9 ± 0.0	NS
P	<i>Festuca subverticillata</i>	Nodding Fescue				S1S2	2 May Be At Risk	2	93.6 ± 1.0	NS
P	<i>Sparganium hyperboreum</i>	Northern Burreed				S1S2	3 Sensitive	2	79.1 ± 0.0	NS
P	<i>Carex vacillans</i>	Estuarine Sedge				S1S3	5 Undetermined	2	18.7 ± 0.0	NS
P	<i>Conioselinum chinense</i>	Chinese Hemlock-parsley				S2	3 Sensitive	1	79.6 ± 5.0	NS
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	2 May Be At Risk	14	61.9 ± 0.0	NS
P	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane				S2	3 Sensitive	3	44.1 ± 5.0	NS
P	<i>Lactuca hirsuta</i> var. <i>sanguinea</i>	Hairy Lettuce				S2	3 Sensitive	1	63.4 ± 7.0	NS
P	<i>Symphyotrichum undulatum</i>	Wavy-leaved Aster				S2	3 Sensitive	2	93.0 ± 7.0	NS
P	<i>Symphyotrichum ciliolatum</i>	Fringed Blue Aster				S2	3 Sensitive	15	51.9 ± 0.0	NS
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2	3 Sensitive	1	74.4 ± 7.0	NS
P	<i>Caulophyllum thalictroides</i>	Blue Cohosh				S2	2 May Be At Risk	43	52.7 ± 0.0	NS
P	<i>Arabis drummondii</i>	Drummond's Rockcress				S2	3 Sensitive	4	75.5 ± 0.0	NS
P	<i>Cardamine parviflora</i> var. <i>arenicola</i>	Small-flowered Bittercress				S2	3 Sensitive	4	15.7 ± 0.0	NS
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S2	3 Sensitive	5	28.5 ± 0.0	NS
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	3 Sensitive	11	51.4 ± 0.0	NS
P	<i>Chenopodium rubrum</i>	Red Pigweed				S2	2 May Be At Risk	4	19.3 ± 2.0	NS
P	<i>Hudsonia ericoides</i>	Pinebarren Golden Heather				S2	3 Sensitive	11	83.2 ± 2.0	NS
P	<i>Hypericum majus</i>	Large St John's-wort				S2	3 Sensitive	2	85.2 ± 7.0	NS
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil				S2	3 Sensitive	8	53.8 ± 0.0	NS
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil				S2	3 Sensitive	1	55.4 ± 0.0	NS
P	<i>Oenothera fruticosa</i> ssp. <i>glauca</i>	Narrow-leaved Evening Primrose				S2	5 Undetermined	4	79.0 ± 7.0	NS
P	<i>Polygonum arifolium</i>	Halberd-leaved Tearthumb				S2	3 Sensitive	3	43.9 ± 0.0	NS
P	<i>Rumex salicifolius</i> var. <i>mexicanus</i>	Triangular-valve Dock				S2	3 Sensitive	1	54.0 ± 0.0	NS
P	<i>Primula mistassinica</i>	Mistassini Primrose				S2	3 Sensitive	16	53.8 ± 1.0	NS
P	<i>Anemone quinquefolia</i>	Wood Anemone				S2	3 Sensitive	16	53.9 ± 0.0	NS
P	<i>Anemone virginiana</i>	Virginia Anemone				S2	3 Sensitive	9	73.7 ± 1.0	NS
P	<i>Anemone virginiana</i> var. <i>virginiana</i>	Virginia Anemone				S2	3 Sensitive	1	77.8 ± 7.0	NS
P	<i>Caltha palustris</i>	Yellow Marsh Marigold				S2	3 Sensitive	1	87.7 ± 0.0	NS
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2	3 Sensitive	79	43.5 ± 0.0	NS

