

Appendix A  
**Registry of Joint Stocks**



## Entity Snapshot

### Entity details

Information as of	02 December 2022
Registry ID	2263472
Business/Organization Name	SHAW RESOURCES
Registration Date	09 August 1993
Annual Return due Date	31 August 2022
Type	Business Name
Status	Active
Registered Office	9105 HIGHWAY #14, NOVA SCOTIA, HARDWOODLANDS, B0N 2H0, CANADA
Mailing Address	100C - 255 LACEWOOD DRIVE, NOVA SCOTIA, HALIFAX, B3M 4G2, CANADA

### People

Name	Position
THE SHAW GROUP LIMITED	Business Name Owner

### Recognized Agent

Name	Position	Civic Address	Mailing Address
LINDSAY HAWKER	Recognized Agent	99 WYSE RD DARTMOUTH NOVA SCOTIA B3A 1L9 CANADA	99 WYSE RD 600 PO BOX 876 DARTMOUTH MAIN DARTMOUTH NOVA SCOTIA B2Y 3Z5 CANADA

## Entity Snapshot

### Entity details

Information as of	22 August 2022
Registry ID	1130368
Business/Organization Name	THE SHAW GROUP LIMITED
Incorporation Date	29 November 1978
Annual Return due Date	30 November 2022
Type	Limited Company
Status	Active
Registered Office	1101 HIGHWAY #2, NOVA SCOTIA, LANTZ, B2S 1M9, CANADA
Mailing Address	1101 HIGHWAY #2, NOVA SCOTIA, LANTZ, B2S 1M9, CANADA
Name History	L. E. SHAW LIMITED 01 November 1995 21 July 1996

### Directors and Officers

Name	Position
DEAN ROBERTSON	Director
ALLAN HORSBURGH	Director
DEAN ROBERTSON	Officer President
ALLAN HORSBURGH	Officer Other, CHIEF FINANCIAL OFFICER
SIMON MCLENNAN	Officer Secretary

### Recognized Agent

Name	Position	Civic Address	Mailing Address
LINDSAY HAWKER	Recognized Agent	99 WYSE ROAD SUITE 600 DARTMOUTH NOVA SCOTIA B3A 4S5 CANADA	PO BOX 876, DARTMOUTH MAIN DARTMOUTH NOVA SCOTIA B2Y 3Z5 CANADA

## Related Registrations

Relationship	Registry ID	Name	Status
Business Name	1422021	SLAGCRETE	Revoked (> 1 year)
Business Name	1867964	SUN-RAY FEED AND FARM SUPPLIES	Active
Business Name	1706123	COLORSTONE	Active
Business Name	1967671	SUN-RAY PRODUCTS	Active
Business Name	1247251	MODERN HOMES	Active
Business Name	1340410	G. K. KEDDY TRANSPORT	Active
Business Name	1358804	ARTSTONE	Revoked (> 1 year)
Business Name	1706136	COLORSTONE PAVERS	Active
Business Name	2263472	SHAW RESOURCES	Active
Business Name	2460926	SHAW WATER PARTNERS	Revoked (> 1 year)
Business Name	2149525	NOVA SCOTIA SAND AND GRAVEL	Active
Business Name	2198838	SHAW TRANSPORT	Active
Business Name	2198896	SHAW MASONRY	Active
Business Name	2265872	SHAW BRICK	Active
Business Name	2198952	SHAW PIPE	Active
Business Name	2239797	SHAW AGGREGATES	Active
Business Name	2213324	THE SHAW GROUP	Active
Business Name	3030134	SHAW WOOD INDUSTRIES	Active
Business Name	3039453	CLAYTON HOME	Active
Business Name	3039454	SHAW WOOD	Active
Business Name	3039455	SHAW HOME	Active
Business Name	3050545	SHAW TRUCK CENTER	Active
Business Name	3283354	SHAW PRECAST SOLUTIONS	Active
Business Name	3041899	GS CONCRETE	Active
Business Name	3309932	SHAW COMMUNITIES	Active
Business Name	3309933	SHAW LIFESTYLE	Active
Business Name	3309934	SHAW OUTDOOR LIVING	Active
Business Name Owner - Reserve Name	4368018	SHAW RENEWABLES	Used
Business Name	4393149	SHAW RENEWABLES	Active



## Entity Snapshot

### Entity details

Information as of	02 December 2022
Registry ID	2149525
Business/Organization Name	NOVA SCOTIA SAND AND GRAVEL
Registration Date	05 February 1992
Annual Return due Date	28 February 2023
Type	Business Name
Status	Active
Registered Office	9105 HIGHWAY #14, NOVA SCOTIA, HARDWOODLANDS, B0N 1Y0, CANADA
Mailing Address	100C - 255 LACEWOOD DRIVE, NOVA SCOTIA, HALIFAX, B3M 4G2, CANADA

### People

Name	Position
THE SHAW GROUP LIMITED	Business Name Owner

### Recognized Agent

Name	Position	Civic Address	Mailing Address
LINDSAY HAWKER	Recognized Agent	100C - 255 LACEWOOD DRIVE HALIFAX NOVA SCOTIA B3M 4G2 CANADA	

# Appendix B

# Regulatory Information

Industrial Approval  
Lease



**eNGLOBE**

## APPROVAL

**Province of Nova Scotia  
Environment Act, S.N.S. 1994-95, c.1 s.1**

**APPROVAL HOLDER:** THE SHAW GROUP LIMITED

**SITE PID:** 55071898, 55377451, 55377550

**APPROVAL NO:** 2008-060956-02

**EXPIRY DATE:** February 28, 2030

**Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 s.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:**

Industrial - Construction - Pit



**Administrator:** Jennifer Lonergan

**Effective Date:** February 29, 2020

The Minister's powers and responsibilities under the Act with respect to this Approval have been delegated to the Administrator named above. Therefore, any information or notifications required to be provided to the Minister under this Approval can be provided to the Administrator unless otherwise advised in writing.

# TERMS AND CONDITIONS OF APPROVAL

## Nova Scotia Environment

**Approval Holder:** THE SHAW GROUP LIMITED

**Project:** Visser Pit

**Site:**

<b>PID</b>	<b>Civic #</b>	<b>Street Name</b>	<b>Street Type</b>	<b>Community</b>	<b>County</b>
55071898				WATERVILLE	KINGS COUNTY
55377451				WATERVILLE	KINGS COUNTY
55377550				WATERVILLE	KINGS COUNTY

**Approval No:** 2008-060956-02

**File No:** 92100-30-KEN-2008-060956

### Reference Documents

- Application submitted January 29, 2020 and attachments.
- Contents of NSE file no. 92100-30-0KEN-2008-060956, all volumes.
- Survey Plan: McKenna Surveys, Plan Showing Parcel V-1, proposed location of pit operation land of William M. Visser and Jennifer D. Visser prepared for Shaw Resources, Plan No. 05-5958, dated April 22, 2005 and stamped by Michael McKenna, NSLS #575.

### 1. Definitions

- Abandonment means cessation of production of aggregate for a period of 36 months or notification of abandonment has been received by the Department in accordance with the Approval and Notification Procedures Regulations.
- Act means Environment Act, 1994-95, c.1, s.1, and includes, unless the context otherwise requires, the regulations made pursuant to the Act, as amended from time to time.
- Active Area means the area occupied by the working face, disturbed areas, rehabilitated areas, any structure, processing facility, pollution abatement

system, settling pond, aggregate stockpile and/or overburden associated with the Pit and Pit activities.

- d. Department means the Department of Environment, and the contact for the Department for this approval is:  
Nova Scotia Environment  
Western Region, Kentville Office  
136 Exhibition Street  
Kentville, Nova Scotia B4N 4E5  
  
Phone: (902) 679-6086  
Fax: (902) 679-6186
- e. Disturbed Area means an area in an unnatural state, affected by human activity associated with the Pit.
- f. Minister means the Minister of Environment and includes any person delegated the authority of the Minister.
- g. Overburden means material, including organics, overlying a deposit of aggregate.
- h. Site means a place where a designated activity and/or undertaking is occurring or may occur.
- i. Surface Watercourse means a watercourse as defined in the Environment Act, excluding groundwater.
- j. Undisturbed means in a natural state, unaffected by human activity, or rehabilitated to the satisfaction of the Department.

## **2. Scope**

- a. This Approval (the "Approval") relates to the Approval Holder(s) and their application and all documentation submitted to the Department prior to the issuance of this approval for the Pit situated at or near PIDs 55377451 and 55377550, located off Parker Condon South Branch Road and Blair Road in Waterville, Kings County (Visser Pit).
- b. The Approval Holder(s) shall ensure the designated activity is carried out in accordance with this Approval and reference documents, including the application and supporting documentation.
- c. The Active Area shall not exceed the 3.997 hectare area specified on the Plan Showing Parcel V-1, Proposed Location of Pit Operation, Land of William M. Visser Jennifer D. Visser, Prepared for Shaw Resources, Plan No. 05-5958, dated April 22, 2005 and stamped by Michael McKenna, Member # 575 of The Association of Nova Scotia Land Surveyors.

## **3. General**

- a. The Approval Holder(s) shall conduct the Designated Activity in accordance with the following provisions:
  - i. The Act, as amended from time to time;
  - ii. Any standard adopted by the Department, as amended from time to time, which includes but is not limited to the following:
    - (a) Nova Scotia Environment and Labour Pit and Quarry Guidelines, 2003, as amended from time to time.
    - (b) Guidelines for Environmental Noise Measurement and Assessment, dated May 18, 2005, as amended from time to time.
- b. Nothing in this Approval relieves the Approval Holder(s) of the responsibility for obtaining and paying for all licenses, permits, approvals or authorizations necessary for carrying out the work authorized to be performed by this Approval which may be required by municipal by-laws, provincial or federal legislation, or other organizations. The Minister does not warrant that such licenses, permits, approvals or other authorizations will be issued.
- c. No authority is granted by this Approval to enable the Approval Holder(s) to commence or continue the designated activity on lands which are not in the control or ownership of the Approval Holder(s). It is the responsibility of the Approval Holder(s) to ensure that such a contravention does not occur. The Approval Holder(s) shall provide, to the Department, proof of such control or ownership upon expiry of any relevant lease or agreement. Failure to retain said authorization may result in this Approval being cancelled or suspended.
- d. If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.
- e. Any request for renewal or amendment of this Approval is to be made in writing, to the Department, at least ninety (90) days prior to the Approval expiry.
- f. The Approval Holder(s) shall not transfer, sell, lease, assign or otherwise dispose of this Approval without the written consent of the Minister. The sale of a controlling interest of a business or a transfer of the approval from a parent company to a subsidiary or an affiliate is deemed to be a transfer requiring consent.
- g. If the Minister cancels or suspends this Approval, the Approval Holder(s) remains subject to the penalty provisions of the Act.
- h. The Approval Holder(s) shall advise the Department in writing prior to any proposed extensions or modifications to the Activity and/or the Site. An amendment to this Approval may be required before implementing any extension or modification.
- i. The Approval Holder(s) shall immediately notify the Department of any incidents of non-compliance with this Approval.

- j. The Approval Holder(s) shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.
- k. Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures that are all deemed acceptable to the Department.
- l. Unless written authorization is received otherwise from the Minister, all samples required by this Approval shall be analyzed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories" as amended from time to time.
- m. The Approval Holder(s) shall ensure that this Approval, or a copy, is present on Site while personnel are on Site.
- n. The Approval Holder(s) shall ensure that personnel directly involved in the designated activity are made fully aware of the terms and conditions of this Approval.
- o. Upon any changes to the Registry of Joint Stock Companies information, the Approval Holder(s) shall provide a copy to the Department within five business days.

#### **4. Separation Distances**

- a. The Approval Holder(s) shall not conduct the designated activity within the following separation distances unless otherwise exempted or varied by conditions of this approval:
  - i. Public or common highway - 30 m
  - ii. Watercourse (top of watercourse bank) or Wetland (boundary) - 30 m undisturbed
  - iii. Property line (of PID) including property lines abutting a public or common highway - 30 m undisturbed
  - iv. Dug or Drilled well not including site monitoring wells or non-potable process water wells located on the site - 90 m
  - v. Other off-site structure - 90 m
- b. The separation distance requirements of the designated activity to the property lines of PIDs 554925085 and 55071898 are waived for as long as these PIDs are owned by The Shaw Group Limited or its subsidiaries.

#### **5. Air Quality**

- a. The Approval Holder(s) shall ensure that air emissions from the designated activity do not contribute to an exceedance of the maximum permissible ground

level concentrations of contaminants specified in Schedule A of the Air Quality Regulations.

- b. Monitoring of ambient air contaminants shall be conducted at the request of the Department. The number and location of the monitoring station(s) shall be established by a qualified person retained by the Approval Holder(s) and the proposed plan submitted to the Department for acceptance; this may include point(s) beyond the property boundary of the Site.
- c. The use of oil as a dust suppressant is prohibited.
- d. The Approval Holder(s) shall retain a qualified person to develop a plan to monitor ambient total suspended particulate matter at the request of the Department, in accordance with the EPA standard: EPA/625/R-96/010a, "Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, Method IO-2.1 Sampling of Ambient Air for Total Suspended Particulate Matter (SPM) and PM10 Using High Volume (HV) Sampler", as amended from time to time.
  - i. The plan shall be deemed acceptable by the Department and implemented upon request.
- e. When required by the Department, the Approval Holder(s) shall conduct source testing in accordance with a standard deemed acceptable to the Department.

## **6. Noise**

- a. The Approval Holder(s) shall ensure that noise generated from the designated activity complies with the equivalent sound level criteria identified in the Nova Scotia Environment and Labour "Guidelines for Environmental Noise Measurement and Assessment" dated May 18, 2005, as amended from time to time.
- b. The Approval Holder(s) shall monitor noise at the request of the Department. The number and location of the monitoring station(s) for noise measurement shall be established by a qualified person retained by the Approval Holder(s). The proposed plan must be deemed acceptable by the Department.

## **7. Surface Water**

- a. The Approval Holder(s) shall ensure the Site is developed and maintained to prevent contaminants from being discharged into a water resource or beyond the property boundary.
- b. The Approval Holder(s) shall ensure that the following water quality limits are met in the water resource downstream of pit activities:
  - i. Total Suspended Solids, Clear Flows (Normal Background Conditions):
    - (a) Maximum increase of 25 mg/l from background levels for any short term exposure (24 hour or less);



- (b) Maximum average increase of 5 mg/l from background levels for longer term exposure (inputs lasting between 24 hours and 30 days);
- ii. Total Suspended Solids, High Flow (Spring Freshets and Storm Events)
  - (a) Maximum increase of 25 mg/l from background levels at any time when background levels are between 25 mg/l and 250 mg/l ;
  - (b) Maximum increase of 10% over background levels when background is >250 mg/l;
- c. Additional surface water monitoring may be required at the request of the Department.
- d. No authority is granted by this Approval to enable the Approval Holder(s) to discharge surface water onto adjoining lands without the authorization of the affected landowner(s).
- e. The Approval Holder(s) shall install and maintain erosion and sediment controls in line with industry best practices (e.g., Nova Scotia Environment Erosion and Sediment Control Handbook for Construction Sites) with the following considerations:
  - i. The controls shall be installed prior to the commencement of the construction activities;
  - ii. The controls shall remain in place until areas disturbed by construction activities are stabilized so that the risk of release of sediment to a water resource has been mitigated;
  - iii. Control features shall be installed as per applicable product specifications or manufacturer's directions; and
  - iv. Control materials shall be clean, non-erodible, non-ore-bearing, non-watercourse derived and non-toxic.
- f. The Approval Holder(s) shall immediately contact the Department should sulphide bearing material be encountered on the Site.
- g. The Approval Holder(s) shall ensure that surface water runoff that may be impacted by petroleum hydrocarbons from the Site is collected and directed for necessary treatment prior to discharge from Site.
- h. Erosion and sediment controls shall be inspected yearly at a minimum, and after a minimum 50 mm/24-hour or 75 mm/48-hour rain event to confirm that controls are working as designed and intended. Records outlining results of the inspections and actions taken to correct any deficiencies shall be kept for the duration of the approval and shall be made available to the Department upon request.

- i. Work at the site shall only take place when erosion and sediment controls are functional. Contingency erosion and sediment control materials shall be kept on Site in case of failure.
- j. Any silted water pumped from work areas shall be directed to vegetated areas, settling ponds, or other treatment devices that mitigate the risk of release of sediment to a water resource.
- k. The Approval Holder(s) shall limit the size of the disturbed area and the removal of riparian vegetation to the area of construction activities as outlined in the supporting documentation.
- l. The Approval Holder(s) shall ensure that the following activities take place at a distance of a minimum of 30 metres from a surface watercourse or wetland in an area such that a release will not enter a surface watercourse or wetland:
  - i. Fuel storage, refueling, and/or lubrication of equipment;
  - ii. Washing of machinery or equipment; and
  - iii. Storage of equipment, excavated/stockpiled materials, and potential contaminants.

## **8. Groundwater Monitoring**

- a. The Approval Holder(s) shall prepare and submit to the Department, a groundwater monitoring plan upon request, which includes, but is not limited to the following:
  - i. the location and design of monitoring well(s);
  - ii. monitoring parameters (groundwater quality and/or water table elevations);
  - iii. sampling methodologies;
  - iv. baseline and regular monitoring; and
  - v. a monitoring schedule.
- b. The water table shall be construed by measuring seasonal water level elevations from monitoring well(s) screened across the water table.
- c. The groundwater monitoring plan shall be designed and signed by a qualified professional who has hydrogeology training and experience, and is licensed to practice in Nova Scotia by the Association of Professional Geoscientists of Nova Scotia (APGNS) or Engineers Nova Scotia.
- d. The groundwater monitoring plan shall be deemed acceptable by the Department.
- e. Once the groundwater monitoring plan has been deemed acceptable by the Department, the Approval Holder(s) shall implement the accepted groundwater monitoring program.

- f. The Approval Holder(s) shall replace, at their expense, any water supply which has been lost or damaged as a result of the designated activity, as authorized and required by the Department.
- g. The Approval Holder shall not excavate within 0.5 metres above the measured maximum annual water table elevation unless an amendment to this Approval is received, or unless otherwise authorized in writing by the Department.

## **10. Operation**

- a. The Approval Holder(s) shall ensure that legible signage is posted at the entrance to the Site that includes, but is not limited to,
  - i. information pertaining to the days and hours of operation;
  - ii. and emergency contact numbers.
- b. The Approval Holder(s) shall cease site work and contact the Department immediately if it is determined that an area of historical, archaeological or paleontological importance may exist or is discovered at the site.
- c. The boundaries of the Active Area shall be both:
  - i. Marked with permanent visible markers placed at changes in direction, with no more than 100 metres between the permanent markers; and
  - ii. mapped on a scale drawing with a list of UTM NAD83 coordinates (with sub-meter accuracy) for each corner of the Site.

## **11. Construction**

- a. Where a ground disturbance or excavation greater than 1 ha is made for removing topsoil from the Site, the Approval Holder(s) shall submit an application for approval for topsoil removal to the Department. The application must be approved by the Department prior to disturbing or excavating the topsoil.
- b. An emergency spill-kit must be kept on site when vehicles (including machinery), equipment, or petroleum products are present on site.
- c. Upon completion of construction, modification, or maintenance work all debris resulting from the work must be removed from the work site.

## **12. Blasting**

- a. Blasting is prohibited at the Site.

## **13. Reporting**

- a. The Approval Holder(s) shall provide an Annual Report summarizing the following information, as required by the terms and conditions of this Approval, for each calendar year, upon request by the Department:

- i. an updated site plan showing the active area, rehabilitated areas, stockpiles, storm drainage discharge locations, and any changes to site features;
  - ii. all groundwater and surface water monitoring data and reports;
  - iii. a description of any complaints received and the follow up actions taken;
  - iv. a summary and interpretation of analytical results obtained in accordance with this Approval;
  - v. a summary and interpretation of any instances of non-compliance with this approval and corrective action taken.
  - vi. hectares disturbed and rehabilitated to date;
  - vii. estimates of hectares planned for disturbance or rehabilitation in the upcoming year;
  - viii. a summary of any communication with the Mi'kmaq of Nova Scotia;
  - ix. any other information requested by the Department.
- b. The annual report described herein shall be submitted to the Department within three months of the Department's request for the annual report.
  - c. All monitoring results shall include interpretation by a qualified person deemed acceptable by the Department.

#### **14. Rehabilitation and Closure**

- a. The Approval Holder(s) shall review the most recent version of the rehabilitation plan for the designated activity by February 24, 2022 and at a minimum of every three years thereafter. The Plan shall be updated accordingly based on current conditions. Updates to the rehabilitation plan must be acceptable to the Department.
- b. The Approval Holder(s) shall review the amount of financial security provided to the Department by February 24, 2022 and at a minimum of every three years thereafter. The amount shall be updated accordingly based on the estimated costs of rehabilitation provided in the most recent version of the rehabilitation plan.
- c. The amount of financial security shall be equal to the cost estimate of the site rehabilitation plan as amended from time to time and shall be no less than \$6,250 per hectare of actual and planned disturbed area.
- d. The Approval Holder(s) shall maintain for the site a financial security in a form and amount acceptable to the Department.
- e. The Approval Holder(s) shall have completed rehabilitation of the designated activity within twelve (12) months of abandonment and in accordance with the

final rehabilitation plan unless an alternate time frame has been provided and/or accepted by the Department.

- f. The Approval Holder(s) shall submit a final rehabilitation plan to the Department for approval at least sixty (60) days prior to abandonment of the designated activity.
- g. The rehabilitation plan shall include but not be limited to the following:
  - i. objectives for final land use;
  - ii. contouring and drainage patterns;
  - iii. soil stabilization methods including but not limited to revegetation and slope grades;
  - iv. objectives for existing structures and access roads; and
  - v. a detailed cost estimate including unit cost breakdown of labor, equipment, supplies, and services to perform the rehabilitation activities as completed by an outside service provider (third party).
- h. The rehabilitation plan shall be implemented by the Approval Holder(s) once deemed acceptable by the Department.
- i. Unless otherwise approved by the Department, updated rehabilitation plans shall meet the following criteria :
  - i. The site shall be contoured and stabilized:
    - (a) for long term erosion control;
    - (b) to mitigate impacts of offsite drainage to adjacent lands, wetlands, and watercourses; and
    - (c) to blend with natural topography.
  - ii. Except for engineered features (i.e., wetlands, ponds), all disturbed areas shall be returned to at least one metre above the water table.
  - iii. If an open pond is to remain on the site, at least 2 exit ramps shall be constructed, on opposite sides of the pond with maximum slope of 5:1 to enable safe exit.

## **15. Site Specific**

- a. The Approval Holder(s) shall submit either an application for Environmental Assessment Approval for the expansion of the active area to PID 55071898, or a rehabilitation plan for the pit on PID 55071898 by March 1, 2023. The rehabilitation plan shall meet the requirements specified in subsection 14.g., 14.h. and 14.i. of this Approval. The application for Environmental Assessment Approval or rehabilitation plan must be deemed acceptable by the Department.

- b. If wood turtles or bald eagle nests are encountered at the Site or surrounding area, any activity that could disturb the wildlife shall immediately cease and the Department shall immediately be notified to discuss mitigation measures. The Approval Holder(s) shall comply with mitigation measures specified by the Department.

### Construction Activities Surface Water Monitoring Table

Parameter:	Criteria:	Monitoring Location(s):	Monitoring Frequency:
		upon Department request	upon Department request

This **LEASE** made this 17 day of ~~September~~ September 2021

**BETWEEN:** William Mitchell Visser and Jennifer Dawn Visser  
of Waterville in the County of Kings,  
Province of Nova Scotia

(herein called WJ Visser)

- And -

Nico W. Visser  
of Waterville in the County of Kings,  
Province of Nova Scotia

(herein after called N. Visser and together with WJ Visser, hereinafter  
collectively referred to as "Visser")

- And -

The Shaw Group Limited  
P.O. Box 60, Shubenacadie  
Hants County, NS  
B0N 2H0

(herein called Shaw)

**WHEREAS:**

- I. WJ Visser are the owner of certain lands and premises located off the Parker Condon Road in Waterville, Kings County and identified in the Nova Scotia Property Online database as PIDs # 55377451 and 55377550 (the "Property").
- II. N. Visser holds a Life Lease over certain portions of the Property granting him the exclusive occupation and use of that portion of the Property together with the right to cut and remove all wood and remove any gravel, sand, soil etc. from those portions of the Property during his lifetime.
- III. The purpose of this Lease is to permit Shaw to lease a portion of the Property in order to extract aggregate (sand and gravel).
- IV. Based on past extractive activities by Shaw and third parties and exploration work conducted on this property by Shaw over the past three decades, it appears that all useable aggregate to be included in this Lease is located within a 37-acre portion of the Property.
- V. Shaw wishes to lease that 37-acre portion of the Property from Visser which portion of the Property is outlined in detail on Schedule "A" attached hereto (the "Leased Lands")



**NOW THEREFORE THIS AGREEMENT WITNESSETH** that in consideration of the sum of One Hundred Dollar (\$100.00) of lawful money of Canada, now paid by Shaw to Visser and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

Lease:

1. Visser hereby demises and leases unto Shaw, and Shaw hereby leases from Visser, the Leased Lands, to have and to hold for the Term and upon the conditions herein mentioned.

Term:

2. The term of the Lease shall be a 10 years, commencing on the date first noted above (the "Initial Term"), unless terminated sooner pursuant to the terms of this Lease. Following the end of this initial 10-year period, this Lease shall automatically renew on a year-to-year basis (each year being herein referred to as an "Extended Term") with both parties having the option to terminate the Lease during an Extended Term on 3-months written notice to the other (the Initial Term and any Extended Term(s) herein after referred to as the "Term").
3. The Extraction Term refers to the period of time between when the amended environmental approvals are received through to the end of the Initial Term.
4. Shaw may terminate this Lease, without notice, if for any reason Shaw is prevented by law from extracting aggregate as outlined in this Lease. In the event of such a termination, all reclamation responsibilities by Shaw shall survive the termination and Shaw shall have up to one year from the date of the "Notice of Termination" to complete all required site reclamation using on-site material.
5. Should the quality of the deposit change to the point that the aggregate is no longer suitable for Shaw's intended use, in Shaw's sole and absolute opinion, Shaw may terminate the Lease upon giving Visser three months of written notice. In the event of such a termination, all reclamation responsibilities by Shaw shall survive the termination and Shaw shall have up to one year from the date of the "Notice of Termination" to complete all required site reclamation using on-site material.

Rent:

6. [REDACTED]
7. [REDACTED]

8. [REDACTED]
9. [REDACTED]
10. [REDACTED]
11. [REDACTED]
12. [REDACTED]
13. [REDACTED]
- a. [REDACTED]
- b. [REDACTED]

c.



Permitted Use, Extraction and Reclamation:

14. During the Term of the Lease, Shaw shall be permitted to strip, extract, process and remove any and all aggregate from the Leased Lands and to use any equipment Shaw deems necessary to strip, extract, process and remove aggregate on the Leased Lands including, but not limited to, bulldozers, trucks, loaders and excavators.
15. As the site is developed, Shaw may need to dig additional test pits or drill the deposit to better establish the position of the water table, aggregate quality, and appropriate depths of excavation or for site reclamation planning purposes. Shaw shall have the right to conduct such work as is required and to use excavators, drill rigs or any other equipment required to carry out this work on the Leased Lands. Any such work will be done by Shaw at their own expense.
16. To the extent it is operationally and economically reasonable to do so, Shaw will attempt to extract and transport all aggregate during winter months. Notwithstanding the foregoing, Visser specifically acknowledges and agrees that there are various factors (including, without limitation, weather, road restrictions, production demands, truck availability, etc.) that may necessitate extractions during other seasons.
17. Shaw shall have the right to build new access roads on the Leased Lands to facilitate aggregate removal as outlined in the Lease. Shaw shall review the location of any required roads with Visser prior to starting construction.
18. Shaw will be responsible for the clean-up and disposal of any environmental spills (petroleum, chemical products, etc.) resulting from the activities during the Term of the Lease of their employees or contractors on the Leased Lands or associated access roads.
19. In regards to overall site preparation, extraction and reclamation activities on the Leased Lands, Shaw will be responsible for the following:
  - a. Grubbing and stockpiling stumps and larger woody debris.
  - b. Excavation and on-site stockpiling of topsoil (approximately the top one foot of material).

- c. Excavation of aggregate.
  - d. Re-grading of the extracted site to pre-agreed slopes. This final grading will be done as the various phase areas are fully depleted.
  - e. Spreading stockpiled topsoil evenly over the extraction site.
  - f. Shaw shall acquire any and all Permits, Approvals, Releases, etc. required by law to carry out the activities covered under the Terms and Conditions of this Lease.
  - g. Visser represents and warrants to Shaw that the Leased Lands have valid deeded access to a Black Rock Road and in the event any access issues do arise, Visser hereby covenants and agrees to grant any additional access rights over its other lands as may be necessary, in Shaw's sole opinion, to ensure that Shaw has continuous uninterrupted access to Black Rock Road during the entire term of this Lease (and any renewals thereof).
  - h. Visser shall assist and cooperate with Shaw as required during the various regulatory processes involved to allow extractions to proceed, including but not limited to (1) registration under the Environmental Assessment Act (2) application for an Industrial Approval (3) implementation of terms and conditions that may be required under (1) and / or (2).
20. Visser agrees to waive any required property boundary setbacks required by Nova Scotia Environment (NSE). This will allow Shaw to extract to and across the Shaw / Visser property boundary, maximizing accessible volume and leaving a more functional property following extraction and reclamation. The waiver will be in the form of a letter or other documentation as required by NSE.
21. [REDACTED]
22. [REDACTED]
23. Shaw will be responsible for completing the reclamation of any extracted areas disturbed by Shaw under the Terms and Conditions of this Lease. Any such reclamation not addressed in 21 and 22 above, shall meet all standards required by Nova Scotia Environment or any Term or Condition of either the Environmental Assessment or Industrial Approval.
24. Unless the planned agricultural use of the reclaimed site results in Nova Scotia Environment waiving the revegetation requirements in their "Pit & Quarry Guidelines", Visser will be responsible for establishing vegetative cover on the non-pond reclaimed site within one year of the final spreading of topsoil by Shaw.
25. Extraction and reclamation will be planned and carried out following discussions with Visser to ensure mutual understanding between both parties and working towards maximizing extraction volumes without compromising the intended future use and condition of the disturbed leased lands.

Visser Licenses:

26. Shaw hereby grants a license to Visser to enter, occupy and use the Leased Lands for the purposes of personal and family access for recreational purposes and post reclamation activities provided those post reclamation activities need to be agreed to in advance between the parties. Without limiting the foregoing but for clarity, Visser agrees that they will not sell, barter or trade any of the aggregates acquired from the Leased Lands to third parties until the conclusion of the Lease.
27. Visser covenants with Shaw that while Visser uses the Leased Lands as permitted in the license noted in clause 26 above, it shall comply, and cause Visser Representatives to comply with all applicable laws and regulations.
28. While using the Leased Lands as permitted in the license noted in clause 26 above, Visser shall indemnify the Licensor and save it harmless from and against any and all loss, claims, actions, damages, liability, and expenses in connection with loss of life, personal injury, damage to property or any other loss or injury whatsoever (collectively called a "Loss") arising from or out of their use of the Leased Lands as permitted in clause 26 or the occupancy or use by the Licensee of the Lands or any party thereof or by anyone Visser has permitted to be upon the Leased Lands.

Taxes:

29. Visser will pay all existing property taxes and keep the Property, including the Leased Lands, unencumbered during the term of this Lease. Shaw shall pay any additional property taxes levied as a result of Shaw's aggregate extraction activities on the Leased Lands.

Title:

30. Visser covenants and warrants that they have good title to the Property, including the Leased Lands and the aggregate contained thereon and have good right to full power to grant and demise the same and that Shaw shall and may peaceably possess and enjoy the same and that the rights and privileges hereby granted during the term of this Lease and any extension thereof without any interruption or disturbance from or by Visser or any other person whomsoever.

Indemnity:

31. Shaw shall indemnify Visser against all actions, suits claims and demands by any person or persons whomsoever in respect of any loss, injury, damage or obligation to compensate such person arising out of the work carried out on the Leased Lands or property by Shaw.

General:

32. Any notice, statement, royalty or other correspondence required under this Lease shall be mailed to:

Visser at 68 Parker Condon South Branch Road, Waterville, Kings County, Nova Scotia, B0P 1V0.

And

Shaw at P.O. Box 60, Shubenacadie, Hants County, Nova Scotia, B0N 2H0.

33. Visser and Shaw hereby agree that they will each do and perform all such acts and things and execute all such deeds, documents and writings and give effect to this Lease and all covenants herein contained.
34. No waiver by any party hereto of any breach by any other party of any of its covenants, agreements or obligations contained in this Lease shall be or be deemed to be a waiver of any subsequent breach thereof or the breach of any other covenants, agreements or obligations, nor shall any forbearance by any party hereto to seek a remedy for any breach by any other party be a waiver by the party so forbearing of its rights and remedies with respect to such breach or any subsequent breach.
35. The terms of the agreement express and constitute the entire agreement between the parties and no implied covenant or liability of any kind is created or shall arise by reason of these presents or anything herein contained.
36. This Lease shall be construed and governed by the laws of the Province of Nova Scotia.
37. This agreement shall ensure to the benefit of and be binding upon the parties hereto and each of them, their respective heirs, executors, administrators, successors and assigns.
38. The parties hereto agree to execute and record a notice of this Lease in the appropriate Registry Office. The cost of such registration shall be borne by Shaw.
39. This Lease may be executed in counterparts and may be executed and delivered via facsimile transmission, including signatures, which counterparts and facsimile copies shall together constitute one and the same Agreement with the same effect as if originally executed and delivered.