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P	<i>Salix pedicellaris</i>	Bog Willow				S2	3 Sensitive	53	43.5 ± 0.0	NS
P	<i>Salix sericea</i>	Silky Willow				S2	2 May Be At Risk	1	82.3 ± 1.0	NS
P	<i>Tiarella cordifolia</i>	Heart-leaved Foamflower				S2	3 Sensitive	216	53.5 ± 5.0	NS
P	<i>Agalinis maritima</i>	Saltmarsh Agalinis				S2	3 Sensitive	1	81.1 ± 0.0	NS
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S2	3 Sensitive	8	44.7 ± 1.0	NS
P	<i>Carex bebbii</i>	Bebb's Sedge				S2	3 Sensitive	6	76.6 ± 0.0	NS
P	<i>Carex castanea</i>	Chestnut Sedge				S2	2 May Be At Risk	22	53.1 ± 0.0	NS
P	<i>Carex comosa</i>	Bearded Sedge				S2	3 Sensitive	2	91.6 ± 0.0	NS
P	<i>Carex tenera</i>	Tender Sedge				S2	3 Sensitive	4	79.9 ± 1.0	NS
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S2	3 Sensitive	1	84.8 ± 0.0	NS
P	<i>Vallisneria americana</i>	Wild Celery				S2	2 May Be At Risk	4	52.1 ± 7.0	NS
P	<i>Allium schoenoprasum</i> var. <i>sibiricum</i>	Wild Chives				S2	2 May Be At Risk	1	84.2 ± 7.0	NS
P	<i>Lilium canadense</i>	Canada Lily				S2	2 May Be At Risk	71	52.8 ± 0.0	NS
P	<i>Cypripedium</i> <i>parviflorum</i> var. <i>pubescens</i>	Yellow Lady's-slipper				S2	3 Sensitive	2	92.1 ± 7.0	NS
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S2	2 May Be At Risk	24	44.7 ± 1.0	NS
P	<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S2	3 Sensitive	1	68.2 ± 1.0	NS
P	<i>Platanthera flava</i> var. <i>herbiola</i>	Pale Green Orchid				S2	5 Undetermined	3	79.0 ± 7.0	NS
P	<i>Platanthera</i> <i>macrophylla</i>	Large Round-Leaved Orchid				S2	3 Sensitive	8	89.2 ± 1.0	NS
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	2 May Be At Risk	11	73.2 ± 1.0	NS
P	<i>Dichantherium</i> <i>linearifolium</i>	Narrow-leaved Panic Grass				S2	3 Sensitive	4	75.4 ± 0.0	NS
P	<i>Piptatherum</i> <i>canadense</i>	Canada Rice Grass				S2	3 Sensitive	7	63.3 ± 7.0	NS
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S2	2 May Be At Risk	2	79.2 ± 5.0	NS
P	<i>Potamogeton</i> <i>richardsonii</i>	Richardson's Pondweed				S2	2 May Be At Risk	4	58.1 ± 0.0	NS
P	<i>Dryopteris fragrans</i> var. <i>remotiuscula</i>	Fragrant Wood Fern				S2	3 Sensitive	3	84.7 ± 7.0	NS
P	<i>Symphotrichum</i> <i>boreale</i>	Boreal Aster				S2?	3 Sensitive	3	84.2 ± 7.0	NS
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S2?	5 Undetermined	3	86.3 ± 1.0	NS
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2?	3 Sensitive	1	85.5 ± 1.0	NS
P	<i>Crataegus submollis</i>	Quebec Hawthorn				S2?	5 Undetermined	3	83.8 ± 7.0	NS
P	<i>Carex peckii</i>	White-Tinged Sedge				S2?	2 May Be At Risk	3	68.8 ± 0.0	NS
P	<i>Eleocharis ovata</i>	Ovate Spikerush				S2?	3 Sensitive	3	86.8 ± 0.0	NS
P	<i>Scirpus pedicellatus</i>	Stalked Bulrush				S2?	3 Sensitive	7	57.1 ± 0.0	NS
P	<i>Potamogeton pulcher</i>	Spotted Pondweed			Vulnerable	S2S3	3 Sensitive	3	44.0 ± 2.0	NS
P	<i>Hieracium robinsonii</i>	Robinson's Hawkweed				S2S3	3 Sensitive	3	79.2 ± 0.0	NS
P	<i>Senecio pseudoarnica</i>	Seabeach Ragwort				S2S3	3 Sensitive	24	10.5 ± 7.0	NS
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch				S2S3	3 Sensitive	22	18.0 ± 0.0	NS
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S2S3	4 Secure	28	11.7 ± 0.0	NS
P	<i>Sagina nodosa</i> ssp. <i>borealis</i>	Knotted Pearlwort				S2S3	4 Secure	7	10.2 ± 0.0	NS
P	<i>Ceratophyllum</i> <i>echinatum</i>	Prickly Hornwort				S2S3	3 Sensitive	2	56.1 ± 0.0	NS
P	<i>Hypericum</i> <i>dissimulatum</i>	Disguised St John's-wort				S2S3	3 Sensitive	3	87.9 ± 0.0	NS
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2S3	3 Sensitive	69	61.1 ± 1.0	NS
P	<i>Empetrum eamesii</i>	Pink Crowberry				S2S3	3 Sensitive	4	85.1 ± 7.0	NS
P	<i>Empetrum eamesii</i> ssp. <i>atropurpureum</i>	Pink Crowberry				S2S3	3 Sensitive	5	85.1 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Chamaesyce polygonifolia</i>	Seaside Spurge				S2S3	3 Sensitive	1	91.1 ± 2.0	NS
P	<i>Halenia deflexa</i>	Spurred Gentian				S2S3	3 Sensitive	1	52.3 ± 1.0	NS
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2S3	3 Sensitive	3	39.8 ± 5.0	NS
P	<i>Polygonum buxiforme</i>	Small's Knotweed				S2S3	5 Undetermined	2	82.7 ± 0.0	NS
P	<i>Polygonum raii</i>	Sharp-fruited Knotweed				S2S3	5 Undetermined	1	99.5 ± 1.0	NS
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S2S3	3 Sensitive	1	85.4 ± 5.0	NS
P	<i>Galium aparine</i>	Common Bedstraw				S2S3	3 Sensitive	17	7.4 ± 0.0	NS
P	<i>Salix pellita</i>	Satiny Willow				S2S3	3 Sensitive	3	62.2 ± 0.0	NS
P	<i>Veronica serpyllifolia</i> <i>ssp. humifusa</i>	Thyme-Leaved Speedwell				S2S3	3 Sensitive	1	47.5 ± 0.0	NS
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	3 Sensitive	6	38.3 ± 5.0	NS
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2S3	3 Sensitive	32	53.8 ± 0.0	NS
P	<i>Carex houghtoniana</i>	Houghton's Sedge				S2S3	3 Sensitive	1	70.7 ± 1.0	NS
P	<i>Eleocharis olivacea</i>	Yellow Spikerush				S2S3	3 Sensitive	8	58.6 ± 0.0	NS
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S2S3	3 Sensitive	4	66.2 ± 7.0	NS
P	<i>Cypripedium parviflorum</i>	Yellow Lady's-slipper				S2S3	3 Sensitive	15	70.1 ± 0.0	NS
P	<i>Botrychium lanceolatum</i> var. <i>angustisegmentum</i>	Lance-Leaf Grape-Fern				S2S3	3 Sensitive	4	62.4 ± 5.0	NS
P	<i>Botrychium simplex</i>	Least Moonwort				S2S3	3 Sensitive	2	50.8 ± 0.0	NS
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	3 Sensitive	4	66.2 ± 7.0	NS
P	<i>Angelica atropurpurea</i>	Purple-stemmed Angelica				S3	4 Secure	1	58.4 ± 0.0	NS
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	3 Sensitive	18	88.5 ± 0.0	NS
P	<i>Hieracium paniculatum</i>	Panicled Hawkweed				S3	4 Secure	6	83.6 ± 0.0	NS
P	<i>Megalodonta beckii</i>	Water Beggarticks				S3	4 Secure	10	50.7 ± 0.0	NS
P	<i>Packera paupercula</i>	Balsam Groundsel				S3	4 Secure	32	72.3 ± 0.0	NS
P	<i>Betula pumila</i>	Bog Birch				S3	3 Sensitive	3	53.2 ± 0.0	NS
P	<i>Campanula aparinoides</i>	Marsh Bellflower				S3	3 Sensitive	22	56.1 ± 0.0	NS
P	<i>Minuartia groenlandica</i>	Greenland Stitchwort				S3	3 Sensitive	19	52.1 ± 7.0	NS
P	<i>Viburnum edule</i>	Squashberry				S3	3 Sensitive	2	85.7 ± 0.0	NS
P	<i>Empetrum eamesii</i>	Pink Crowberry				S3	3 Sensitive	76	85.2 ± 7.0	NS
P	<i>Vaccinium boreale</i>	Northern Blueberry				S3	3 Sensitive	3	36.0 ± 1.0	NS
P	<i>Vaccinium caespitosum</i>	Dwarf Bilberry				S3	4 Secure	54	46.5 ± 0.0	NS
P	<i>Vaccinium uliginosum</i>	Alpine Bilberry				S3	3 Sensitive	3	88.4 ± 1.0	NS
P	<i>Bartonia virginica</i>	Yellow Bartonia				S3	4 Secure	23	82.3 ± 7.0	NS
P	<i>Proserpinaca palustris</i>	Marsh Mermaidweed				S3	4 Secure	13	43.3 ± 0.0	NS
P	<i>Proserpinaca palustris</i> var. <i>crebra</i>	Marsh Mermaidweed				S3	4 Secure	18	52.4 ± 2.0	NS
P	<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed				S3	4 Secure	3	45.4 ± 1.0	NS
P	<i>Teucrium canadense</i>	Canada Germander				S3	3 Sensitive	10	63.5 ± 5.0	NS
P	<i>Epilobium strictum</i>	Downy Willowherb				S3	3 Sensitive	2	79.4 ± 0.0	NS
P	<i>Polygala sanguinea</i>	Blood Milkwort				S3	3 Sensitive	9	56.5 ± 5.0	NS
P	<i>Polygonum pensylvanicum</i>	Pennsylvania Smartweed				S3	4 Secure	11	26.4 ± 1.0	NS
P	<i>Polygonum scandens</i>	Climbing False Buckwheat				S3	3 Sensitive	28	54.0 ± 0.0	NS
P	<i>Plantago rugelii</i>	Rugel's Plantain				S3	4 Secure	7	57.3 ± 0.0	NS
P	<i>Samolus valerandi</i> ssp. <i>parviflorus</i>	Seaside Brookweed				S3	3 Sensitive	7	86.3 ± 5.0	NS
P	<i>Pyrola asarifolia</i>	Pink Pyrola				S3	4 Secure	6	52.8 ± 50.0	NS
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	3 Sensitive	1	92.8 ± 0.0	NS
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup				S3	4 Secure	33	43.5 ± 0.0	NS
P	<i>Rhamnus alnifolia</i>	Alder-leaved Buckthorn				S3	4 Secure	101	43.1 ± 1.0	NS
P	<i>Agrimonia gryposepala</i>	Hooked Agrimony				S3	4 Secure	81	52.8 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Amelanchier stolonifera</i>	Running Serviceberry				S3	4 Secure	2	9.7 ± 0.0	NS
P	<i>Geocaulon lividum</i>	Northern Comandra				S3	4 Secure	2	4.3 ± 0.0	NS
P	<i>Limosella australis</i>	Southern Mudwort				S3	4 Secure	6	38.9 ± 5.0	NS
P	<i>Lindernia dubia</i>	Yellow-seeded False Pimperel				S3	4 Secure	7	72.2 ± 0.0	NS
P	<i>Laportea canadensis</i>	Canada Wood Nettle				S3	3 Sensitive	32	53.7 ± 0.0	NS
P	<i>Verbena hastata</i>	Blue Vervain				S3	4 Secure	68	61.1 ± 0.0	NS
P	<i>Carex cryptolepis</i>	Hidden-scaled Sedge				S3	4 Secure	6	53.1 ± 0.0	NS
P	<i>Carex eburnea</i>	Bristle-leaved Sedge				S3	3 Sensitive	6	85.6 ± 0.0	NS
P	<i>Carex lupulina</i>	Hop Sedge				S3	4 Secure	18	53.1 ± 0.0	NS
P	<i>Carex rosea</i>	Rosy Sedge				S3	4 Secure	16	56.3 ± 4.0	NS
P	<i>Carex swanii</i>	Swan's Sedge				S3	3 Sensitive	2	80.2 ± 0.0	NS
P	<i>Carex tribuloides</i>	Blunt Broom Sedge				S3	4 Secure	5	52.6 ± 0.0	NS
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	3 Sensitive	2	63.0 ± 2.0	NS
P	<i>Carex foenea</i>	Fernald's Hay Sedge				S3	4 Secure	8	51.2 ± 0.0	NS
P	<i>Elodea canadensis</i>	Canada Waterweed				S3	4 Secure	4	74.3 ± 0.0	NS
P	<i>Juncus subcaudatus</i> var. <i>planisepalus</i>	Woods-Rush				S3	3 Sensitive	11	43.0 ± 1.0	NS
P	<i>Juncus dudleyi</i>	Dudley's Rush				S3	4 Secure	38	21.5 ± 1.0	NS
P	<i>Goodyera repens</i>	Lesser Rattlesnake-plantain				S3	3 Sensitive	1	9.9 ± 0.0	NS
P	<i>Listera australis</i>	Southern Twayblade				S3	4 Secure	84	24.7 ± 0.0	NS
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	4 Secure	71	26.4 ± 1.0	NS
P	<i>Platanthera hookeri</i>	Hooker's Orchid				S3	4 Secure	1	99.8 ± 0.0	NS
P	<i>Platanthera orbiculata</i>	Small Round-leaved Orchid				S3	4 Secure	13	80.9 ± 0.0	NS
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S3	4 Secure	3	92.3 ± 0.0	NS
P	<i>Alopecurus aequalis</i>	Short-awned Foxtail				S3	4 Secure	5	77.8 ± 1.0	NS
P	<i>Dichanthelium clandestinum</i>	Deer-tongue Panic Grass				S3	4 Secure	85	48.5 ± 0.0	NS
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	4 Secure	8	69.3 ± 0.0	NS
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S3	3 Sensitive	9	64.1 ± 1.0	NS
P	<i>Potamogeton zosteriformis</i>	Flat-stemmed Pondweed				S3	3 Sensitive	13	22.3 ± 7.0	NS
P	<i>Sparganium natans</i>	Small Burreed				S3	4 Secure	8	52.4 ± 1.0	NS
P	<i>Equisetum pratense</i>	Meadow Horsetail				S3	3 Sensitive	8	71.5 ± 0.0	NS
P	<i>Equisetum variegatum</i>	Variegated Horsetail				S3	4 Secure	26	57.3 ± 1.0	NS
P	<i>Isoetes acadensis</i>	Acadian Quillwort				S3	3 Sensitive	2	73.7 ± 14.0	NS
P	<i>Lycopodium sitchense</i>	Sitka Clubmoss				S3	4 Secure	2	56.5 ± 1.0	NS
P	<i>Huperzia appalachiana</i>	Appalachian Fir-Clubmoss				S3	3 Sensitive	4	88.0 ± 5.0	NS
P	<i>Botrychium dissectum</i>	Cut-leaved Moonwort				S3	4 Secure	4	63.9 ± 1.0	NS
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	5 Undetermined	8	50.8 ± 0.0	NS
P	<i>Asclepias incarnata</i> ssp. <i>pulchra</i>	Swamp Milkweed				S3?	5 Undetermined	45	43.2 ± 0.0	NS
P	<i>Polygonum amphibium</i> var. <i>emersum</i>	Water Smartweed				S3?	5 Undetermined	1	72.8 ± 0.0	NS
P	<i>Lycopodium sabinifolium</i>	Ground-Fir				S3?	4 Secure	4	71.7 ± 1.0	NS
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	4 Secure	7	10.3 ± 0.0	NS
P	<i>Vaccinium corymbosum</i>	Highbush Blueberry				S3S4	4 Secure	2	88.3 ± 5.0	NS
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	4 Secure	6	55.7 ± 0.0	NS
P	<i>Nuphar lutea</i> ssp. <i>pumila</i>	Small Yellow Pond-lily				S3S4	4 Secure	1	78.7 ± 2.0	NS
P	<i>Sanguinaria canadensis</i>	Bloodroot				S3S4	4 Secure	91	52.8 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Polygonum fowleri</i>	Fowler's Knotweed				S3S4	4 Secure	3	10.1 ± 0.0	NS
P	<i>Rumex maritimus</i>	Sea-Side Dock				S3S4		5	10.2 ± 0.0	NS
P	<i>Rumex maritimus</i> var. <i>fueginus</i>	Tierra del Fuego Dock				S3S4	4 Secure	12	9.8 ± 0.0	NS
P	<i>Crataegus succulenta</i>	Fleshy Hawthorn				S3S4	5 Undetermined	1	88.2 ± 0.0	NS
P	<i>Fragaria vesca</i> ssp. <i>americana</i>	Woodland Strawberry				S3S4	4 Secure	52	43.7 ± 0.0	NS
P	<i>Salix petiolaris</i>	Meadow Willow				S3S4	4 Secure	17	53.6 ± 0.0	NS
P	<i>Agalinis neoscotica</i>	Nova Scotia Agalinis				S3S4	4 Secure	5	78.4 ± 0.0	NS
P	<i>Viola sagittata</i> var. <i>ovata</i>	Arrow-Leaved Violet				S3S4	4 Secure	3	86.5 ± 0.0	NS
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	4 Secure	4	9.2 ± 0.0	NS
P	<i>Triglochin gaspensis</i>	Gasp Arrowgrass				S3S4	5 Undetermined	18	9.4 ± 0.0	NS
P	<i>Juncus acuminatus</i>	Sharp-Fruit Rush				S3S4	4 Secure	2	74.5 ± 0.0	NS
P	<i>Luzula parviflora</i>	Small-flowered Woodrush				S3S4	4 Secure	2	47.4 ± 0.0	NS
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3S4	4 Secure	1	81.1 ± 5.0	NS
P	<i>Trisetum spicatum</i>	Narrow False Oats				S3S4	4 Secure	9	72.4 ± 0.0	NS
P	<i>Cystopteris bulbifera</i>	Bulblet Bladder Fern				S3S4	4 Secure	64	50.7 ± 0.0	NS
P	<i>Equisetum hyemale</i> var. <i>affine</i>	Common Scouring-rush				S3S4	4 Secure	13	64.7 ± 0.0	NS
P	<i>Equisetum scirpoides</i>	Dwarf Scouring-Rush				S3S4	4 Secure	31	68.2 ± 0.0	NS
P	<i>Lycopodium complanatum</i>	Northern Clubmoss				S3S4	4 Secure	3	19.0 ± 0.0	NS
P	<i>Schizaea pusilla</i>	Little Curlygrass Fern				S3S4	4 Secure	5	58.7 ± 1.0	NS
P	<i>Solidago simplex</i> var. <i>randii</i>	Sticky Goldenrod				SH	0.1 Extirpated	1	45.9 ± 1.0	NS
P	<i>Viola canadensis</i>	Canada Violet				SH	0.1 Extirpated	1	77.1 ± 7.0	NS