WJ  
Witness

William Mitchell Visser  
William Mitchell Visser, acting in his capacity as authorized Power of Attorney for Nico Visser

WJ  
Witness

Jennifer Dawn Visser  
Jennifer Dawn Visser

WJ  
Witness

Andrew Visser  
Andrew Visser, acting in his capacity as authorized Power of Attorney for Nico Visser

**The Shaw Group Limited**

Kim Anstey  
Witness

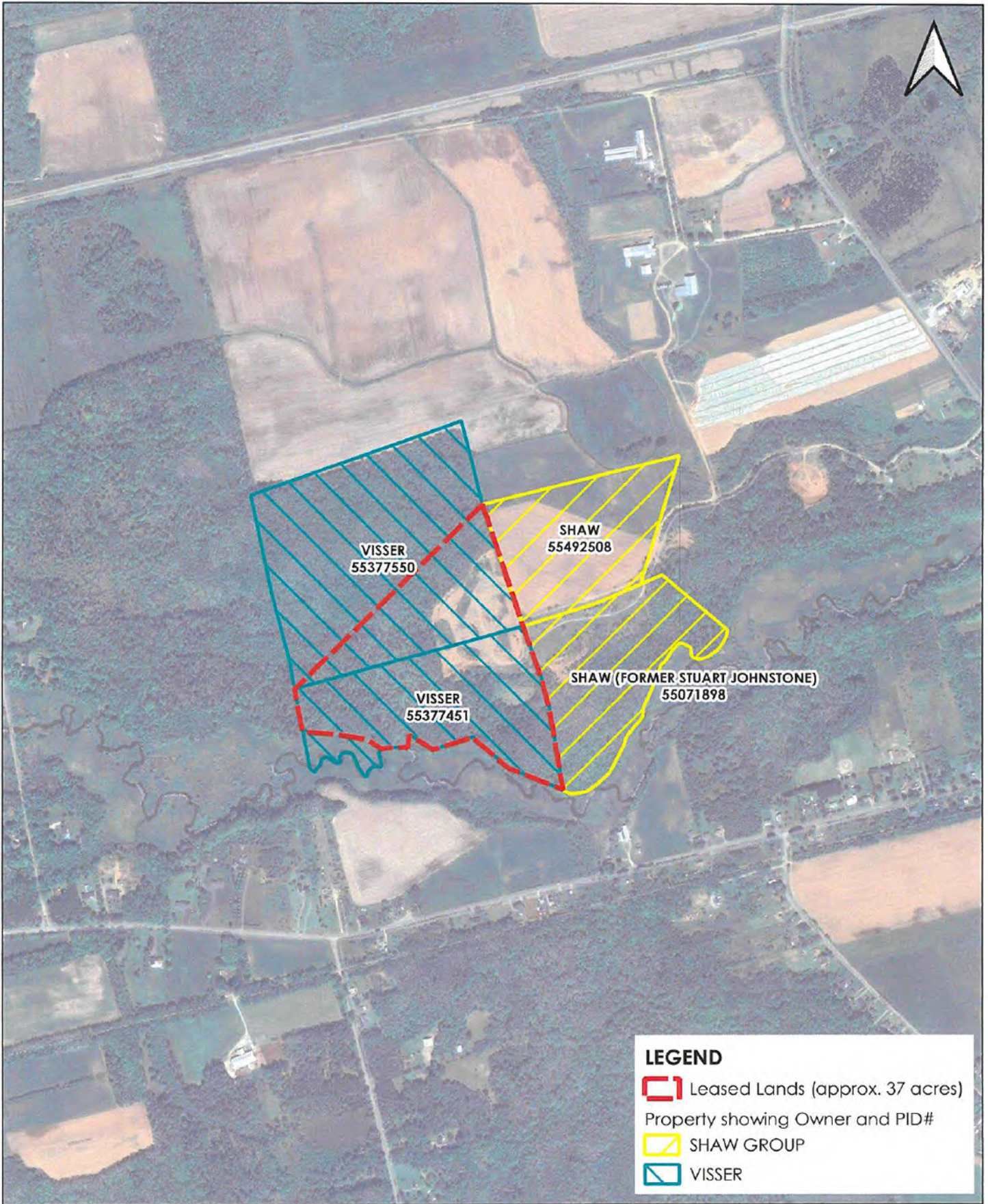
Per: [Signature]

\_\_\_\_\_  
Witness

Per: R. Jeff McLean

**SCHEDULE A**





0 100 200 300 400 500 m



**PROPERTY AND LEASED LANDS - VISSER**

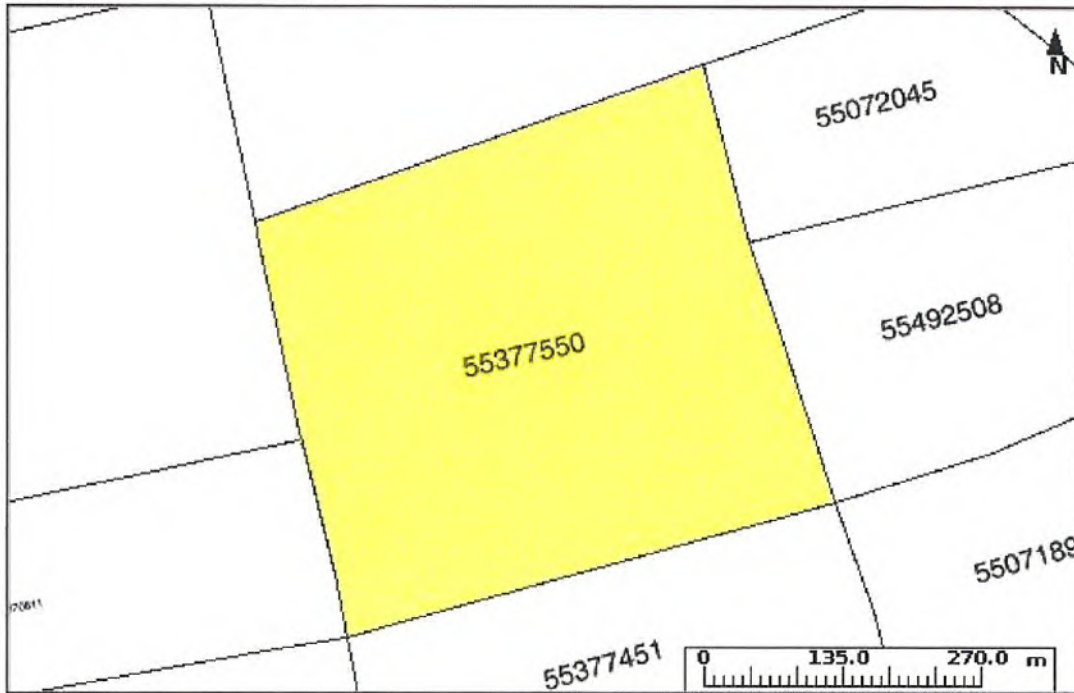
Schedule A





## Property Online Map

Date: Jun 10, 2021 3:06:10 PM



<b>PID:</b> 55377550	<b>Owner:</b> WILLIAM M VISSER	<b>AAN:</b> 08125384
<b>County:</b> KINGS COUNTY	JENNIFER DAWN VISSER	<b>Value:</b> \$21,600 (2021 RESOURCE FOREST)
<b>LR Status:</b> NOT LAND REGISTRATION	NICO WILLIAM VISSER	
	<b>Address:</b> PARKER CONDON RD S B	
	WATERVILLE	

The Provincial mapping is a graphical representation of property boundaries which approximate the size, configuration and location of parcels. Care has been taken to ensure the best possible quality, however, this map is not a land survey and is not intended to be used for legal descriptions or to calculate exact dimensions or area. The Provincial mapping is not conclusive as to the location, boundaries or extent of a parcel [*Land Registration Act* subsection 21(2)]. THIS IS NOT AN OFFICIAL RECORD.

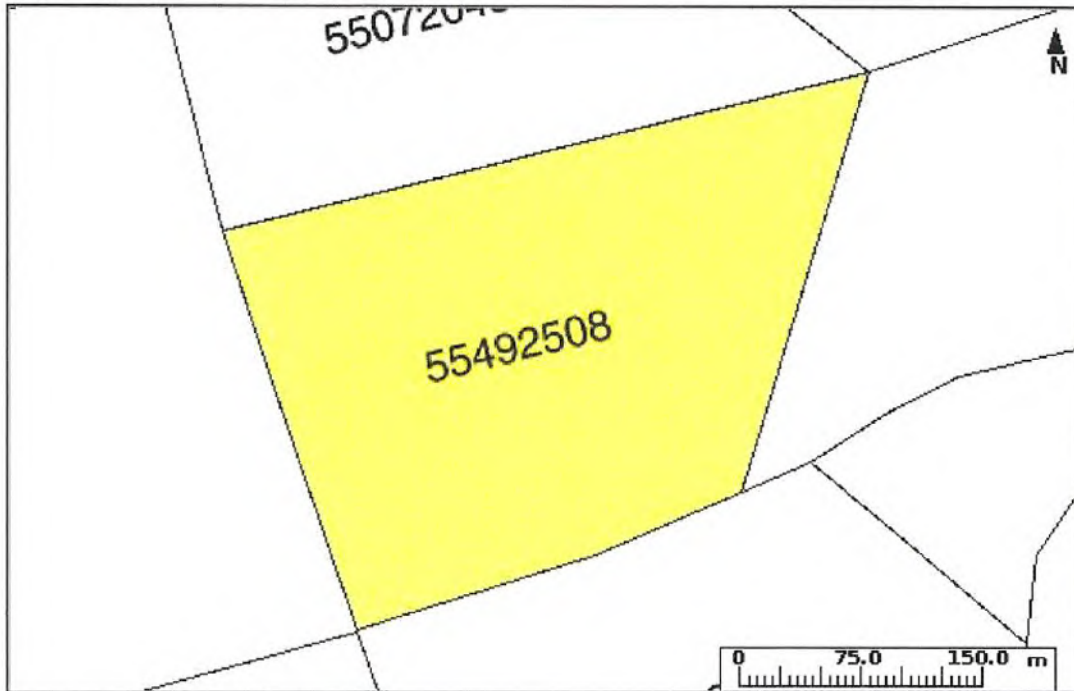
### Property Online version 2.0

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## Property Online Map

Date: Jun 11, 2021 10:48:08 AM



**PID:** 55492508      **Owner:** THE SHAW GROUP LIMITED      **AAN:** 05042313  
**County:** KINGS COUNTY      **Address:** BLAIR ROAD      **Value:** \$3,000 (2021 RESOURCE FARM)  
**LR Status:** LAND REGISTRATION      WATERVILLE      \$9,700 (2021 RESOURCE FOREST)

The Provincial mapping is a graphical representation of property boundaries which approximate the size, configuration and location of parcels. Care has been taken to ensure the best possible quality, however, this map is not a land survey and is not intended to be used for legal descriptions or to calculate exact dimensions or area. The Provincial mapping is not conclusive as to the location, boundaries or extent of a parcel [*Land Registration Act* subsection 21(2)]. THIS IS NOT AN OFFICIAL RECORD.

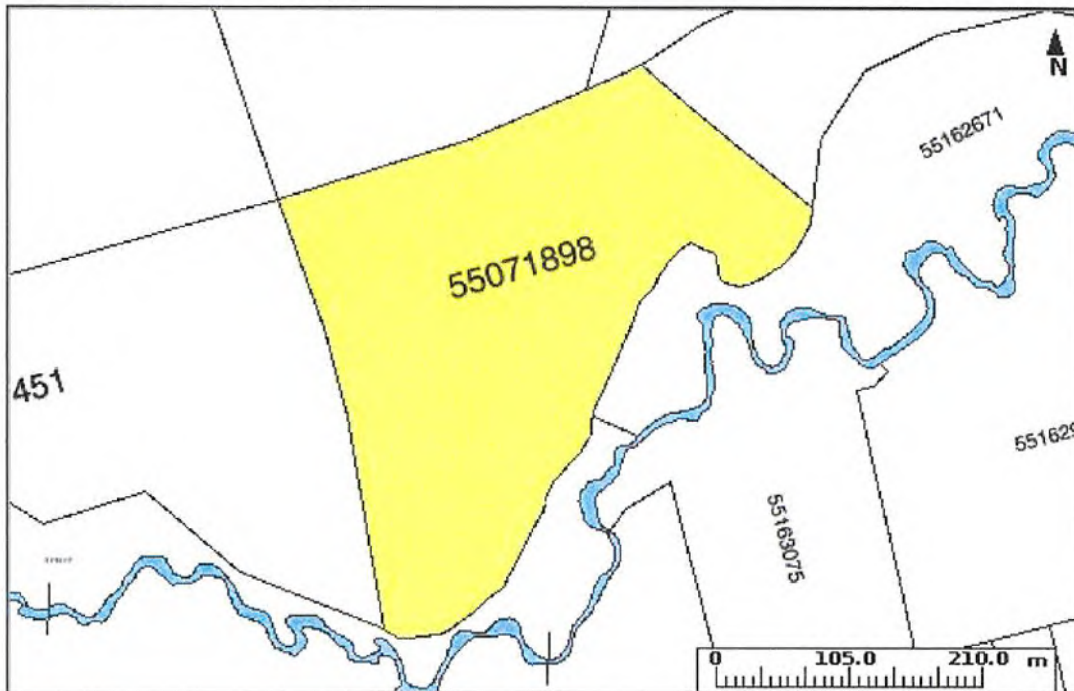
### Property Online version 2.0

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## Property Online Map

Date: Jun 10, 2021 3:09:05 PM



<b>PID:</b> 55071898	<b>Owner:</b> NOVA SCOTIA SAND AND GRAVEL	<b>AAN:</b> 05423139
<b>County:</b> KINGS COUNTY	<b>Address:</b> MAPLE STREET	<b>Value:</b> \$11,600 (2021 RESOURCE FOREST)
<b>LR Status:</b> NOT LAND REGISTRATION	<b>Address:</b> WATERVILLE	

The Provincial mapping is a graphical representation of property boundaries which approximate the size, configuration and location of parcels. Care has been taken to ensure the best possible quality, however, this map is not a land survey and is not intended to be used for legal descriptions or to calculate exact dimensions or area. The Provincial mapping is not conclusive as to the location, boundaries or extent of a parcel [*Land Registration Act* subsection 21(2)]. THIS IS NOT AN OFFICIAL RECORD.

### Property Online version 2.0

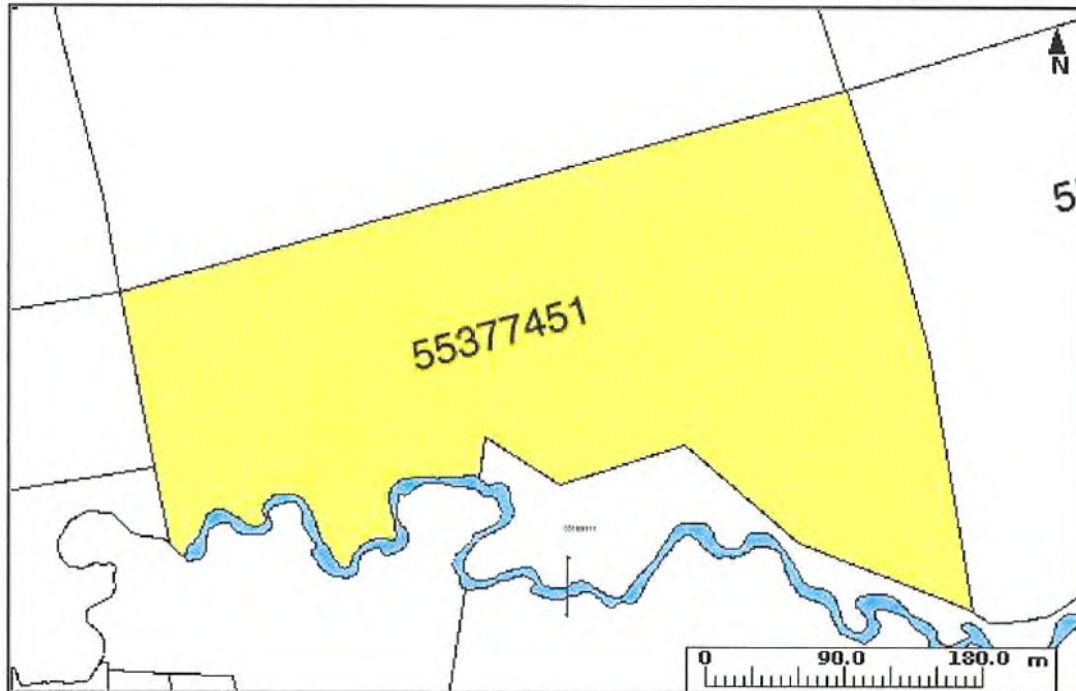
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## Property Online Map

Date: Jun 10, 2021 3:07:24 PM



**PID:** 55377451      **Owner:** WILLIAM M VISSER      **AAN:** 08125287  
**County:** KINGS COUNTY      JENNIFER DAWN VISSER      **Value:** \$37,500 (2021 RESOURCE FARM)  
**LR Status:** NOT LAND REGISTRATION      NICO WILLIAM VISSER  
**Address:** MAPLE STREET  
 WATERVILLE

The Provincial mapping is a graphical representation of property boundaries which approximate the size, configuration and location of parcels. Care has been taken to ensure the best possible quality, however, this map is not a land survey and is not intended to be used for legal descriptions or to calculate exact dimensions or area. The Provincial mapping is not conclusive as to the location, boundaries or extent of a parcel [*Land Registration Act* subsection 21(2)]. THIS IS NOT AN OFFICIAL RECORD.

### Property Online version 2.0

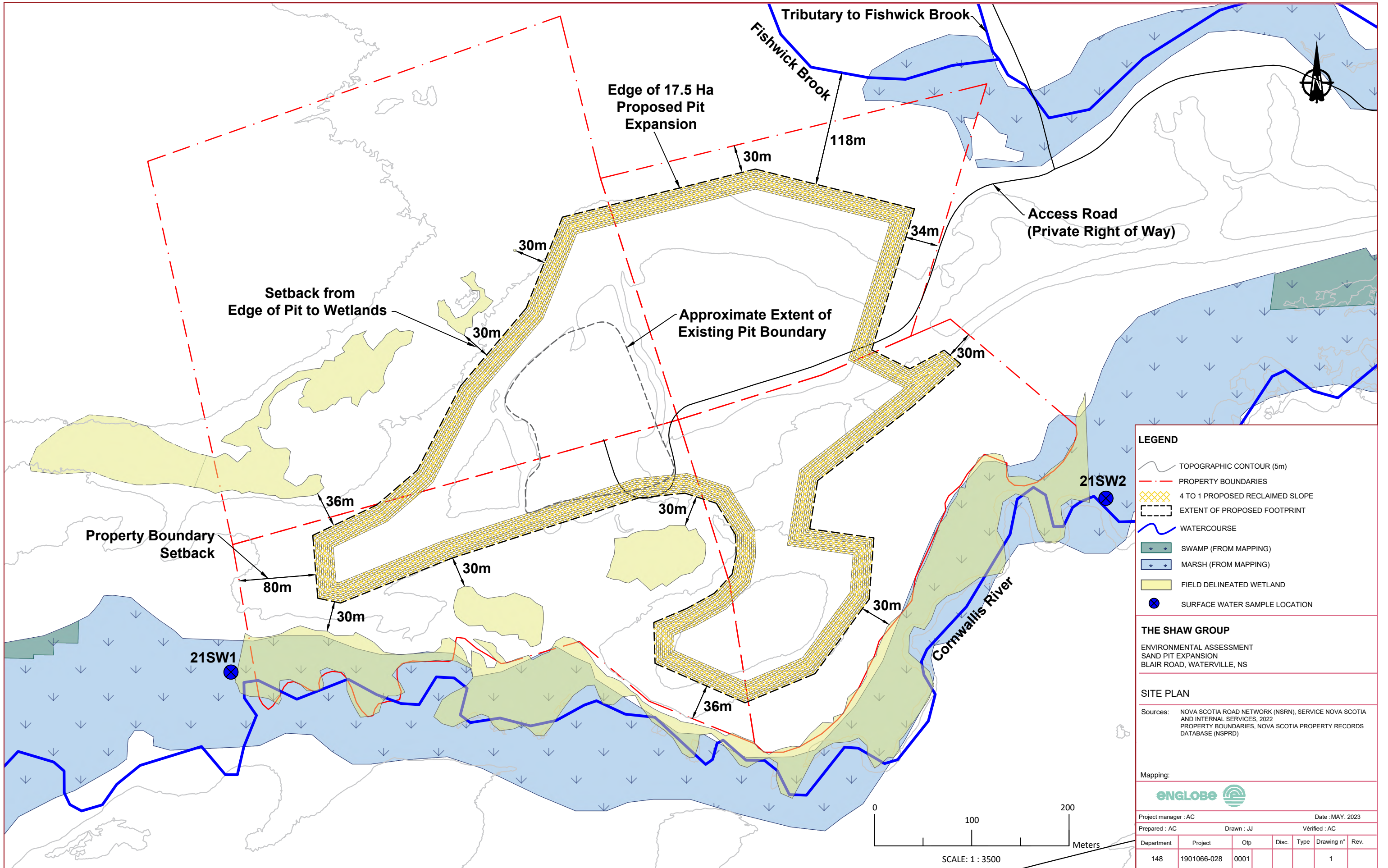
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# Appendix C

# Site Plans

Figure 1 Site Plan





**LEGEND**

- TOPOGRAPHIC CONTOUR (5m)
- PROPERTY BOUNDARIES
- 4 TO 1 PROPOSED RECLAIMED SLOPE
- EXTENT OF PROPOSED FOOTPRINT
- WATERCOURSE
- SWAMP (FROM MAPPING)
- MARSH (FROM MAPPING)
- FIELD DELINEATED WETLAND
- SURFACE WATER SAMPLE LOCATION

**THE SHAW GROUP**  
 ENVIRONMENTAL ASSESSMENT  
 SAND PIT EXPANSION  
 BLAIR ROAD, WATERVILLE, NS

**SITE PLAN**  
 Sources: NOVA SCOTIA ROAD NETWORK (NSRN), SERVICE NOVA SCOTIA AND INTERNAL SERVICES, 2022  
 PROPERTY BOUNDARIES, NOVA SCOTIA PROPERTY RECORDS DATABASE (NSPRD)



Project manager : AC		Date : MAY. 2023				
Prepared : AC		Drawn : J.J		Verified : AC		
Department	Project	Otp	Disc.	Type	Drawing n°	Rev.
148	1901066-028	0001			1	

# Appendix D

## Regional Figures

Figure 1 Aerial Photo and Topography

Figure 2 Significant Habitats

Figure 3 Wetlands and Water Resources

Figure 4 Surficial Geology

Figure 5 Bedrock Geology

Figure 6 Land Use

















File : Y:\Share\CA\Dam\mouh\Data\Projects\2019\_Dellek\1901066\_CD\Environmental\Consulting\1901066\_028\_Vessers EA\_Water\ville\4\_CAD\G02\_carro5\_produit\0001\_EnvAss\0001\_EnvAss\version\_0A1148-1901066-028-0001-EN-C-04-0A\_SurfGeo\_221201.mxd



**Project components**

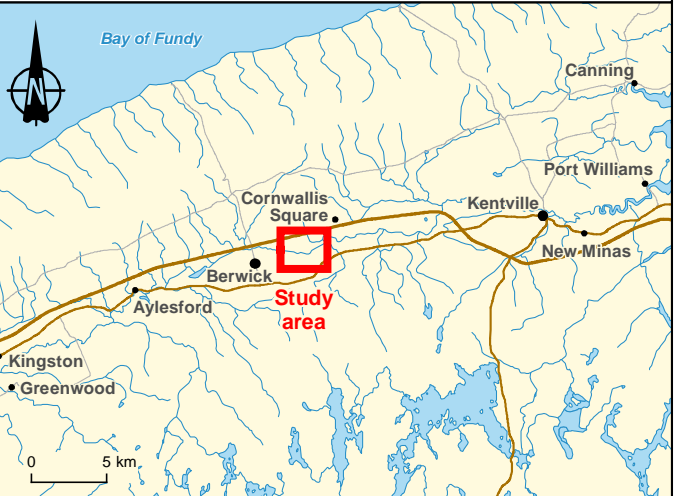
- Sand extraction footprint
- Ice contact sediments
- Littoral, prelittoral and deep water sediment
- Modern alluvium
- Organic deposits
- Subaerial proglacial fan sediment
- Esker (direction of flow known)
- Gravel or Sand pit

**Hydrography**

- Body of water
- Watercourse
- Flow direction

**Infrastructure**

- Road network



The Shaw Group  
Environmental Assessment

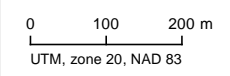
**Figure 4**  
**Surficial Geology**

Sources :  
Base : Orthophoto, © 2014 DigitalGlobe Image courtesy of USGS  
CANVec Version 7, 1/50 000, RNCAN, 2010  
Nova Scotia Road Network (NSRN), Service Nova Scotia and Internal Services, 2022  
Surficial geology Open file 5276, Geological Survey of Canada, 2006  
Cartography : Englobe

December 2022

**PRELIMINARY**

Project manager : A. Cole		Date : 2022-11-29				
Prepared : A. Cole		Drawn : F. Thériault		Verified : B. Andrieux		
Department	Project	Sub-phase	Disc.	Type	Drawing n°	Rev.
148	1901066-028	0001	EN	F	04	0A





File : Y:\Share\CA\Damouth\Projects\2019\_Deltek\1901066\_CD\Environmental\Consulting\1901066\_028\_Vessers EA\_Water\ville\4\_CAD\G02\_carro5\_produit\0001\_EnvAss\version\_0A1148-1901066-028-0001-EN-C-05-0A\_BedrockGeo\_221201.mxd



**Project components**

- Sand extraction footprint

**Bedrock geology**

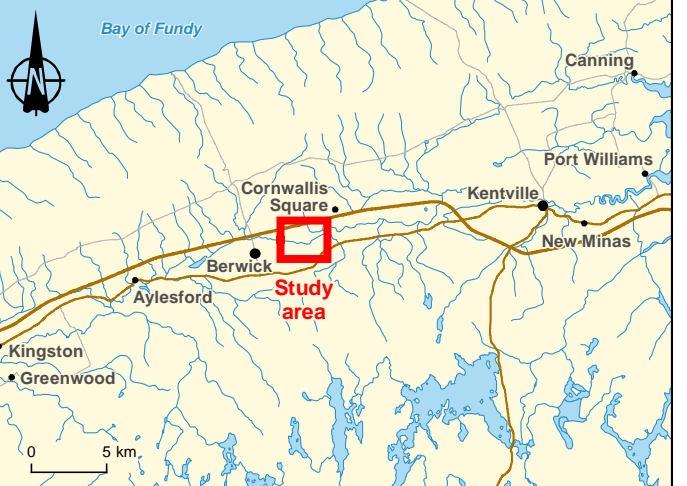
- Wolfville Formation : pink to red coarse-grained sandstone and conglomerate with minor red to red-brown siltstone and shale

**Hydrography**

- Body of water
- Watercourse
- Flow direction

**Infrastructure**

- Road network



The Shaw Group  
Environmental Assessment

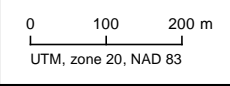
**Figure 5  
Bedrock Geology**

**Sources :**  
 Base : Orthophoto, © 2014 DigitalGlobe Image courtesy of USGS  
 CANVec Version 7, 1 /50 000, RNCAN, 2010  
 Bedrock Geology Map of the Central Annapolis Valley Area,  
 Nova Scotia Department of Energy and Mines, 2019  
 Nova Scotia Road Network (NSRN), Service Nova Scotia and Internal Services, 2022  
 Cartography : Englobe

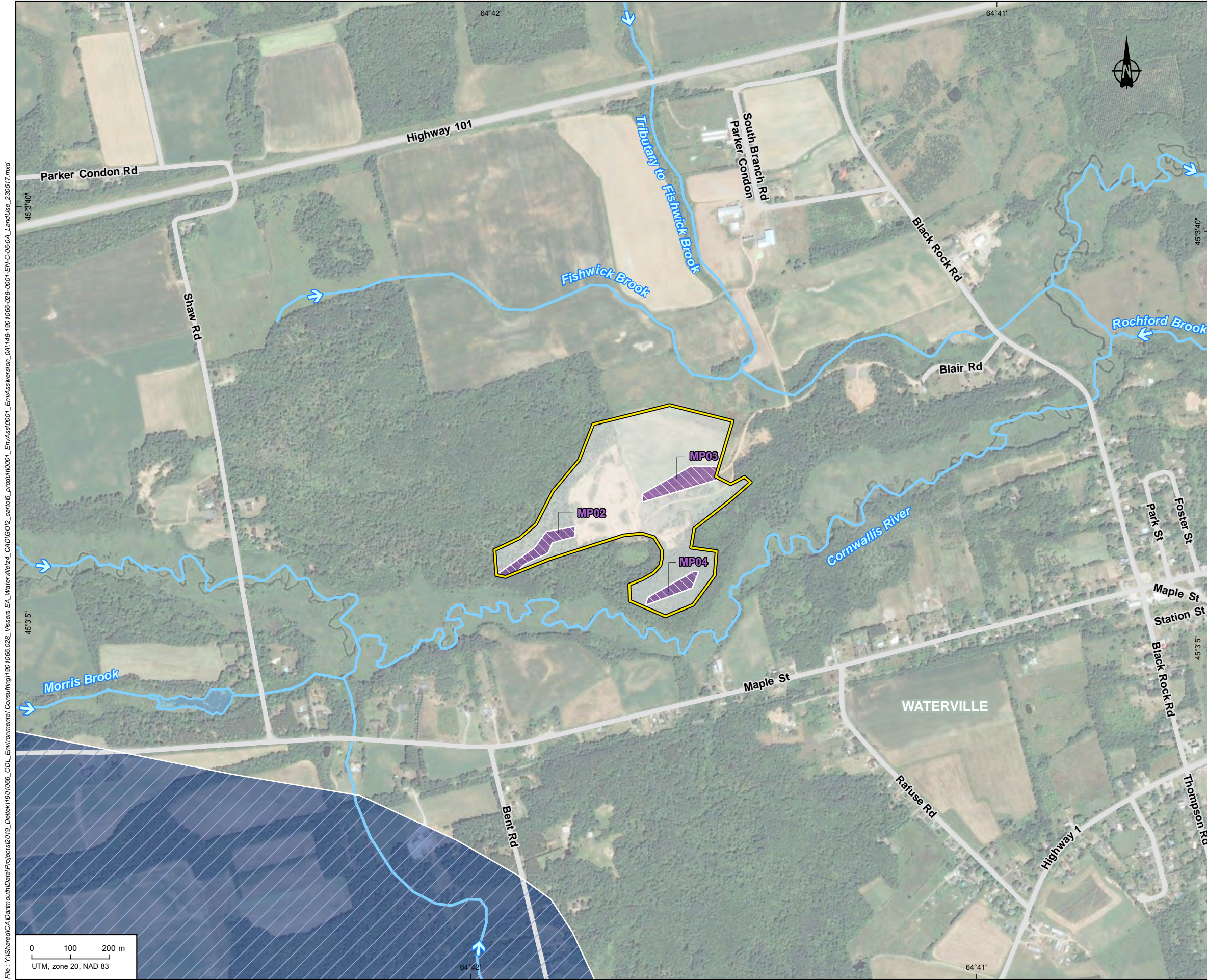
December 2022

**PRELIMINARY**

Project manager : A. Cole		Date : 2022-11-29				
Prepared : A. Cole		Drawn : F. Thériault		Verified : B. Andrieux		
Department	Project	Sub-phase	Disc.	Type	Drawing n°	Rev.
148	1901066-028	0001	EN	F	05	0A







**Project components**

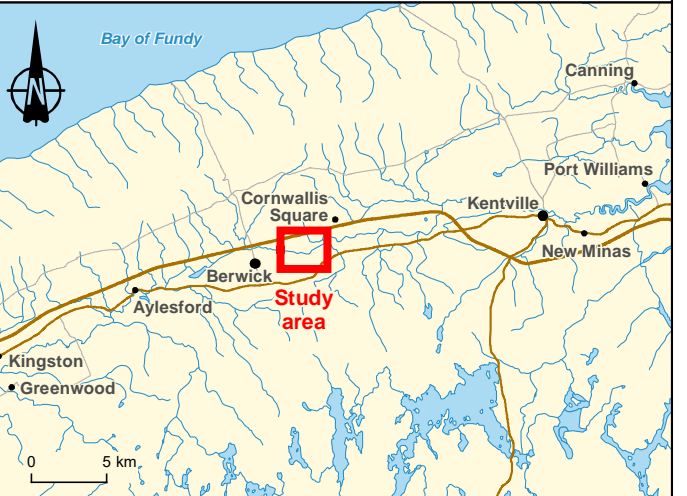
- Sand extraction footprint
- Moderate archaeological potential for L'nuk resources and identifier
- Archaeological testing cleared for development
- Source-water and well-field protection areas (Berwick)

**Hydrography**

- Body of water
- Watercourse
- Flow direction

**Infrastructure**

- Road network



The Shaw Group  
Environmental Assessment

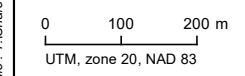
**Figure 6**  
**Land Use**

**Sources :**  
 Base : Orthophoto, © 2014 DigitalGlobe Image courtesy of USGS  
 CANVec Version 7, 1/50 000, RNCAN, 2010  
 Source-water and Well-field Protection Area, Municipality of Kings Database, 2020  
 Nova Scotia Road Network (NSRN), Service Nova Scotia and Internal Services, 2022  
 Inventory : Englobe, 2022  
 Cartography : Englobe

May 2023

ENGLOBE		<b>PRELIMINARY</b>				
Project manager : A. Cole			Date : 2023-05-17			
Prepared : A. Cole		Drawn : F. Thériault		Verified : B. Andrieux		
Department	Project	Sub-phase	Disc.	Type	Drawing n°	Rev.
148	1901066-028	0001	EN	F	06	0A

File : Y:\Share\CA\Damrough\Data\Projects\2019\_Deltek\1901066\_CDLE\_Environmental Consulting\1901066\_028\_Vessers EA\_Water\ville\4\_CAD\G02\_carole5\_produit\0001\_EnvAss\0001\_EnvAss\version\_0A1148-1901066-028-0001-EN-C-06-0A\_LandUse\_230517.mxd





# Appendix E

## Analytical Results

Table 1 Groundwater Metals and Elements

Table 2 Groundwater General Chemistry

Table 3 Surface Water Metals and Elements

Table 4 Surface Water General Chemistry



TABLE 1: Groundwater Metals and Elements (>10m from a Surface Water Body)  
 Client: Shaw Group  
 Site: Sand Pit Expansion, Blair Road, Waterville, NS  
 Englobe Job No: 1901066.028

Inorganic Parameters	Units	NSE Tier 2 PSS Drinking Water <sup>1</sup>	NSE Tier 2 PSS Ecological <sup>2</sup>	Sample ID															
				21-MW1				21-MW2				21-MW3				21-MW4			
				29-Dec-21	29-Mar-22	27-Jun-22	30-Sep-22	29-Dec-21	29-Mar-22	27-Jun-22	30-Sep-22	29-Dec-21	29-Mar-22	27-Jun-22	30-Sep-22	29-Dec-21	29-Mar-22	27-Jun-22	30-Sep-22
Aluminum	ug/L	-	50 <sup>3</sup>	8.8	14	13	24	880	660	760	830	11	27	24	17	100	39	160	150
Antimony	ug/L	6	90	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.5	4.1	<1.0	<1.0	<1.0	<1.0
Arsenic	ug/L	10	50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.2	<1.0	6.2	3.1	1.2	<1.0	<1.0	<1.0	<1.0
Barium	ug/L	1000	10000	8.8	9.9	8.7	9.1	8.2	3.6	5.9	2.2	35	<1.0	1.6	25	40	67	28	42
Beryllium	ug/L	4	1.5	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.1	0.13
Bismuth	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
Boron	ug/L	5000	15000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	ug/L	5	0.9 <sup>4</sup>	<0.010	<0.010	<0.010	<0.010	0.013	0.017	0.03	0.031	0.042	<0.010	0.015	0.019	0.03	0.019	0.045	0.045
Calcium	ug/L			540	620	470	430	540	620	630	920	36000	520	1400	32000	12000	20000	8800	8700
Chromium	ug/L	50	89	<1.0	<1.0	<1.0	<1.0	1	<1.0	1	2.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2
Cobalt	ug/L	3.8	10 <sup>5</sup>	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.43	0.55	<0.40	<0.40	<0.40	<0.40	0.5	<0.40	<0.40	<0.40
Copper	ug/L	2000	20 <sup>6</sup>	<0.50	0.72	0.51	1.5	1.7	1.8	1.9	30	0.76	1.9	3.3	7.5	4.8	<0.50	10	12
Iron	ug/L	300	3000	<50	<50	<50	<50	55	280	100	1600	<50	<50	55	<50	51	<50	97	100
Lead	ug/L	5	10 <sup>7</sup>	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.55	<0.50	1	0.98	<0.50	<0.50	<0.50	<0.50	<0.50
Magnesium	ug/L			450	670	380	380	770	430	960	850	2500	<100	<100	2500	3200	7000	2400	2100
Manganese	ug/L	120	4300 <sup>8</sup>	13	9.3	7.9	8	30	49	47	120	350	2.6	7.3	330	42	29	30	20
Mercury	ug/L	1	0.26	<0.01	<0.013	<0.013	<0.013	<0.01	<0.013	<0.013	<0.013	<0.01	<0.013	<0.013	<0.013	<0.01	<0.013	<0.013	<0.013
Molybdenum	ug/L	70	730	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	15	13	3.5	<2.0	<2.0	<2.0	<2.0
Nickel	ug/L	100	250 <sup>9</sup>	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	3.5	<2.0	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	3.4	2.7
Phosphorus	ug/L			<100	<100	<100	<100	<100	<100	180	<100	<100	110	<100	<100	<100	<100	<100	<100
Potassium	ug/L			860	960	1100	720	1200	670	120000	1000	2400	250	790	1900	1800	3800	2600	2500
Selenium	ug/L	50	10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver	ug/L		2.5	<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
Sodium	ug/L	200000		2400	5200	2600	3000	3600	5300	4500	6900	5000	69000	91000	43000	3800	5500	8400	4300
Strontium	ug/L	2400	210000	3.4	4.2	2.7	2.7	3.3	4.9	4.5	5.2	42	2.4	6.7	87	20	44	18	17
Thallium	ug/L	2	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
Tin	ug/L	2400	-	<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
Titanium	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	2.6	4.3	2.3	7.1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.3	<2.0
Uranium	ug/L	20	150	<0.10	<0.10	<0.10	<0.10	<0.10	0.28	<0.10	0.2	0.13	9.3	6.3	1.6	0.13	<0.10	0.39	0.34
Vanadium	ug/L	6.2	1200	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	3.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Zinc	ug/L	5000	70 <sup>10</sup>	<5.0	10	6.4	<5.0	8.9	10	20	17	<5.0	<5.0	<5.0	5.5	<5.0	6.7	14	6.4

Notes:

- value - exceeds Drinking Water Tier 2 PSS
- value - exceeds Ecological Tier 2 PSS
- - no guideline

<sup>1</sup> 2021 (July 2022 update) Nova Scotia Environment Tier II Pathway Specific Standard (PSS) for Drinking Water (Agricultural)

<sup>2</sup> 2021 (July 2022 update) Nova Scotia Environment Tier II Pathway Specific Standard (PSS) for Surface Water and Groundwater discharging to surface water, >10m from surface water

<sup>3</sup> Aluminium Guideline for pH < 6.5 = 50 ug/L  
 Aluminium Guideline for pH ≥ 6.5 = 1000 ug/L

<sup>4</sup> At [CaCO<sub>3</sub>] = > 0 to < 17 mg/L, cadmium guideline = 0.4 µg/L  
 At [CaCO<sub>3</sub>] = ≥ 17 to ≤ 280 mg/L, cadmium guideline (µg/L) = 10<sup>{0.83(log[hardness]) - 2.46}</sup>  
 At [CaCO<sub>3</sub>] = > 280 mg/L, cadmium guideline = 3.7 µg/L

<sup>5</sup> At [CaCO<sub>3</sub>] = 0 to ≤ 52 mg/L, cobalt guideline = 7.8 ug/L  
 At [CaCO<sub>3</sub>] = > 52 to ≤ 396 mg/L, cobalt guideline = e<sup>{0.414 ln(hardness) - 1.887}</sup>  
 At [CaCO<sub>3</sub>] = > 396 mg/L, cobalt guideline = 18 ug/L

<sup>6</sup> At [CaCO<sub>3</sub>] = 0 to 120 mg/L, copper guideline = 20 ug/L.  
 At [CaCO<sub>3</sub>] = ≥ 82 to ≤ 180 mg/L, copper guideline = 0.2 \* e<sup>{0.8545 ln(hardness) - 1.465}</sup>  
 At [CaCO<sub>3</sub>] = > 180 mg/L, copper guideline = 40 ug/L.

<sup>7</sup> At [CaCO<sub>3</sub>] = 0 to ≤ 60 mg/L, lead guideline = 10 ug/L  
 At [CaCO<sub>3</sub>] = > 60 to ≤ 180 mg/L, lead guideline = e<sup>{1.273 ln(hardness) - 4.705}</sup>  
 At [CaCO<sub>3</sub>] = > 180 mg/L, lead guideline = 70 ug/L

<sup>8</sup> 2019 CCME Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life Appendix B - Manganese - Canadian Water Quality Guideline and Benchmark Calculator

<sup>9</sup> At [CaCO<sub>3</sub>] = 0 to 60 mg/L, nickel guideline = 250 ug/L.  
 At [CaCO<sub>3</sub>] = > 60 to ≤ 180 mg/L, nickel guideline (µg/L) = e<sup>{0.76 ln(hardness) + 1.06}</sup>  
 At [CaCO<sub>3</sub>] = > 180 mg/L, nickel guideline = 1500 µg/L

<sup>10</sup> exp<sup>{0.94 / [ln(hardness mg-L-1)] - 0.815 [pH] + 0.398 ln(LUOC mg-L-1) + 4.625}</sup>  
 When CaCO<sub>3</sub> 23.4 to 399 mg/L and pH 6.5 to 8.13  
 Otherwise, zinc guideline = 70 ug/L



TABLE 2: Groundwater General Chemistry (>10m from a Surface Water Body)

Client: Shaw Group  
 Site: Sand Pit Expansion, Blair Road, Waterville, NS  
 Englobe Job No: 1901066.028

Parameter	Units	NSE Tier 2 PSS Drinking Water <sup>1</sup>	NSE Tier 2 PSS Ecological <sup>2</sup>	Sample ID									
				21-MW1				21-MW2					
				29-Dec-21	29-Mar-22	27-Jun-22	30-Sep-22	29-Dec-21	21-MW2 Lab-Dup	29-Mar-22	27-Jun-22	30-Sep-22	21-MW2 Lab-Dup
<b>Field Readings</b>													
Field pH	Units	7 - 10.5	6.5 - 9.0	<b>6.2</b>	<b>5.4</b>	8.0	8.0	<b>4.7</b>	-	7.0	<b>5.9</b>	<b>6.7</b>	-
Field Conductivity	uS/cm		-	0.060	0.032	1.69	0.895	0.087	-	0.196	1.203	0.087	-
Field Temperature	°C		-	5.57	4.65	10.16	11.46	2.84	-	4.74	11.15	12.62	-
Field Dissolved Oxygen	mg/L		-	14.33	25.59	18.31	11.6	9.13	-	18.28	7.69	3.79	-
<b>Calculated Parameters</b>													
Anion Sum	me/L		-	0.24	0.3	0.24	0.25	0.25	-	0.28	0.42	0.44	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		-	6.4	5.2	3	3.3	7	-	6.8	6.6	5	-
Calculated TDS	mg/L		-	18	24	19	20	22	-	21	150	45	-
Carb. Alkalinity (calc. as CaCO3)	mg/L		-	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	-
Cation Sum	me/L		-	0.19	0.34	0.2	0.2	0.3	-	0.33	3.3	0.51	-
Hardness (CaCO3)	mg/L		-	3.2	4.3	2.7	2.6	4.5	-	3.3	5.5	5.8	-
Ion Balance (% Difference)	%		-	11.6	6.25	9.09	11.1	9.09	-	8.2	77.4	7.37	-
Langelier Index (@ 20C)	N/A		-	-4.8	-4.74	-4.85	-4.71	-5.54	-	-5.31	-5.46	-5.08	-
Langelier Index (@ 4C)	N/A		-	-5.05	-4.99	-5.1	-4.96	-5.79	-	-5.57	-5.71	-5.33	-
Nitrate (N)	mg/L		-	<0.050	0.077	<0.050	<0.050	<0.050	-	<0.050	0.069	<0.050	-
Saturation pH (@ 20C)	N/A		-	10.7	10.8	11.1	11.1	10.7	-	10.7	10.8	10.6	-
Saturation pH (@ 4C)	N/A		-	11	11	11.4	11.4	11	-	10.9	11	10.9	-
<b>Inorganics</b>													
Total Alkalinity (Total as CaCO3)	mg/L		-	6.4	5.2	3	3.3	7	-	6.8	6.6	5	-
Dissolved Chloride (Cl-)	mg/L	250	1200	1.9	3.4	2.9	2.6	4	-	4.9	5.6	7.8	8
Colour	TCU		Narrative	<5.0	<5.0	<5.0	<5.0	49	-	240	82	56	53
Nitrate + Nitrite (N)	mg/L		-	<0.050	0.077	<0.050	<0.050	<0.050	-	<0.050	0.08	<0.050	<0.050
Nitrite (N)	mg/L	10	0.6	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	0.011	<0.010	<0.010
Ammonia (N)	mg/L		varies <sup>3</sup>	<0.050	<0.050	0.05	<0.050	0.18	-	0.078	0.33	0.15	-
Total Organic Carbon (C)	mg/L		-	<5.0	0.91	2.1	0.53	14	-	31	150	130	-
Orthophosphate (P)	mg/L		-	<0.010	<0.010	<0.010	<0.010	0.033	-	0.036	0.023	0.011	0.014
pH	pH	7 - 10.5	6.5 - 9.0	<b>5.94</b>	<b>6.04</b>	<b>6.28</b>	<b>6.42</b>	<b>5.16</b>	-	<b>5.34</b>	<b>5.29</b>	<b>5.56</b>	-
Reactive Silica (SiO2)	mg/L		-	5.4	4.8	4.9	6	6.9	-	4.4	11	17	17
Dissolved Sulphate (SO4)	mg/L		1280 <sup>4</sup>	2.8	4.6	4.5	5.1	<2.0	-	<2.0	5.8	6	6
Turbidity	NTU		-	140	26	68	0.74	19	-	18	>1000	>1000	-
Conductivity	uS/cm		-	21	27	30	25	35	-	32	58	49	-
Total Suspended Solids (TSS)	mg/L		-	5.2	28	24	8.6	97	92	1000	3100	3600	-

Notes:

- value - exceeds Drinking Water Tier 2 PSS
- value - exceeds Ecological Tier 2 PSS
- - no guideline

<sup>1</sup> 2021 (July 2022 update) Nova Scotia Environment Tier II Pathway Specific Standard (PSS) for Drinking Water (Agricultural)

<sup>2</sup> 2021 (July 2022 update) Nova Scotia Environment Tier II Pathway Specific Standard (PSS) for Surface Water and Groundwater discharging to surface water, >10m from surface water

<sup>3</sup> Ammonia - calculations as per [http://st-ts.cme.ca/en/index.html?lang=en&factsheet=5#aql\\_fresh\\_concentration](http://st-ts.cme.ca/en/index.html?lang=en&factsheet=5#aql_fresh_concentration).

<sup>4</sup> At [CaCO<sub>3</sub>] = 0 to ≤30 mg/L, sulphate guideline = 1280 mg/L

At [CaCO<sub>3</sub>] = >30 to ≤75 mg/L, sulphate guideline = 2180 mg/L

At [CaCO<sub>3</sub>] = >75 to ≤180 mg/L, sulphate guideline = 3090 mg/L

At [CaCO<sub>3</sub>] = >180 mg/L, sulphate guideline = 4290 mg/L

TABLE 2: Groundwater General Chemistry (>10m from a Surface Water Body)

Client: Shaw Group

Site: Sand Pit Expansion, Blair Road, Waterville, NS

Englobe Job No: 1901066.028

Parameter	Units	NSE Tier 2 PSS Drinking Water <sup>1</sup>	NSE Tier 2 PSS Ecological <sup>2</sup>	Sample ID									
				21-MW3					21-MW4				
				29-Dec-21	21-MW3 Lab-Dup	29-Mar-22	27-Jun-22	30-Sep-22	29-Dec-21	29-Mar-22	21-MW4 Lab-Dup	27-Jun-22	30-Sep-22
<b>Field Readings</b>													
Field pH	Units	7 - 10.5	6.5 - 9.0	<b>6.3</b>	-	-	7.3	<b>6.4</b>	<b>5.5</b>	<b>5.0</b>	-	<b>6.7</b>	<b>6.2</b>
Field Conductivity	uS/cm		-	0.288	-	-	7.713	0.779	0.147	0.152	-	3.156	0.316
Field Temperature	°C		-	4.84	-	-	13.94	16.25	1.64	4.66	-	18.25	14.99
Field Dissolved Oxygen	mg/L		-	6.88	-	-	5.02	4.93	8.47	20.19	-	2.69	5.33
<b>Calculated Parameters</b>													
Anion Sum	me/L		-	2.22	-	2.84	3.66	3.81	0.98	1.96	-	0.94	0.84
Bicarb. Alkalinity (calc. as CaCO <sub>3</sub> )	mg/L		-	83	-	110	150	160	17	11	-	15	14
Calculated TDS	mg/L		-	130	-	180	230	210	72	150	-	67	59
Carb. Alkalinity (calc. as CaCO <sub>3</sub> )	mg/L		-	<1.0	-	1.7	<1.0	1.2	<1.0	<1.0	-	<1.0	<1.0
Cation Sum	me/L		-	2.27	-	3.11	4.11	3.69	1.08	1.92	-	1.07	0.87
Hardness (CaCO <sub>3</sub> )	mg/L		-	99	-	1.3	3.6	89	43	79	-	32	31
Ion Balance (% Difference)	%		-	1.11	-	4.54	5.79	1.6	4.85	1.03	-	6.47	1.75
Langelier Index (@ 20C)	N/A		-	-0.845	-	-1.4	-1.43	0.208	-2.81	-2.52	-	-2.84	-2.33
Langelier Index (@ 4C)	N/A		-	-1.1	-	-1.65	-1.68	-0.042	-3.06	-2.77	-	-3.1	-2.59
Nitrate (N)	mg/L		-	3	-	2	1.6	0.31	5.3	20	-	2	1.6
Saturation pH (@ 20C)	N/A		-	7.89	-	9.62	9.06	7.69	9.01	9.03	-	9.19	9.22
Saturation pH (@ 4C)	N/A		-	8.14	-	9.87	9.31	7.94	9.27	9.28	-	9.44	9.47
<b>Inorganics</b>													
Total Alkalinity (Total as CaCO <sub>3</sub> )	mg/L		-	83	-	110	150	160	17	11	-	15	14
Dissolved Chloride (Cl <sup>-</sup> )	mg/L	250	1200	3.6	-	4.6	6.2	6.4	6	8.2	-	12	11
Colour	TCU		Narrative	<5.0	-	35	37	29	16	<5.0	-	34	27
Nitrate + Nitrite (N)	mg/L		-	3	-	2	1.6	0.35	5.3	20	-	2.1	1.6
Nitrite (N)	mg/L	10	0.6	0.013	-	0.015	0.041	0.035	<0.010	<0.010	-	0.013	<0.010
Ammonia (N)	mg/L		varies <sup>3</sup>	0.24	0.19	1.1	0.64	0.15	0.21	0.067	-	<0.050	<0.050
Total Organic Carbon (C)	mg/L		-	14	-	<50	100	9.1	12	<5.0	-	64	7.6
Orthophosphate (P)	mg/L		-	<0.010	-	0.097	0.038	0.017	0.016	0.036	-	<0.010	0.012
pH	pH	7 - 10.5	6.5 - 9.0	7.04	-	8.22	7.63	7.9	<b>6.21</b>	<b>6.51</b>	-	<b>6.34</b>	<b>6.88</b>
Reactive Silica (SiO <sub>2</sub> )	mg/L		-	6.1	-	12	12	5.4	7.2	8.6	-	7.3	8.6
Dissolved Sulphate (SO <sub>4</sub> )	mg/L		1280 <sup>4</sup>	11	-	14	18	19	4.4	4.5	-	6.9	5.9
Turbidity	NTU		-	>1000	-	>1000	>1000	280	>1000	>1000	-	>1000	51
Conductivity	uS/cm		-	210	-	320	490	390	110	230	-	120	95
Total Suspended Solids (TSS)	mg/L		-	1100	-	11000	70000	3000	1100	350	360	2500	220

Notes:

<b>value</b>	- exceeds Drinking Water Tier 2 PSS
<b>value</b>	- exceeds Ecological Tier 2 PSS
-	- no guideline

<sup>1</sup> 2021 (July 2022 update) Nova Scotia Environment Tier II Pathway Specific Standard (PSS) for Drinking Water (Agricultural)

<sup>2</sup> 2021 (July 2022 update) Nova Scotia Environment Tier II Pathway Specific Standard (PSS) for Surface Water and Groundwater discharging to surface water, >10m from surface water

<sup>3</sup> Ammonia - calculations as per [http://st-ts.cme.ca/en/index.html?lang=en&factsheet=5#aql\\_fresh\\_concentration](http://st-ts.cme.ca/en/index.html?lang=en&factsheet=5#aql_fresh_concentration).

<sup>4</sup> At [CaCO<sub>3</sub>] = 0 to ≤30 mg/L, sulphate guideline = 1280 mg/L

At [CaCO<sub>3</sub>] = >30 to ≤75 mg/L, sulphate guideline = 2180 mg/L

At [CaCO<sub>3</sub>] = >75 to ≤180 mg/L, sulphate guideline = 3090 mg/L

At [CaCO<sub>3</sub>] = >180 mg/L, sulphate guideline = 4290 mg/L

TABLE 3: Surface Water Metals and Elements  
 Client: Shaw Group  
 Site: Sand Pit Expansion, Blair Road, Waterville, NS  
 Englobe Job No: 1901066.028

Inorganic Parameters	Units	NSE Tier 2 PSS <sup>1</sup>	Sample ID								
			21-SW1				21-SW2				
			29-Dec-21	29-Mar-22	27-Jun-22	30-Sep-22	21-SW1 Lab-Dup	29-Dec-21	29-Mar-22	27-Jun-22	30-Sep-22
Total Aluminum (Al)	ug/L	5 <sup>2</sup>	330	82	47	96	89	2500	530	70	130
Total Antimony (Sb)	ug/L	9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Arsenic (As)	ug/L	5	<1.0	<1.0	1.3	1.6	1.6	1.9	<1.0	1.3	1.7
Total Barium (Ba)	ug/L	1000	34	20	35	36	36	54	24	34	37
Total Beryllium (Be)	ug/L	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	0.17	<0.10	<0.10	<0.10
Total Calcium (Ca)	ug/L		38000	21000	48000	53000	52000	39000	22000	51000	51000
Total Chromium (Cr)	ug/L	8.9	<1.0	<1.0	<1.0	<1.0	<1.0	3.7	<1.0	<1.0	1.2
Total Cobalt (Co)	ug/L	1 <sup>4</sup>	<0.40	<0.40	<0.40	<0.40	<0.40	2.1	<0.40	<0.40	<0.40
Total Copper (Cu)	ug/L	2 <sup>5</sup>	2.6	2.1	0.82	1.2	1	6	2.9	1.4	2
Total Iron (Fe)	ug/L	300	1300	320	620	1000	1000	4800	920	580	1000
Total Lead (Pb)	ug/L	1 <sup>6</sup>	0.88	<0.50	<0.50	<0.50	<0.50	2.2	0.64	<0.50	<0.50
Total Magnesium (Mg)	ug/L		4100	3000	4900	5300	5200	4900	3100	5100	5100
Total Manganese (Mn)	ug/L	4307	130	50	32	170	170	360	63	24	200
Total Mercury (Hg)	ug/L	0.026	<0.01	<0.013	<0.013	<0.013	-	<0.01	<0.013	<0.013	0.013
Total Molybdenum (Mo)	ug/L	73	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Nickel (Ni)	ug/L	25 <sup>8</sup>	<2.0	<2.0	<2.0	<2.0	<2.0	4.3	2	<2.0	<2.0
Total Phosphorus (P)	ug/L	-	380	110	340	740	760	540	150	350	730
Total Potassium (K)	ug/L	-	3100	2000	3900	6200	6000	3700	2100	3600	6100
Total Selenium (Se)	ug/L	1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Silver (Ag)	ug/L	0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Sodium (Na)	ug/L	-	18000	14000	22000	26000	26000	16000	14000	24000	27000
Total Strontium (Sr)	ug/L	21000	170	80	240	270	260	160	83	250	250
Total Thallium (Tl)	ug/L	0.8	<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
Total Titanium (Ti)	ug/L	-	9.5	2.3	2.2	2.8	3.2	74	11	2.7	3.9
Total Uranium (U)	ug/L	15	1.7	0.71	1.5	2.3	2.3	2	0.91	1.8	2.1
Total Vanadium (V)	ug/L	120	<2.0	<2.0	<2.0	<2.0	<2.0	6	2.2	<2.0	<2.0
Total Zinc (Zn)	ug/L	7 <sup>9</sup>	10	8.6	8.5	<5.0	5.1	20	14	22	<5.0

Notes:

- value - exceeds NSE Tier 2 PSS
- - no guideline

<sup>1</sup> 2021 (July 2022 update) Nova Scotia Environment Tier II Pathway Specific Standard (PSS) for Surface Water and Groundwater discharging to surface water

<sup>2</sup> Aluminium Guideline for pH < 6.5 = 5 ug/L

Aluminium Guideline for pH ≥ 6.5 = 100 ug/L

<sup>3</sup> At [CaCO<sub>3</sub>] = > 0 to < 17 mg/L, cadmium guideline = 0.04 µg/L

At [CaCO<sub>3</sub>] = ≥ 17 to ≤ 280 mg/L, cadmium guideline (µg/L) = 10<sup>{0.83(log[hardness]) - 2.46}</sup>

At [CaCO<sub>3</sub>] = > 280 mg/L, cadmium guideline = 0.37 µg/L

<sup>4</sup> At [CaCO<sub>3</sub>] = 0 to ≤ 52 mg/L, cobalt guideline = 0.78 ug/L

At [CaCO<sub>3</sub>] = > 52 to ≤ 396 mg/L, cobalt guideline = e<sup>{0.414[ln(hardness)] - 1.887}</sup>

At [CaCO<sub>3</sub>] = > 396 mg/L, cobalt guideline = 1.8 ug/L

<sup>5</sup> At [CaCO<sub>3</sub>] = 0 to 120 mg/L, copper guideline = 2 ug/L.

At [CaCO<sub>3</sub>] = ≥ 82 to ≤ 180 mg/L, copper guideline = 0.2 \* e<sup>{0.8545[ln(hardness)] - 1.465}</sup>

At [CaCO<sub>3</sub>] = > 180 mg/L, copper guideline = 4 ug/L.

<sup>6</sup> At [CaCO<sub>3</sub>] = 0 to ≤ 60 mg/L, lead guideline = 1 ug/L

At [CaCO<sub>3</sub>] = > 60 to ≤ 180 mg/L, lead guideline = e<sup>{1.273[ln(hardness)] - 4.705}</sup>

At [CaCO<sub>3</sub>] = > 180 mg/L, lead guideline = 7 ug/L

<sup>7</sup> 2019 CCME Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life Appendix B - Manganese - Canadian Water Quality Guideline and Benchmark Calculator

<sup>8</sup> At [CaCO<sub>3</sub>] = 0 to 60 mg/L, nickel guideline = 25 ug/L.

At [CaCO<sub>3</sub>] = > 60 to ≤ 180 mg/L, nickel guideline (µg/L) = e<sup>{0.70[ln(hardness)] + 1.06}</sup>

At [CaCO<sub>3</sub>] = > 180 mg/L, nickel guideline = 150 µg/L

<sup>9</sup> exp<sup>{0.94[ln(hardness mg-L-1)] - 0.815[pH] + 0.398[ln(UCC mg-L-1)] + 4.625}</sup>

When CaCO<sub>3</sub> 23.4 to 399 mg/L and pH 6.5 to 8.13

Otherwise, zinc guideline = 7 ug/L

**TABLE 4: Surface Water General Chemistry**  
**Client: Shaw Group**  
**Site: Sand Pit Expansion, Blair Road, Waterville, NS**  
**Englobe Job No: 1901066.028**

Parameter	Units	NSE Tier 2 PSS <sup>1</sup>	Sample ID									
			21-SW1					21-SW2				
			29-Dec-21	21-SW1 Lab-Dup	29-Mar-22	27-Jun-22	21-SW1 Lab-Dup	30-Sep-22	29-Dec-21	29-Mar-22	27-Jun-22	30-Sep-22
<b>Field Readings</b>												
Field pH	Units	6.5 - 9.0	7.1	-	6.06	7.4	-	6.6	6.8	6.26	7.5	6.3
Field Conductivity	uS/cm	-	0.5	-	0.1	2.6	-	0.7	0.4	0.1	2.6	0.7
Field Temperature	°C	-	2.4	-	2.8	21.7	-	14.4	0.6	4.3	23.4	14.6
Field Dissolved Oxygen	mg/L	-	16.6	-	24.1	11.0	-	10.9	15.6	26.0	11.9	10.6
<b>Calculated Parameters</b>												
Anion Sum	me/L	-	3.38	-	2.13	4.06	-	4.27	3.13	2.04	3.96	4.3
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	77	-	46	74	-	64	73	46	71	70
Calculated TDS	mg/L	-	200	-	130	240	-	270	200	120	240	270
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	<1.0	-	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0
Cation Sum	me/L	-	3.24	-	2	3.92	-	4.56	3.41	2.07	4.09	4.43
Hardness (CaCO3)	mg/L	-	110	-	64	140	-	150	120	67	150	150
Ion Balance (% Difference)	%	-	2.11	-	3.15	1.75	-	3.28	4.28	0.73	1.61	1.49
Langelier Index (@ 20C)	N/A	-	-0.33	-	-0.846	-0.017	-	-0.271	-0.313	-0.756	0.259	0.026
Langelier Index (@ 4C)	N/A	-	-0.58	-	-1.1	-0.267	-	-0.521	-0.563	-1.01	0.009	-0.224
Nitrate (N)	mg/L	3	1.9	-	1.5	2.4	-	3.3	1.9	1.1	2.4	2.5
Saturation pH (@ 20C)	N/A	-	7.92	-	8.38	7.85	-	7.89	7.93	8.35	7.84	7.86
Saturation pH (@ 4C)	N/A	-	8.17	-	8.63	8.1	-	8.14	8.18	8.6	8.09	8.11
<b>Inorganics</b>												
Total Alkalinity (Total as CaCO3)	mg/L	-	77	-	46	74	-	64	73	47	72	70
Dissolved Chloride (Cl-)	mg/L	120	31	-	25	42	-	48	27	23	41	49
Colour	TCU	-	25	-	60	30	-	27	24	63	30	28
Nitrate + Nitrite (N)	mg/L	-	1.9	-	1.5	2.5	-	3.6	1.9	1.1	2.4	2.7
Nitrite (N)	mg/L	0.06	0.017	-	<0.010	0.094	-	0.34	0.015	<0.010	0.05	0.13
Nitrogen (Ammonia Nitrogen)	mg/L	varies <sup>2</sup>	1.4	-	0.53	0.074	-	2	1.3	0.49	0.084	1.6
Total Organic Carbon (C)	mg/L	-	4.4	-	7.7	7.3	-	6.4	4.8	6.6	7.6	6.4
Orthophosphate (P)	mg/L	-	0.16	-	0.062	0.13	-	0.35	0.15	0.071	0.14	0.37
pH	pH	6.5 - 9.0	7.59	-	7.54	7.83	-	7.61	7.62	7.59	8.1	7.88
Reactive Silica (SiO2)	mg/L	-	10	-	7.3	4.7	-	10	10	7.1	4.8	10
Dissolved Sulphate (SO4)	mg/L	128 <sup>3</sup>	39	-	19	58	-	66	37	18	57	63
Turbidity	NTU	-	15	-	18	6.8	-	1.5	88	19	5.5	2.6
Conductivity	uS/cm	-	340	-	220	450	-	470	320	200	430	470
Total Suspended Solids	mg/L	5 - 25 mg/L <sup>4</sup>	15	16	29.0	11.0	17.0	4.8	200	18.0	8.8	6.6

Notes: value - exceeds NSE Tier 2 PSS  
- - no guideline

<sup>1</sup> 2021 (July 2022 update) Nova Scotia Environment Tier II Pathway Specific Standard (PSS) for Surface Water and Groundwater discharging to surface water

<sup>2</sup> Ammonia - calculations as per [http://st-ts.ccme.ca/en/index.html?lang=en&factsheet=5#aql\\_fresh\\_concentration](http://st-ts.ccme.ca/en/index.html?lang=en&factsheet=5#aql_fresh_concentration).