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15	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
15	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
14	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of <i>C. insculpta</i> sightings. Acadia University, Wolfville NS, 88 recs.
14	Cameron, R.P. 2014. 2013-14 rare species field data. Nova Scotia Department of Environment, 35 recs.
14	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
14	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
14	Robinson, S.L. 2015. 2014 field data.
13	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
12	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
12	Neily, T.H. 2013. Email communication to Sean Blaney regarding <i>Listera australis</i> observations made from 2007 to 2011 in Nova Scotia. , 50.
11	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
11	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
10	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
9	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
9	Cameron, R.P. 2005. Erioderma pedicellatum unpublished data. NS Dept of Environment, 9 recs.
9	Cameron, R.P. 2006. Erioderma pedicellatum 2006 field data. NS Dept of Environment, 9 recs.
8	Hill, N.M. 1994. Status report on the Long's bulrush <i>Scirpus longii</i> in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
8	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
8	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
7	Cameron, B. 2006. Hepatica americana Survey at Scotia Mine Site in Gays River, and Discovery of Three Yellow-listed Species. Conestoga-Rovers and Associates, (a consulting firm), october 25. 7 recs.
6	Hall, R. 2008. Rare plant records in old fieldbook notes from Truro area. Pers. comm. to C.S. Blaney. 6 recs, 6 recs.
6	Neily, T.H. & Anderson, F. 2011. Lichen observations from NRC site at Sandy Cove. , 97.
6	O'Neil, S. 1998. Atlantic Salmon: Northumberland Strait Nova Scotia part of SFA 18. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-08. 9 recs.
6	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.

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5	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
5	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
5	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
5	Bredin, K.A. 2002. NS Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centre, 30 recs.
5	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
5	Towell, C. 2014. 2014 Northern Goshawk and Common Nighthawk email reports, NS. NS Department of Natural Resources.
5	Whittam, R.M. 1997. Status Report on the Roseate Tern (<i>Sterna dougallii</i>) in Canada. Committee on the Status of Endangered Wildlife in Canada, 5 recs.
4	Belliveau, A. 2013. Rare species records from Nova Scotia. Mersey Tobeatic Research Institute, 296 records. 296 recs.
4	Clayden, S.R. 2005. Confidential supplement to Status Report on Ghost Antler Lichen (<i>Pseudevernia cladonia</i>). Committee on the Status of Endangered Wildlife in Canada, 27 recs.
4	Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
4	O'Neil, S. 1998. Atlantic Salmon: Eastern Shore Nova Scotia SFA 20. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-10. 4 recs.
3	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
3	Blaney, C.S. Miscellaneous specimens received by ACCDC (botany). Various persons. 2001-08.
3	Brunelle, P.-M. (compiler). 2010. ADIP/MDDS Odonata Database: NB, NS Update 1900-09. Atlantic Dragonfly Inventory Program (ADIP), 935 recs.
3	Cameron, R.P. 2012. Additional rare plant records, 2009. , 7 recs.
3	LaPaix, R.; Parker, M. 2013. email to Sean Blaney regarding <i>Listera australis</i> observations near Kearney Lake. East Coast Aquatics, 2.
2	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
2	Belliveau, A.G. 2014. Plant Records from Southern and Central Nova Scotia. Atlantic Canada Conservation Data Centre, 919 recs.
2	Blaney, C.S. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 6719 recs.
2	Cameron, B. 2005. <i>C. palmicola</i> , <i>E. pedicellatum</i> records from Sixth Lake. Pers. comm. to C.S. Blaney. 3 recs, 3 recs.
2	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
2	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
2	Hill, N. 2003. <i>Floerkea proserpinacoides</i> at Heatherdale, Antigonish Co. 2002. , Pers. comm. to C.S. Blaney. 2 recs.
2	Neily, T.H.; Smith, C.; Whitman, E. 2011. NCC Logging Lake (Halifax Co. NS) properties baseline survey data. Nature Conservancy of Canada, 2 recs.
2	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J.; ONHIC, 487 recs.
2	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
2	Robinson, S.L. 2011. 2011 ND dune survey field data. Atlantic Canada Conservation Data Centre, 2715 recs.
2	Sollows, M.C.. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
2	Standley, L.A. 2002. <i>Carex haydenii</i> in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
2	Whittam, R.M. et al. 1998. Country Island Tern Restoration Project. Canadian Wildlife Service, Sackville, 2 recs.
1	Amiro, Peter G. 1998. Atlantic Salmon: Inner Bay of Fundy SFA 22 & part of SFA 23. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-12. 4 recs.
1	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
1	Basquill, S.P. 2011. Field observations & specimen collections, 2010. Nova Scotia Department of Natural Resources, Pers. comm. , 8 Recs.
1	Benedict, B. Connell Herbarium Specimens, Digital photos. University New Brunswick, Fredericton. 2005.
1	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
1	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
1	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.
1	Bridgehouse, D. Email communication (July 3, 2014) to John Klymko regarding hairstreak butterfly observations made Nova Scotia. 2014.
1	Bruce, J. 2014. 2014 Wood Turtle email report, Nine Mile River, NS. NS Department of Natural Resources.
1	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
1	Clayden, S.R. 2006. <i>Pseudevernia cladonia</i> records. NB Museum. Pers. comm. to S. Blaney, Dec, 4 recs.
1	Daury, R.W. & Bateman, M.C. 1996. The Barrow's Goldeneye (<i>Bucephala islandica</i>) in the Atlantic Provinces and Maine. Canadian Wildlife Service, Sackville, 47pp.
1	Jacques Whitford Ltd. 2003. Cananda Lily location. Pers. Comm. to S. Blaney. 2pp, 1 rec, 1 rec.
1	Lautenschlager, R.A. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 2 recs.
1	MacKinnon, D.; Wright, P.; Smith, D. 2014. 2014 Common Tern email report, Eastern Passage, NS. NS Department of Environment.
1	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.
1	Neily, P.D. Plant Specimens. Nova Scotia Dept Natural Resources, Truro. 2006.
1	Neily, T.H. 2013. Email communication to Sean Blaney regarding <i>Agalinis paupercula</i> observations made in 2013 in Nova Scotia. , 1 rec.
1	Newell, R.B.; Sam, D. 2014. 2014 Bloodroot personal communication report, Antigonish, NS. NS Department of Natural Resources.
1	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
1	Robinson, C.B. 1907. Early intervale flora of eastern Nova Scotia. Transactions of the Nova Scotia Institute of Science, 10:502-506. 1 rec.
1	Robinson, S.L. 2016. 2016 field data. Atlantic Canada Conservation Data Centre.
1	Speers, L. 2008. Butterflies of Canada database: New Brunswick 1897-1999. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 2048 recs.
1	Whittam, R.M. 2000. <i>Senecio pseudoarnica</i> on Country Island. , Pers. comm. to S. Gerriets. 1 rec.
1	Williams, M. Cape Breton University Digital Herbarium. Cape Breton University Digital Herbarium. 2013.



Square Summary (20NQ36)

#species (1st atlas)				#species (2nd atlas)				#hours	#pc done		
poss	prob	conf	total	poss	prob	conf	total	1st	2nd	road	offrd
28	5	43	76	20	26	59	105	44	136.4	17	3

Region summary (#20: Chebucto - Musquodoboit)

#squares	#sq with data		#species		#pc done	target #pc
	1st	2nd	1st	2nd		
103	93	98	146	177	944	386

Target number of point counts in this square: 12 road side, 3 off road (1 in Mature deciduous, 1 in Open wetlands, 1 in Upland open country). 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		
Canada Goose		FY	15	61	Great Blue Heron §	H	P	26	40	Common Tern §	ON	NY	17	30
Wood Duck		FY	17	46	Green Heron †			0	0	Arctic Tern †§	ON	H	9	11
Gadwall ‡			0	4	Turkey Vulture ‡¶			0	4	Black Guillemot ‡§		P	1	12
Eurasian Wigeon ‡			0	0	Osprey	ON	NY	56	72	Rock Pigeon	H	FY	49	67
American Wigeon ‡			0	7	Bald Eagle ¶	H	T	24	69	Mourning Dove	H	FY	24	81
American Black Duck	FL	FY	68	84	Northern Harrier		CF	41	53	Black-billed Cuckoo			4	17
Mallard			17	38	Sharp-shinned Hawk	H	H	20	43	Great Horned Owl		FY	24	47
Mallard x Am. Black Duck ‡			0	4	Northern Goshawk			17	33	<u>Barred Owl</u>			37	67
Blue-winged Teal			8	6	Red-should Hawk †			1	0	Long-eared Owl †			1	7
Northern Pintail			3	3	Broad-winged Hawk		T	22	45	Short-eared Owl †			1	2
Green-winged Teal		FY	21	24	Red-tailed Hawk		A	37	63	North Saw-whet Owl		T	16	45
Ring-necked Duck		FY	40	50	Virginia Rail †			2	3	<u>Common Nighthawk</u> †			49	56
Greater Scaup †			0	0	Sora			15	10	Chimney Swift †			35	14
Common Eider §	AY	FY	7	20	American Coot †			0	1	Ruby-thr Hummingbird	H	FY	52	86
Harlequin Duck †			0	0	Semipalmated Plover †			2	0	Belted Kingfisher	ON	H	49	82
Common Goldeneye ‡			0	7	Piping Plover †		H	3	6	Yellow-bellied Sapsucker			36	41
Hooded Merganser		P	6	28	Killdeer			51	36	Downy Woodpecker		T	51	81
Common Merganser		FY	33	55	Spotted Sandpiper	AY	FY	54	66	Hairy Woodpecker		NY	54	86
Red-breast Merganser		T	6	15	Greater Yellowlegs †		H	3	23	Black-back Woodpecker		NY	22	47
Ring-necked Pheasant		S	29	70	Willet	A	FY	16	24	Northern Flicker	H	NY	82	92
Ruffed Grouse		FY	49	78	Lesser Yellowlegs ‡			0	0	Pileated Woodpecker		NY	41	72
Spruce Grouse	FL	FY	25	27	Least Sandpiper †			4	2	<u>American Kestrel</u>			39	50
Common Loon		T	61	72	Wilson's Snipe			45	43	Merlin	H	NY	18	52
Pied-billed Grebe			10	13	American Woodcock		H	20	53	Olive-sided Flycatcher †		P	44	60
Leach's Storm-Petrel ‡§		NU	1	5	Black-headed Gull ‡			0	0	Eastern Wood-Pewee	H	S	55	55
Northern Gannet ‡			0	0	Ring-billed Gull ‡§		H	0	3	Yellow-bellied Flycatcher	H	T	58	73
Double-crest Cormorant §	ON	NE	13	31	Herring Gull §	ON	NY	31	40	Alder Flycatcher	H	T	77	89
Great Cormorant ‡§	NE	V	2	5	Great Black-backed Gull §	FL	NY	31	31	Least Flycatcher		H	36	68
American Bittern			19	26	Roseate Tern ‡§			3	2	Eastern Phoebe			4	15

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Maritimes Breeding Bird Atlas - Summary Sheet for Square 20NQ36 (page 2 of 3)

SPECIES	Code		%		SPECIES	Code		%		SPECIES	Code		%	
	1st	2nd	1st	2nd		1st	2nd	1st	2nd		1st	2nd	1st	2nd
Gr Crested Flycatcher			6	2	American Robin	AY	FY	87	91	Vesper Sparrow †			0	3
Eastern Kingbird		P	22	25	Gray Catbird	P	FY	51	57	Savannah Sparrow	FL	NE	58	58
Blue-headed Vireo	AY	FY	69	89	Northern Mockingbird †			9	2	Ipswich Sparrow †			0	2
Warbling Vireo †			0	4	Brown Thrasher †			1	2	Nelson's Sh.-tail Sparrow			13	15
Philadelphia Vireo ‡			2	9	European Starling	NY	NY	75	75	Fox Sparrow	H	CF	10	16
Red-eyed Vireo	H	T	81	88	Cedar Waxwing	H	H	68	88	Song Sparrow	AY	CF	84	92
Gray Jay	FL	FY	62	68	<u>Ovenbird</u>	H		66	74	Lincoln's Sparrow	AY	CF	41	57
Blue Jay	H	FY	77	85	North Waterthrush		T	40	34	Swamp Sparrow	AY	T	58	85
American Crow	H	FY	83	91	Black-white Warbler	AY	CF	81	87	White-throat Sparrow	AY	CF	87	90
Common Raven	H	FY	74	91	Tennessee Warbler	AY	T	78	48	Dark-eyed Junco	AY	NE	86	91
Horned Lark †		H	3	1	Nashville Warbler	AY	T	65	83	Scarlet Tanager †			4	4
Tree Swallow	NY	AE	80	87	<u>Mourning Warbler</u>	H		32	32	Northern Cardinal ‡			0	7
Bank Swallow §			49	22	Common Yellowthroat	AY	CF	86	91	Rose-breast Grosbeak			32	30
Cliff Swallow §			34	18	American Redstart	AY	H	87	88	Indigo Bunting ‡			1	1
Barn Swallow	ON	AE	83	75	Cape May Warbler		H	19	29	Bobolink			38	24
Black-capp Chickadee	AY	T	79	91	Northern Parula		H	72	85	<u>Red-wing Blackbird</u>			61	71
Boreal Chickadee	AY	FY	72	78	Magnolia Warbler	AY	CF	77	91	Rusty Blackbird †			49	24
Red-breast Nuthatch	H	S	73	89	Bay-breasted Warbler	AY	CF	52	54	Common Grackle	AY	CF	76	88
White-breast Nuthatch			17	24	<u>Blackburnian Warbler</u>			56	68	Brown-head Cowbird			39	14
Brown Creeper		P	27	65	Yellow Warbler	H	H	69	81	Baltimore Oriole			5	5
House Wren †			0	0	Chestn-sided Warbler		NB	51	72	Pine Grosbeak	AY	FY	54	30
Winter Wren	H	FY	60	82	Blackpoll Warbler	AY	CF	10	27	Purple Finch		T	74	87
Golden-crown Kinglet	H	CF	70	90	Black-thr Blue Warbler			32	39	House Finch †			3	1
Ruby-crown Kinglet	H	T	81	88	Palm Warbler	AY	NB	62	87	Red Crossbill †	P	S	21	32
Eastern Bluebird †			3	5	Yellow-rumped Warbler	AY	CF	82	92	White-winged Crossbill	P	H	53	38
Veery			44	30	Black-thr Green Warbler	AY	CF	82	89	<u>Pine Siskin</u>	H		65	68
Swainson's Thrush	AY	FY	74	85	Canada Warbler †	H	T	66	52	American Goldfinch	H	P	82	88
Hermit Thrush	AY	CF	80	91	Wilson's Warbler	H	H	15	20	<u>Evening Grosbeak</u>	P		58	48
Wood Thrush †			1	4	<u>Chipping Sparrow</u>	AY		51	54	<u>House Sparrow</u>	ON		63	46

This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #20 (Chebucto - Musquodoboit). Underlined species are those that you should try to add to this square (20NQ36). 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 20NQ36 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 #20). 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 23/08/2018. An up-to-date version of this sheet is available from <http://www.mba-aom.ca/jsp/summaryform.jsp?squareID=20NQ36?lang=en>

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Appendix D. WETLAND FUNCTIONAL ASSESSMENT RESULTS

Table D1: WESP Evaluation Results - Grouped Wetland Functions

WL ID	HYDROLOGIC Group		WATER PURIFICATION Group		AQUATIC SUPPORT Group		AQUATIC HABITAT Group		TERRESTRIAL HABITAT Group		WETLAND CONDITION		WETLAND RISK		Average Function	Average Benefits
	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits		
1	2	1	3	1	1	1	2	2	1	3	N/A	3	N/A	2	1.5	1.6
2	1	1	1	1	1	1	2	2	3	1	N/A	3	N/A	1	1.3	1.3
3	3	1	3	1	2	1	1	2	3	2	N/A	3	N/A	2	2.0	1.5
4	3	1	3	1	2	1	1	1	3	1	N/A	3	N/A	2	2.0	1.3
5	3	1	3	1	2	1	1	1	3	1	N/A	3	N/A	2	2.0	1.3
6	3	1	3	1	2	1	1	1	2	1	N/A	3	N/A	2	1.8	1.3
7	3	1	3	1	1	1	1	1	2	1	N/A	2	N/A	1	1.7	1.0
8	2	1	3	1	1	1	2	2	3	1	N/A	3	N/A	2	1.8	1.4
9	3	1	3	1	2	1	1	2	3	2	N/A	3	N/A	2	2.0	1.5
10	3	1	3	1	2	1	1	2	3	2	N/A	3	N/A	2	2.0	1.5
11	2	1	3	1	1	1	2	3	3	2	N/A	3	N/A	2	1.8	1.6
12	2	1	3	1	1	1	2	3	3	2	N/A	3	N/A	2	1.8	1.6
13	3	1	3	1	2	1	1	2	2	2	N/A	3	N/A	2	1.8	1.5
14	2	1	3	1	2	1	1	2	3	2	N/A	3	N/A	2	1.8	1.5
15	2	1	3	1	1	2	2	3	3	2	N/A	3	N/A	2	1.8	1.8
16	3	1	3	1	2	1	1	2	2	2	N/A	3	N/A	2	1.8	1.5
17	3	1	3	1	2	1	1	2	2	2	N/A	3	N/A	2	1.8	1.5
18	2	1	3	1	1	1	2	3	3	2	N/A	3	N/A	2	1.8	1.6
19	2	1	3	1	1	1	2	3	3	2	N/A	3	N/A	1	1.8	1.5
20	3	1	3	1	2	1	1	2	3	2	N/A	3	N/A	2	2.0	1.5
21	2	1	3	1	1	1	2	3	3	2	N/A	3	N/A	2	1.8	1.6
22	2	1	3	1	1	1	2	3	3	2	N/A	3	N/A	2	1.8	1.6
23	1	2	2	2	1	1	2	2	3	1	N/A	3	N/A	1	1.5	1.5
24	2	1	3	1	2	1	2	2	3	1	N/A	3	N/A	2	2.0	1.4
25	2	1	3	1	1	1	2	2	3	1	N/A	3	N/A	2	1.8	1.4
26	3	2	3	2	2	1	1	1	2	1	N/A	2	N/A	2	1.8	1.4
27	3	2	3	2	2	1	1	1	3	1	N/A	3	N/A	2	2.0	1.5
Total Average (all wetlands)	2	1	3	1	2	1	1	2	3	2	N/A	3	N/A	2	1.8	1.5

1-1.4 = Low Average Accumulated Score
 1.5-2.4 = Moderate Average Accumulated Score
 2.5-3 = High Average Accumulated Score

Table D2: WESP Evaluation Results - Specific Wetland F

Wetland	25		26		27	
Individual Wetland Services	Function Rating	Benefits Rating	Function Rating	Benefits Rating	Function Rating	Benefits Rating
Surface Water Storage (WS)	2	1	3	2	3	2
Stream Flow Support (SFS)	1	1	1	1	1	1
Streamwater Cooling (WC)	1	1	1	1	1	1
Sediment & Toxicant Retention & Stabilization (SR)	1	1	2	2	2	2
Phosphorus Retention (PR)	1	1	2	2	1	2
Nitrate Removal & Retention (NR)	3	1	3	2	3	2
Carbon Sequestration (CS)	2		3		3	
Organic Nutrient Export (OE)	2		3		3	
Anadromous Fish Habitat (FA)	1	1	1	1	1	1
Resident & Other Fish Habitat (FR)	1	1	1	1	1	1
Aquatic Invertebrate Habitat (INV)	1	2	3	2	3	2
Amphibian Habitat (AM)	2	2	2	1	2	1
Waterbird Feeding Habitat (WBF)	2	2	1	1	1	1
Waterbird Nesting Habitat (WBN)	2	1	1	1	1	1
Songbird, Raptor, & Mammal Habitat (SBM)	3	2	2	1	2	1
Pollinator Habitat (POL)	3	1	2	1	3	1
Native Plant Habitat (PH)	2	1	2	1	2	1
Public Use & Recognition (PU)		2		2		2
Wetland Sensitivity (Sens)		3		3		3
Wetland Ecological Condition (EC)		3		2		3
Wetland Stressors (STR) (higher score means more)		1		1		1