<sup>3</sup> At [CaCO<sub>3</sub>] = 0 to ≤30 mg/L, sulphate guideline = 128 mg/L

At [CaCO<sub>3</sub>] = >30 to ≤75 mg/L, sulphate guideline = 218 mg/L

At [CaCO<sub>3</sub>] = >75 to ≤180 mg/L, sulphate guideline = 309 mg/L

At [CaCO<sub>3</sub>] = >180 mg/L, sulphate guideline = 429 mg/L

<sup>4</sup> **TSS (Normal Background Conditions)**

- Maximum increase of 25 mg/L from background levels for any short term exposure (24 hours or less)

- Maximum average increase of 5 mg/L from background levels for longer term exposure (inputs lasting between 24 hours and 30 days)

**TSS (High Flow (Spring Freshets and Storm Events))**

- Maximum increase of 25 mg/L from background levels at any time when background levels are between 25 mg/L and 250 mg/L

# Appendix F

## Hydrogeologic Information

Borehole Logs

Terms and Symbols



**eNGLOBE**





97 Troop Avenue  
Dartmouth NS  
B3B 2A7

## 21-MW2

CLIENT: The Shaw Group Limited

PROJECT: Environmental Assessment (EA)

DWN.: NS		CKD.: AC		DATE DRILLED: 12/14/2021		JOB NO.: 1901066.028		DRILLER: Nova Drilling					
SPT TEST N-VALUE blows/305mm					DEPTH ft m	ELEVATION (m)	SOIL SYMBOL	LOCATION: Blair Road, Waterville, NS COORD.: N 4990532 E 25484944		SAMPLES		DRILL TYPE/METHOD: Track-Mount Drill Rig	
WC %	wp-□	w-○	wl-△	vs-↓				TYPE / No.	N-VALUE / RECOVERY	OTHER TESTS/NOTES WELL DETAILS			
10	20	30	40	50			<b>SUBSURFACE DESCRIPTION</b>						
					22.150			<b>SILTY SAND TO SANDY SILT</b> with organics, loose, moist, brown.			N=2		
					21.388			<b>SAND</b> some silt, loose to compact, moist, dark brown.			N=30		
					21.236			<b>SAND</b> medium to coarse sand, trace silt, loose to dense, moist to saturated with depth, reddish-brown.			N=24		
					20.169			Groundwater measured at 2.02 m below ground surface on December 29, 2021. Groundwater measured at 0.99 m below ground surface on March 29, 2022. Groundwater measured at 2.34 m below ground surface on June 27 2022.			N=19		
											N=6		
											N=2		
					16.968			End of Borehole at 5.2 m in Sand. Groundwater encountered at 0.98 m below ground surface on December 17, 2021.					
					18								








97 Troop Avenue  
Dartmouth NS  
B3B 2A7

**21-MW3**

CLIENT: The Shaw Group Limited

PROJECT: Environmental Assessment (EA)

DWN.: NS		CKD.: AC		DATE DRILLED: 12/14/2021		JOB NO.: 1901066.028		DRILLER: Nova Drilling							
SPT TEST N-VALUE blows/305mm					DEPTH ft m	ELEVATION (m)	SOIL SYMBOL	LOCATION: Blair Road, Waterville, NS COORD.: N 4990795 E 25484937		SAMPLES		DRILL TYPE/METHOD: Track-Mount Drill Rig			
WC %	wp-□	w-○	wl-△	vs-↓				TYPE / No.	N-VALUE / RECOVERY	OTHER TESTS/NOTES WELL DETAILS					
10	20	30	40	50											
					22.290	22.290		<b>SAND</b> medium to coarse sand, trace silt, very loose to compact, moist to wet, reddish brown.  Groundwater measured at 1.21 m below ground surface on December 29, 2021. Groundwater measured at 0.92 m below ground surface on March 29, 2022. Groundwater measured at 1.55 m below ground surface on June 27 2022.							
					21.071	21.071									
					17.413	17.413		<b>SAND</b> fine to coarse sand, silty with depth, fining downward from 4.9 to 6.1 m depth, loose, wet, red/brown.							
					16.194	16.194		<b>SILT</b> soft, wet, red/brown.							
					13.451	13.451		End of Borehole at 8.8 m in SILT. Groundwater encountered at 1.5 m below ground surface on December 15, 2021.							





# SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

## STRATA PLOT

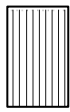
Strata plots symbolize the soil or bedrock descriptions, using a combination of the following basic symbols.



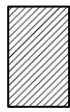
Boulders  
Cobbles  
Gravel



Sand



Silt



Clay



Topsoil  
Organics



Asphalt



Concrete



Fill



Glacial Till



Bedrock

## SOIL SAMPLES

### Sample Type

A	- auger sample
B	- block sample
C	- core sample
D	- drive sample
G	- grab (bulk) sample
SS	- split spoon sample
U	- tube sample (thin wall)
W	- wash or air return sample
HQ, BQ, NQ	- Rock core sample

### Sample Condition

	- undisturbed
	- disturbed
	- no recovery

### Water Level Measurement

	Measured in standpipe, piezometer, or well
	Inferred groundwater condition

**Standard Penetration Resistance (N-Value)** – unless otherwise noted this column refers to the Standard Penetration Test N-Value: the number of blows for a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. Where insufficient penetration was achieved and N-Values cannot be presented, the number of blows is reported over sampler penetration in millimetres (e.g. 50/75). No corrections have been applied to the N-Values presented in the log.

**Dynamic Cone Penetration Test (DCPT)** – performed using a standard 60-degree apex cone connected to 'A' size drill rods. Applied energy is as per the Standard Penetration Test [140 pound (64 kg) hammer falling 30 inches (760 mm)]. The DCPT value is represented as the number of blows of the hammer required to drive the penetrating cone one foot (300 mm) into the soil.

## SOIL TESTING

### Soil Testing Descriptors

MA	- mechanical grain size analysis (reported separately)
$\emptyset$	- moisture content
C	- consolidation test (reported separately)
$D_R$	- relative density
k	- permeability coefficient (reported separately)
pp	- pocket penetrometer strength
q	- triaxial compression test
UCS	- unconfined compressive strength
SB	- shear box test (reported separately)
TV	- torvane shear strength
VS	- vane shear strength
$\gamma$	- unit weight of soil or rock
$\gamma_d$	- dry unit weight of soil or rock
$\rho$	- density of soil or rock
$\rho_d$	- dry density of soil or rock

## SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

*The classification of soil types is made in accordance with the Canadian Foundation Engineering Manual (4<sup>th</sup> Edition)*

### SOIL DESCRIPTIONS

#### *Common Soil Descriptors*

<i>Rootmat/Topsoil</i>	- Organic matter (roots, moss, topsoil) typically forming a vegetative mattress, and/or is capable of supporting vegetative growth
<i>Fill</i>	- Material identified as placed by others
	- Undisturbed in-situ stratified deposit
<i>Till</i>	<i>Glacial Till</i> – unsorted sediment from glacial sources <i>Alluvial/Fluvial Till</i> – material deposited by watercourses, commonly stratified
<i>Peat</i>	- Partially decayed vegetation (humas) material that has accumulated in a water-saturated environment
<i>Bedrock</i>	- Deposit of rock beneath soil and other broken or unconsolidated material (regolith)

#### *Soil Structure Descriptors*

<i>Desiccated</i>	- Having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
<i>Fissured</i>	- Having cracks and, hence, a blocky structure
<i>Varved</i>	- Composed of regular alternating layers of silt and clay
<i>Stratified</i>	- Composed of alternating layers of different soil types (e.g. silt and sand/silt and clay)
<i>Well-Graded</i>	- Having a generally uniform distribution in a range of grain sizes, with no dominating size
<i>Poorly Graded</i>	- predominantly of one-grain size

#### *Terminology used for describing soil strata based on the proportion of individual particle size present:*

<i>main component</i>	(gravel, sand, silt, clay)	>35 % and main fraction
<i>“and”</i>	(and gravel, and silt, etc.)	>35 %
<i>adjective</i>	(gravelly, sandy, silty, clayey, etc.)	20 % – 35 %
<i>“some”</i>	(some sand, some silt, etc.)	10 % - 20 %
<i>“trace” or “occasional”</i>	(trace sand, trace silt, etc.)	1 % - 10 %

### COMPACTNESS CONDITION

The standard terminology to describe soils, as determined by the Standard Penetration Test N-Value: the number of blows for a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil.

#### *Compaction Condition Cohesionless Soils*

Compaction Condition	SPT N-Index
Very Loose	0 – 4
Lose	4 – 10
Compact	10 – 30
Dense	30 – 50
Very Dense	> 50

#### *Consistency and Undrained Shear Strength of Cohesive Soils*

Consistency	Undrained Shear Strength		SPT N-Index
	(Kips/ft <sup>2</sup> )	(kPa)	
Very Soft	< 0.25	<12	0 – 2
Soft	0.25 – 0.5	12 – 25	2 – 4
Firm	0.5 – 1.0	25 – 50	4 – 8
Stiff	1.0 – 2.0	50 – 100	8 – 15
Very Stiff	2.0 – 4.0	100 – 200	15 – 30
Hard	> 4.0	> 200	> 30

# SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

## ROCK DESCRIPTIONS

**RQD (Rock Quality Designation)** denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. Reported as the fraction of all pieces of intact and sound rock core equal to or greater than 4 inches (100 mm) are summed and divided by the total length of core run (as per ASTM 6032)

**TCR (Total Core Recovery)** denotes the percentage of solid (cylindrical) core retrieved from a borehole of any orientation. Reported as the fraction of all pieces of the solid (cylindrical) core are summed and divided by the total length of the core run.

**FI (Fracture Index)** denotes the number of naturally occurring fractures within a given length of the core. Reported as a simple count of naturally occurring fractures.

### *Rock Quality Descriptors*

<b>Rock Mass Quality</b>		<b>RQD</b>	<b>Alternate (Colloquial) Rock Mass Quality</b>	
<i>Very Poor</i>		0 – 25	Very Severely Fractured	crushed
<i>Poor</i>		25 – 50	Severely Fractured	shattered or very blocky
<i>Fair</i>		50 – 75	Fractured	blocky
<i>Good</i>		75 – 90	Moderately Jointed	sound
<i>Excellent</i>		90 - 100	Intact	very sound

### *Rock Discontinuity Descriptors*

<b>Spacing (mm)</b>	<b>Discontinuities</b>	<b>Bedding</b>
< 20	Extremely close	Laminated
20 – 60	Very close	Very thin
60 – 200	Close	Thin
200 – 600	Moderately close	Medium
600 – 2000	Wide	Thick
2000 – 6000	Very wide	Very thick
> 6000	Extremely wide	-

### *Rock Strength Descriptors*

<b>Strength Classification</b>	<b>Grade</b>	<b>Unconfined Compressive Strength (MPa)</b>	<b>Point Load Index (MPa)</b>
<i>Extremely Weak</i>	R0	0.25 – 1	-
<i>Very Weak</i>	R1	1 – 5	-
<i>Weak</i>	R2	5 – 25	-
<i>Medium Strong</i>	R3	25 – 50	1 – 2
<i>Strong</i>	R4	50 – 100	2 – 4
<i>Very Strong</i>	R5	100 – 250	4 – 10
<i>Extremely Strong</i>	R6	> 250	> 10

### *Rock Weathering Descriptors*

<b>Term</b>	<b>Symbol</b>	<b>Description</b>
<i>Fresh</i>	W1	No visible signs of rock weathering, slight discoloration along major discontinuities
<i>Slightly</i>	W2	Discoloration indicates weathering of rock on discontinuity surfaces, all rock material may be discoloured
<i>Moderately</i>	W3	Less than half of the rock is decomposed and/or disintegrated into the soil.
<i>Highly</i>	W4	More than half of the rock is decomposed and/or disintegrated into the soil.
<i>Completely</i>	W5	All the rock material is decomposed and/or disintegrated into the soil, original mass is still largely intact.
<i>Residual Soil</i>	W6	All the rock converted to the soil. Structure and fabric destroyed.

# Appendix G

# Botanical Report



Vascular Plant Survey  
FOR  
**Shaw Resources**  
**PIDS 55377550, 55377451, 55071898, 55492508**  
**Waterville, Kings County, Nova Scotia**

November 7, 2022

Prepared By:  
**Jim Jotcham, Marbicon Inc.**

Marbicon Inc. was contracted in the fall of 2021 to perform a botanical survey for four adjoining properties (totaling approximately 44 ha) located in Waterville, Kings County, Nova Scotia. The site included some agricultural areas and farm roads, and this contributed to the number of non-native/exotic weedy species listed. The sampled forested sections included some wetlands, but the general composition of the area was upland secondary coniferous and mixed forest. The Cornwallis river is immediately to the south, and occasionally formed the southern boundary of the study area. Figure 1 is an aerial view (Google Earth 2022) showing the study site and surrounding area.

The study site was inventoried by Marbicon Botanist Jim Jotcham and Technician Peter Eaton on November 3, 2021, June 19, 2022, July 14, 2022, and August 2, 2022, covering most of the growing season. The list of plant species identified, and their rarity status is presented in Appendix 1. Species identifications and habitat preferences were usually determined using Nova Scotia Plants (Munro *et al* 2014). The taxon names and S-ranks were taken from ACCDC (2022-03-14 update). A summary of the S-Rank system used by ACCDC is presented in Appendix 3.

No conclusions may be drawn as to the presence or absence of species more easily seen or identified in other seasons.

Figure 2 is a photograph of Wild Leek (*Allium tricoccum*), a species of concern found on site. The forested areas were secondary (or possibly tertiary) growth with several localized habitats as shown in the attached Figures 3 to 11. Although no old growth forest was identified, a small Eastern Hemlock (*Tsuga canadensis*) stand was identified on site. The most common conifer species were Red Spruce (*Picea rubens*) and Balsam Fir (*Abies balsamea*) with White Pine (*Pinus strobus*) also common throughout. Some Scotch pine was established in the quarried sandy areas. Eastern Hemlock was mostly restricted to the one stand. The most common hardwood species throughout was Large-toothed Aspen (*Populus grandidentata*), but other hardwoods were also common, such as Northern Red Oak (*Quercus rubra*), Paper Birch (*Betula papyrifera*), Trembling Aspen (*Populus tremuloides*), and maples, both Sugar Maple (*Acer saccharum*) and Red Maple (*Acer rubra*).

Like the overhead forest, the understory layer was also somewhat variable, but where conifers were dominant, there were usually fewer plants established in the shade. Where a little more light was available, there was typically an abundance of woodland mosses and occasional grasses and forbs such as Rough Goldenrod (*Solidago rugosa*), Wild Lily-of-the-Valley (*Maianthemum canadense*), Northern Starflower (*Lysimachia borealis*), and Eastern Tea-berry (*Gaultheria procumbens*). Open woods with yet more sunshine included common shrubs such as Northern Bush Honeysuckle (*Diervilla lonicera*), Sheep Laurel (*Kalmia angustifolia*) and Blueberries (*Vaccinium angustifolium* and *V. myrtilloides*). Wooded wetlands in the subject area tended to have shrubs such as Green Alder (*Alnus alnobetula*) present. Herbaceous cover in shaded wetlands often included abundant Cinnamon Fern (*Osmunda cinnamomea*) with small carpets of *Sphagnum* spp. Sensitive Fern (*Onoclea sensibilis*) was also present in the wooded wetlands and the river floodplain. Open wetlands such as the riparian zone along the Cornwallis River tended to be marsh-like, dominated by grasses and sedges such as Reed Canary Grass (*Phalaris arundinacea*), Bluejoint Reed Grass (*Calamagrostis canadensis*), and Common Woolly Bulrush (*Scirpus cyperinus*). Occasional patches of Broadleaf Cattail (*Typha latifolia*) and White Meadowsweet (*Spiraea alba*) were common along the upper parts of the river floodplain. The most xeric habitats were the roadsides and especially the quarried sand pits. These habitats were commonly dominated by weedy species such as Goldenrods (*Solidago* spp.) and Clovers (*Trifolium* spp.) and several species of common grasses.

Regarding the rare plant species, five ACCDC species of concern were identified on or immediately beside the site. Wild Leek (*Allium tricoccum*) was confirmed at a site already listed in the 2021 ACCDC report, as was the Common Scouring Rush (*Equisetum hyemale*). A couple Meadow Willow (*Salix petiolaris*) shrubs were found along the access road through the centre of the site on the way to the central sand pit. American Beech (*Fagus grandifolia*) was found occasionally in the forested areas. The S-rank of American Beech has recently been changed from S5 to S3S4, possibly because of the pest pressure recently brought to bear upon the species. The S-rank of Wild Leek changed in 2022 from S1 to S2. Common Scouring Rush and Meadow Willow both changed from S3S4 to S4. Although not directly on the subject properties, a healthy population of Blue Vervain (*Verbena hastata*) was found bordering the site on the Cornwallis



River floodplain along the trail leading to the ATV/Snowmobile bridge. The S-rank of Blue Vervain changed in 2022 from S3 to S3S4.

Appendix 1 shows the full list of plant species identified on site. It must be noted again that no conclusions may be drawn as to the presence or absence of species more easily seen or identified in other seasons. For example, Wild Leek was already fading from view when confirmed on June 19. Figure 2 demonstrates the condition of the species on June 19, 2022

Appendix 2 is a summary of a portion of the report supplied by the Atlantic Canada Conservation Data Centre (ACCDC, October 19, 2021). There were 58 records for 20 vascular and 9 records for 8 nonvascular flora previously identified in or near (i.e. less than 5 km) to the study area. Table 1 summarizes the list of 28 species of concern and updates their 2022 S-rank.

**Table 1: Summary of the plant species of concern in the general study area (ACCDC report 7089, 2021). Only the nearest distance (km) is shown. Note the changes in S-rank in the 2022-03-14 revision from ACCDC. Bolded scientific names were found on or directly beside the study area.**

Scientific Name	Common Name	2021 S-RANK	DIST-km	2022 S-RANK
<b>Allium tricoccum</b>	Wild Leek	S1	0.3 ± 0.0	S2
<b>Equisetum hyemale ssp. affine</b>	Common Scouring-rush	S3S4	0.3 ± 0.0	S4
<b>Verbena hastata</b>	Blue Vervain	S3	0.3 ± 0.0	S3S4
<i>Platanthera hookeri</i>	Hooker's Orchid	S3	1.3 ± 1.0	
<b>Salix petiolaris</b>	Meadow Willow	S3S4	2.3 ± 0.0	S4
<i>Salix pedicellaris</i>	Bog Willow	S2	2.4 ± 0.0	S3
<i>Geranium bicknellii</i>	Bicknell's Crane's-bill	S3	2.6 ± 2.0	
<i>Thuja occidentalis</i>	Eastern White Cedar	S1	3.1 ± 0.0	S2S3
<i>Carex lupulina</i>	Hop Sedge	S3	3.4 ± 1.0	
<i>Amelanchier spicata</i>	Running Serviceberry	S3	3.4 ± 2.0	S3S4
<i>Physconia detersa</i>	Bottlebrush Frost Lichen	S3S4	3.5 ± 0.0	S4
<i>Caulophyllum thalictroides</i>	Blue Cohosh	S2	3.6 ± 0.0	S2S3
<i>Stereocaulon condensatum</i>	Granular Soil Foam Lichen	S2S3	3.7 ± 0.0	
<i>Floerkea proserpinacoides</i>	False Mermaidweed	S2	4.7 ± 1.0	S2S3
<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely	S2	4.7 ± 1.0	S2S3
<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid	S3	4.7 ± 1.0	
<i>Calliergon giganteum</i>	Giant Spear Moss	S3?	4.7 ± 3.0	
<i>Dicranum condensatum</i>	Condensed Broom Moss	S2?	4.7 ± 3.0	

**Table 1 (continued):**

Scientific Name	Common Name	2021 S-RANK	DIST-km	2022 S-RANK
<i>Hypnum pratense</i>	Meadow Plait Moss	S1S2	4.7 ± 3.0	
<i>Pseudocampyllum radicale</i>	Long-stalked Fine Wet Moss	S2?	4.7 ± 3.0	
<i>Tortula truncata</i>	a Moss	S2S3	4.7 ± 3.0	S4S5
<i>Weissia muhlenbergiana</i>	a Moss	S2?	4.7 ± 3.0	
<i>Agrimonia gryposepala</i>	Hooked Agrimony	S3	4.7 ± 5.0	S4
<i>Elodea canadensis</i>	Canada Waterweed	S3	4.8 ± 0.0	S4
<i>Hylodesmum glutinosum</i>	Large Tick-trefoil	S1	4.9 ± 7.0	S2
<i>Lilium canadense</i>	Canada Lily	S2	4.9 ± 7.0	
<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower	S1S2	4.9 ± 7.0	S2
<i>Viola sagittata var. ovata</i>	Arrow-Leaved Violet	S3S4	5.0 ± 5.0	
<b><i>Fagus grandifolia</i></b>	American Beech	S5	n/a	S3S4

Hooker’s Orchid (*Platanthera hookeri*) had previously been found just over a kilometer from the centre of the study site. This species grows in open dry forests of mixed conifers, so some of the local habitat would have been suitable, but no specimen was found in this survey.

Looking at the full ACCDC list of nearby rare species shown in Appendix 2, Wild Leek had previously been identified within 5 km at least 25 times before the current survey. The plants found on site were at a previously known site on the edge of the upland beside the river. No new populations were found. This was also the case with Common Scouring-rush, with a small population confirmed at the ecotone between the Cornwallis floodplain and the edge of the forest, low on a sandy embankment

Other than American Beech, which was occasional throughout the site, the species of concern that were identified in this survey had already been found somewhat close to the site (ACCDC 2021). American Beech would likely have been a species of concern if the ACCDC report was produced after the 2022 change in S-rank status.

The remaining species in the ACCDC report were previously found more than 2 km from the surveyed site, but this does not mean that they would not be found on site. This site was large enough to cover most habitats – upland dry conifers or mixed forest of varying species dominance and density, occasional forested wetlands including ephemeral ponds, riparian

riverbanks, marshes, open grassy fields, roadsides, and agricultural areas. The river provided aquatic habitats. Perhaps the only habitat not seen at this site would be an open ericaceous sphagnum bog. Otherwise there was no reason to exclude any listed species, other than the fact that they were not identified in this survey.

A handwritten signature in black ink that reads "Jim Golcham". The signature is written in a cursive style with a large initial "J" and a long, sweeping underline.

November 7, 2022

## Figures & Photographs:



Figure 1. Study site and vicinity.  
The base map is 06/05/2021 imagery taken from Google Earth (2022).  
The outlined polygon represents the approximate area covered in this report.





Figure 2. Wild Leek (*Allium tricoccum*) identified on site June 19, 2022, at the same coordinates as presented in the 2021 ACCDC report. The leaves are senescing, and no trace was found on subsequent dates in 2022.



Figure 3. Young conifer-dominated site, mostly Red Spruce – Balsam Fir, with occasional Red Maple. The understory is mostly young conifers. Judging from the discoloured leaves, some of these depressions may be ephemeral ponds in the spring.





Figure 4. Dry upland conifer stand, with a conifer understory.



Figure 5. Open mature mixed-woods upland site, with a well-developed diverse understory.





Figure 6. Eastern Hemlock stand with a sparse well-shaded understory. A mild survey did not reveal any Hemlock Woolly Adelgid (*Adelges tsugae*) in 2022.



Figure 7. A small, shaded woodland pond, likely ephemeral in nature.





Figure 8. Wooded wetland with occasional *Sphagnum spp.* under a canopy of Cinnamon Fern.



Figure 9, Dry grassland habitat. Likely a former sandpit.





Figure 10. The ecotone between the upland forest (left) and the marshy floodplain of the Cornwallis River (right).



Figure 11. Older sand pit near the centre of the survey area. A very xeric habitat.

## REFERENCES

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**Appendix 1:** Vascular plant inventory, surveyed on November 3, 2021, June 19, 2022, July 14, 2022, and August 2, 2022. Bolded entries were highlighted species of concern in the 2021 ACCDC report. American Beech was highlighted based on the 2022 S-rank updates.

<b>Scientific Name</b>	<b>Common Name</b>	<b>S-Rank</b>	<b>Notes</b>
<i>Abies balsamea</i>	Balsam Fir	S5	
<i>Abutilon theophrasti</i>	Velvet-Leaf	SNA	Exotic
<i>Acer pensylvanicum</i>	Striped Maple	S5	
<i>Acer rubrum</i>	Red Maple	S5	
<i>Acer saccharum</i>	Sugar Maple	S4S5	
<i>Achillea borealis</i>	Northern Yarrow	S5	
<i>Actaea rubra</i>	Red Baneberry	S5	
<b><i>Allium tricoccum</i></b>	<b>Wild Leek</b>	<b>S2</b>	
<i>Alnus alnobetula</i> ssp. <i>crispa</i>	Mountain Alder	S5	
<i>Alnus incana</i> ssp. <i>rugosa</i>	Speckled Alder	S5	
<i>Ambrosia artemisiifolia</i>	Common Ragweed	S5	
<i>Amelanchier</i> sp.	Serviceberries		
<i>Anaphalis margaritacea</i>	Pearly Everlasting	S5	
<i>Anthoxanthum odoratum</i>	Large Sweet Vernal Grass	SNA	Exotic
<i>Apocynum androsaemifolium</i>	Spreading Dogbane	S5	
<i>Aralia hispida</i>	Bristly Sarsaparilla	S5	
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	S5	
<i>Arctium minus</i>	Common Burdock	SNA	Exotic
<i>Arctostaphylos uva-ursi</i>	Common Bearberry	S4	
<i>Asclepias syriaca</i>	Common Milkweed	SU	Exotic
<i>Berteroa incana</i>	Hoary False-Alyssum	SNA	Exotic
<i>Betula papyrifera</i>	Paper Birch	S5	
<i>Betula populifolia</i>	Gray Birch	S5	
<i>Bidens frondosa</i>	Devil's Beggarticks	S5	
<i>Brachyelytrum erectum</i>	Bearded Shorthusk	SNA	
<i>Calamagrostis canadensis</i>	Bluejoint Reed Grass	S5	
<i>Carex communis</i>	Fibrous-Root Sedge	S5	
<i>Carex gracillima</i>	Graceful Sedge	S4S5	
<i>Carex gynandra</i>	Nodding Sedge	S5	
<i>Carex intumescens</i>	Bladder Sedge	S5	
<i>Carex lurida</i>	Sallow Sedge	S5	
<i>Carex scoparia</i>	Broom Sedge	S5	
<i>Carex stipata</i>	Awl-fruited Sedge	S5	
<i>Carex trisperma</i>	Three-seeded Sedge	S5	
<i>Centaurea nigra</i>	Black Knapweed	SNA	Exotic
<i>Chaenorhinum minus</i>	Dwarf Snapdragon	SNA	Exotic
<i>Chamaenerion angustifolium</i>	Fireweed	S5	
<i>Chimaphila umbellata</i> ssp. <i>Umbellata</i>	Common Pipsissewa	S4	
<i>Cirsium arvense</i>	Canada Thistle	SNA	Exotic
<i>Claytosmunda claytoniana</i>	Interrupted Fern	S5	

Appendix 1 continued...

Scientific Name	Common Name	S-Rank	Notes
<i>Clintonia borealis</i>	Yellow Bluebead Lily	S5	
<i>Comptonia peregrina</i>	Sweet-fern	S5	
<i>Convolvulus arvensis</i>	Field Bindweed	SNA	Exotic
<i>Coptis trifolia</i>	Goldthread	S5	
<i>Corema conradii</i>	Broom Crowberry	S4	
<i>Cornus canadensis</i>	Bunchberry	S5	
<i>Corylus cornuta</i>	Beaked Hazel	S5	
<i>Crataegus chrysoarpa</i>	Fireberry Hawthorn	S4S5	
<i>Cypripedium acaule</i>	Pink Lady's-Slipper	S5	
<i>Dactylis glomerata</i>	Orchard Grass	SNA	Exotic
<i>Danthonia compressa</i>	Flattened Oat Grass	S5	
<i>Danthonia spicata</i>	Poverty Oat Grass	S5	
<i>Daucus carota</i>	Queen Anne's Lace	SNA	Exotic
<i>Dianthus armeria</i>	Deptford Pink	SNA	Exotic
<i>Diervilla lonicera</i>	Northern Bush Honeysuckle	S5	
<i>Diphasiastrum digitatum</i>	Southern Ground-cedar	S5	
<i>Diphasiastrum tristachyum</i>	Blue Ground-cedar	S4	
<i>Doellingeria umbellata</i>	Hairy Flat-top White Aster	S5	
<i>Dryopteris campyloptera</i>	Mountain Wood Fern	S5	
<i>Dryopteris carthusiana</i>	Spinulose Wood Fern	S5	
<i>Dryopteris cristata</i>	Crested Wood Fern	S5	
<i>Echinocystis lobata</i>	Wild Cucumber	SNA	Exotic
<i>Eleocharis obtusa</i>	Blunt Spikerush	S5	
<i>Elymus repens</i>	Quack Grass	SNA	Exotic
<i>Epigaea repens</i>	Trailing Arbutus	S5	
<i>Epipactis helleborine</i>	Helleborine	SNA	Exotic
<i>Equisetum arvense</i>	Field Horsetail	S5	
<b>Equisetum hyemale</b>	<b>Common Scouring-rush</b>	<b>S3S4</b>	
<i>Erigeron annuus</i>	Annual Fleabane	S4S5	
<i>Erigeron strigosus</i>	Rough Fleabane	S5	
<i>Euthamia graminifolia</i>	Grass-leaved Goldenrod	S5	
<i>Eutrochium maculatum</i>	Spotted Joe Pye Weed	S5	
<b>Fagus grandifolia</b>	<b>American Beech</b>	<b>S3S4</b>	
<i>Festuca rubra</i>	Red Fescue	S5	
<i>Festuca trachyphylla</i>	Hard Fescue	SNA	Exotic
<i>Fragaria virginiana</i>	Wild Strawberry	S5	
<i>Galeopsis tetrahit</i>	Common Hemp-nettle	SNA	Exotic
<i>Galium palustre</i>	Common Marsh Bedstraw	S5	
<i>Gaultheria procumbens</i>	Eastern Teaberry	S5	
<i>Geum aleppicum</i>	Yellow Avens	S5	
<i>Geum canadense</i>	White Avens	S4S5	
<i>Geum macrophyllum</i>	Large-Leaved Avens	S5	
<i>Glyceria canadensis</i>	Canada Manna Grass	S5	

Appendix 1 continued...

<b>Scientific Name</b>	<b>Common Name</b>	<b>S-Rank</b>	<b>Notes</b>
Gnaphalium uliginosum	Marsh Cudweed	SNA	Exotic
Gymnocarpium dryopteris	Common Oak Fern	S5	
Hypericum perforatum	Common St. John's-wort	SNA	Exotic
Hypericum virginicum	Virginia St. John's-wort	S5	
Ilex verticillata	Common Winterberry	S5	
Impatiens capensis	Spotted Jewelweed	S5	
Juncus bufonius	Toad Rush	S5	
Juncus effusus	Soft Rush	S5	
Juncus tenuis	Slender Rush	S5	
Kalmia angustifolia	Sheep Laurel	S5	
Lactuca biennis	Tall Blue Lettuce	S5	
Lactuca canadensis	Canada Lettuce	S5	
Leucanthemum vulgare	Oxeye Daisy	SNA	Exotic
Lonicera canadensis	Canada Fly Honeysuckle	S5	
Luzula acuminata	Hairy Woodrush	S5	
Lysimachia borealis	Northern Starflower	S5	
Maianthemum canadense	Wild Lily-of-The-Valley	S5	
Maianthemum racemosum	Large False Solomon's Seal	S4S5	
Malva moschata	Musk Mallow	SNA	Exotic
Matricaria discoidea	Pineapple Weed	SNA	Exotic
Medeola virginiana	Cucumber Root	S5	
Mitchella repens	Partridgeberry	S5	
Monotropa uniflora	Convulsion-Root	S5	
Morella pensylvanica	Northern Bayberry	S5	
Myosotis scorpioides	True Forget-Me-Not	SNA	Exotic
Oclemena acuminata	Whorled Wood Aster	S5	
Oenothera biennis	Common Evening Primrose	S5	
Onoclea sensibilis	Sensitive Fern	S5	
Osmundastrum cinnamomeum	Cinnamon Fern	S5	
Oxalis stricta	European Wood Sorrel	S5	
Panicum capillare	Common Witch Grass	SNA	Exotic
Panicum dichotomiflorum	Fall Panic Grass	S5	
Persicaria sagittata	Arrow-leaved Smartweed	S5	
Phalaris arundinacea	reed canary grass	S5	
Phleum pratense	Common Timothy	SNA	Exotic
Picea glauca	White Spruce	S5	
Picea rubens	Red Spruce	S5	
Pilosella officinarum	Mouse-ear Hawkweed	SNA	Exotic
Pilosella piloselloides	Tall Hawkweed	SNA	Exotic
Pinus strobus	Eastern White Pine	S5	
Pinus sylvestris	Scotch Pine	SNA	Exotic
Plantago lanceolata	English Plantain	SNA	Exotic
Plantago major	Common Plantain	SNA	Exotic

Appendix 1 continued...

<b>Scientific Name</b>	<b>Common Name</b>	<b>S-Rank</b>	<b>Notes</b>
<i>Poa pratensis</i>	Kentucky Blue Grass	S5	
<i>Populus grandidentata</i>	Large-toothed Aspen	S5	
<i>Populus tremuloides</i>	Trembling Aspen	S5	
<i>Potentilla norvegica</i>	Rough Cinquefoil	S5	
<i>Potentilla simplex</i>	Old Field Cinquefoil	S5	
<i>Prunella vulgaris</i>	Common Self-heal	S5	
<i>Prunus pensylvanica</i>	Pin Cherry	S5	
<i>Prunus virginiana</i>	Chokecherry	S5	
<i>Pteridium aquilinum</i>	Bracken Fern	S5	
<i>Pyrola elliptica</i>	Shinleaf	S5	
<i>Quercus rubra</i>	Northern Red Oak	S5	
<i>Ranunculus acris</i>	Common Buttercup	SNA	Exotic
<i>Ranunculus repens</i>	Creeping Buttercup	SNA	Exotic
<i>Raphanus raphanistrum</i>	Wild Radish	SNA	Exotic
<i>Rosa multiflora</i>	Multiflora Rose	SNA	Exotic
<i>Rosa nitida</i>	Shining Rose	S4S5	
<i>Rosa virginiana</i>	Virginia Rose	S5	
<i>Rubus allegheniensis</i>	Alleghaney Blackberry	S5	
<i>Rubus canadensis</i>	Smooth Blackberry	S5	
<i>Rubus hispidus</i>	Bristly Dewberry	S5	
<i>Rubus idaeus</i>	Red Raspberry	S5	
<i>Rumex acetosella</i>	Sheep Sorrel	SNA	Exotic
<i>Rumex crispus</i>	Curled Dock	SNA	Exotic
<i>Salix bebbiana</i>	Bebb's Willow	S5	
<i>Salix discolor</i>	Pussy Willow	S5	
<i>Salix humilis</i>	Upland Willow	S5	
<b><i>Salix petiolaris</i></b>	<b>Meadow Willow</b>	<b>S3S4</b>	
<i>Sambucus canadensis</i>	Common Elderberry	S5	
<i>Scirpus cyperinus</i>	Common Woolly Bulrush	S5	
<i>Silene flos-cuculi</i>	Ragged-robin	SNA	Exotic
<i>Solidago bicolor</i>	White Goldenrod	S5	
<i>Solidago canadensis</i>	Canada Goldenrod	S4S5	
<i>Solidago nemoralis</i>	Gray-stemmed Goldenrod	S5	
<i>Solidago puberula</i>	Downy Goldenrod	S5	
<i>Solidago rugosa</i>	Rough-stemmed Goldenrod	S5	
<i>Sonchus oleraceus</i>	Common Sow Thistle	SNA	Exotic
<i>Sparganium americanum</i>	American Burreed	S5	
<i>Spinulum annotinum</i>	Stiff Clubmoss	S5	
<i>Spiraea alba</i>	White Meadowsweet	S5	
<i>Spirodela polyrhiza</i>	great duckweed	S4?	
<i>Symphyotrichum lateriflorum</i>	Calico Aster	S5	
<i>Symphyotrichum novi-belgii</i>	New York Aster	S5	
<i>Taraxacum officinale</i>	Common Dandelion	SNA	Exotic

Appendix 1 continued...