Appendix D

Water Quality Data

Appendix D
Water Quality Data - Surface Water

Sample	Units	RDL	NS Tier 1 EQS	SW-2				SW-3				SW-4				SW-5				SW-6							
				25-Sep-17	11-Dec-17	13-Apr-18	28-Jun-18	25-Sep-17	11-Dec-17	13-Apr-18	28-Jun-18	25-Sep-17	25-Sep-17 SW-DUP	11-Dec-17	13-Apr-18	13-Apr-18 SW-DUP	28-Jun-18	25-Sep-17	11-Dec-17	11-Dec-17 SW-DUP	13-Apr-18	28-Jun-18	25-Sep-17	11-Dec-17	13-Apr-18	28-Jun-18	28-Jun-18 SW-DUP
CALCULATED PARAMETERS																											
Anion Sum	me/L	NA	-	0.200	0.280	0.330	0.260	-	0.360	0.310	0.270	0.280	0.290	0.340	0.360	0.370	0.310	0.240	0.310	0.290	0.250	0.210	0.150	0.210	0.210	0.180	0.180
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Calculated TDS	mg/L	1.0	-	16	22	23	18	-	25	22	23	22	23	25	25	25	22	24	21	20	17	17	11	16	15	13	13
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cation Sum	me/L	NA	-	0.300	0.370	0.420	0.350	-	0.450	0.440	0.420	0.350	0.370	0.410	0.450	0.430	0.380	0.400	0.360	0.370	0.330	0.310	0.210	0.290	0.290	0.250	0.250
Hardness (CaCO3)	mg/L	1.0	-	3.7	5.7	6.2	4.5	-	7.8	5.2	4.9	4.1	4.2	5.8	5.4	5.2	4.3	6.0	5.5	5.6	3.8	3.8	2.8	4.6	4.0	3.4	3.4
Ion Balance (% Difference)	%	NA	-	20.0	13.9	12.0	14.8	-	11.1	17.3	21.7	11.1	12.1	9.33	11.1	7.50	10.1	25.0	7.46	12.1	13.8	19.2	16.7	16.0	16.0	16.3	16.3
Langelier Index (@ 20C)	NA	-	-	NC	NC	NC	NC	-	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Langelier Index (@ 4C)	NA	-	-	NC	NC	NC	NC	-	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitrate (N)	mg/L	0.050	-	<0.050	<0.050	<0.050	<0.050	-	<0.050	<0.050	<0.050	0.086	0.084	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Saturation pH (@ 20C)	NA	-	-	NC	NC	NC	NC	-	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Saturation pH (@ 4C)	NA	-	-	NC	NC	NC	NC	-	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
INORGANICS																											
Total Alkalinity (Total as CaCO3)	mg/L	5.0	-	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dissolved Chloride (Cl)	mg/L	1.0	-	7.2	9.9	12	9.4	-	13	11	9.6	9.9	10	12	13	13	11	8.6	11	10	8.8	7.4	5.1	7.3	7.4	6.3	6.3
Colour	TCU	25	-	200	190	91	130	-	230	170	290	150	190	160	67	74	130	370	210	210	120	320	61	140	61	97	100
Nitrate + Nitrite (N)	mg/L	0.050	-	<0.050	<0.050	<0.050	<0.050	-	<0.050	<0.050	<0.050	0.086	0.084	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Nitrite (N)	mg/L	0.010	-	<0.010	<0.010	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrogen (Ammonia Nitrogen)	mg/L	0.050	-	<0.050	<0.050	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.095	<0.050	<0.050	<0.050	<0.050
Total Organic Carbon (C)	mg/L	0.50	-	14	17	10	12	-	24	19	30	12	12	17	7.9	8.3	13	31	22	23	15	33	6.4	17	7.1	10	9.7
Orthophosphate (P)	mg/L	0.010	-	<0.010	<0.010	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
pH	pH	NA	-	5.04	5.61	5.73	5.87	-	4.94	4.62	5.39	5.90	5.24	5.02	5.66	6.01	5.71	5.46	5.29	4.70	4.89	5.62	6.01	5.18	6.19	5.58	5.93
Reactive Silica (SiO2)	mg/L	0.50	-	2.0	3.9	2.2	1.0	-	3.1	2.3	4.4	4.2	4.2	4.0	2.3	2.3	2.3	6.9	2.2	2.1	1.6	2.9	1.6	2.4	1.8	1.1	1.2
Dissolved Sulphate (SO4)	mg/L	2.0	-	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Turbidity	NTU	0.10	-	1.5	2.0	1.3	1.4	-	1.5	1.5	1.0	0.40	0.39	1.0	0.45	0.35	1.0	0.92	1.5	1.1	0.87	1.2	0.59	0.90	0.43	0.92	2.0
Conductivity	uS/cm	1.0	-	33	47	56	46	-	66	60	51	44	44	58	60	<1.0	50	44	59	64	51	45	23	44	<1.0	31	32
INORGANICS - FIELD																											
Temperature	°C	-	-	23.04	6.17	7.82	20.43	-	7.42	3.74	12.03	18.3	-	6.08	7.48	-	18.05	15.63	5.70	-	5.07	14.58	19.33	5.85	7.80	20.06	-
pH	NA	-	-	4.55	4.17	2.81	4.71	-	3.76	2.26	4.25	4.18	-	4.13	3.41	-	3.6	3.9	4.34	-	1.81	3.1	4.68	4.34	3.24	3.65	-
Conductivity	uS/cm	-	-	16	25	30	23	-	35	31	26	22	-	29	31	-	26	21	32	-	27	23	15	22	19	16	-
Dissolved Oxygen	mg/L	-	-	5.13	27.5	21.81	7.47	-	28.09	21.93	9.11	3.45	-	24.02	24.97	-	9.45	6.92	23.76	-	28.07	10.41	5.79	20.78	19.46	7.21	-

Appendix D
Water Quality Data - Surface Water

Sample	Units	RDL	NS Tier 1 EQS	SW-2				SW-3				SW-4				SW-5				SW-6							
				25-Sep-17	11-Dec-17	13-Apr-18	28-Jun-18	25-Sep-17	11-Dec-17	13-Apr-18	28-Jun-18	25-Sep-17	25-Sep-17 SW-DUP	11-Dec-17	13-Apr-18	13-Apr-18 SW-DUP	28-Jun-18	25-Sep-17	11-Dec-17	11-Dec-17 SW-DUP	13-Apr-18	28-Jun-18	25-Sep-17	11-Dec-17	13-Apr-18	28-Jun-18	28-Jun-18 SW-DUP
METALS																											
Total Aluminum (Al)	ug/L	5.0	5	340	400	240	280	-	470	350	490	300	310	430	220	220	320	440	430	300	230	400	130	260	190	220	230
Total Antimony (Sb)	ug/L	1.0	20	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Arsenic (As)	ug/L	1.0	5	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	1.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.9	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	<1.0
Total Barium (Ba)	ug/L	1.0	1000	2.0	3.0	3.1	2.4	-	4.6	2.7	2.8	2.8	2.8	4.9	4.0	4.0	3.4	1.9	4.9	2.1	1.3	1.4	2.0	3.4	3.2	3.1	3.4
Total Beryllium (Be)	ug/L	1.0	5.3	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Bismuth (Bi)	ug/L	2.0	-	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Boron (B)	ug/L	50	1200	<50	<50	<50	<50	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Total Cadmium (Cd)	ug/L	0.010	0.01	0.014	0.024	0.023	0.019	-	0.047	0.023	0.021	0.016	0.014	0.024	0.023	0.020	0.019	0.014	0.024	0.036	0.015	0.015	<0.010	0.025	0.019	0.016	0.018
Total Calcium (Ca)	ug/L	100	-	660	1000	980	750	-	1500	900	1000	750	780	1100	870	850	790	1400	1100	1100	650	780	560	960	730	670	670
Total Chromium (Cr)	ug/L	1.0	-	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.4	<1.0	<1.0	<1.0
Total Cobalt (Co)	ug/L	0.40	10	0.45	0.50	0.45	0.48	-	1.1	0.73	0.86	0.50	0.48	0.56	0.48	0.41	0.43	<0.40	0.56	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Total Copper (Cu)	ug/L	2.0	2	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Iron (Fe)	ug/L	50	300	1000	920	460	560	-	1200	960	1800	670	690	650	270	260	490	1900	650	720	520	1200	310	460	200	370	380
Total Lead (Pb)	ug/L	0.50	1	0.55	0.63	<0.50	<0.50	-	1.1	0.73	1.1	<0.50	<0.50	0.64	<0.50	<0.50	<0.50	1.1	0.64	0.75	<0.50	0.89	<0.50	0.57	<0.50	<0.50	<0.50
Total Magnesium (Mg)	ug/L	100	-	500	760	920	650	-	980	720	590	540	550	760	790	750	560	600	760	700	530	450	340	540	520	420	430
Total Manganese (Mn)	ug/L	2.0	820	58	77	79	64	-	130	95	87	44	47	62	56	55	42	100	62	75	51	45	12	38	37	40	41
Total Molybdenum (Mo)	ug/L	2.0	73	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Nickel (Ni)	ug/L	2.0	25	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	3.6	<2.0	<2.0	<2.0
Total Phosphorus (P)	ug/L	100	-	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Total Potassium (K)	ug/L	100	-	300	410	370	340	-	250	200	130	200	230	400	360	360	210	110	400	300	210	<100	270	340	260	240	260
Total Selenium (Se)	ug/L	1.0	1	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Silver (Ag)	ug/L	0.10	0.1	<0.10	<0.10	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Sodium (Na)	ug/L	100	-	3900	4800	6300	5200	-	5300	6300	5800	5400	5700	5700	7300	7000	6100	4700	5700	4800	4900	4300	3000	3800	4400	3700	3700
Total Strontium (Sr)	ug/L	2.0	21000	5.9	9.1	9.8	7.7	-	13	7.7	7.9	7.8	8.3	12	9.5	9.9	8.5	10	12	9.5	5.5	6.6	5.6	9.5	8.0	7.0	7.6
Total Thallium (Tl)	ug/L	0.10	0.8	<0.10	<0.10	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Tin (Sn)	ug/L	2.0	-	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Titanium (Ti)	ug/L	2.0	-	4.8	5.9	4.0	4.2	-	6.3	8.4	12	2.7	3.9	4.2	2.6	2.1	3.5	7.9	4.2	4.0	6.5	5.6	<2.0	2.7	3.6	<2.0	2.6
Total Uranium (U)	ug/L	0.10	300	<0.10	<0.10	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Vanadium (V)	ug/L	2.0	6	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Zinc (Zn)	ug/L	5.0	30	<5.0	<5.0	5.9	<5.0	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
PETROLEUM HYDROCARBONS																											
Benzene	mg/L	0.0010	2.1	-	-	-	-	-	<0.0010	-	-	<0.0010	-	-	<0.0010	-	<0.0010	-	<0.0010	-	-	-	<0.0010	-	<0.0010	<0.0010	-
Toluene	mg/L	0.0010	0.77	-	-	-	-	-	<0.0010	-	-	<0.0010	-	-	<0.0010	-	<0.0010	-	<0.0010	-	-	-	<0.0010	-	<0.0010	<0.0010	-
Ethylbenzene	mg/L	0.0010	0.32	-	-	-	-	-	<0.0010	-	-	<0.0010	-	-	<0.0010	-	<0.0010	-	<0.0010	-	-	-	<0.0010	-	<0.0010	<0.0010	-
Total Xylenes	mg/L	0.0020	0.33	-	-	-	-	-	<0.0020	-	-	<0.0020	-	-	<0.0020	-	<0.0020	-	<0.0020	-	-	-	<0.0020	-	<0.0020	<0.0020	-
C6 - C10 (less BTEX)	mg/L	0.010	-	-	-	-	-	-	<0.010	-	-	<0.010	-	-	<0.010	-	<0.010	-	<0.010	-	-	-	<0.010	-	<0.010	<0.010	-
>C10-C16 Hydrocarbons	mg/L	0.050	-	-	-	-	-	-	<0.050	-	-	<0.050	-	-	<0.050	-	<0.050	-	<0.050	-	-	-	<0.050	-	<0.050	<0.050	-
>C16-C21 Hydrocarbons	mg/L	0.050	-	-	-	-	-	-	<0.050	-	-	<0.050	-	-	<0.050	-	<0.050	-	<0.050	-	-	-	<0.050	-	<0.050	<0.050	-
>C21-<C32 Hydrocarbons	mg/L	0.10	-	-	-	-	-	-	<0.10	-	-	<0.10	-	-	<0.10	-	<0.10	-	<0.10	-	-	-	<0.10	-	<0.10	<0.10	-
Modified TPH (Tier1)	mg/L	0.10	-	-	-	-	-	-	<0.10	-	-	<0.10	-	-	<0.10	-	<0.10	-	<0.10	-	-	-	<0.10	-	<0.10	<0.10	-
Reached Baseline at C32	mg/L	NA	-	-	-	-	-	-	NA	-	-	NA	-	-	NA	-	NA	-	NA	-	-	-	NA	-	NA	NA	-
Hydrocarbon Resemblance	mg/L	NA	-	-	-	-	-	-	NA	-	-	NA	-	-	NA	-	NA	-	NA	-	-	-	NA	-	NA	NA	-

RDL = Reportable Detection Limit

NA = Not Applicable

- = no guideline/not analyzed

NC = not calculated

NS Tier 1 EQS = Nova Scotia Contaminated Site Regulations Tier 1 Environmental Quality Standards for Surface Water - Freshwater (Table 3), July 2013

Appendix E

Preliminary Water Balance Analysis



Memorandum

January 10, 2019

To: Jeff Parks Ref. No.: 11141046

From: ^{A.B} Andrew Betts/Chris Muirhead/aj/1 Tel: 519-340-4101

Subject: Sheet Harbour – Preliminary Water Balance Analysis

1. Background

The following technical memorandum summarizes the preliminary water balance assessment completed for the proposed Dexter Sheet Harbour Quarry (Project) located near Mushaboom, NS. The proposed Project Site comprises 157 hectares (ha) of forested land that is in varying degrees of re-growth due to historical logging. There are no streams within the Project Site, however, the Site is adjacent to Big Eastern Lake to the north and does contribute surface water runoff to surrounding wetlands and lakes. The water balance presented here is a preliminary assessment of the effects on surrounding surface waterbodies caused by development of the quarry area. Three (3) situations were analyzed; existing conditions; mid-life quarry conditions (~20 years into quarry operations) and End-of-Quarry (EOQ) conditions. In the mid-life quarry conditions the quarry is approximately 20% of the full proposed extent with an area of 15 ha. EOQ conditions consider the quarry at full development of 81 ha.

1.1 Data Collection

The following sections discuss the datasets that were collected to facilitate the water balance analysis.

1.1.1 Topographic Data

A 5 m contour dataset, collected from the Nova Scotia Enhanced Topographic Database – GeoNova, was used to delineate the subcatchment areas for the Project Site in combination with Nova Scotia Lake Survey Program (Nova Scotia, 2017). The contours were assessed manually and compared with data from the Lake Survey Program to delineate subcatchments during pre- and post-conditions.

1.1.2 Climate Data

Precipitation totals were obtained from the Environment Canada Malay Falls Climate Station (Climate ID 8203400) from 1950-2000. The station was selected based on its proximity to the Project Site, approximately 15 km from the Site, and relatively long record. Total monthly precipitation values were averaged to determine the average precipitation depths for the Project area. Monthly lake evaporation normals were obtained from the Environment Canada Truro Station (Climate ID 8205990). The Truro station is the closest climate station to the Project Site that collects lake evaporation data. The Truro station is approximately 82 km away from the project site.



Table 1.1 presents total precipitation and lake evaporation that are used in the analysis.

Table 1.1 Climate Normals (Data taken from Malay Falls and Truro Climate Stations)

	January	February	March	April	May	June	July	August	September	October	November	December
Precipitation ¹ (mm)	140.3	126.8	133.0	123.4	125.2	67.1	94.3	92.9	112.1	140.6	170.4	143.3
Lake Evaporation ² (mm)	0.0	0.0	0.0	0.0	89.9	102.0	111.6	99.2	69.0	40.3	0.0	0.0
Notes:												
¹ Values obtained from the Malay Falls climate station 8203400												
² Values obtained from the Truro climate station 8205990												

2. Methodology

GHD developed a preliminary water balance assessment to assess the potential environmental impacts of the proposed Project from existing conditions to mid-life of the quarry (20-year) and EOQ conditions. The assessment was developed to determine the yearly changes to flow composition during an average year for the three (3) scenarios mentioned previously.

2.1 Watershed Delineation

The Project site area surrounding the project site was delineated into five (5) watersheds, titled Powers Cove SE (44.18 ha), Powers Cove NW (63.36 ha), Lawrence Lake (227.67 ha), Big Eastern Lake (187.56 ha) and East Mushaboom Lake (299.85 ha). Big Eastern Lake catchment is a subwatershed to the East Mushaboom Lake catchment. It should be noted that the contributing drainage area calculated for East Mushaboom Lake only accounts for the eastern tributaries, which have potential for impacts due to quarry development. In fact the contributing drainage area to the northern tributary to East Mushaboom Lake is substantially larger, which diminishes the potential impacts. The following analysis will focus primarily on the eastern tributary to East Mushaboom Lake, referred to herein as East Mushaboom Lake.

The contributing watershed areas were delineated using manual methods within a GIS environment utilizing the 5 m topographic data set. Final watershed boundaries were verified through comparison with the provincial tertiary watershed map (Nova Scotia, 2017). Watershed delineations are presented based on three life-cycle phases of the proposed quarry: Figure 1, Baseline Watershed Delineation; Figure 2, 20-Year (Mid-life) Quarry Life Cycle Watershed Delineation; and Figure 3, 60-Year (End of Quarry).

2.2 Evapotranspiration Potential

Evaporation describes the process of the return of moisture to the atmosphere from open water and land surfaces. Evaporation from plant surfaces is called evapotranspiration. The magnitude of evaporation or



evapotranspiration over time is a function of the climate, soil and the vegetation in the area. Evaporation rates tend to peak in the summer months when temperatures are highest, daylight hours are longest, sun intensity is greatest and the growing season is at its peak.

Lake evaporation is the amount of evaporation from an open water body. In Atlantic Canada, lake evaporation rate is greater than the standard evaporation rate because of the constant availability of water. For this analysis, lake evaporation rates were collected from a weather station in Truro, Nova Scotia for the period of 1961 to 2010. The average total annual lake evaporation rate is 512 mm per year. July represents the month with the highest lake evaporation rate on average, at 111.6 mm per month. The temperature during the winter months of December, January, February and March are typically below zero degrees during which time there may be little to no evaporation. **Table 1.1** provides a summary of the lake evaporation rates used as a water loss parameter in the water balance assessment.

2.3 Infiltration Factor

The water storage/infiltration has been estimated using the infiltration factors taken from Table 3.1 from the Ontario Ministry of Environment, Conservation and Parks (MECP) SWM planning and Design Manual (2003). Calculations using MECP (2003) **Table 3.1** accounts for slope, soil types, and vegetation cover when estimating water holding capacity for an area. During existing conditions each subcatchment was deemed to be hilly land (0.1 infiltration factor) with partial woodland (0.15) and imperfectly drained Sandy Loam soil (0.15). The soil in the area is Sandy Loam as per the Nova Scotia Soil Survey and imperfect drainage occurs due to the high elevation of bedrock in the area (Nova Scotia Museum, 1996). During mid-life and EOQ conditions, the quarry area was assumed to be 100% impervious and produce flatter topography than existing conditions. The new infiltration parameters were computed based on an area-ratio method. Runoff volumes were assumed to equal the total precipitation less the lake evaporation and infiltration.

3. Results

Table 3.1, **Table 3.2** and **Table 3.3** present the area of each catchment as well as runoff, evaporation and infiltration volumes during existing, mid-life and EOQ conditions respectively. **Table 3.4** and **Table 3.5** display the percentage change in area, runoff and infiltration from existing conditions to mid-life and EOQ conditions respectively. It can be noted during mid-life conditions Powers Cove SE and Powers Cove NW catchments remain untouched from quarry activities and therefore do not experience any change to the area, runoff or infiltration.