<b>Scientific Name</b>	<b>Common Name</b>	<b>S-Rank</b>	<b>Notes</b>
Taxus canadensis	Canada Yew	S4S5	
Thalictrum pubescens	Tall Meadow-Rue	S5	
Trifolium arvense	Rabbit's-foot Clover	SNA	Exotic
Trifolium aureum	Yellow Clover	SNA	Exotic
Trifolium hybridum	Alsike Clover	SNA	Exotic
Trifolium pratense	Red Clover	SNA	Exotic
Trifolium repens	White Clover	SNA	Exotic
Trillium undulatum	Painted Trillium	S5	
Tsuga canadensis	Eastern Hemlock	S4S5	
Tussilago farfara	Coltsfoot	SNA	Exotic
Typha latifolia	Broad-leaved Cattail	S5	
Vaccinium angustifolium	Late Lowbush Blueberry	S5	
Vaccinium myrtilloides	Velvet-leaved Blueberry	S5	
Verbascum thapsus	Common Mullein	SNA	Exotic
<b>Verbena hastata</b>	<b>Blue Vervain</b>	<b>S3</b>	
Veronica officinalis	Common Speedwell	SNA	Exotic
Viburnum nudum	Northern Wild Raisin	S5	
Vicia cracca	Tufted Vetch	SNA	Exotic
Viola spp.	Violets		

**Appendix 2.** Modified data summary from the Atlantic Canada Conservation Data Centre (ACCDC data report 7089: Waterville, NS), prepared 3 October 2021. Only the botanical information is presented here, up to a 4.8-km radius. The updated (2022-03-14) S-ranks are not shown here.

Scientific Name	Common Name	G - Rank	S - Rank	Distance (km)
<i>Agrimonia gryposepala</i>	Hooked Agrimony	G5	S3	4.7 ± 5.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	0.3 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	0.3 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	0.3 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	0.6 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	0.6 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	0.8 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.0 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.4 ± 0.0
<i>Allium tricoccum</i>	Wild Leek	G5	S1	2.4 ± 0.0
<i>Amelanchier spicata</i>	Running Serviceberry	G5	S3	3.4 ± 2.0
<i>Carex lupulina</i>	Hop Sedge	G5	S3	3.4 ± 1.0
<i>Caulophyllum thalictroides</i>	Blue Cohosh	G5	S2	3.6 ± 0.0
<i>Caulophyllum thalictroides</i>	Blue Cohosh	G5	S2	3.6 ± 1.0
<i>Caulophyllum thalictroides</i>	Blue Cohosh	G5	S2	3.6 ± 1.0
<i>Caulophyllum thalictroides</i>	Blue Cohosh	G5	S2	4.2 ± 0.0
<i>Caulophyllum thalictroides</i>	Blue Cohosh	G5	S2	4.6 ± 5.0
<i>Elodea canadensis</i>	Canada Waterweed	G5	S3	4.8 ± 0.0



Appendix 2 continued...

Scientific Name	Common Name	G - Rank	S - Rank	Distance (km)
<i>Equisetum hyemale</i> ssp. <i>affine</i>	Common Scouring-rush	G5T5	S3S4	0.3 ± 0.0
<i>Equisetum hyemale</i> ssp. <i>affine</i>	Common Scouring-rush	G5T5	S3S4	2.6 ± 0.0
<i>Equisetum hyemale</i> ssp. <i>affine</i>	Common Scouring-rush	G5T5	S3S4	3.4 ± 0.0
<i>Equisetum hyemale</i> ssp. <i>affine</i>	Common Scouring-rush	G5T5	S3S4	3.7 ± 0.0
<i>Floerkea proserpinacoides</i>	False Mermaidweed	G5	S2	4.7 ± 1.0
<i>Floerkea proserpinacoides</i>	False Mermaidweed	G5	S2	4.8 ± 0.0
<i>Geranium bicknellii</i>	Bicknell's Crane's-bill	G5	S3	2.6 ± 2.0
<i>Hylodesmum glutinosum</i>	Large Tick-trefoil	G5	S1	4.9 ± 7.0
<i>Lilium canadense</i>	Canada Lily	G5	S2	4.9 ± 7.0
<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely	G5	S2	4.7 ± 1.0
<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid	G5	S3	4.7 ± 1.0
<i>Platanthera hookeri</i>	Hooker's Orchid	G4	S3	1.3 ± 1.0
<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower	G5	S1S2	4.9 ± 7.0
<i>Salix pedicellaris</i>	Bog Willow	G5	S2	2.4 ± 0.0
<i>Salix pedicellaris</i>	Bog Willow	G5	S2	4.7 ± 0.0
<i>Salix petiolaris</i>	Meadow Willow	G5	S3S4	2.3 ± 0.0
<i>Thuja occidentalis</i>	Eastern White Cedar	G5	S1	3.1 ± 0.0
<i>Verbena hastata</i>	Blue Vervain	G5	S3	0.3 ± 0.0
<i>Verbena hastata</i>	Blue Vervain	G5	S3	1.3 ± 1.0
<i>Verbena hastata</i>	Blue Vervain	G5	S3	3.8 ± 0.0
<i>Verbena hastata</i>	Blue Vervain	G5	S3	4.4 ± 0.0
<i>Verbena hastata</i>	Blue Vervain	G5	S3	4.4 ± 0.0
<i>Verbena hastata</i>	Blue Vervain	G5	S3	4.7 ± 1.0
<i>Viola sagittata</i> var. <i>ovata</i>	Arrow-Leaved Violet	G5T5	S3S4	5.0 ± 5.0

**Appendix 3. ACCDC Sub-national (provincial) Species Rarity Ranks – S-ranks (2022):**

<b>SX</b>	<b>Presumed Extirpated</b> - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
<b>S1</b>	<b>Critically Imperiled</b> - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
<b>S2</b>	<b>Imperiled</b> - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
<b>S3</b>	<b>Vulnerable</b> - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
<b>S4</b>	<b>Apparently Secure</b> - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
<b>S5</b>	<b>Secure</b> - Common, widespread, and abundant in the province.
<b>SNR</b>	<b>Unranked</b> - Provincial conservation status not yet assessed.
<b>SU</b>	<b>Unrankable</b> - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
<b>SNA</b>	<b>Not Applicable</b> - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
<b>S#S#</b>	<b>Range Rank</b> - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

# Appendix H Fauna Report



**Report To:** Englobe

**For:** Proposed Sand Pit Expansion, Waterville, Nova Scotia

**On:** Wildlife Fauna and Habitats

**September 13, 2022**

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## **INTRODUCTION**

An assessment of wildlife fauna and habitat was conducted for a proposed sand pit expansion in Waterville, NS, on four properties (PIDS 55377550, 55377451, 55492508, and 55071898) that encompass 112 acres, centred at approximately (45.054372, -64.694821). Four field surveys were conducted (May, June, July, and August) to determine what avian and other fauna species were using the site, and to check for potential habitat for provincially listed Species at Risk (SAR) other provincially rare (S1-S3S4) species. Reports from the Atlantic Canada Conservation Data Centre (ACCDC) containing records of SAR and provincially rare species within 5km and 100km of the project area were reviewed to determine which of these species might occur in the project area. Results of the field surveys and review of the ACCDC report are presented, and potential impacts of the development of these properties and potential mitigation measures are discussed.

### ***Upland Habitats and Land Use Activities***

The habitats and vegetation species are described in detail in sections of the report covering the flora at the proposed sand pit expansion. Broadly speaking, the site consists of several habitat types, including an existing sand pit and surrounding disturbed/edge habitat, mature mixed forest on sandy soil, riparian floodplain along the Cornwallis River, and cultivated fields (Corn). There are no human-made structures on the property other than a small wooden bridge over the river and beehives.

### ***Wetlands***

A wetland study was conducted to identify and delineate wetlands in the project area, and more detail will be in that report. Five wetlands were identified in the project area, including the Cornwallis River runs along the southern edge of the study area. Of the five wetlands, two were forested wetland swamps on the western side of the property, with numerous vernal pools. There was standing water in the pools on the May and June surveys, but these were dry on the July and August surveys. These forested wetlands appeared suitable for amphibian breeding and avian SAR (Canada Warbler), while the others were smaller and did not likely support avian SAR.

## **METHODS**

### ***Field Surveys***

Four site visits were made to determine which bird species were breeding at the site, which bird species use the site during spring and fall migration, and to check for turtle nesting activity. Dates were chosen in late-May, June, early July, and late August to maximize chances of detecting nesting bird species (early and late) and turtles, as well as migratory birds in spring and

fall migration. Specific survey days were chosen based on short term weather forecasts for days with light winds and no precipitation. See Table 1 for survey dates, weather conditions, and distance covered on foot and Figure 1 for a map of the GPS tracks from the surveys. All site visits began at dawn, and continued until the site was completely covered. An area-search methodology was used where the entire property in the study area was covered on foot, making sure to pass within 200m (approximate birdsong detection radius) of all locations and to visit all habitat types. Some coaxing (pishing and owl imitations) and call broadcasting was used to increase detections, especially when in habitat for SAR (e.g. Canada Warbler calls were broadcast in the forested wetlands on the west side of the property; pishing was used mostly in the July and August surveys when birds were not singing as much). For turtles, on the May survey, the entire river bank within the project area was walked to look for turtle activity in the river. This was not possible on the June-August surveys due to the dense growth of Reed Canary Grass (*Phalaris arundinacea*) along the river, which was over head-high. On the June-August surveys, all sandy areas on the property were walked to check for evidence of turtle nesting activity. This included the open sandy areas of the existing pit, and along and on top of the slope bordering the river. From this slope every visible part of the river was checked for basking or swimming turtles with binoculars. Sandy deposits in the river floodplain seen in May were completely covered with dense Reed Canary Grass, so I believe these would not be used by turtles. Sandy and muddy areas were checked for mammal tracks wherever possible.

### ***Acoustic Recordings***

An Audiomoth ([www.openacousticdevices.info/audiomoth](http://www.openacousticdevices.info/audiomoth)) microphone and acoustic file recorder was deployed at the western edge of the existing sand pit (45.05369, -64.69678) primarily to determine if Common Nighthawks or Eastern Whip-poor-wills breeding in the area, but also to check for other nocturnal or crepuscular species that may have been missed in the diurnal surveys. The Audiomoth was deployed May 23-30, and again June 27-July 14. The Audiomoth was programmed to record from 8:45PM-10:45PM, and 4:00AM-7:00AM, which would cover both dawn and dusk and active calling periods for nocturnal and diurnal species. Recording dates were subsampled by interpreting recordings from approximately 1-week intervals, on nights when weather conditions were favorable for recording interpretation (low wind, no precipitation). The dates analysed for evening recordings were: May 23, May 29, June 28, July 5, and July 13. The dates interpreted for morning recordings were: May 24, May 30, June 29, July 5, and July 12. Evening recordings were interpreted in a different method from morning recordings. Evening recordings were interpreted in their entirety by visually scanning through the spectrograms for calls and verifying each by listening. Morning recordings were subsampled, the first 30 minutes (pre-dawn chorus) were visually scanned, then 3-minute segments were interpreted by ear at 30 minute intervals for the remainder of the morning, with the last 3-minutes of the recording also interpreted. Each bird, amphibian, or mammal species detected was recorded for each date analysed.

## ***ACCDC Report***

An ACCDC report on SAR and vulnerable species within 5km and 100km of the proposed sand pit expansion was received and reviewed to determine if other SAR or vulnerable species that were not detected on the surveys were likely to occur in the project area.

## **RESULTS**

### ***Birds***

A total of 81 species of birds were detected on the study area between the nocturnal surveys and the acoustic recordings. Of these species 52 were likely breeding on the property, 6 were possibly breeding on the property, 11 were likely breeding locally but there was no suitable habitat on the property, and 12 were detected as migrants. Table 2 lists the numbers of each bird species seen on each survey, and the scientific names, breeding status, SAR status, provincial S-ranking, and comments about each species use of the property.

The forest was typical of mature mixed hardwoods in the Annapolis Valley, and was large enough to support both nesting Great Horned Owls and Barred Owls (fledglings were seen of both species), Red-tailed Hawk, and a diverse suite of forest-nesting species of migratory birds. The existing pit and regenerating areas attracted edge specialists such as Chestnut-sided Warblers, Rose-breasted Grosbeaks, Gray Catbirds, Chipping Sparrows, Veerys, and Vesper Sparrows. During the July and August surveys, many birds were observed using the regenerating edge of the sand pit and forest edge for foraging, while the forest interior was much quieter. Several nesting burrows were seen in the existing sand pit, and all appeared to be from Belted Kingfisher. One active Kingfisher nest was found in the bank at 45.05569, -64.69557. The acoustic recordings detected 41 species of birds, including three species not observed during the surveys: Common Nighthawk, Great Blue Heron, and Killdeer. None of these three were detected frequently enough to be considered as breeders on the property.

### ***Birds—SAR and vulnerable species***

Eight bird species considered SAR in Nova Scotia were detected from the study area, but of these only one species likely nests on the property or uses the property regularly: Eastern Wood-Pewee. The forest on the property is mature and provides good nesting habitat for Eastern Wood-Pewees, which were observed on all four surveys. It appeared that 6-7 pairs of Eastern Wood-Pewees were nesting on the property. Locations where Eastern Wood-Pewees were on

territory are depicted in Figure 2, and coordinates for sightings of this species and other notable observations are in Table 3.

There was seemingly suitable habitat for several bird SAR (Canada Warbler, Common Nighthawk, and Bank Swallow) which were detected on the surveys but apparently not nesting in the project area. The forested wetland swamp on the western side of the property appeared suitable for Canada Warbler, but none were detected on territory despite using call broadcasting. One Canada Warbler was observed on the August 30 survey in a mixed flock in the edge of the forest, but was likely a migrant. The open sand pit appeared suitable for Common Nighthawk, but none were seen in the field and only one was detected on the acoustic recordings on July 5. Other recordings from dates preceding and proceeding July 5 were checked during the same time of night to determine if the bird was displaying regularly, but it was not detected on any other night. Bank Swallows were not using the existing pit on the property, and no nesting burrows were seen from previous seasons. Approximately 33 active Bank Swallow nests were found in a smaller sand pit nearby on Blair Rd (45.05666, -64.68730) on the May 23 survey, and were also active on the June 27 and July 14 surveys. These nests are outside the project area, but Bank Swallows likely from these nests were seen feeding over the project area cultivated fields on several occasions.

The other SAR detected during the surveys (Peregrine Falcon, Barn Swallow, Bobolink, and Rusty Blackbird) were all seen flying over the project area, but no suitable habitat was present for nesting. The Peregrine Falcon was observed flying low and fast downstream along the river, apparently hunting waterfowl. Barn Swallows for seen feeding over the NE corner of the property, but no suitable nesting sites exist in the project area. A Bobolink and two Rusty Blackbirds flew over calling during the Aug 30 survey but were likely migrating. Table 4 lists bird SAR and vulnerable species that were detected on the surveys, as well as additional species with S-rankings of S3S4 and lower found in NS that could potentially breed in the area based on reviewing the ACCDC report and field surveys.

Another notable observation was three singing Vesper Sparrows on the May 23 survey. Two were singing along the edge of the forest and cultivated field on the north side of the project area (45.05766, -64.69768) and one was singing in the sandy disturbed area east of the existing pit (45.05442, -64.69323). These birds appeared to be on breeding territory. The Vesper Sparrows were not detected on the June 27 or subsequent surveys, however Vesper Sparrows are early migrants that return in to territories in late April, so it is not unexpected that they would be done breeding by late June. Vesper Sparrows have and S-rank of S1S2 in Nova Scotia and are now only known to be nesting at a handful of locations in the Annapolis Valley.

### ***Mammals***



No concentrated survey effort was spent on mammals using the project area, but opportunistic observations were made during the field surveys. I looked for tracks and scat wherever possible, especially in the sand pit and muddy areas along the riverbank. On the May 23 survey, a Common Muskrat (*Ondatra zibethicus*) was observed in the river, and tracks of River Otter (*Lontra canadensis*), White-tailed Deer (*Odocoileus virginianus*), Raccoon (*Procyon lotor*), and Coyote (*Canis latrans*) were seen along the bank. Deer and Coyote prints were throughout the existing sand pit and a Coyote pup was observed near the NW corner of the project area on July 14. There were many burrows in the sandy soil in the forest and some larger apparent dens (Figures 3, 4, and 5).

### ***Mammals--SAR***

After reviewing the ACCDC report, it is apparent that there are records of bats in the vicinity of the proposed sand pit expansion, including many of Little Brown Myotis (*Myotis lucifugus*) within 1.6km of the project area, and Northern Myotis (*Myotis septentrionalis*) and Tricolored Bat (*Perimyotis subflavus*) at 10km from the project area. The Audiomoth recorder used was not programmed to record at frequencies high enough to detect bats. No evidence of bats or suitable hollow trees were observed during the surveys, however the forest present is mature and there could be large hollow trees that were not observed during the surveys. No other mammalian SAR are likely to inhabit the project area.

### ***Reptiles***

No turtles or evidence of turtles was observed on the May 23 survey when the length of the river bank in the project area was walked. A single Eastern Painted Turtle (*Chrysemys picta picta*) was observed in the river on the July 14 survey. The existing sand pit and disturbed sandy areas were checked on the June 27, July 14, and August 30 surveys for evidence of turtle nesting (e.g. scrapes, depredated nests, hatched nests) but no evidence was found. Scrapes in the sandy soil were found in several areas on the crest of the slope along the river on the July 14 survey, at (45.05271, -64.69986) and (45.05276, -64.69838) (Figure 6). These scrapes were checked again on August 30, but they had not changed in appearance. A Common Gartersnake (*Thamnophis sirtalis*) was observed on August 30.

### ***Reptiles—SAR***

While no turtle nesting activity or turtle SAR were observed on the surveys, review of the ACCDC report and local knowledge suggests that both Wood Turtles (*Glyptemys insculpta*) and Snapping Turtles (*Chelydra serpentina*) could inhabit and potentially nest in the project area. In the ACCDC database, there are records of Wood Turtle within 1km and Snapping Turtles within 3km of the project area. I consulted with a local naturalist who lives near the project area, and he said in 2020 he found a Wood Turtle in the Cornwallis River at the Shaw Rd bridge, which is

400m west of the project area. It seems likely that Wood Turtles inhabit the project area, considering that Wood Turtles may wander over 1km from the river channel in the woods. Neither Blanding's Turtle (*Emydoidea blandingii*) nor Eastern Ribbonsnake (*Thamnophis sauritus*) have records within 40km of the project area in the ACCDC database.

### ***Amphibians***

Spring Peepers (*Pseudacris crucifer*), American Toads (*Anaxyrus americanus*), and Green Frogs (*Lithobates clamitans*) were heard on multiple surveys and on the Audiomoth recordings, and two Wood Frogs (*Lithobates sylvaticus*) were observed on August 30. Medium-sized tadpoles were seen in the Cornwallis River, perhaps Green Frog. Red-backed Salamanders (*Plethodon cinereus*) and Spotted Salamanders (*Ambystoma maculatum*) likely inhabit the woods, but were not observed. No egg masses were observed in the pools in the forested swamp on the west side of the project area, though not every pool was checked.

### ***Fish***

While walking the riverbank on the May 23 survey, both Brook Trout (*Salvelinus fontinalis*) and Brown Trout (*Salmo trutta*) were observed in the Cornwallis River. Atlantic Salmon (*Salmo salar*) of the Inner Bay of Fundy population formerly came into the Cornwallis River, though this run is likely extirpated or nearly so.

### ***Invertebrates***

The only notable invertebrates observed on the field surveys were Monarch (*Danaus plexippus*) butterflies and caterpillars, that were using stands of Common Milkweed (*Asclepias syriaca*) growing in the disturbed area around the existing sand pit. Three larger stands of Milkweed were observed, and Monarch caterpillars were found in all three, coordinates are in Table 3. Other smaller patches of Milkweed were also around the pit, but were not noteworthy compared to the larger stands.

## **POTENTIAL IMPACTS ON WILDLIFE**

Clearing of the mature mixed forest that border existing sand pit would impact most of the bird species breeding on the site create a net loss of mature mixed-forest in the floor of the Annapolis Valley, which has already mostly been cleared for agriculture, industrial activities such as sand pits, and commercial and residential areas. The Eastern Wood-Pewee is provincially listed as vulnerable, and this species was found on breeding territory throughout the forested areas in the project area, with an estimated breeding population of 6-7 pairs on the property, 5 of which fall within the boundary of the proposed expansion area. Other provincially rare bird species that

were found using the property and would likely be impacted by the sand pit expansion are Vesper Sparrow (S1S2) and Rose-breasted Grosbeak (S3). However, both Vesper Sparrow and Rose-breasted Grosbeak were found using the edge habitat around the existing pit, and any future expansion would eventually create similar habitat around the new edge. Red Crossbills breed in mature coniferous forest, but are highly nomadic and may not breed in the project area most years, and no nesting evidence was found in the project area. The forest on the property could provide suitable habitat for a number of provincially rare species that do not necessarily nest in the same location between years, such as: Indigo Bunting, Cooper's Hawk, Great Crested Flycatcher, Brown Thrasher, Warbling Vireo, Scarlet Tanager, Baltimore Oriole, Red Crossbill, and Black-billed Cuckoo. Of these, only Brown Thrasher, Red Crossbill, and Baltimore Oriole were observed, though it did not appear that any of these species were nesting on the property.

The sand pit expansion could potentially create nesting habitat for some SAR or provincially rare species not currently breeding on the property, which could require monitoring. Expanding the sand pit could create nesting habitat for Bank Swallows if the edge of the exposed bank becomes suitable. Open sandy areas may also attract nesting Common Nighthawks, Killdeer, or nesting turtles. Disturbed soils also promote the growth of Common Milkweed, which is a host for Monarchs.

Non-avian fauna that are provincially listed and could potentially be impacted by sand pit expansion include: Little Brown Myotis, Northern Myotis, Tricolored Myotis, Wood Turtle, Snapping Turtle, and Monarch. There are numerous records of the bat species above in close proximity to the project area in the ACCDC database. No suitable hibernacula were found on the property, however these bat species would likely use the mature forest on the property at other times of year if they were still present in the area. As bat populations potentially rebound with resistance to white-nose syndrome, they will need mature forested areas. Wood Turtles have been found in the stretch of the river along the project area, and there are many records in the ACCDC database from just 1km from the property. The patch of forest that is partially encompassed by the properties in the project area is one of the largest patches of woods remaining along the Cornwallis River in this vicinity, so it seems likely that it is used by Wood Turtles which are partially terrestrial. To my knowledge, it is unknown where Wood Turtles might be nesting in the area. Snapping Turtles have been recorded within 3km of the property, and could potentially use the stretch of the Cornwallis River to the south and nest in sandy soil nearby. Patches of Common Milkweed in and around the existing pit were hosts to Monarch caterpillars, and if these patches were removed and not replaced by other patches of Milkweed it would be a net loss of habitat for Monarchs.

## **MITIGATING ACTIONS**

Any clearing of forest or other vegetation should be done between August and April to avoid disturbing nesting migratory bird species. For Eastern Wood-Pewees and other bird and bat

species that require mature mixed-forest, there are no mitigating actions that can be taken for clearing the forest as the canopy trees take many years to reach maturity. Allowing other properties to return to mature forest would mitigate this loss, but much farther in the future.

Sand pit expansion could create nesting habitat for several provincially rare species, such as Bank Swallows, Common Nighthawks, and Killdeer. If Bank Swallows start nesting in the sand pit, it will be necessary to avoid these burrows during the nesting season. The edge of the pit should be checked for burrows in early June each year if any operations are to occur in summer. If the edge of the pit is maintained at a gradual slope, without vertical edges or overhangs, then Bank Swallows would not be likely to use the bank for nesting. It seems unlikely but possible that Common Nighthawks or Killdeer might attempt nesting in an active sand pit. Killdeer return the province early in the spring, and could potentially nest if the site were not in operation at that time. If operations were to be conducted during summer, site operators should be vigilant for this species, which is not difficult to find when nesting, and if present the nesting area should be avoided. To check for Common Nighthawk nesting, the site should be visited at dusk each June evening under favorable weather conditions to listen for Common Nighthawk calls and flight displays.

Some of the provincially rare species found at the site were attracted to the regenerating habitat around the existing pit, such as: Brown Thrasher, Vesper Sparrow, and Rose-breasted Grosbeak. While the expansion may temporarily remove habitat for these species, it would regenerate over time once pit operations cease.

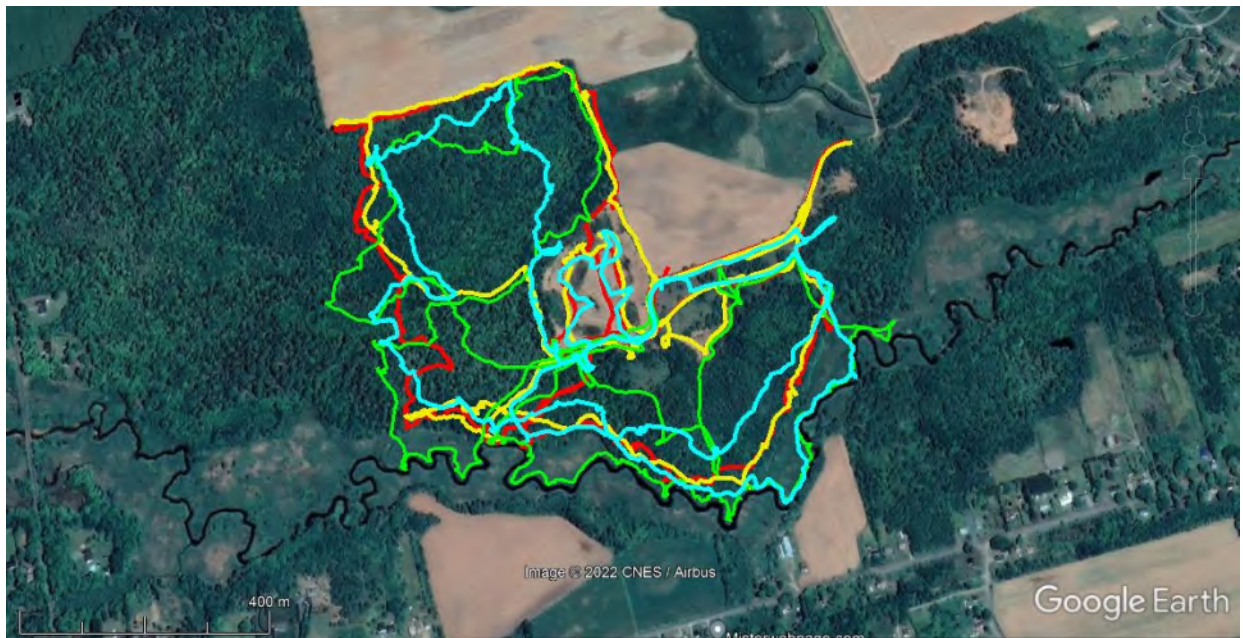
Wood Turtles could potentially use the river, forested portions of the property for foraging, and any sandy soil in the forest or sand pit for nesting. Snapping Turtles may inhabit the river and potentially nest in the sand pit. If operations were to be conducted in summer, site operators should be vigilant for turtles, and if present give them a wide berth. If turtles are found, they should be followed to determine where they are nesting, and operations in that area should cease until the eggs have hatched. Bordering the site with drift fence could limit the turtles' ability to enter the site for nesting.

Patches of Common Milkweed present in the summer months could attract Monarch butterflies, which are currently present in several patches in the existing pit. It would be possible to cultivate stands of Milkweed adjacent to the pit to mitigate losses of existing patches that Monarchs are currently using.