Table 3.1 Water Balance - Existing conditions

Catchment	Area (ha)	Runoff (m ³)	Evaporation (m ³)	Infiltration (m ³)
Powers Cove SE	44.18	269,268	213,595	179,512
Lawrence Lake	227.67	1,387,637	1,100,734	925,092
Big Eastern Lake	187.56	1,143,154	906,800	762,103
Powers Cove NW	63.36	386,171	306,328	257,448
East Mushaboom Lake	299.85	1,827,577	1,449,714	1,218,385



Table 3.2 Water Balance - Mid-life quarry conditions

Catchment	Area (ha)	Runoff (m ³)	Evaporation (m ³)	Infiltration (m ³)
Power Cove SE	44.18	269,268	213,595	179,512
Hubley Cove	229.97	1,378,324	1,111,856	957,772
Big Eastern	185.32	1,129,530	895,992	753,020
Power Cove NW	63.36	386,171	306,328	257,448
East Mushaboom Lake	297.62	1,813,953	1,438,906	1,209,302

Table 3.3 Water Balance - EOQ conditions

Catchment	Area (ha)	Runoff (m ³)	Evaporation (m ³)	Infiltration (m ³)
Power Cove SE	42.05	256,290	203,300	170,860
Hubley Cove	273.12	2,011,021	1,320,468	763,386
Big Eastern	160.63	979,002	776,587	652,668
Power Cove NW	60.65	369,645	293,218	246,430
East Mushaboom Lake	259.48	1,581,490	1,254,506	1,054,326

Table 3.4 Mid-life quarry conditions comparison to Existing conditions

Catchment	%Area Change	%Runoff Change	%Infiltration Change
Powers Cove SE	0.00%	0.00%	0.00%
Lawrence Lake	1.01%	-0.67%	3.53%
Big Eastern Lake	-1.19%	-1.19%	-1.19%
Powers Cove NW	0.00%	0.00%	0.00%
East Mushaboom Lake	-0.75%	-0.75%	-0.75%

Table 3.5 EOQ conditions comparison to Existing conditions

Catchment	%Area Change	%Runoff Change	%Infiltration Change
Powers Cove SE	-4.82%	-4.82%	-4.82%
Lawrence Lake	19.96%	44.92%	-17.48%
Big Eastern Lake	-14.36%	-14.36%	-14.36%
Powers Cove NW	-4.28%	-4.28%	-4.28%
East Mushaboom Lake	-13.47%	-13.47%	-13.47%



4. Conclusion

The results from the water balance analysis can be used to assess the potential impact of the proposed quarry development on the receiving environment in terms of the change in water volume discharged to the East Mushaboom Lake and Lawrence Lake.

The mid-life quarry development results in a 0.75% decrease in runoff volume discharged to East Mushaboom Lake while EOQ conditions result in a 13.47% decrease in runoff volume. This is largely due to the decrease in catchment area contributing to East Mushaboom Lake due to quarry operations.

Lawrence Lake experiences a 0.67% decrease in runoff volume during mid-life conditions while seeing a 44.92% increase in runoff during EOQ conditions. This is due to the additional area draining to Lawrence Lake. These results are based on the conservative assumption that all precipitation that falls directly on the quarry floor will be converted to runoff. In reality, there is a high likelihood for infiltration to occur. However, this assumptions allows us to examine the worst case scenario with regards to water transfers from one watershed to another.

Powers Cove SE, Powers Cove NW and Big Eastern catchments all experience decreases in runoff ranking from 4.28% to 14.36% in EOQ conditions. These percent changes are directly proportional to the drainage area lost due to the quarry site.

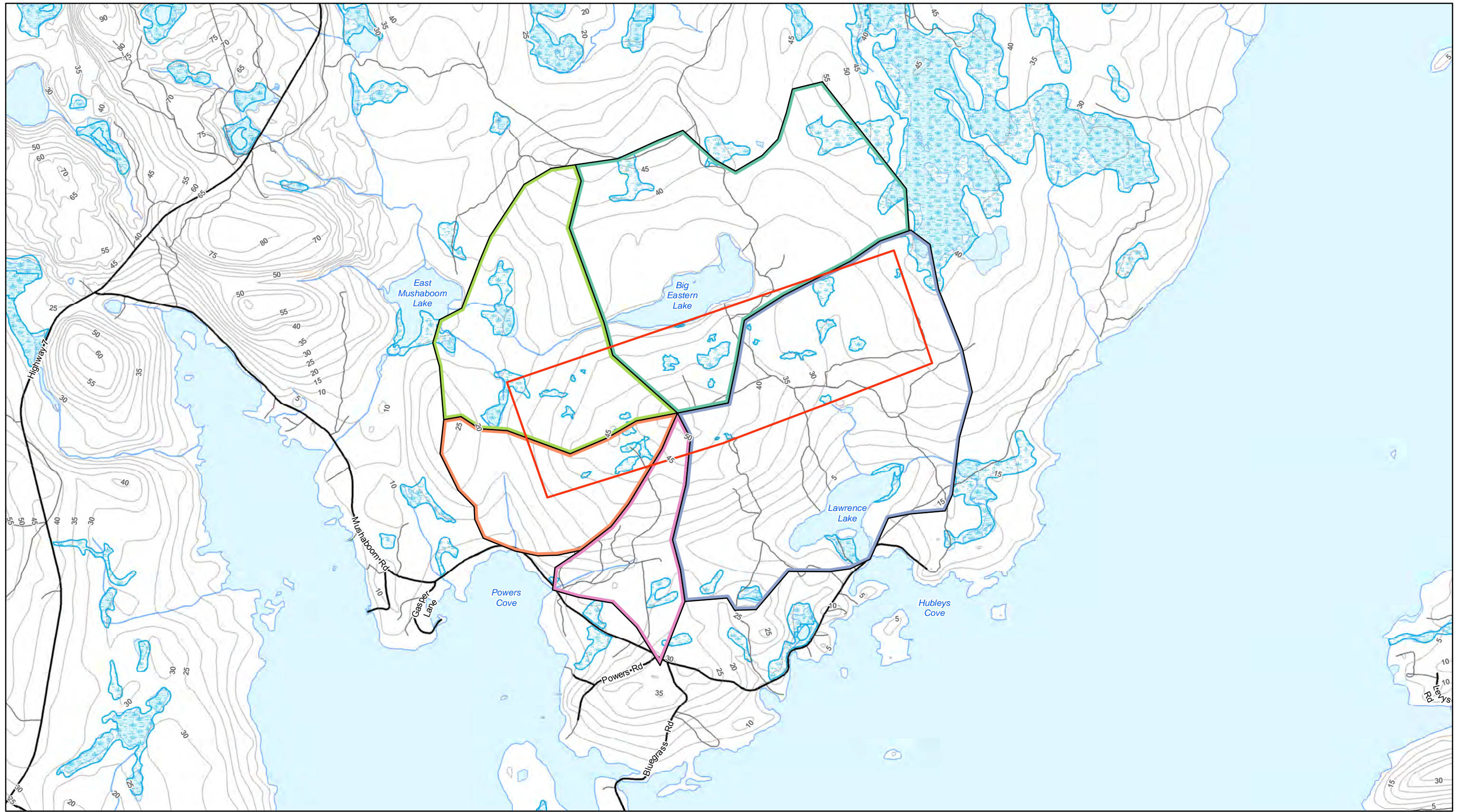
It can be seen that the mid-life quarry operations have minimal impact on the receiving water bodies with a maximum change in runoff percentage of 1.19%. However, EOQ conditions could potentially have a significant impact on Lawrence Lake, Big Eastern Lake and East Mushaboom Lake. Big Eastern Lake and East Mushaboom Lake lose approximately 14% of runoff that enters the lakes resulting in a potentially significant impact. Lawrence Lake experiences a 44.92% increase in runoff, based on the conservative assumption of the runoff coefficient of the quarry floor and the added drainage area.

5. References

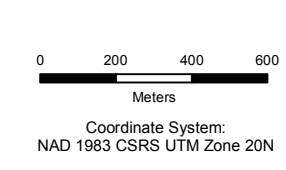
Ministry of the Environment. (2003). Stormwater Management Planning and Design Manual.

Nova Scotia (2017). Nova Scotia Lake Survey Program: Lake Mapping Tool.

Nova Scotia Museum (1996). The Natural History of Nova Scotia, Volume 2: Theme Regions. Pg. 201-202.



Source: Nova Scotia Topographic Database, Nova Scotia Road Network



Legend

- Study Area
- Contours (5m)
- Waterbody
- Wetlands
- Streams

Catchment Areas

- Big Eastern Lake
- East Mushaboom
- Lawrence Lake
- Powers Cove NW
- Powers Cove SE

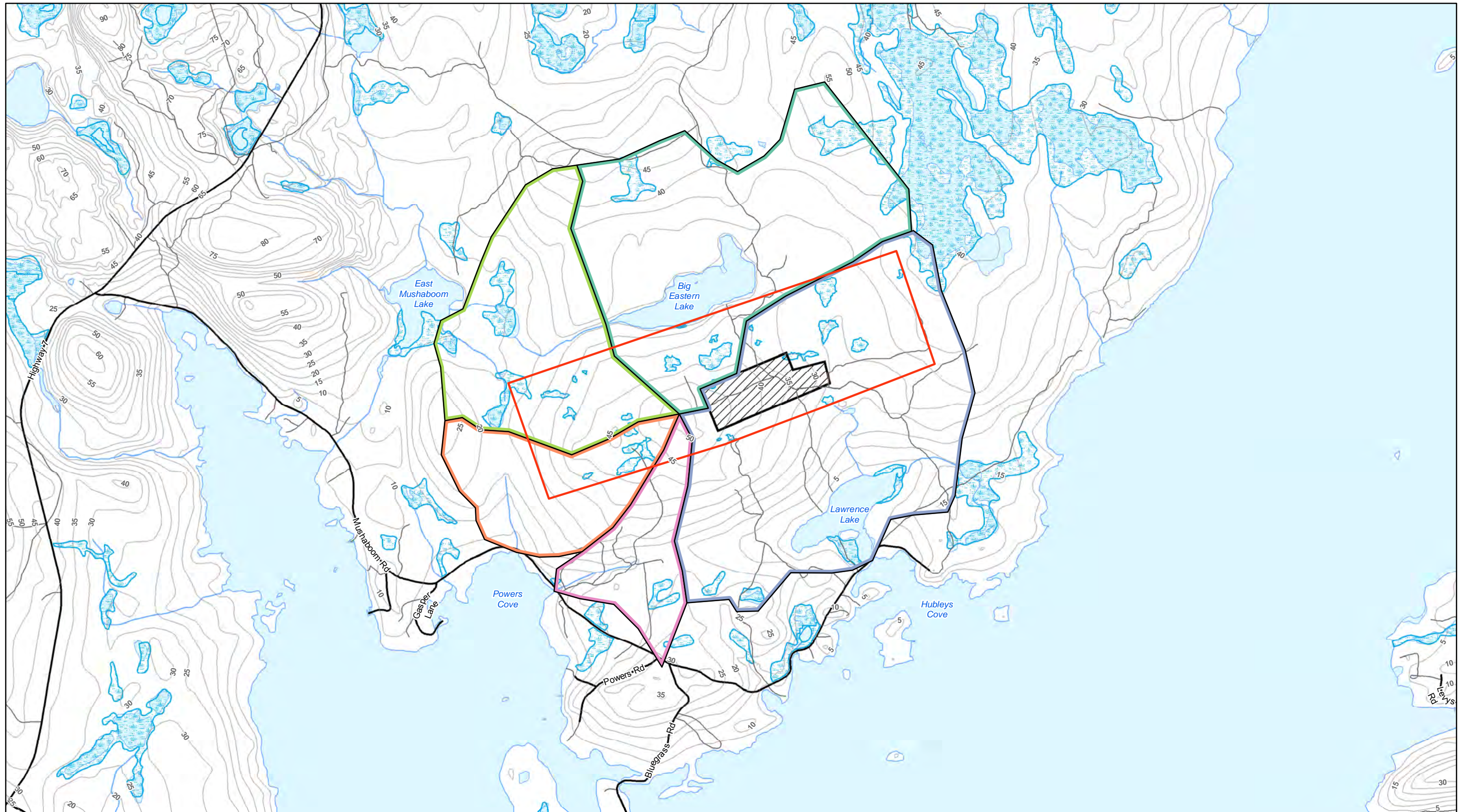


DEXTER CONSTRUCTION
SHEET HARBOUR - PRELIMINARY WATER BALANCE ANALYSIS

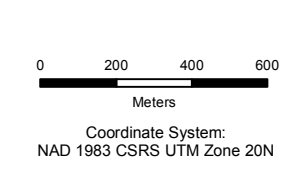
BASELINE WATERSHED DELINEATION

11141046
Dec 5, 2018

FIGURE 1



Source: Nova Scotia Topographic Database, Nova Scotia Road Network



Legend

- Study Area
- Quarry Footprint
- Contours (5m)
- Waterbody
- Wetlands
- Streams

Catchment Areas

- Big Eastern Lake
- East Mushaboom
- Lawrence Lake
- Powers Cove NW
- Powers Cove SE

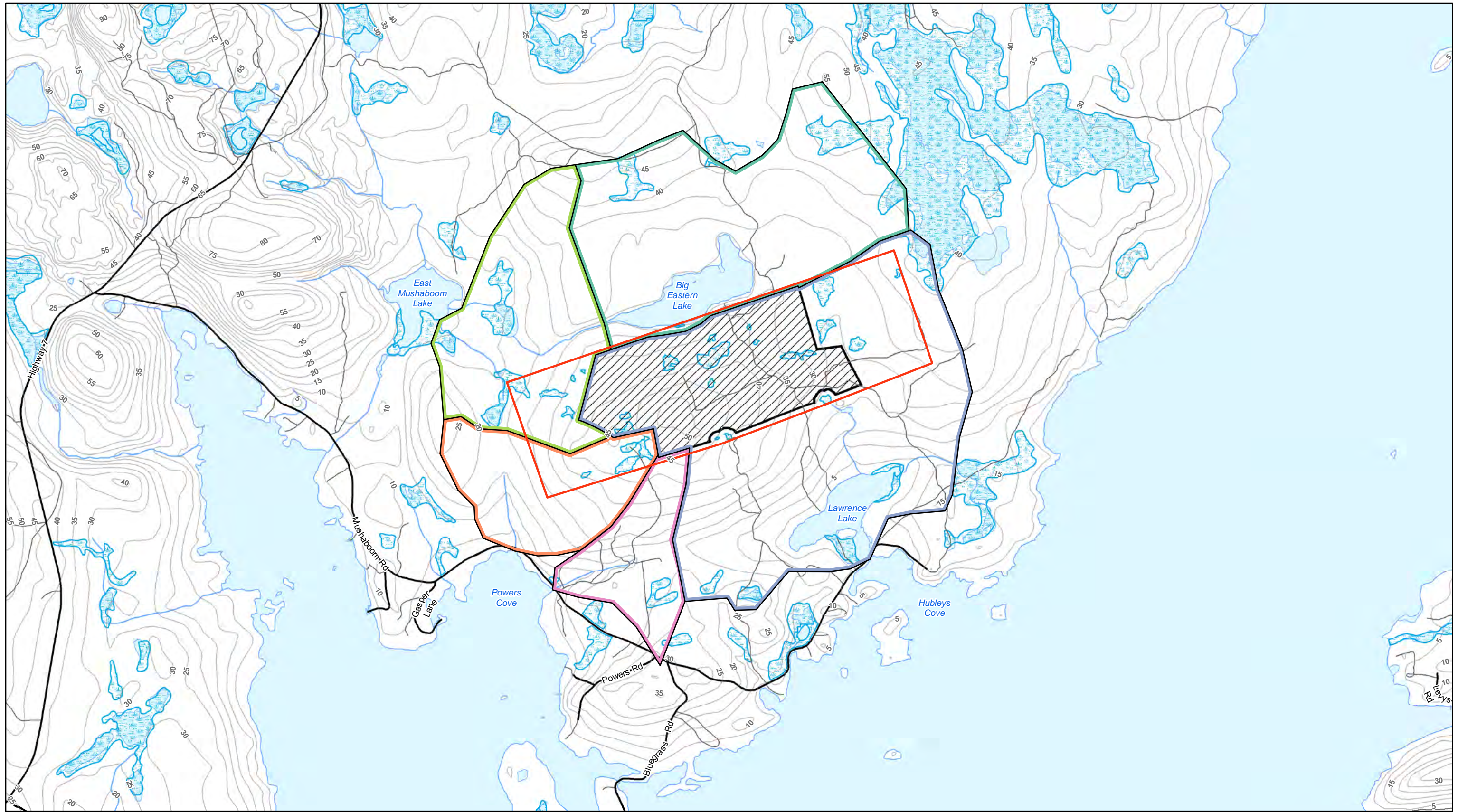


DEXTER CONSTRUCTION
SHEET HARBOUR - PRELIMINARY WATER BALANCE ANALYSIS

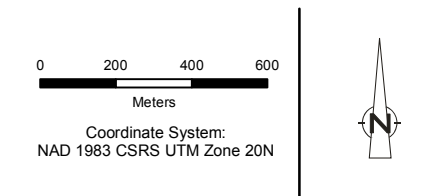
20-YEAR QUARRY LIFE CYCLE WATERSHED DELINEATION

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Dec 5, 2018

FIGURE 2



Source: Nova Scotia Topographic Database, Nova Scotia Road Network



Legend

- Study Area
- Quarry Footprint
- Contours (5m)
- Waterbody
- Wetlands
- Streams

Catchment Areas

- Big Eastern Lake
- Powers Cove NW
- Powers Cove SE
- Lawrence Lake



DEXTER CONSTRUCTION
SHEET HARBOUR - PRELIMINARY WATER BALANCE ANALYSIS

60-YEAR QUARRY LIFE CYCLE WATERSHED DELINEATION

11141046
Dec 5, 2018

FIGURE 3

Appendix F

Domestic Well Water Records

**Appendix F
Domestic Well Water Records**

Well Log No.	Community	Civic Address	Year of Record	Well Depth (ft)	Casing Depth (ft)	Yield (igpm)	Well Type (Drilled/Dug)	Stratigraphic Log Primary Lithology	Secondary Lithology	Depth to Bedrock (ft)	Water Bearing Fracture Zones Encountered at: (ft)	Depth to Static Level (ft)	Water Quality Notes
890102	Mushaboom	N/A	1989	140	22	1.2	Drilled	0-10 boulders, 10-140 granite	0-10 hardpan	10	40, 130	-	
012369	Mushaboom	1086 Mushaboom Rd.	2001	243	27	1.0	Drilled	0-22 large boulders, 22-243 blue rock	22-243 gray rock	22	155,218,243	-	
021161	Mushaboom	1093 Mushaboom Rd.	2002	245	31	2.0	Drilled	0-20 gravel, 20-245 blue quartzite	-	20	160,215	10	Colour - clear
032202	Mushaboom	1075 Mushaboom Rd.	2003	165	29	10.0	Drilled	0-25 boulders, 25-165 blue whinrock	0-25 gravel	25	35, 155	-	
711276	Mushaboom	N/A	1971	100	33.5	10.0	Drilled	0-25 gravel and clay, 25-100 windstone	-	25		-	
811689	Mushaboom	N/A	1981	140	22	3.0	Drilled	0-17 gravel, 17-140 quartzite	0-17 boulders	17		-	
860624	Mushaboom	RR#1 Tangier	1986	140	50	0.5	Drilled	0-45 clay, 45-140 slate	0-45 boulders	45	120,140	-	water quality - salt water
880743	Mushaboom	N/A	1988	220	20	12.0	Drilled	0-12 boulders, 12-220 quartzite	0-12 hardpan	12	120, 210	-	
882115	Mushaboom	N/A	1988	232	65	1.5	Drilled	0-38 mud, 38-61 sand/lenses, 61-231 quartzite	0-38 sand/lenses, 38-61 gravel	61	85,97	19	
011663	Mushaboom	N/A	2001	203	20	1.5	Drilled	0-15 boulders, 15-203 gray rock	0-15 drift, 15-203 blue rock	15	55,165,190,203	-	
882673	Mushaboom	RR #1	1988	205	115	4.0	Drilled	-	-	-		-	
990678	Mushaboom	Mushaboom Rd.	1999	87	20	1.5	Drilled	0-7 gravel, 7-87 quartzite	-	7	27,65	10	
900754	Mushaboom	N/A	1990	207	64	0.7	Drilled	0-12 topsoil, 12-54 gravel, 54-207 slate	0-12 sand/lenses	54	150	-	
901062	Mushaboom	RR#1 Mushaboom	1990	187	85	3.0	Drilled	0-85 gravel, 85-187 quartzite	0-85 boulders	85	184	-	
910267	Mushaboom	Powers Rd.	1991	167	20	6.0	Drilled	0-6 topsoil, 6-167 slate	0-6 gravel	6		-	
910622	Mushaboom	Powers Rd.	1991	167	24	1.2	Drilled	0-4 topsoil, 4-20 rock, 20-167 quartzite	0-4 gravel	4	130	-	
920802	Mushaboom	N/A	1992	206	39	1.5	Drilled	0-17 gravel, 17-35 rock, 35-206 quartzite	-	17	195,206	15	
140222	Mushaboom	175 Mushaboom Rd.	2014	300	20	0.125	Drilled	0-8 brown clay and boulders, 8-20 gray greywacke, 20-187 gray greywacke, 187-300 gray greywacke. Water f found at 20-187 depth.	-	8	187	-	Comments - Well needs frack to obtain more water. Not enough after drilling. Assumed well finish open hole. Lot from Pol.
140491.0	Mushaboom	1048 Mushaboom Rd.	2014	225 188.3684	23	1.0	Drilled	0-17 gravel and clay, 17-225 gray shale	-	17 25	220	10	

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943014	Mushaboom	N/A	1994	18	3	25.0	Dug	0-2 topsoil, 2-18 sand/lenses	2-18 gravel	12	
972628	Mushaboom	N/A	1997	27	27	45.0	Dug	0-2 topsoil, 2-6 sand/lenses, 6-20 sand/lenses, 20-27 clay	2-6 gravel, 6-20 clay	17	
951915	Mushaboom	Devils Elbow	1995	12	12	40.0	Dug	0-6 peat moss, 6-12 clay	- - -	8	