## TABLES AND FIGURES

**Table 1. Survey dates with start time, duration, distance walked on foot, and weather.**

Date	Start	Duration	Km	Weather
23-May-22	6:01	6:10	7.7	15C. Partly cloudy with light N wind. Rain shower 9:30-9:50AM
27-Jun-22	6:13	4:37	5.8	15-25C. Partly cloudy with light N wind.
14-Jul-22	5:45	5:15	6.3	14-25C. Clear and calm.
30-Aug-22	7:06	4:52	6.4	18-27C. Overcast, light SW wind



**Figure 1. Map of the project area showing the GPS tracks from the four surveys. The May 23 survey is green, June 27 is blue, July 14 is red, and August 30 is yellow.**

**Table 2. Bird species observed during field surveys and detected on Audiomoth recordings from the proposed sand pit expansion in Waterville. The number of each species on each survey, the breeding status on the property, SAR listing, provincial S-Rank (if S3S4 or below), and comments are included.**

Species	May	Jun	Jul	Aug	Breeding Status	SAR	SRank	Comments
Canada Goose ( <i>Branta canadensis</i> )	2	2			Possible			Could nest along river
Hooded Merganser ( <i>Lophodytes cucullatus</i> )	1				Possible			Female flushed from river
Ruffed Grouse ( <i>Bonasa umbellus</i> )	3				Breeding			Drumming in forest
Ring-necked Pheasant ( <i>Phasianus colchicus</i> )	5				Breeding			Calling from cultivated fields
Mourning Dove ( <i>Zenaidura macroura</i> )	8	1	3	2	Breeding			In sand pit and forest
Common Nighthawk ( <i>Chordeiles minor</i> )					Local Breeder	Threatened	S3B	Detected on one audio recording
Ruby-throated Hummingbird ( <i>Archilochus colubris</i> )		1	2	8	Breeding			In forest
Killdeer ( <i>Charadrius vociferus</i> )					Local Breeder		S3B	Detected on audio recordings
American Woodcock ( <i>Scolopax minor</i> )		1			Breeding			Flushed in forest and heard on audio recordings
Great Blue Heron ( <i>Ardea herodias</i> )					Local Breeder			Detected on audio recordings
Bald Eagle ( <i>Haliaeetus leucocephalus</i> )				1	Local Breeder			Flyover
Red-tailed Hawk ( <i>Buteo jamaicensis</i> )	1		1	1	Breeding			Calling from perch, likely nesting
Great Horned Owl ( <i>Bubo virginianus</i> )	2				Breeding			Adult and young at 45.05307, -64.69604
Barred Owl ( <i>Strix varia</i> )			2		Breeding			Adult and young at 45.05371, -64.69941
Belted Kingfisher ( <i>Megaceryle alcyon</i> )			1		Breeding			Nest in sand pit bank at 45.05569, -64.69557
Yellow-bellied Sapsucker ( <i>Sphyrapicus varius</i> )	3	1	2		Breeding			In forest
Downy Woodpecker ( <i>Dryobates pubescens</i> )	2	3	3	4	Breeding			In forest
Hairy Woodpecker ( <i>Dryobates villosus</i> )		4	3		Breeding			In forest
Pileated Woodpecker ( <i>Dryocopus pileatus</i> )	1		1	1	Possible			In forest
Northern Flicker (Yellow-shafted) ( <i>Colaptes auratus</i> )	2	1	11	4	Breeding			In forest
Peregrine Falcon ( <i>Falco peregrinus</i> )	1				Local Breeder	Vulnerable	S1B	Flew up river, appeared to be hunting
Eastern Wood-Pewee ( <i>Contopus virens</i> )	2	6	7	6	Breeding	Vulnerable	S3S4B	Nesting in forest
Yellow-bellied Flycatcher ( <i>Empidonax flaviventris</i> )				2	Migrant			In migrant flock



Species	May	Jun	Jul	Aug	Breeding Status	SAR	SRank	Comments
Alder Flycatcher ( <i>Empidonax alnorum</i> )	2	1	3	1	Breeding			Nesting in disturbed area around pit
Least Flycatcher ( <i>Empidonax minimus</i> )	8	5	4	6	Breeding			In forest
Eastern Kingbird ( <i>Tyrannus tyrannus</i> )	4				Migrant		S3B	Migrants along the river
Blue-headed Vireo ( <i>Vireo solitarius</i> )	1	3		3	Breeding			In forest
Red-eyed Vireo ( <i>Vireo olivaceus</i> )	11	12	27	10	Breeding			In forest
Blue Jay ( <i>Cyanocitta cristata</i> )	6	1	7	5	Breeding			In forest
American Crow ( <i>Corvus brachyrhynchos</i> )	9		11	6	Possible			No nests were seen, but could be on property
Common Raven ( <i>Corvus corax</i> )	1	1	2		Possible			No nests were seen, but could be on property
Black-capped Chickadee ( <i>Poecile atricapillus</i> )	8	3	12	35	Breeding			In forest
Tree Swallow ( <i>Tachycineta bicolor</i> )	3				Local Breeder			Flyover
Bank Swallow ( <i>Riparia riparia</i> )		1	2		Local Breeder	Endangered	S2B	Flyover. Nesting nearby at 45.05666, -64.68730
Barn Swallow ( <i>Hirundo rustica</i> )	2			7	Local Breeder	Endangered	S3B	Flyover. No nesting areas on property
Golden-crowned Kinglet ( <i>Regulus satrapa</i> )	2	3			Breeding			In forest
Red-breasted Nuthatch ( <i>Sitta canadensis</i> )			2		Breeding			In forest
White-breasted Nuthatch ( <i>Sitta carolinensis</i> )		2	3	3	Breeding			In forest
Brown Creeper ( <i>Certhia americana</i> )	3	3	5	4	Breeding			In forest
House Wren ( <i>Troglodytes aedon</i> )			1		Local Breeder			Rare. Likely nested nearby
European Starling ( <i>Sturnus vulgaris</i> )	1			1	Local Breeder			Flyovers. No obvious nesting cavities.
Gray Catbird ( <i>Dumetella carolinensis</i> )		3	1		Breeding		S3	Edge of pit
Veery ( <i>Catharus fuscescens</i> )	17	8	6	1	Breeding		S3S4	Edge of pit and forest
Hermit Thrush ( <i>Catharus guttatus</i> )	3	3	3	1	Breeding			In forest
American Robin ( <i>Turdus migratorius</i> )	5	6	15	3	Breeding			In forest
Cedar Waxwing ( <i>Bombycilla cedrorum</i> )	4	2	4	4	Breeding			Edge of pit and river
Purple Finch ( <i>Haemorhous purpureus</i> )	3		3	1	Breeding			In forest
Red Crossbill ( <i>Loxia curvirostra</i> )	5	1	3		Possible		S3S4	Flyovers. Could breed in Hemlock or Pine
American Goldfinch ( <i>Spinus tristis</i> )	10	7	16	12	Breeding			Edge of pit, and cultivated fields
Chipping Sparrow ( <i>Spizella passerina</i> )	1	1	10	14	Breeding			Edge of pit
Dark-eyed Junco (Slate-colored) ( <i>Junco hyemalis</i> )		1			Breeding			In forest
White-throated Sparrow ( <i>Zonotrichia albicollis</i> )		2		6	Breeding			In forest

Species	May	Jun	Jul	Aug	Breeding Status	SAR	SRank	Comments
Vesper Sparrow ( <i>Pooecetes gramineus</i> )	3				Breeding		S1S2B	Edge of pit and forest edge along cultivated field
Savannah Sparrow ( <i>Passerculus sandwichensis</i> )		2	3		Breeding			Cultivated fields
Song Sparrow ( <i>Melospiza melodia</i> )	10	9	20	19	Breeding			Edge of pit
Swamp Sparrow ( <i>Melospiza georgiana</i> )	2		2	1	Breeding			Along river
Bobolink ( <i>Dolichonyx oryzivorus</i> )				1	Migrant	Vulnerable	S3B	Flyover
Baltimore Oriole ( <i>Icterus galbula</i> )	1				Migrant		S2S3B	Along river
Red-winged Blackbird ( <i>Agelaius phoeniceus</i> )	5	1		35	Local Breeder			Cultivated fields
Rusty Blackbird ( <i>Euphagus carolinus</i> )				2	Migrant	Endangered	S2B	Flyover
Common Grackle ( <i>Quiscalus quiscula</i> )	2	1	3		Breeding			Edge of pit
Ovenbird ( <i>Seiurus aurocapilla</i> )	31	27	17	5	Breeding			In forest
Northern Waterthrush ( <i>Parkesia noveboracensis</i> )	3	1			Breeding			In forested wetland
Black-and-white Warbler ( <i>Mniotilta varia</i> )	3	3	5	4	Breeding			In forest
Nashville Warbler ( <i>Leiothlypis ruficapilla</i> )			1		Migrant			In migrant flock
Mourning Warbler ( <i>Geothlypis philadelphia</i> )				1	Migrant			In migrant flock
Common Yellowthroat ( <i>Geothlypis trichas</i> )	12	4	8	6	Breeding			Along river
American Redstart ( <i>Setophaga ruticilla</i> )	8	3		3	Breeding			In forest
Northern Parula ( <i>Setophaga americana</i> )	10	2	7	3	Breeding			In forest
Magnolia Warbler ( <i>Setophaga magnolia</i> )				2	Migrant			In migrant flock
Bay-breasted Warbler ( <i>Setophaga castanea</i> )				3	Migrant		S3S4B	In migrant flock
Blackburnian Warbler ( <i>Setophaga fusca</i> )	2		3		Breeding			In forest
Yellow Warbler ( <i>Setophaga petechia</i> )	5		4	7	Breeding			Edge of pit and river
Chestnut-sided Warbler ( <i>Setophaga pensylvanica</i> )	10	8	12	2	Breeding			Edge of pit
Palm Warbler ( <i>Setophaga palmarum</i> )				2	Migrant			In migrant flock
Yellow-rumped Warbler ( <i>Setophaga coronata</i> )	5	4	6	3	Breeding			In forest
Black-throated Green Warbler ( <i>Setophaga virens</i> )	8	7	8		Breeding			In forest
Canada Warbler ( <i>Cardellina canadensis</i> )				1	Migrant	Endangered	S3B	In migrant flock
Wilson's Warbler ( <i>Cardellina pusilla</i> )				5	Migrant		S3B	In migrant flock
Northern Cardinal ( <i>Cardinalis cardinalis</i> )	2		3	2	Breeding			Edge of pit
Rose-breasted Grosbeak ( <i>Pheucticus ludovicianus</i> )	9	6	1		Breeding		S3B	Edge of pit and river



**Figure 2. Locations of Eastern Wood-Pewee territories in the forest around the proposed sand pit expansion.**



**Figure 3. Mammal den found on the property at (45.05429, -64.701467)**





**Figure 4. Large mammal den found on the property at (45.05667, -64.69315)**





**Figure 5. Entrance to mammal den on property at (45.05224, -64.69315).**

**Table 3. Coordinates for notable sightings during the surveys.**

<b>Name</b>	<b>lat</b>	<b>lon</b>	<b>time</b>
Barred Owl	45.053696	-64.699409	2022-07-14T11:11:38Z
Belted Kingfisher nest	45.055693	-64.695574	2022-07-14T10:02:00Z
Canada Warbler	45.056323	-64.695729	2022-08-30T11:56:49Z
Eastern Wood-pewee	45.053691	-64.696787	2022-05-23T09:20:20Z
Eastern Wood-pewee	45.052253	-64.694523	2022-05-23T14:57:10Z
Eastern Wood-pewee	45.057137	-64.697595	2022-06-27T10:19:29Z
Eastern Wood-pewee	45.052695	-64.695848	2022-06-27T11:50:00Z
Eastern Wood-pewee	45.052358	-64.694865	2022-06-27T11:56:06Z
Eastern Wood-pewee	45.052040	-64.693325	2022-06-27T12:03:20Z
Eastern Wood-pewee	45.053180	-64.692072	2022-06-27T12:10:27Z
Eastern Wood-pewee	45.055307	-64.700752	2022-07-14T10:52:15Z
Eastern Wood-pewee	45.053324	-64.699540	2022-07-14T11:12:15Z
Eastern Wood-pewee	45.052470	-64.699998	2022-07-14T11:33:49Z
Eastern Wood-pewee	45.053097	-64.692080	2022-07-14T12:42:57Z
Eastern Wood-pewee	45.052329	-64.694727	2022-07-14T13:06:09Z
Garter Snake	45.052695	-64.698604	2022-08-30T13:50:10Z
Great Horned Owl	45.053071	-64.696042	2022-05-23T09:30:10Z
House Wren	45.057810	-64.697276	2022-07-14T10:17:50Z
Milkweed and Monarchs	45.054638	-64.694730	2022-08-30T10:12:23Z
Milkweed and Monarchs	45.054005	-64.694706	2022-08-30T10:16:08Z
Milkweed and Monarchs	45.055705	-64.695502	2022-08-30T11:43:38Z
Nodding Trillium	45.056593	-64.698151	2022-05-23T10:22:33Z
Painted Turtle	45.051424	-64.694422	2022-07-14T12:59:29Z
Peregrine Falcon	45.052317	-64.691699	2022-05-23T14:08:08Z
Possible Den	45.054290	-64.701467	2022-05-23T09:59:57Z
Possible Den	45.056666	-64.697454	2022-06-27T10:16:14Z
Possible Den	45.052241	-64.693147	2022-06-27T12:05:47Z
possible turtle nests	45.052707	-64.699861	2022-07-14T11:30:39Z
possible turtle nests	45.052769	-64.698377	2022-09-12T15:08:48Z
Vesper Sparrow	45.057660	-64.697687	2022-05-23T10:33:46Z
Vesper Sparrow	45.054429	-64.693230	2022-05-23T14:37:26Z
Wood Frog	45.057884	-64.696823	2022-08-30T12:20:41Z

**Table 4. Provincially listed and rare bird species that could be present on the property. Marine species are not considered. Species detected on the property are in bold font.**

CommonName	ScientificName	SAR status	SRank	Comments
<b>Bank Swallow</b>	<b>Riparia riparia</b>	<b>Endangered</b>	<b>S2B</b>	<b>Not nesting on property, but in nearby pit</b>
<b>Rusty Blackbird</b>	<b>Euphagus carolinus</b>	<b>Endangered</b>	<b>S2B</b>	<b>Flyover. No suitable nesting habitat</b>
Chimney Swift	Chaetura pelagica	Endangered	S2S3B	No large hollow trees observed, no chimneys
<b>Barn Swallow</b>	<b>Hirundo rustica</b>	<b>Endangered</b>	<b>S3B</b>	<b>No suitable nesting structures on property</b>
<b>Canada Warbler</b>	<b>Cardellina canadensis</b>	<b>Endangered</b>	<b>S3B</b>	<b>None responded to call broadcast in suitable forested wetland</b>
Eastern Whip-Poor-Will	Antrostomus vociferus	Threatened	S1?B	None detected on Audiomoth recordings
<b>Common Nighthawk</b>	<b>Chordeiles minor</b>	<b>Threatened</b>	<b>S3B</b>	<b>One detected on July 5 at 9:16 PM</b>
Olive-sided Flycatcher	Contopus cooperi	Threatened	S3B	No suitable nesting habitat
<b>Peregrine Falcon</b>	<b>Falco peregrinus</b>	<b>Vulnerable</b>	<b>S1B</b>	<b>No suitable nesting habitat</b>
<b>Bobolink</b>	<b>Dolichonyx oryzivorus</b>	<b>Vulnerable</b>	<b>S3B</b>	<b>Flyover. No suitable nesting habitat</b>
Evening Grosbeak	Coccothraustes vespertinus	Vulnerable	S3B	Could use the forest at times
<b>Eastern Wood-Pewee</b>	<b>Contopus virens</b>	<b>Vulnerable</b>	<b>S3S4B</b>	<b>Likely 6-7 breeding pairs in forest</b>
Indigo Bunting	Passerina cyanea		S1?B	Rare in area, suitable habitat
Cooper's Hawk	Accipiter cooperii		S1?B	Rare in area, suitable habitat
Great Crested Flycatcher	Myiarchus crinitus		S1B	Rare in area, suitable habitat
Northern Mockingbird	Mimus polyglottos		S1B	Rare in area, suitable habitat
<b>Brown Thrasher</b>	<b>Toxostoma rufum</b>		<b>S1B</b>	<b>Seen by another observer on the property this spring</b>
Warbling Vireo	Vireo gilvus		S1B	Rare in area, suitable habitat
<b>Vesper Sparrow</b>	<b>Pooecetes gramineus</b>		<b>S1S2B</b>	<b>Three singing along edge of forest and sand pit. Likely breeding</b>
Willow Flycatcher	Empidonax traillii		S2B	Rare in area, suitable habitat
Brown-headed Cowbird	Molothrus ater		S2B	Rare in area, suitable habitat
Scarlet Tanager	Piranga olivacea		S2B	Rare in area, suitable habitat
Long-eared Owl	Asio otus		S2S3	Rare in area, suitable habitat
<b>Baltimore Oriole</b>	<b>Icterus galbula</b>		<b>S2S3B</b>	<b>Only detected on May 23 survey along river. Likely migrant</b>
<b>Killdeer</b>	<b>Charadrius vociferus</b>		<b>S3B</b>	<b>Detected on audio recording June 29 at 4:16 AM</b>
Black-billed Cuckoo	Coccyzus erythrophthalmus		S3B	Rare in area, suitable habitat
<b>Eastern Kingbird</b>	<b>Tyrannus tyrannus</b>		<b>S3B</b>	<b>Only detected on May 23 survey along river. Likely migrants</b>
<b>Rose-breasted Grosbeak</b>	<b>Pheucticus ludovicianus</b>		<b>S3B</b>	<b>Breeding along river and edge of sand pit</b>
American Kestrel	Falco sparverius		S3B	Rare in area, suitable habitat
Wilson's Snipe	Gallinago delicata		S3B	Rare in area, suitable habitat
Northern Goshawk	Accipiter gentilis		S3S4	Rare in area, suitable habitat
<b>Red Crossbill</b>	<b>Loxia curvirostra</b>		<b>S3S4</b>	<b>Flyover, calling. Could nest on property some years</b>



CommonName	ScientificName	SAR status	SRank	Comments
Spotted Sandpiper	<i>Actitis macularius</i>		S3S4B	No suitable banks in river
Northern Shrike	<i>Lanius borealis</i>		S3S4N	Could use property for hunting some winters



**Figure 6. Possible nest scrapes in forest at (45.05270, -64.69986).**



Appendix I  
**ACCDC Report**



# DATA REPORT 7089: Waterville, NS

Prepared 19 October 2021  
by J. Churchill, Data Manager

## CONTENTS OF REPORT

### 1.0 Preface

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- 1.2 Restrictions
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- Map 1: Buffered Study Area

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- 2.2 Fauna
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- 3.2 Significant Areas
- Map 3: Special Areas

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

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- 5.1 Source Bibliography



**Map 1.** A 100 km buffer around the study area

## 1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; [www.accdc.com](http://www.accdc.com)) 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 AC CDC 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 AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC 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 AC CDC 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

WatervilleNS\_7089ob.xls  
WatervilleNS\_7089ob100km.xls  
WatervilleNS\_7089ff\_py.xls

#### Contents

Rare or legally-protected Flora and Fauna in your study area  
A list of Rare and legally protected Flora and Fauna within 100 km of your study area  
Rare Freshwater Fish in your study area (DFO database)

## 1.2 RESTRICTIONS

The AC CDC 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 AC CDC 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 AC CDC 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) AC CDC 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) AC CDC 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 AC CDC data response.

## 1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

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

### Plants, Lichens, Ranking Methods, All other Inquiries

Sean Blaney  
Senior Scientist / Executive Director  
(506) 364-2658  
[sean.blaney@accdc.ca](mailto:sean.blaney@accdc.ca)

### Animals (Fauna)

John Klymko  
Zoologist  
(506) 364-2660  
[john.klymko@accdc.ca](mailto:john.klymko@accdc.ca)

### Plant Communities

Caitlin Porter  
Botanist / Community Ecologist  
(902) 719-4815  
[caitlin.porter@accdc.ca](mailto:caitlin.porter@accdc.ca)

### Data Management, GIS

James Churchill  
Conservation Data Analyst / Field Biologist  
(902) 679-6146  
[james.churchill@accdc.ca](mailto:james.churchill@accdc.ca)

### Billing

Jean Breau  
Financial Manager / Executive Assistant  
(506) 364-2657  
[jean.breau@accdc.ca](mailto:jean.breau@accdc.ca)

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (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 Hubert Askanas, Energy and Resource Development: (506) 453-5873.

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 Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

**Western:** Emma Vost  
(902) 670-8187  
[Emma.Vost@novascotia.ca](mailto:Emma.Vost@novascotia.ca)

**Western:** Sarah Spencer  
(902) 541-0081  
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[Shavonne.Meyer@novascotia.ca](mailto:Shavonne.Meyer@novascotia.ca)

**Central:** Kimberly George  
(902) 890-1046  
[Kimberly.George@novascotia.ca](mailto:Kimberly.George@novascotia.ca)

**Eastern:** Harrison Moore  
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**Eastern:** Maureen Cameron-MacMillan  
(902) 295-2554  
[Maureen.Cameron-MacMillan@novascotia.ca](mailto:Maureen.Cameron-MacMillan@novascotia.ca)

**Eastern:** Elizabeth Walsh  
(902) 563-3370  
[Elizabeth.Walsh@novascotia.ca](mailto:Elizabeth.Walsh@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

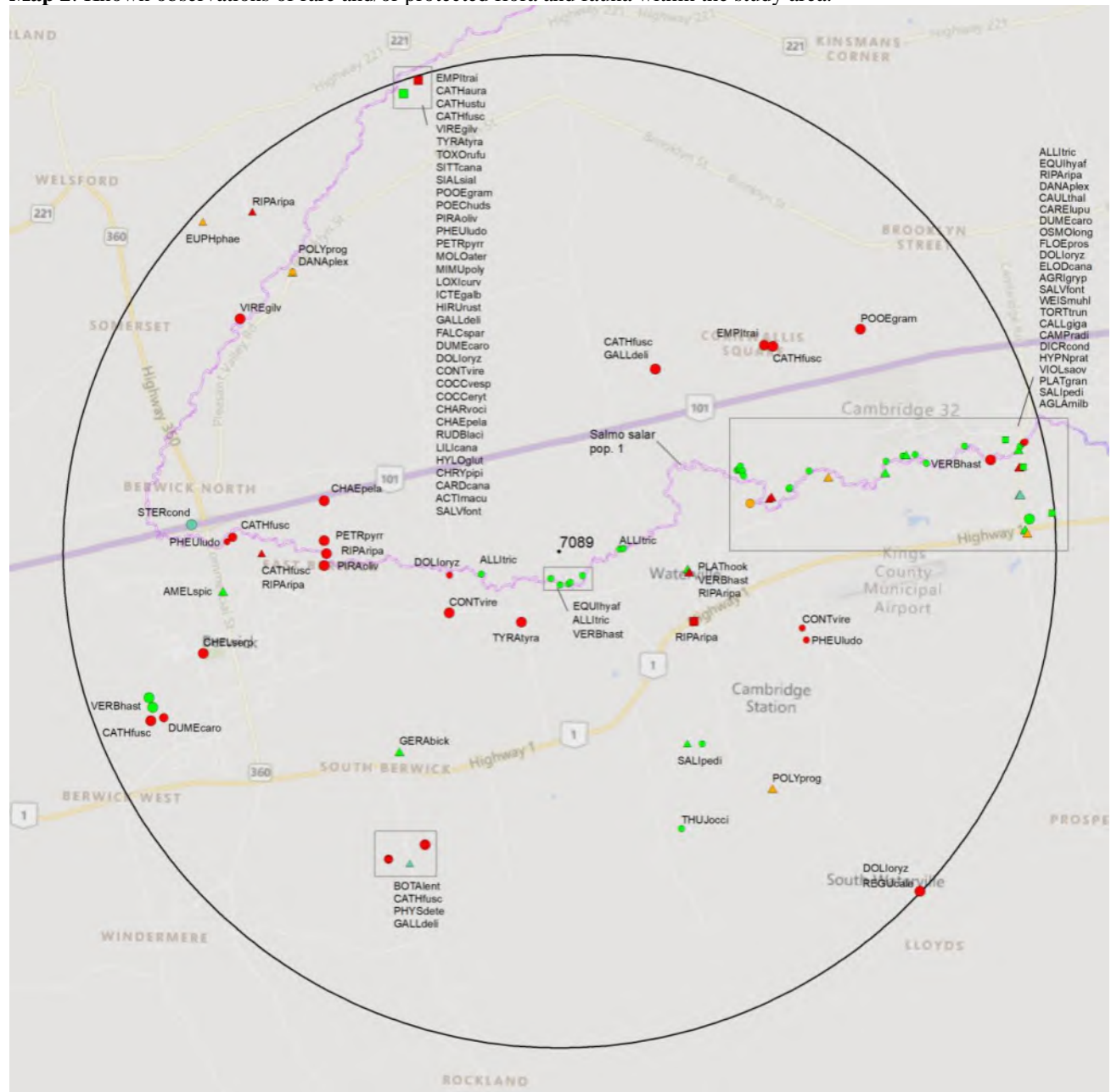
### 2.1 FLORA

The study area contains 58 records of 20 vascular, 9 records of 8 nonvascular flora (Map 2 and attached: \*ob.xls).

### 2.2 FAUNA

The study area contains 104 records of 36 vertebrate, 8 records of 4 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

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



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

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



### 3.0 SPECIAL AREAS

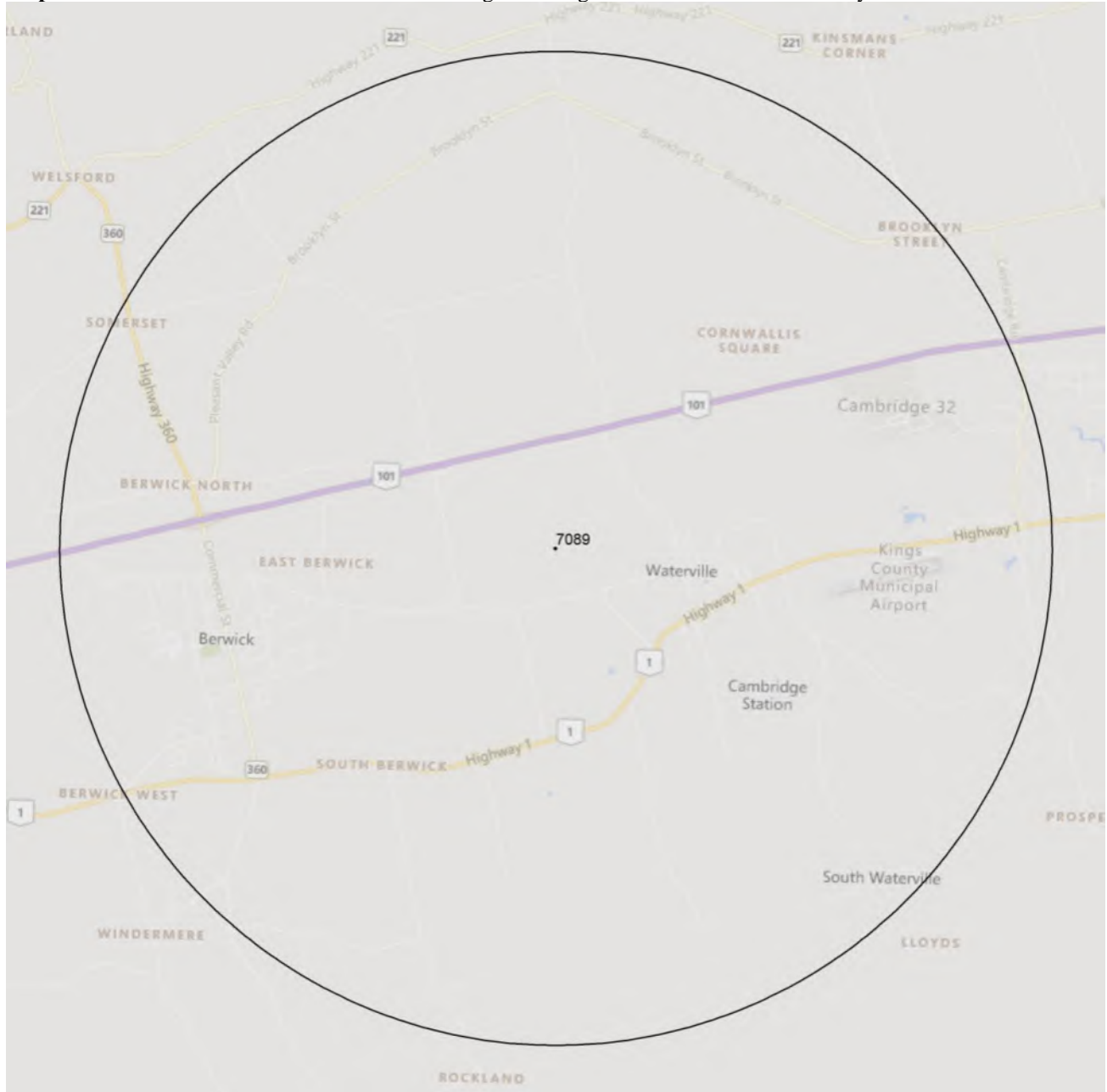
#### 3.1 MANAGED AREAS

The GIS scan identified no managed areas in the vicinity of the study area (Map 3).

#### 3.2 SIGNIFICANT AREAS

The GIS scan identified no biologically significant sites in the vicinity of the study area (Map 3).

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



 Managed Area  Significant Area

## 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	# recs	Distance (km)
N	<i>Hypnum pratense</i>	Meadow Plait Moss				S1S2	1	4.7 $\pm$ 3.0
N	<i>Weissia muhlenbergiana</i>	a Moss				S2?	1	4.7 $\pm$ 3.0
N	<i>Pseudocampyllum radicale</i>	Long-stalked Fine Wet Moss				S2?	1	4.7 $\pm$ 3.0
N	<i>Dicranum condensatum</i>	Condensed Broom Moss				S2?	1	4.7 $\pm$ 3.0
N	<i>Tortula truncata</i>	a Moss				S2S3	1	4.7 $\pm$ 3.0
N	<i>Stereocaulon condensatum</i>	Granular Soil Foam Lichen				S2S3	1	3.7 $\pm$ 0.0
N	<i>Calliergon giganteum</i>	Giant Spear Moss				S3?	1	4.7 $\pm$ 3.0
N	<i>Physconia detersa</i>	Bottlebrush Frost Lichen				S3S4	2	3.5 $\pm$ 0.0
P	<i>Floerkea proserpinacoides</i>	False Mermaidweed	Not At Risk			S2	2	4.7 $\pm$ 1.0
P	<i>Thuja occidentalis</i>	Eastern White Cedar			Vulnerable	S1	1	3.1 $\pm$ 0.0
P	<i>Hylodesmum glutinosum</i>	Large Tick-trefoil				S1	1	4.9 $\pm$ 7.0
P	<i>Allium tricoccum</i>	Wild Leek				S1	25	0.3 $\pm$ 0.0
P	<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower				S1S2	1	4.9 $\pm$ 7.0
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	1	4.7 $\pm$ 1.0
P	<i>Caulophyllum thalictroides</i>	Blue Cohosh				S2	5	3.6 $\pm$ 0.0
P	<i>Salix pedicellaris</i>	Bog Willow				S2	2	2.4 $\pm$ 0.0
P	<i>Lilium canadense</i>	Canada Lily				S2	1	4.9 $\pm$ 7.0
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill				S3	1	2.6 $\pm$ 2.0
P	<i>Agrimonia gryposepala</i>	Hooked Agrimony				S3	1	4.7 $\pm$ 5.0
P	<i>Amelanchier spicata</i>	Running Serviceberry				S3	1	3.4 $\pm$ 2.0
P	<i>Verbena hastata</i>	Blue Vervain				S3	6	0.3 $\pm$ 0.0
P	<i>Carex lupulina</i>	Hop Sedge				S3	1	3.4 $\pm$ 1.0
P	<i>Elodea canadensis</i>	Canada Waterweed				S3	1	4.8 $\pm$ 0.0
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	1	4.7 $\pm$ 1.0
P	<i>Platanthera hookeri</i>	Hooker's Orchid				S3	1	1.3 $\pm$ 1.0
P	<i>Salix petiolaris</i>	Meadow Willow				S3S4	1	2.3 $\pm$ 0.0
P	<i>Viola sagittata var. ovata</i>	Arrow-Leaved Violet				S3S4	1	5.0 $\pm$ 5.0
P	<i>Equisetum hyemale ssp. affine</i>	Common Scouring-rush				S3S4	4	0.3 $\pm$ 0.0

### 4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	2	2.4 $\pm$ 0.0
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	12	1.3 $\pm$ 1.0
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	7	1.1 $\pm$ 0.0
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Endangered	S2S3B	2	4.9 $\pm$ 7.0
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	1	3.7 $\pm$ 0.0
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Endangered	S3B	1	4.9 $\pm$ 7.0
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	4	1.3 $\pm$ 0.0
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	1	4.9 $\pm$ 7.0
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern			S4S5	1	4.9 $\pm$ 10.0
A	<i>Sialia sialis</i>	Eastern Bluebird	Not At Risk			S3B	2	4.9 $\pm$ 7.0
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S1B	1	4.9 $\pm$ 7.0
A	<i>Toxostoma rufum</i>	Brown Thrasher				S1B	1	4.9 $\pm$ 7.0
A	<i>Vireo gilvus</i>	Warbling Vireo				S1B	2	4.0 $\pm$ 0.0

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Empidonax traillii</i>	Willow Flycatcher				S2B	3	2.9 ± 0.0
A	<i>Piranga olivacea</i>	Scarlet Tanager				S2B	2	2.4 ± 0.0
A	<i>Poocetes gramineus</i>	Vesper Sparrow				S2B	2	3.8 ± 0.0
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S2B	2	4.9 ± 7.0
A	<i>Cathartes aura</i>	Turkey Vulture				S2S3B	1	4.9 ± 7.0
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B	3	2.4 ± 0.0
A	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak				S2S3B	5	2.6 ± 0.0
A	<i>Icterus galbula</i>	Baltimore Oriole				S2S3B	3	4.9 ± 7.0
A	<i>Poecile hudsonicus</i>	Boreal Chickadee				S3	1	4.9 ± 7.0
A	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	3	4.9 ± 7.0
A	<i>Salvelinus fontinalis</i>	Brook Trout				S3	2	4.4 ± 0.0
A	<i>Falco sparverius</i>	American Kestrel				S3B	2	4.9 ± 7.0
A	<i>Charadrius vociferus</i>	Killdeer				S3B	2	4.9 ± 7.0
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3B	5	2.1 ± 0.0
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B	1	4.9 ± 7.0
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3B	5	0.8 ± 0.0
A	<i>Dumetella carolinensis</i>	Gray Catbird				S3B	5	4.3 ± 0.0
A	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	1	4.9 ± 7.0
A	<i>Botaurus lentiginosus</i>	American Bittern				S3S4B	1	3.2 ± 0.0
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B	1	4.9 ± 7.0
A	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	1	5.0 ± 0.0
A	<i>Catharus fuscescens</i>	Veery				S3S4B	15	2.1 ± 0.0
A	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	1	4.9 ± 7.0
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Endangered	S2B	4	2.0 ± 0.0
I	<i>Aglais milberti</i>	Milbert's Tortoiseshell				S2	1	4.7 ± 2.0
I	<i>Euphydryas phaeton</i>	Baltimore Checkerspot				S2S3	1	4.9 ± 0.0
I	<i>Polygona progne</i>	Grey Comma				S3S4	2	3.2 ± 1.0

### 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
<b><i>Glyptemys insculpta</i></b>	<b>Wood Turtle</b>	<b>Threatened</b>	<b>Threatened</b>	<b>YES</b>
<i>Falco peregrinus</i> pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Vulnerable	No
<b><i>Bat hibernaculum</i> or bat species occurrence</b>		<b>[Endangered]<sup>1</sup></b>	<b>[Endangered]<sup>1</sup></b>	<b>YES</b>

<sup>1</sup> *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 AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
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## 5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 69849 records of 164 vertebrate and 2184 records of 79 invertebrate fauna; 17915 records of 337 vascular, 3662 records of 225 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 (including “location-sensitive” species). 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	# recs	Distance (km)	Prov
A	<i>Coregonus huntsmani</i>	Atlantic Whitefish	Endangered	Endangered	Endangered	S1	128	24.2 $\pm$ 1.0	NS
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	696	1.6 $\pm$ 0.0	NS
A	<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	97	10.4 $\pm$ 0.0	NS
A	<i>Perimyotis subflavus</i>	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	192	10.6 $\pm$ 0.0	NS
A	<i>Emydoidea blandingii</i>	Blanding's Turtle - Nova Scotia pop.	Endangered	Endangered	Endangered	S1	9994	48.2 $\pm$ 0.0	NS
A	<i>Salmo salar pop. 1</i>	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered		S1	212	7.4 $\pm$ 0.0	NS
A	<i>Salmo salar pop. 6</i>	Atlantic Salmon - Nova Scotia Southern Upland pop.	Endangered			S1	19	43.9 $\pm$ 1.0	NS
A	<i>Eubalaena glacialis</i>	North Atlantic Right Whale	Endangered	Endangered		S1	1	91.3 $\pm$ 50.0	NS
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	183	40.4 $\pm$ 0.0	NS
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1B	49	21.5 $\pm$ 0.0	NS
A	<i>Morone saxatilis pop. 2</i>	Striped Bass - Bay of Fundy pop.	Endangered			S1B	6	20.9 $\pm$ 1.0	NS
A	<i>Dermochelys coriacea (Atlantic pop.)</i>	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered		S1S2N	4	69.8 $\pm$ 5.0	NS
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	14	11.1 $\pm$ 0.0	NS
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Threatened	Endangered	S1S2B	8	36.5 $\pm$ 7.0	NS
A	<i>Asio flammeus</i>	Short-eared Owl	Threatened	Special Concern		S1S2B	34	28.8 $\pm$ 7.0	NS
A	<i>Limosa haemastica</i>	Hudsonian Godwit	Threatened			S1S2M	164	27.0 $\pm$ 0.0	NS
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2	971	1.0 $\pm$ 0.0	NS
A	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	Threatened			S2	6	35.9 $\pm$ 0.0	NS
A	<i>Anguilla rostrata</i>	American Eel	Threatened			S2	500	12.2 $\pm$ 0.0	NS
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	682	2.4 $\pm$ 0.0	NS
A	<i>Thamnophis sauritus pop. 3</i>	Eastern Ribbonsnake - Atlantic pop.	Threatened	Threatened	Threatened	S2S3	2097	43.2 $\pm$ 0.0	NS
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	2018	1.3 $\pm$ 1.0	NS
A	<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel	Threatened			S3B,S5M	21	78.1 $\pm$ 0.0	NS
A	<i>Tringa flavipes</i>	Lesser Yellowlegs	Threatened			S3M	1314	16.4 $\pm$ 0.0	NS
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	1925	1.1 $\pm$ 0.0	NS
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened		SHB	11	38.7 $\pm$ 7.0	NS
A	<i>Ixobrychus exilis</i>	Least Bittern	Threatened	Threatened		SUB	10	71.5 $\pm$ 0.0	NB
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened		SUB	76	11.8 $\pm$ 0.0	NS
A	<i>Salmo salar pop. 12</i>	Atlantic Salmon - Gaspé - Southern Gulf of St Lawrence pop.	Special Concern			S1	5	85.4 $\pm$ 0.0	NS
A	<i>Bucephala islandica (Eastern pop.)</i>	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	6	22.9 $\pm$ 0.0	NS
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	289	9.2 $\pm$ 0.0	NS
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	519	9.6 $\pm$ 7.0	NS
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	949	5.4 $\pm$ 0.0	NS
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	26	19.3 $\pm$ 1.0	NS
A	<i>Balaenoptera physalus</i>	Fin Whale	Special Concern	Special Concern		S2S3	3	63.1 $\pm$ 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Endangered	S2S3B	1541	4.9 ± 7.0	NS
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	12	46.4 ± 0.0	NS
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	414	3.7 ± 0.0	NS
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Endangered	S3B	914	4.9 ± 7.0	NS
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	1402	1.3 ± 0.0	NS
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	906	4.9 ± 7.0	NS
A	<i>Phocoena phocoena</i>	Harbour Porpoise	Special Concern			S4	19	15.0 ± 6.0	NS
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern	Special Concern		S4N	13	21.6 ± 10.0	NS
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern			S4S5	701	4.9 ± 10.0	NS
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S1	16	61.4 ± 5.0	NB
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1?B	10	75.0 ± 0.0	NS
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1B	49	70.7 ± 0.0	NB
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S1B	78	70.0 ± 0.0	NB
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Vulnerable	S1B,SNAM	407	13.7 ± 0.0	NS
A	<i>Sorex dispar</i>	Long-tailed Shrew	Not At Risk			S2	6	31.1 ± 0.0	NS
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S2?B	3	84.1 ± 0.0	NB
A	<i>Glaucomys volans</i>	Southern Flying Squirrel	Not At Risk			S2S3	15	16.9 ± 0.0	NS
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk			S2S3	1	82.3 ± 0.0	NB
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk			S3	47	20.1 ± 0.0	NS
A	<i>Megaptera novaeangliae</i>	Humpback Whale (NW Atlantic pop.)	Not At Risk			S3	3	15.1 ± 1.0	NS
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B	207	62.3 ± 7.0	NS
A	<i>Sialia sialis</i>	Eastern Bluebird	Not At Risk			S3B	168	4.9 ± 7.0	NS
A	<i>Buteo lagopus</i>	Rough-legged Hawk	Not At Risk			S3N	9	46.5 ± 0.0	NS
A	<i>Accipiter gentilis</i>	Northern Goshawk	Not At Risk			S3S4	139	5.6 ± 7.0	NS
A	<i>Lagenorhynchus acutus</i>	Atlantic White-sided Dolphin	Not At Risk			S3S4	3	72.6 ± 0.0	NS
A	<i>Circus hudsonius</i>	Northern Harrier	Not At Risk			S3S4B	373	6.4 ± 0.0	NS
A	<i>Ammospiza nelsoni</i>	Nelson's Sparrow	Not At Risk			S3S4B	574	5.1 ± 0.0	NS
A	<i>Calidris canutus rufa</i>	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	590	27.0 ± 0.0	NS
A	<i>Morone saxatilis</i>	Striped Bass	E,SC			S2S3	7	16.4 ± 0.0	NS
A	<i>Gadus morhua</i>	Atlantic Cod	E,SC,DD			SNR	1	87.6 ± 0.0	NS
A	<i>Odobenus rosmarus pop. 5</i>	Atlantic Walrus - Nova Scotia-Newfoundland-Gulf of St. Lawrence population (DU3)	X			SX	1	73.2 ± 5.0	NS
A	<i>Martes americana</i>	American Marten			Endangered	S1	21	49.5 ± 0.0	NS
A	<i>Alces americanus</i>	Moose			Endangered	S1	82	19.7 ± 0.0	NS
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S1?	3	65.1 ± 11.0	NB
A	<i>Passerina cyanea</i>	Indigo Bunting				S1?B	55	15.5 ± 7.0	NS
A	<i>Uria aalge</i>	Common Murre				S1?B,S5N	2	89.9 ± 0.0	NB
A	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1B	1	85.3 ± 3.0	NB
A	<i>Anas acuta</i>	Northern Pintail				S1B	93	19.0 ± 7.0	NS
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B	54	71.0 ± 7.0	NS
A	<i>Gallinula galeata</i>	Common Gallinule				S1B	51	44.2 ± 7.0	NS
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S1B	59	9.2 ± 0.0	NS
A	<i>Cistothorus palustris</i>	Marsh Wren				S1B	42	57.5 ± 7.0	NS
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S1B	101	4.9 ± 7.0	NS
A	<i>Toxostoma rufum</i>	Brown Thrasher				S1B	30	4.9 ± 7.0	NS
A	<i>Vireo gilvus</i>	Warbling Vireo				S1B	51	4.0 ± 0.0	NS
A	<i>Setophaga pinus</i>	Pine Warbler				S1B	62	9.2 ± 0.0	NS
A	<i>Calidris minutilla</i>	Least Sandpiper				S1B,S3M	1302	16.4 ± 0.0	NS
A	<i>Charadrius semipalmatus</i>	Semipalmated Plover				S1B,S3S4M	1896	16.4 ± 0.0	NS
A	<i>Vespertilionidae sp.</i>	bat species				S1S2	403	3.5 ± 0.0	NS
A	<i>Lasiurus borealis</i>	Eastern Red Bat				S1S2B,S1M	8	31.4 ± 0.0	NS
A	<i>Lasiurus cinereus</i>	Hoary Bat				S1S2B,S1M	65	10.6 ± 0.0	NS
A	<i>Pluvialis dominica</i>	American Golden-Plover				S1S2M	205	26.9 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Vireo philadelphicus</i>	Philadelphia Vireo				S2?B	86	32.8 ± 0.0	NS
A	<i>Spatula clypeata</i>	Northern Shoveler				S2B	253	15.6 ± 7.0	NS
A	<i>Mareca strepera</i>	Gadwall				S2B	325	16.3 ± 0.0	NS
A	<i>Empidonax traillii</i>	Willow Flycatcher				S2B	73	2.9 ± 0.0	NS
A	<i>Setophaga tigrina</i>	Cape May Warbler				S2B	187	25.8 ± 0.0	NS
A	<i>Piranga olivacea</i>	Scarlet Tanager				S2B	68	2.4 ± 0.0	NS
A	<i>Poocetes gramineus</i>	Vesper Sparrow				S2B	91	3.8 ± 0.0	NS
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S2B	274	4.9 ± 7.0	NS
A	<i>Alca torda</i>	Razorbill				S2B,S4N	17	89.6 ± 7.0	NS
A	<i>Bucephala clangula</i>	Common Goldeneye				S2B,S5N	84	10.0 ± 7.0	NS
A	<i>Branta bernicla</i>	Brant				S2M	18	25.1 ± 0.0	NS
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2S3	33	19.8 ± 14.0	NS
A	<i>Asio otus</i>	Long-eared Owl				S2S3	29	28.8 ± 7.0	NS
A	<i>Spinus pinus</i>	Pine Siskin				S2S3	648	5.6 ± 7.0	NS
A	<i>Cathartes aura</i>	Turkey Vulture				S2S3B	198	4.9 ± 7.0	NS
A	<i>Rallus limicola</i>	Virginia Rail				S2S3B	154	22.2 ± 7.0	NS
A	<i>Tringa semipalmata</i>	Willet				S2S3B	780	14.7 ± 0.0	NS
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B	417	2.4 ± 0.0	NS
A	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak				S2S3B	700	2.6 ± 0.0	NS
A	<i>Icterus galbula</i>	Baltimore Oriole				S2S3B	110	4.9 ± 7.0	NS
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2S3B,S5N	118	11.0 ± 0.0	NS
A	<i>Numerius phaeopus hudsonicus</i>	Hudsonian Whimbrel				S2S3M	144	32.1 ± 0.0	NS
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S2S3M	367	16.4 ± 0.0	NS
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S2S3M	4	65.1 ± 11.0	NB
A	<i>Perisoreus canadensis</i>	Canada Jay				S3	577	5.6 ± 7.0	NS
A	<i>Poecile hudsonicus</i>	Boreal Chickadee				S3	512	4.9 ± 7.0	NS
A	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	2033	4.9 ± 7.0	NS
A	<i>Alosa pseudoharengus</i>	Alewife				S3	12	24.7 ± 0.0	NS
A	<i>Salvelinus fontinalis</i>	Brook Trout				S3	101	4.4 ± 0.0	NS
A	<i>Salvelinus namaycush</i>	Lake Trout				S3	1	90.4 ± 0.0	NB
A	<i>Menidia menidia</i>	Atlantic Silverside				S3	2	26.9 ± 0.0	NS
A	<i>Sorex maritimensis</i>	Maritime Shrew				S3	1	62.6 ± 0.0	NS
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3	22	31.1 ± 0.0	NS
A	<i>Pekania pennanti</i>	Fisher				S3	13	25.9 ± 0.0	NS
A	<i>Calidris maritima</i>	Purple Sandpiper				S3?N	202	21.6 ± 10.0	NS
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S3?N	9	64.5 ± 1.0	NB
A	<i>Falco sparverius</i>	American Kestrel				S3B	398	4.9 ± 7.0	NS
A	<i>Charadrius vociferus</i>	Killdeer				S3B	739	4.9 ± 7.0	NS
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3B	923	2.1 ± 0.0	NS
A	<i>Sterna paradisaea</i>	Arctic Tern				S3B	44	65.1 ± 11.0	NB
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B	70	4.9 ± 7.0	NS
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3B	387	0.8 ± 0.0	NS
A	<i>Dumetella carolinensis</i>	Gray Catbird				S3B	792	4.3 ± 0.0	NS
A	<i>Cardellina pusilla</i>	Wilson's Warbler				S3B	156	6.9 ± 0.0	NS
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S3B,S3S4M	2211	16.4 ± 0.0	NS
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S3B,S5N	9	32.0 ± 0.0	NS
A	<i>Fratercula arctica</i>	Atlantic Puffin				S3B,S5N	23	65.1 ± 11.0	NB
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3M	1988	27.0 ± 0.0	NS
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	624	27.0 ± 0.0	NS
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3M	2242	16.4 ± 0.0	NS
A	<i>Calidris fuscicollis</i>	White-rumped Sandpiper				S3M	1014	27.0 ± 0.0	NS
A	<i>Limnodromus griseus</i>	Short-billed Dowitcher				S3M	1362	16.4 ± 0.0	NS
A	<i>Calidris alba</i>	Sanderling				S3M,S2N	1542	27.0 ± 0.0	NS
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S3N	2	73.8 ± 0.0	NB
A	<i>Somateria mollissima</i>	Common Eider				S3S4	356	12.5 ± 7.0	NS
A	<i>Picoides arcticus</i>	Black-backed Woodpecker				S3S4	107	17.6 ± 7.0	NS
A	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	299	4.9 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Sorex palustris</i>	American Water Shrew				S3S4	1	97.3 ± 1.0	NB
A	<i>Botaurus lentiginosus</i>	American Bittern				S3S4B	606	3.2 ± 0.0	NS
A	<i>Spatula discors</i>	Blue-winged Teal				S3S4B	337	16.4 ± 0.0	NS
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B	831	4.9 ± 7.0	NS
A	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher				S3S4B	762	5.6 ± 7.0	NS
A	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	1708	5.0 ± 0.0	NS
A	<i>Catharus fuscescens</i>	Veery				S3S4B	1465	2.1 ± 0.0	NS
A	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	2245	4.9 ± 7.0	NS
A	<i>Oreothlypis peregrina</i>	Tennessee Warbler				S3S4B	412	9.6 ± 7.0	NS
A	<i>Setophaga castanea</i>	Bay-breasted Warbler				S3S4B	594	6.3 ± 0.0	NS
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3S4B	89	16.4 ± 0.0	NS
A	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B	78	5.6 ± 7.0	NS
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3S4B,S5N	109	9.6 ± 7.0	NS
A	<i>Bucephala albeola</i>	Bufflehead				S3S4N	75	16.4 ± 0.0	NS
A	<i>Lanius borealis</i>	Northern Shrike				S3S4N	36	46.1 ± 0.0	NS
A	<i>Leucophaeus atricilla</i>	Laughing Gull				SHB	7	70.7 ± 0.0	NS
A	<i>Progne subis</i>	Purple Martin				SHB	38	39.2 ± 7.0	NS
A	<i>Eremophila alpestris</i>	Horned Lark				SHB,S4S5N	28	11.8 ± 0.0	NS
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	29	31.9 ± 0.0	NS
A	<i>Aythya americana</i>	Redhead				SHB,SNAM	4	92.9 ± 7.0	NS
I	<i>Bombus (Psithyrus) bohemicus</i>	Gypsy Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	26	9.1 ± 1.0	NS
I	<i>Epeoloides pilosula</i>	Macropis Cuckoo Bee	Endangered	Endangered	Endangered	S1	2	31.5 ± 5.0	NS
I	<i>Gomphus ventricosus</i>	Skillet Clubtail	Endangered	Endangered		S1	2	67.5 ± 1.0	NS
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Endangered	S2B	547	2.0 ± 0.0	NS
I	<i>Danaus plexippus plexippus</i>	Monarch	Endangered	Special Concern		S2B	2	32.8 ± 0.0	NS
I	<i>Barnea truncata</i>	Atlantic Mud-piddock	Threatened	Threatened		S1	1	81.2 ± 1.0	NS
I	<i>Bombus suckleyi</i>	Suckley's Cuckoo Bumble Bee	Threatened			SNR	1	91.3 ± 5.0	NS
I	<i>Alasmidonta varicosa</i>	Brook Floater	Special Concern	Special Concern	Threatened	S1S2	3	67.9 ± 0.0	NS
I	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern	Special Concern	Vulnerable	S3	178	9.6 ± 40.0	NS
I	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle	Special Concern		Endangered	SH	4	32.0 ± 2.0	NS
I	<i>Cicindela formosa</i>	Big Sand Tiger Beetle				S1	1	17.2 ± 1.0	NS
I	<i>Satyrium acadica</i>	Acadian Hairstreak				S1	5	68.3 ± 2.0	NS
I	<i>Erora laeta</i>	Early Hairstreak				S1	3	95.2 ± 1.0	NS
I	<i>Ophiogomphus anomalus</i>	Extra-Striped Snaketail				S1	8	90.7 ± 0.0	NS
I	<i>Somatochlora brevicincta</i>	Quebec Emerald				S1	1	73.2 ± 1.0	NS
I	<i>Leptodea ochracea</i>	Tidewater Mucket				S1	11	58.1 ± 1.0	NS
I	<i>Strophitus undulatus</i>	Creeper				S1	6	96.4 ± 1.0	NS
I	<i>Chlosyne nycteis</i>	Silvery Checkerspot				S1?	4	77.8 ± 2.0	NS
I	<i>Polygonia comma</i>	Eastern Comma				S1?	21	12.0 ± 0.0	NS
I	<i>Polygonia satyrus</i>	Satyr Comma				S1?	12	44.9 ± 2.0	NS
I	<i>Strymon melinus</i>	Grey Hairstreak				S1S2	18	8.9 ± 2.0	NS
I	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S1S2	28	60.8 ± 0.0	NB
I	<i>Somatochlora kennedyi</i>	Kennedy's Emerald				S1S2	3	67.5 ± 1.0	NS
I	<i>Coenagrion resolutum</i>	Taiga Bluet				S1S2	13	63.2 ± 0.0	NB
I	<i>Stylurus scudderii</i>	Zebra Clubtail				S1S2	8	9.3 ± 0.0	NS
I	<i>Lycaena hyllus</i>	Bronze Copper				S2	62	15.9 ± 1.0	NS
I	<i>Satyrium calanus</i>	Banded Hairstreak				S2	59	9.2 ± 1.0	NS
I	<i>Boloria chariclea</i>	Arctic Fritillary				S2	9	44.9 ± 2.0	NS
I	<i>Aglais milberti</i>	Milbert's Tortoiseshell				S2	21	4.7 ± 2.0	NS
I	<i>Aglais milberti milberti</i>	Milbert's Tortoise Shell				S2	2	75.0 ± 0.0	NB
I	<i>Epitheca princeps</i>	Prince Baskettail				S2	24	61.3 ± 1.0	NS
I	<i>Somatochlora williamsoni</i>	Williamson's Emerald				S2	5	63.3 ± 0.0	NB
I	<i>Williamsonia fletcheri</i>	Ebony Boghaunter				S2	2	72.7 ± 0.0	NS
I	<i>Enallagma signatum</i>	Orange Bluet				S2	14	63.8 ± 0.0	NS
I	<i>Margaritifera margaritifera</i>	Eastern Pearlshell				S2	58	65.9 ± 0.0	NS



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	<i>Pantala hymenaea</i>	Spot-Winged Glider				S2?B	5	61.8 ± 0.0	NB
	<i>Thorybes pylades</i>	Northern Cloudywing				S2S3	3	77.9 ± 0.0	NB
	<i>Amblyscirtes hegon</i>	Pepper and Salt Skipper				S2S3	23	25.2 ± 2.0	NS
	<i>Satyrium liparops</i>	Striped Hairstreak				S2S3	26	9.0 ± 0.0	NS
	<i>Euphydryas phaeton</i>	Baltimore Checkerspot				S2S3	26	4.9 ± 0.0	NS
	<i>Gomphus descriptus</i>	Harpoon Clubtail				S2S3	2	98.1 ± 0.0	NS
	<i>Ophiogomphus aspersus</i>	Brook Snaketail				S2S3	9	52.7 ± 0.0	NS
	<i>Ophiogomphus mainensis</i>	Maine Snaketail				S2S3	12	60.4 ± 1.0	NS
	<i>Ophiogomphus rupinulensis</i>	Rusty Snaketail				S2S3	30	52.7 ± 0.0	NS
	<i>Somatochlora forcipata</i>	Forcinate Emerald				S2S3	8	45.0 ± 0.0	NS
	<i>Somatochlora franklini</i>	Delicate Emerald				S2S3	5	46.8 ± 0.0	NS
	<i>Erythrodixys berenice</i>	Seaside Dragonlet				S2S3	1	72.5 ± 0.0	NS
	<i>Enallagma vesperum</i>	Vesper Bluet				S2S3	20	40.2 ± 0.0	NS
	<i>Alasmidonta undulata</i>	Triangle Floater				S2S3	19	50.3 ± 0.0	NS
	<i>Strophiona nitens</i>	a Longhorned Beetle				S3	2	86.9 ± 0.0	NS
	<i>Hippodamia parenthesis</i>	Parenthesis Lady Beetle				S3	4	60.1 ± 0.0	NS
	<i>Naemia seriata</i>	a Ladybird beetle				S3	26	13.8 ± 0.0	NS
	<i>Chilocorus stigma</i>	Twice-stabbed Lady Beetle				S3	10	62.2 ± 0.0	NS
	<i>Myzia pullata</i>	Streaked Lady Beetle				S3	2	63.1 ± 0.0	NB
	<i>Trachysida aspera</i>	a Longhorned Beetle				S3	2	68.6 ± 0.0	NB
	<i>Dicerca tenebrosa</i>	Dark Jewel Beetle				S3	2	46.8 ± 0.0	NS
	<i>Astylopsis sexguttata</i>	A Longhorned Beetle				S3	1	89.1 ± 0.0	NS
	<i>Callophrys henrici</i>	Henry's Elfin				S3	46	12.5 ± 2.0	NS
	<i>Callophrys lanoraieensis</i>	Bog Elfin				S3	20	24.9 ± 0.0	NS
	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	34	6.8 ± 0.0	NS
	<i>Polygonia faunus</i>	Green Comma				S3	26	33.7 ± 1.0	NS
	<i>Megisto cymela</i>	Little Wood-satyr				S3	17	14.0 ± 0.0	NS
	<i>Oeneis jutta</i>	Jutta Arctic				S3	23	43.2 ± 0.0	NS
	<i>Aeshna clepsydra</i>	Mottled Darner				S3	24	21.0 ± 1.0	NS
	<i>Aeshna constricta</i>	Lance-Tipped Darner				S3	22	12.1 ± 0.0	NS
	<i>Boyeria grafiana</i>	Ocellated Darner				S3	17	7.0 ± 0.0	NS
	<i>Gomphaeschna furcillata</i>	Harlequin Darner				S3	23	47.9 ± 0.0	NS
	<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald				S3	18	42.9 ± 0.0	NS
	<i>Nannothemis bella</i>	Elfin Skimmer				S3	19	24.6 ± 0.0	NS
	<i>Sympetrum danae</i>	Black Meadowhawk				S3	1	76.9 ± 0.0	NS
	<i>Enallagma vernale</i>	Vernal Bluet				S3	4	66.0 ± 1.0	NS
	<i>Amphiagrion saucium</i>	Eastern Red Damsel				S3	8	64.7 ± 0.0	NB
	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3?	26	13.7 ± 0.0	NS
	<i>Polygonia interrogationis</i>	Question Mark				S3B	199	6.8 ± 0.0	NS
	<i>Erynnis juvenalis</i>	Juvenal's Duskywing				S3S4	128	8.9 ± 0.0	NS
	<i>Amblyscirtes vialis</i>	Common Roadside-Skipper				S3S4	42	33.7 ± 1.0	NS
	<i>Polygonia progne</i>	Grey Comma				S3S4	50	3.2 ± 1.0	NS
	<i>Lanthus parvulus</i>	Northern Pygmy Clubtail				S3S4	16	63.3 ± 0.0	NB
	<i>Lampsilis radiata</i>	Eastern Lamprussel				S3S4	19	58.1 ± 1.0	NS
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	15	40.4 ± 0.0	NS
N	<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1S2	5	38.3 ± 1.0	NS
N	<i>Peltigera hydrothyria</i>	Eastern Waterfan	Threatened	Threatened	Threatened	S1	789	41.9 ± 0.0	NS
N	<i>Pannaria lurida</i>	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S1S2	162	14.4 ± 0.0	NS
N	<i>Fuscopannaria leucosticta</i>	White-rimmed Shingle Lichen	Threatened			S2S3	48	45.9 ± 0.0	NS
N	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened	Threatened	Threatened	S3	99	22.2 ± 0.0	NS
N	<i>Sclerophora peronella</i> (Atlantic pop.)	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S1?	16	29.0 ± 3.0	NS
N	<i>Pectenium plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	265	34.8 ± 1.0	NS
N	<i>Fissidens exilis</i>	Pygmy Pocket Moss	Not At Risk			S1S2	14	29.9 ± 0.0	NS
N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk			S2S3	25	35.8 ± 1.0	NS
N	<i>Aloina brevirostris</i>	Short-Beaked Rigid Screw				S1	1	53.0 ± 2.0	NS

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N	<i>Orthotrichum pallens</i>	Moss Pale Bristle Moss				S1	1	84.8 ± 0.0	NS
N	<i>Umbilicaria vellea</i>	Grizzled Rocktripe Lichen				S1	2	60.6 ± 1.0	NB
N	<i>Usnea perplexans</i>	Powdered Beard Lichen				S1	1	42.8 ± 0.0	NS
N	<i>Leptogium azureum</i>	Blue Jellyskin Lichen				S1	1	21.2 ± 1.0	NS
N	<i>Scytinium dactylinum</i>	Brown-buttoned Jellyskin Lichen				S1	2	19.2 ± 0.0	NS
N	<i>Lathagrium cristatum</i>	Fingered Jelly Lichen				S1	6	47.9 ± 0.0	NS
N	<i>Ephebe hispidula</i>	Dryside Rockshag Lichen				S1	1	42.0 ± 0.0	NS
N	<i>Ephebe perspinulosa</i>	Thread Lichen				S1	2	19.0 ± 1.0	NS
N	<i>Euopsis granatina</i>	Lesser Rockbud Lichen				S1	1	44.0 ± 1.0	NS
N	<i>Fuscopannaria praetermissa</i>	Moss Shingles Lichen				S1	1	47.4 ± 0.0	NS
N	<i>Scytinium schraderi</i>	Wrinkled Jellyskin Lichen				S1	1	94.1 ± 0.0	NS
N	<i>Parmotrema perforatum</i>	Perforated Ruffle Lichen				S1	4	86.3 ± 0.0	NS
N	<i>Pseudevernia consocians</i>	Common Antler Lichen				S1	1	83.1 ± 0.0	NS
N	<i>Spilonema revertens</i>	Rock Hairball Lichen				S1	4	49.9 ± 0.0	NS
N	<i>Lathagrium fuscovirens</i>	Crumpled Rock Tarpaper Lichen				S1	1	43.3 ± 0.0	NS
N	<i>Leptogium hibernicum</i>	Hibernia Jellyskin Lichen				S1	12	55.5 ± 0.0	NS
N	<i>Peltigera lepidophora</i>	Scaly Pelt Lichen				S1	5	35.8 ± 0.0	NS
N	<i>Hypogymnia hultenii</i>	Powdered Honeycomb Lichen				S1	3	80.5 ± 0.0	NS
N	<i>Calyptogeia neogaea</i>	Common Pouchwort				S1?	1	62.9 ± 0.0	NS
N	<i>Moerckia hibernica</i>	Irish Ruffwort				S1?	1	54.5 ± 0.0	NS
N	<i>Aloina rigida</i>	Aloe-Like Rigid Screw Moss				S1?	4	51.6 ± 0.0	NS
N	<i>Imbriobryum muehlenbeckii</i>	Muehlenbeck's Bryum Moss				S1?	2	34.0 ± 0.0	NS
N	<i>Conardia compacta</i>	Coast Creeping Moss				S1?	2	59.9 ± 1.0	NB
N	<i>Tortula obtusifolia</i>	a Moss				S1?	1	73.3 ± 0.0	NB
N	<i>Didymodon tophaceus</i>	Olive Beard Moss				S1?	1	54.2 ± 0.0	NS
N	<i>Grimmia anodon</i>	Toothless Grimmia Moss				S1?	2	85.3 ± 3.0	NS
N	<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss				S1?	1	86.8 ± 5.0	NS
N	<i>Meesia triquetra</i>	Three-ranked Cold Moss				S1?	1	81.0 ± 0.0	NS
N	<i>Paludella squarrosa</i>	Tufted Fen Moss				S1?	3	57.4 ± 0.0	NS
N	<i>Physcomitrium immersum</i>	a Moss				S1?	1	24.8 ± 0.0	NS
N	<i>Schistostega pennata</i>	Luminous Moss				S1?	1	65.7 ± 0.0	NS
N	<i>Timmia norvegica</i>	a moss				S1?	3	60.0 ± 0.0	NB
N	<i>Syntrichia ruralis</i>	a Moss				S1?	2	93.5 ± 0.0	NS
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss				S1?	1	13.9 ± 3.0	NS
N	<i>Plagiomnium ellipticum</i>	Marsh Leafy Moss				S1?	1	22.8 ± 0.0	NS
N	<i>Blennothallia crispa</i>	Crinkled Jelly Lichen				S1?	1	54.1 ± 0.0	NS
N	<i>Polychidium muscicola</i>	Eyed Mossthorns Woollybear Lichen				S1?	6	29.7 ± 0.0	NS
N	<i>Parmeliella parvula</i>	Poor-man's Shingles Lichen				S1?	1	80.7 ± 0.0	NS
N	<i>Arrhenopterum heterostichum</i>	One-sided Groove Moss				S1S2	3	53.0 ± 2.0	NS
N	<i>Brachythecium turgidum</i>	Thick Ragged Moss				S1S2	3	13.9 ± 3.0	NS
N	<i>Dicranoweisia crispula</i>	Mountain Thatch Moss				S1S2	1	65.5 ± 0.0	NB
N	<i>Didymodon rigidulus</i>	Rigid Screw Moss				S1S2	10	60.0 ± 0.0	NB
N	<i>Didymodon ferrugineus</i>	Rusty Beard Moss				S1S2	1	60.3 ± 0.0	NB
N	<i>Hygrohypnum montanum</i>	a Moss				S1S2	2	68.6 ± 1.0	NB
N	<i>Hypnum pratense</i>	Meadow Plait Moss				S1S2	1	4.7 ± 3.0	NS
N	<i>Mnium thomsonii</i>	Thomson's Leafy Moss				S1S2	1	47.7 ± 2.0	NS
N	<i>Tortula acaulon</i>	Cuspidate Earth Moss				S1S2	1	7.3 ± 2.0	NS
N	<i>Plagiothecium latebricola</i>	Alder Silk Moss				S1S2	3	61.1 ± 1.0	NB
N	<i>Platydictya confervoides</i>	a Moss				S1S2	1	48.8 ± 0.0	NS
N	<i>Seligeria calcarea</i>	Chalk Brittle Moss				S1S2	2	73.5 ± 0.0	NB
N	<i>Sematophyllum demissum</i>	a Moss				S1S2	2	55.3 ± 1.0	NS
N	<i>Sphagnum platyphyllum</i>	Flat-leaved Peat Moss				S1S2	3	31.6 ± 0.0	NS

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N	<i>Tetradontium brownianum</i>	Little Georgia				S1S2	8	60.3 ± 0.0	NB
N	<i>Timmia megapolitana</i>	Metropolitan Timmia Moss				S1S2	2	63.3 ± 1.0	NS
N	<i>Tortula mucronifolia</i>	Mucronate Screw Moss				S1S2	2	38.2 ± 3.0	NS
N	<i>Cyrto-hypnum minutulum</i>	Tiny Cedar Moss				S1S2	1	84.3 ± 0.0	NS
N	<i>Hamatocaulis vernicosus</i>	a Moss				S1S2	3	81.2 ± 0.0	NS
N	<i>Haplocladium microphyllum</i>	Tiny-leaved Haplocladium Moss				S1S2	2	60.3 ± 3.0	NS
N	<i>Enchylium bachmanianum</i>	Bachman's Jelly Lichen				S1S2	1	48.0 ± 0.0	NS
N	<i>Cladonia sulphurina</i>	Greater Sulphur-cup Lichen				S1S2	5	70.4 ± 0.0	NB
N	<i>Peltigera ponojensis</i>	Pale-bellied Pelt Lichen				S1S2	3	62.5 ± 1.0	NB
N	<i>Pilophorus cereolus</i>	Powdered Matchstick Lichen				S1S2	3	73.9 ± 3.0	NS
N	<i>Rhizoplaca subdiscrepans</i>	Scattered Rock-posy Lichen				S1S2	1	73.9 ± 1.0	NS
N	<i>Sticta limbata</i>	Powdered Moon Lichen				S1S2	12	37.7 ± 2.0	NS
N	<i>Candelaria concolor</i>	Elfin Candleflame Lichen				S1S2	5	63.2 ± 0.0	NB
N	<i>Peltigera malacea</i>	Veinless Pelt Lichen				S1S2	1	66.2 ± 1.0	NB
N	<i>Porella pinnata</i>	Pinnate Scalewort				S1S3	1	83.8 ± 0.0	NS
N	<i>Umbilicaria polyrhiza</i>	Ballpoint Rocktripe Lichen				S1S3	1	98.6 ± 0.0	NS
N	<i>Heterodermia galactophylla</i>	Branching Fringe Lichen				S1S3	1	74.4 ± 0.0	NS
N	<i>Melanelia culbersonii</i>	Appalachian Camouflage Lichen				S1S3	1	73.4 ± 0.0	NS
N	<i>Peltigera neckeri</i>	Black-saddle Pelt Lichen				S1S3	1	68.5 ± 5.0	NB
N	<i>Usnea chaetophora</i>	Articulated Beard Lichen				S1S3	1	36.0 ± 0.0	NS
N	<i>Stereocaulon intermedium</i>	Pacific Brain Foam Lichen				S1S3	10	24.8 ± 0.0	NS
N	<i>Cystocoleus ebeneus</i>	Rockgossamer Lichen				S2	4	44.0 ± 0.0	NS
N	<i>Nephroma resupinatum</i>	a lichen				S2	10	19.1 ± 0.0	NS
N	<i>Parmotrema reticulatum</i>	Netted Ruffle Lichen				S2	9	32.0 ± 0.0	NS
N	<i>Riccardia multifida</i>	Delicate Germanderwort				S2?	1	72.8 ± 0.0	NB
N	<i>Anacamptodon splachnoides</i>	a Moss				S2?	3	64.6 ± 3.0	NS
N	<i>Anomodon viticulosus</i>	a Moss				S2?	1	95.1 ± 0.0	NB
N	<i>Weissia muhlenbergiana</i>	a Moss				S2?	5	4.7 ± 3.0	NS
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S2?	7	80.8 ± 0.0	NS
N	<i>Ptychostomum pendulum</i>	Drooping Bryum				S2?	1	53.0 ± 2.0	NS
N	<i>Drepanocladus polygamus</i>	Polygamous Hook Moss				S2?	5	53.8 ± 0.0	NS
N	<i>Pseudocampyllum radicale</i>	Long-stalked Fine Wet Moss				S2?	3	4.7 ± 3.0	NS
N	<i>Climacium americanum</i>	American Tree Moss				S2?	9	79.9 ± 0.0	NS
N	<i>Dicranum condensatum</i>	Condensed Broom Moss				S2?	6	4.7 ± 3.0	NS
N	<i>Ditrichum rhynchostegium</i>	a Moss				S2?	6	81.9 ± 1.0	NS
N	<i>Fissidens bushii</i>	Bush's Pocket Moss				S2?	5	31.2 ± 0.0	NS
N	<i>Fissidens taxifolius</i>	Yew-leaved Pocket Moss				S2?	7	45.2 ± 5.0	NS
N	<i>Fontinalis hypnoides</i>	a moss				S2?	1	84.6 ± 0.0	NS
N	<i>Fontinalis sullivantii</i>	Sullivant's Water Moss				S2?	3	75.3 ± 0.0	NS
N	<i>Grimmia olneyi</i>	a Moss				S2?	10	79.8 ± 0.0	NS
N	<i>Grimmia anomala</i>	Mountain Forest Grimmia				S2?	1	60.6 ± 1.0	NS
N	<i>Hygrohypnum bestii</i>	Best's Brook Moss				S2?	6	30.7 ± 0.0	NS
N	<i>Orthotrichum anomalum</i>	Anomalous Bristle Moss				S2?	5	43.7 ± 2.0	NS
N	<i>Philonotis marchica</i>	a Moss				S2?	1	79.9 ± 0.0	NS
N	<i>Physcomitrium collenchymatum</i>	a Moss				S2?	1	13.9 ± 0.0	NS
N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2?	3	60.3 ± 0.0	NB
N	<i>Racomitrium affine</i>	a Moss				S2?	3	71.1 ± 2.0	NS
N	<i>Rhytidium rugosum</i>	Wrinkle-leaved Moss				S2?	2	60.1 ± 1.0	NB
N	<i>Saelania glaucescens</i>	Blue Dew Moss				S2?	2	65.5 ± 0.0	NB
N	<i>Seligeria donniana</i>	Donian Beardless Moss				S2?	1	91.3 ± 3.0	NS
N	<i>Sematophyllum marylandicum</i>	a Moss				S2?	3	80.0 ± 0.0	NS
N	<i>Sphagnum subnitens</i>	Lustrous Peat Moss				S2?	4	91.3 ± 0.0	NS
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen				S2?	5	41.2 ± 0.0	NS

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N	<i>Tortella fragilis</i>	Moss				S2?	1	60.0 ± 0.0	NB
N	<i>Anomobryum julaceum</i>	Fragile Twisted Moss				S2?	4	60.1 ± 1.0	NB
N	<i>Plagiomnium rostratum</i>	Slender Silver Moss				S2?	10	13.6 ± 2.0	NS
N	<i>Pseudotaxiphyllum distichaceum</i>	Long-beaked Leafy Moss				S2?	2	56.7 ± 4.0	NS
N	<i>Rauveliella scita</i>	a Moss				S2?	16	79.7 ± 0.0	NS
N	<i>Cyrtomnium hymenophylloides</i>	Smaller Fern Moss				S2?	8	60.0 ± 0.0	NB
N	<i>Platylomella lescurii</i>	Short-pointed Lantern Moss				S2?	9	55.3 ± 1.0	NS
N	<i>Phyllicium demangeonii</i>	a Moss				S2?	5	42.5 ± 0.0	NS
N	<i>Usnea flavocardia</i>	Black Rock-wafer Lichen				S2?	1	85.6 ± 4.0	NS
N	<i>Scytinium teretiusculum</i>	Blood-splattered Beard Lichen				S2?	17	8.3 ± 0.0	NS
N	<i>Rostania occultata</i>	Curly Jellyskin Lichen				S2?	7	10.8 ± 0.0	NS
N	<i>Scytinium imbricatum</i>	Crusted Tarpaper Lichen				S2?	2	54.6 ± 0.0	NB
N	<i>Nephroma arcticum</i>	Scaly Jellyskin Lichen				S2?	2	46.1 ± 0.0	NS
N	<i>Placynthium flabelliforme</i>	Arctic Kidney Lichen				S2?	7	29.7 ± 0.0	NS
N	<i>Peltigera collina</i>	Scaly Ink Lichen				S2?	5	6.9 ± 0.0	NS
N	<i>Ephemerum serratum</i>	Tree Pelt Lichen				S2S3	6	13.9 ± 0.0	NS
N	<i>Oxyrrhynchium hians</i>	a Moss				S2S3	7	31.8 ± 5.0	NS
N	<i>Platydictya subtilis</i>	Light Beaked Moss				S2S3	5	23.8 ± 0.0	NS
N	<i>Tortula truncata</i>	Bark Willow Moss				S2S3	10	4.7 ± 3.0	NS
N	<i>Scorpidium revolvens</i>	a Moss				S2S3	2	57.4 ± 0.0	NS
N	<i>Collema leptaleum</i>	Limprichtia Moss				S2S3	61	9.4 ± 0.0	NS
N	<i>Solorina saccata</i>	Crumpled Bat's Wing Lichen				S2S3	15	47.7 ± 0.0	NS
N	<i>Ahtiana aurescens</i>	Woodland Owl Lichen				S2S3	20	42.4 ± 2.0	NS
N	<i>Usnocetraria oakesiana</i>	Eastern Candlewax Lichen				S2S3	16	14.3 ± 0.0	NS
N	<i>Cladonia incrassata</i>	Yellow Band Lichen				S2S3	1	95.1 ± 3.0	NS
N	<i>Cladonia mateocyatha</i>	Powder-foot British Soldiers Lichen				S2S3	4	22.5 ± 1.0	NS
N	<i>Cladonia parasitica</i>	Mixed-up Pixie-cup				S2S3	3	37.9 ± 1.0	NS
N	<i>Hypotrachyna catawbiensis</i>	Fence-rail Lichen				S2S3	20	29.1 ± 0.0	NS
N	<i>Leptogium milligranum</i>	Powder-tipped Antler Lichen				S2S3	15	19.8 ± 0.0	NS
N	<i>Scytinium tenuissimum</i>	Stretched Jellyskin Lichen				S2S3	6	48.9 ± 0.0	NS
N	<i>Melanohalea septentrionalis</i>	Birdnest Jellyskin Lichen				S2S3	3	43.3 ± 0.0	NS
N	<i>Myelochroa aurulenta</i>	Northern Camouflage Lichen				S2S3	6	23.4 ± 2.0	NS
N	<i>Parmelia fertilis</i>	Powdery Axil-bristle Lichen				S2S3	4	34.8 ± 0.0	NS
N	<i>Hypotrachyna minarum</i>	Fertile Shield Lichen				S2S3	5	36.1 ± 1.0	NS
N	<i>Parmeliopsis ambigua</i>	Hairless-spined Shield Lichen				S2S3	3	22.2 ± 2.0	NS
N	<i>Racodium rupestre</i>	Green Starburst Lichen				S2S3	3	80.6 ± 0.0	NS
N	<i>Umbilicaria polyphylla</i>	Rockhair Lichen				S2S3	1	22.2 ± 2.0	NS
N	<i>Usnea cavernosa</i>	Petalled Rocktripe Lichen				S2S3	2	42.4 ± 2.0	NS
N	<i>Usnea ceratina</i>	Pitted Beard Lichen				S2S3	3	37.2 ± 0.0	NS
N	<i>Usnea mutabilis</i>	Warty Beard Lichen				S2S3	1	42.7 ± 0.0	NS
N	<i>Usnea rubicunda</i>	Bloody Beard Lichen				S2S3	4	42.8 ± 0.0	NS
N	<i>Stereocaulon condensatum</i>	Red Beard Lichen				S2S3	10	3.7 ± 0.0	NS
N	<i>Stereocaulon subcoralloides</i>	Granular Soil Foam Lichen				S2S3	1	61.3 ± 1.0	NB
N	<i>Hypotrachyna revoluta</i>	Coralloid Foam Lichen				S2S3	1	38.0 ± 2.0	NS
N	<i>Cetraria arenaria</i>	Granulating Loop Lichen				S2S3	17	16.9 ± 0.0	NS
N	<i>Cladonia coccifera</i>	Sand-loving Icelandmoss Lichen				S2S3	2	24.8 ± 0.0	NS
N	<i>Cladonia deformis</i>	Eastern Boreal Pixie-cup Lichen				S2S3	11	27.1 ± 3.0	NS
N	<i>Cladonia phyllophora</i>	Lesser Sulphur-cup Lichen				S2S3	2	10.8 ± 4.0	NS
N	<i>Hypotrachyna afrorevoluta</i>	Felt Lichen				S2S3	3	36.1 ± 1.0	NS
N		Pustulate Revolute Loop Lichen				S2S3			
N		Lichen							



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N	<i>Usnea flammaea</i>	Coastal Bushy Beard Lichen				S2S3	1	40.5 ± 0.0	NS
N	<i>Ramalina thrausta</i>	Angelhair Ramalina Lichen				S3	12	38.6 ± 1.0	NS
N	<i>Enchylium tenax</i>	Soil Tarpaper Lichen				S3	6	32.8 ± 0.0	NS
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	30	10.6 ± 0.0	NS
N	<i>Sticta fuliginosa</i>	Peppered Moon Lichen				S3	52	21.5 ± 0.0	NS
N	<i>Scytinium subtile</i>	Appressed Jellyskin Lichen				S3	18	10.1 ± 0.0	NS
N	<i>Fuscopannaria ahlneri</i>	Corrugated Shingles Lichen				S3	36	34.8 ± 0.0	NS
N	<i>Heterodermia speciosa</i>	Powdered Fringe Lichen				S3	60	8.7 ± 0.0	NS
N	<i>Heterodermia squamulosa</i>	Scaly Fringe Lichen				S3	87	32.0 ± 0.0	NS
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S3	90	8.3 ± 0.0	NS
N	<i>Scytinium lichenoides</i>	Tattered Jellyskin Lichen				S3	32	47.7 ± 0.0	NS
N	<i>Nephroma bellum</i>	Naked Kidney Lichen				S3	10	65.7 ± 1.0	NB
N	<i>Placynthium nigrum</i>	Common Ink Lichen				S3	1	60.6 ± 1.0	NB
N	<i>Punctelia appalachensis</i>	Appalachian Speckleback Lichen				S3	138	13.7 ± 0.0	NS
N	<i>Moelleropsis nebulosa</i> ssp. <i>frullaniae</i>	Blue-gray Moss Shingle Lichen				S3	1	90.5 ± 0.0	NS
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen				S3	13	11.3 ± 0.0	NS
N	<i>Usnea hirta</i>	Bristly Beard Lichen				S3	4	62.1 ± 1.0	NB
N	<i>Fuscopannaria soreliata</i>	a Lichen				S3	4	75.1 ± 0.0	NS
N	<i>Ephebe lanata</i>	Waterside Rockshag Lichen				S3	8	66.2 ± 1.0	NB
N	<i>Usnea macaronesica</i>	Beard Lichen				S3	6	35.7 ± 0.0	NS
N	<i>Metzgeria conjugata</i>	Rock Veilwort				S3?	2	39.6 ± 0.0	NS
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss				S3?	3	31.7 ± 0.0	NS
N	<i>Calliergon giganteum</i>	Giant Spear Moss				S3?	3	4.7 ± 3.0	NS
N	<i>Drummondia prorepens</i>	a Moss				S3?	4	44.1 ± 5.0	NS
N	<i>Anomodon tristis</i>	a Moss				S3?	14	34.9 ± 0.0	NS
N	<i>Elodium blandowii</i>	Blandow's Bog Moss				S3?	5	8.9 ± 3.0	NS
N	<i>Mnium stellare</i>	Star Leafy Moss				S3?	3	51.1 ± 1.0	NS
N	<i>Sphagnum riparium</i>	Streamside Peat Moss				S3?	1	32.7 ± 1.0	NS
N	<i>Phaeophyscia pusilloides</i>	Pompom-tipped Shadow Lichen				S3?	11	16.6 ± 0.0	NS
N	<i>Cladonia stygia</i>	Black-footed Reindeer Lichen				S3?	1	10.5 ± 0.0	NS
N	<i>Anomodon rugelii</i>	Rugel's Anomodon Moss				S3S4	9	14.9 ± 3.0	NS
N	<i>Dichelyma capillaceum</i>	Hairlike Dichelyma Moss				S3S4	9	41.9 ± 3.0	NS
N	<i>Dicranella varia</i>	a Moss				S3S4	3	13.9 ± 3.0	NS
N	<i>Dicranum leioneuron</i>	a Dicranum Moss				S3S4	2	69.2 ± 0.0	NB
N	<i>Encalypta procera</i>	Slender Extinguisher Moss				S3S4	7	60.0 ± 0.0	NB
N	<i>Myurella julacea</i>	Small Mouse-tail Moss				S3S4	3	49.9 ± 0.0	NS
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S3S4	4	83.5 ± 5.0	NB
N	<i>Splachnum ampullaceum</i>	Cruet Dung Moss				S3S4	4	40.5 ± 0.0	NS
N	<i>Thamnobryum alleghaniense</i>	a Moss				S3S4	30	19.5 ± 4.0	NS
N	<i>Schistidium agassizii</i>	Elf Bloom Moss				S3S4	6	21.7 ± 0.0	NS
N	<i>Hylocomiastrum pyrenaicum</i>	a Feather Moss				S3S4	5	31.5 ± 0.0	NS
N	<i>Arctoparmelia incurva</i>	Finger Ring Lichen				S3S4	31	80.7 ± 0.0	NS
N	<i>Hypogymnia vittata</i>	Slender Monk's Hood Lichen				S3S4	63	25.4 ± 1.0	NS
N	<i>Leptogium acadense</i>	Acadian Jellyskin Lichen				S3S4	32	14.0 ± 0.0	NS
N	<i>Cladonia floerkeana</i>	Gritty British Soldiers Lichen				S3S4	6	43.6 ± 0.0	NS
N	<i>Vahlia leucophaea</i>	Shelter Shingle Lichen				S3S4	19	29.6 ± 0.0	NS
N	<i>Melanohalea olivacea</i>	Spotted Camouflage Lichen				S3S4	8	17.1 ± 1.0	NS
N	<i>Parmeliopsis hyperopta</i>	Gray Starburst Lichen				S3S4	4	40.5 ± 0.0	NS
N	<i>Parmotrema perlatum</i>	Powdered Ruffle Lichen				S3S4	31	28.0 ± 0.0	NS
N	<i>Peltigera hymenina</i>	Cloudy Pelt Lichen				S3S4	1	42.1 ± 1.0	NS
N	<i>Physconia detersa</i>	Bottlebrush Frost Lichen				S3S4	34	3.5 ± 0.0	NS
N	<i>Sphaerophorus fragilis</i>	Fragile Coral Lichen				S3S4	2	87.9 ± 3.0	NS

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N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S3S4	116	20.0 ± 0.0	NS
N	<i>Physcia caesia</i>	Blue-gray Rosette Lichen				S3S4	2	25.7 ± 0.0	NS
N	<i>Physcia tenella</i>	Fringed Rosette Lichen				S3S4	3	63.1 ± 0.0	NB
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen				S3S4	155	11.1 ± 0.0	NS
N	<i>Bryoria pikei</i>	Pike's Horsehair Lichen				S3S4	12	34.4 ± 1.0	NS
N	<i>Evernia prunastri</i>	Valley Oakmoss Lichen				S3S4	32	10.2 ± 0.0	NS
N	<i>Dermatocarpon luridum</i>	Brookside Stippleback Lichen				S3S4	141	11.7 ± 0.0	NS
N	<i>Heterodermia neglecta</i>	Fringe Lichen				S3S4	107	18.9 ± 0.0	NS
P	<i>Rhynchospora macrostachya</i>	Tall Beakrush	Endangered	Endangered	Endangered	S1	57	76.6 ± 0.0	NS
P	<i>Clethra alnifolia</i>	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S1	172	72.2 ± 0.0	NS
P	<i>Fraxinus nigra</i>	Black Ash	Threatened		Threatened	S1S2	323	5.4 ± 0.0	NS
P	<i>Hydrocotyle umbellata</i>	Water Pennywort	Special Concern	Special Concern	Endangered	S1	71	84.3 ± 0.0	NS
P	<i>Lilaeopsis chinensis</i>	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	S2	136	76.7 ± 0.0	NS
P	<i>Lachnanthes caroliniana</i>	Redroot	Special Concern	Special Concern	Vulnerable	S2	1470	75.7 ± 0.0	NS
P	<i>Lophiola aurea</i>	Goldencrest	Special Concern	Special Concern	Vulnerable	S2	777	66.3 ± 0.0	NS
P	<i>Isoetes prototypus</i>	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S2	17	43.1 ± 0.0	NS
P	<i>Scirpus longii</i>	Long's Bulrush	Special Concern		Vulnerable	S3	469	64.2 ± 0.0	NS
P	<i>Floerkea proserpinacoides</i>	False Mermaidweed	Not At Risk			S2	36	4.7 ± 1.0	NS
P	<i>Smilax rotundifolia</i>	Round-leaved Greenbrier	Not At Risk			S3	381	78.1 ± 0.0	NS
P	<i>Crocianthemum canadense</i>	Long-branched Frostweed			Endangered	S1	135	11.8 ± 0.0	NS
P	<i>Cypripedium arietinum</i>	Ram's-Head Lady's-Slipper			Endangered	S1	278	46.6 ± 0.0	NS
P	<i>Thuja occidentalis</i>	Eastern White Cedar			Vulnerable	S1	310	3.1 ± 0.0	NS
P	<i>Acer saccharinum</i>	Silver Maple				S1	12	10.4 ± 0.0	NS
P	<i>Toxicodendron vernix</i>	Poison Sumac				S1	41	87.9 ± 0.0	NS
P	<i>Osmorhiza depauperata</i>	Blunt Sweet Cicely				S1	1	26.1 ± 5.0	NS
P	<i>Sanicula odorata</i>	Clustered Sanicle				S1	10	5.1 ± 2.0	NS
P	<i>Zizia aurea</i>	Golden Alexanders				S1	4	58.8 ± 0.0	NS
P	<i>Antennaria rosea ssp. arida</i>	Rosy Pussytoes				S1	1	27.1 ± 0.0	NS
P	<i>Antennaria parlinii ssp. fallax</i>	Parlin's Pussytoes				S1	25	29.7 ± 0.0	NS
P	<i>Nabalus racemosus</i>	Glaucous Rattlesnakeroot				S1	1	96.5 ± 0.0	NS
P	<i>Ageratina altissima</i>	White Snakeroot				S1	51	28.5 ± 0.0	NS
P	<i>Andersonglossum boreale</i>	Northern Wild Comfrey				S1	5	13.7 ± 0.0	NS
P	<i>Turritis glabra</i>	Tower Mustard				S1	2	36.8 ± 0.0	NS
P	<i>Draba glabella</i>	Rock Whitlow-Grass				S1	8	27.0 ± 0.0	NS
P	<i>Lobelia spicata</i>	Pale-Spiked Lobelia				S1	8	32.0 ± 7.0	NS
P	<i>Silene antirrhina</i>	Sleepy Catchfly				S1	5	17.6 ± 0.0	NS
P	<i>Astragalus robbinsii var. minor</i>	Robbins' Milkvetch				S1	31	27.1 ± 0.0	NS
P	<i>Desmodium canadense</i>	Canada Tick-trefoil				S1	10	19.2 ± 7.0	NS
P	<i>Hylodesmum glutinosum</i>	Large Tick-trefoil				S1	38	4.9 ± 7.0	NS
P	<i>Ribes americanum</i>	Wild Black Currant				S1	9	44.0 ± 1.0	NS
P	<i>Trichostema dichotomum</i>	Forked Bluecurls				S1	6	70.9 ± 0.0	NS
P	<i>Fraxinus pennsylvanica</i>	Red Ash				S1	12	17.6 ± 1.0	NS
P	<i>Polygala polygama</i>	Racemed Milkwort				S1	24	10.9 ± 0.0	NS
P	<i>Polygonum achoreum</i>	Leathery Knotweed				S1	2	57.5 ± 10.0	NS
P	<i>Podostemum ceratophyllum</i>	Horn-leaved Riverweed				S1	4	48.2 ± 0.0	NS
P	<i>Montia fontana</i>	Water Blinks				S1	3	31.6 ± 0.0	NS
P	<i>Lysimachia minima</i>	Chaffweed				S1	1	83.1 ± 0.0	NS
P	<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife				S1	1	73.2 ± 0.0	NS
P	<i>Anemone parviflora</i>	Small-flowered Anemone				S1	9	89.0 ± 0.0	NB
P	<i>Clematis occidentalis</i>	Purple Clematis				S1	15	60.3 ± 0.0	NB
P	<i>Ranunculus pennsylvanicus</i>	Pennsylvania Buttercup				S1	25	69.6 ± 0.0	NB
P	<i>Amelanchier nantucketensis</i>	Nantucket Serviceberry				S1	1	51.6 ± 1.0	NS
P	<i>Salix myrtilifolia</i>	Blueberry Willow				S1	25	89.4 ± 0.0	NB
P	<i>Scrophularia lanceolata</i>	Lance-leaved Figwort				S1	5	17.7 ± 1.0	NS
P	<i>Dirca palustris</i>	Eastern Leatherwood				S1	65	43.6 ± 13.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle				S1	50	21.9 ± 0.0	NS
P	<i>Pilea pumila</i>	Dwarf Clearweed				S1	7	54.2 ± 0.0	NS
P	<i>Carex chordorrhiza</i>	Creeping Sedge				S1	2	69.8 ± 0.0	NB
P	<i>Carex digitalis</i>	Slender Wood Sedge				S1	4	77.9 ± 0.0	NS
P	<i>Carex granularis</i>	Limestone Meadow Sedge				S1	1	99.5 ± 5.0	NB
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S1	1	92.5 ± 1.0	NB
P	<i>Carex haydenii</i>	Hayden's Sedge				S1	4	21.8 ± 1.0	NS
P	<i>Carex laxiflora</i>	Loose-Flowered Sedge				S1	6	5.6 ± 7.0	NS
P	<i>Carex ormostachya</i>	Necklace Spike Sedge				S1	7	5.3 ± 5.0	NS
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge				S1	3	60.4 ± 0.0	NB
P	<i>Carex prairea</i>	Prairie Sedge				S1	2	14.9 ± 1.0	NS
P	<i>Carex tincta</i>	Tinged Sedge				S1	4	63.5 ± 0.0	NB
P	<i>Carex viridula</i> var. <i>saxillitoralis</i>	Greenish Sedge				S1	1	25.6 ± 0.0	NS
P	<i>Carex grisea</i>	Inflated Narrow-leaved Sedge				S1	1	99.6 ± 5.0	NB
P	<i>Eleocharis erythropoda</i>	Red-stemmed Spikerush				S1	2	95.2 ± 0.0	NB
P	<i>Fimbristylis autumnalis</i>	Slender Fimbry				S1	3	90.4 ± 0.0	NS
P	<i>Scirpus atrovirens</i>	Dark-green Bulrush				S1	3	53.0 ± 0.0	NS
P	<i>Schoenoplectus torreyi</i>	Torrey's Bulrush				S1	8	64.8 ± 0.0	NS
P	<i>Iris prismatica</i>	Slender Blue Flag				S1	1	9.7 ± 100.0	NS
P	<i>Sisyrinchium fuscatum</i>	Coastal Plain Blue-eyed- grass				S1	6	63.6 ± 0.0	NS
P	<i>Juncus secundus</i>	Secund Rush				S1	3	5.5 ± 0.0	NS
P	<i>Juncus vaseyi</i>	Vasey Rush				S1	6	71.1 ± 0.0	NB
P	<i>Allium tricoccum</i>	Wild Leek				S1	102	0.3 ± 0.0	NS
P	<i>Trillium grandiflorum</i>	White Trillium				S1	3	15.0 ± 1.0	NS
P	<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	North American White Adder's-mouth				S1	6	32.0 ± 10.0	NS
P	<i>Spiranthes casei</i> var. <i>casei</i>	Case's Ladies'-Tresses				S1	2	27.8 ± 0.0	NS
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S1	3	98.3 ± 0.0	NS
P	<i>Dichanthelium xanthophyllum</i>	Slender Panic Grass				S1	9	67.3 ± 0.0	NS
P	<i>Elymus wiegandii</i>	Wiegand's Wild Rye				S1	7	88.3 ± 0.0	NB
P	<i>Elymus hystrix</i>	Spreading Wild Rye				S1	10	54.3 ± 0.0	NS
P	<i>Torreyochloa pallida</i> var. <i>pallida</i>	Pale False Manna Grass				S1	2	15.2 ± 1.0	NS
P	<i>Graphephorum melicoides</i>	Purple False Oats				S1	4	61.6 ± 0.0	NB
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S1	10	9.7 ± 100.0	NS
P	<i>Dryopteris goldiana</i>	Goldie's Woodfern				S1	1	71.8 ± 1.0	NS
P	<i>Equisetum palustre</i>	Marsh Horsetail				S1	1	15.3 ± 5.0	NS
P	<i>Selaginella rupestris</i>	Rock Spikemoss				S1	10	52.2 ± 0.0	NS
P	<i>Solidago hispida</i>	Hairy Goldenrod				S1?	1	99.4 ± 7.0	NS
P	<i>Suaeda rolandii</i>	Roland's Sea-Blite				S1?	11	33.9 ± 0.0	NS
P	<i>Carex pensylvanica</i>	Pennsylvania Sedge				S1?	2	76.5 ± 10.0	NS
P	<i>Carex rostrata</i>	Narrow-leaved Beaked Sedge				S1?	1	75.4 ± 0.0	NB
P	<i>Bolboschoenus robustus</i>	Sturdy Bulrush				S1?	1	68.7 ± 5.0	NS
P	<i>Juncus antheratus</i>	Greater Poverty Rush				S1?	1	35.0 ± 0.0	NS
P	<i>Dichanthelium lindheimeri</i>	Lindheimer's Panicgrass				S1?	6	35.7 ± 0.0	NS
P	<i>Panicum dichotomiflorum</i> ssp. <i>puritanorum</i>	Spreading Panicgrass				S1?	5	83.9 ± 0.0	NS
P	<i>Huperzia selago</i>	Northern Firmoss				S1?	1	32.6 ± 1.0	NS
P	<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower				S1S2	16	4.9 ± 7.0	NS
P	<i>Arabis pycnocarpa</i>	Cream-flowered Rockcress				S1S2	12	35.6 ± 0.0	NS
P	<i>Cardamine maxima</i>	Large Toothwort				S1S2	20	29.0 ± 0.0	NS
P	<i>Proserpinaca intermedia</i>	Intermediate Mermaidweed				S1S2	4	16.4 ± 2.0	NS
P	<i>Conopholis americana</i>	American Cancer-root				S1S2	59	18.1 ± 0.0	NS

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P	<i>Hepatica americana</i>	Round-lobed Hepatica				S1S2	46	18.4 ± 0.0	NS
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1S2	17	89.8 ± 0.0	NS
P	<i>Gratiola neglecta</i>	Clammy Hedge-Hyssop				S1S2	1	70.9 ± 0.0	NB
P	<i>Carex livida</i>	Livid Sedge				S1S2	2	44.5 ± 10.0	NS
P	<i>Juncus greenei</i>	Greene's Rush				S1S2	5	70.2 ± 0.0	NS
P	<i>Juncus alpinoarticulatus ssp. americanus</i>	Northern Green Rush				S1S2	2	68.4 ± 0.0	NB
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S1S2	5	36.5 ± 10.0	NS
P	<i>Calamagrostis stricta ssp. stricta</i>	Slim-stemmed Reed Grass				S1S2	6	66.8 ± 7.0	NS
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S1S2	36	10.0 ± 0.0	NS
P	<i>Festuca subverticillata</i>	Nodding Fescue				S1S2	15	28.8 ± 7.0	NS
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S1S2	5	44.5 ± 0.0	NS
P	<i>Woodsia alpina</i>	Alpine Cliff Fern				S1S2	5	65.2 ± 0.0	NB
P	<i>Selaginella selaginoides</i>	Low Spikemoss				S1S2	8	60.2 ± 0.0	NB
P	<i>Carex vacillans</i>	Estuarine Sedge				S1S3	3	93.7 ± 0.0	NB
P	<i>Conioselinum chinense</i>	Chinese Hemlock-parsley				S2	24	27.1 ± 0.0	NS
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	19	4.7 ± 1.0	NS
P	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane				S2	4	32.7 ± 0.0	NS
P	<i>Eutrochium dubium</i>	Coastal Plain Joe Pye Weed				S2	2	85.1 ± 0.0	NS
P	<i>Lactuca hirsuta</i>	Hairy Lettuce				S2	5	26.3 ± 2.0	NS
P	<i>Solidago multiradiata</i>	Multi-rayed Goldenrod				S2	19	88.8 ± 0.0	NB
P	<i>Symphotrichum undulatum</i>	Wavy-leaved Aster				S2	139	30.8 ± 0.0	NS
P	<i>Symphotrichum ciliolatum</i>	Fringed Blue Aster				S2	21	32.3 ± 1.0	NS
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2	11	9.6 ± 7.0	NS
P	<i>Caulophyllum thalictroides</i>	Blue Cohosh				S2	62	3.6 ± 0.0	NS
P	<i>Boechera stricta</i>	Drummond's Rockcress				S2	22	31.5 ± 1.0	NS
P	<i>Cardamine parviflora</i>	Small-flowered Bittercress				S2	17	12.8 ± 7.0	NS
P	<i>Draba arabisans</i>	Rock Whitlow-Grass				S2	39	27.0 ± 0.0	NS
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S2	15	28.4 ± 1.0	NS
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	2	61.7 ± 0.0	NB
P	<i>Hudsonia ericoides</i>	Pinebarren Golden Heather				S2	115	6.2 ± 1.0	NS
P	<i>Hypericum majus</i>	Large St John's-wort				S2	10	65.3 ± 0.0	NS
P	<i>Crassula aquatica</i>	Water Pygmyweed				S2	1	87.6 ± 0.0	NS
P	<i>Oxytropis campestris var. johannensis</i>	Field Locoweed				S2	26	27.1 ± 0.0	NS
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil				S2	11	40.7 ± 1.0	NS
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil				S2	9	58.2 ± 3.0	NS
P	<i>Utricularia resupinata</i>	Inverted Bladderwort				S2	12	66.5 ± 0.0	NS
P	<i>Oenothera fruticosa ssp. tetragona</i>	Narrow-leaved Evening Primrose				S2	6	27.1 ± 0.0	NS
P	<i>Persicaria arifolia</i>	Halberd-leaved Tearthumb				S2	34	10.3 ± 0.0	NS
P	<i>Rumex triangulivalvis</i>	Triangular-valve Dock				S2	12	16.2 ± 1.0	NS
P	<i>Anemonastrum canadense</i>	Canada Anemone				S2	12	25.8 ± 1.0	NS
P	<i>Anemone quinquefolia</i>	Wood Anemone				S2	38	30.2 ± 0.0	NS
P	<i>Anemone virginiana</i>	Virginia Anemone				S2	12	47.6 ± 0.0	NS
P	<i>Anemone virginiana var. virginiana</i>	Virginia Anemone				S2	1	58.7 ± 7.0	NS
P	<i>Caltha palustris</i>	Yellow Marsh Marigold				S2	8	25.6 ± 5.0	NS
P	<i>Galium boreale</i>	Northern Bedstraw				S2	12	32.0 ± 7.0	NS
P	<i>Salix pedicellaris</i>	Bog Willow				S2	97	2.4 ± 0.0	NS
P	<i>Salix sericea</i>	Silky Willow				S2	136	31.2 ± 0.0	NS
P	<i>Saxifraga paniculata ssp. laestadii</i>	Laestadius' Saxifrage				S2	43	27.1 ± 0.0	NS
P	<i>Tiarella cordifolia</i>	Heart-leaved Foamflower				S2	34	13.8 ± 0.0	NS
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S2	14	27.5 ± 1.0	NS
P	<i>Carex bebbii</i>	Bebb's Sedge				S2	22	47.1 ± 0.0	NS
P	<i>Carex capillaris</i>	Hairlike Sedge				S2	20	27.1 ± 0.0	NS



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P	<i>Carex castanea</i>	Chestnut Sedge				S2	2	60.7 ± 0.0	NS
P	<i>Carex comosa</i>	Bearded Sedge				S2	12	6.5 ± 1.0	NS
P	<i>Carex hystericina</i>	Porcupine Sedge				S2	9	5.5 ± 0.0	NS
P	<i>Carex longii</i>	Long's Sedge				S2	1	99.1 ± 10.0	NS
P	<i>Carex scirpoidea</i>	Scirpuslike Sedge				S2	6	87.1 ± 0.0	NB
P	<i>Carex tenera</i>	Tender Sedge				S2	10	33.8 ± 0.0	NS
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S2	39	50.1 ± 0.0	NS
P	<i>Carex atratiformis</i>	Scabrous Black Sedge				S2	3	54.4 ± 0.0	NS
P	<i>Vallisneria americana</i>	Wild Celery				S2	12	63.6 ± 0.0	NS
P	<i>Allium schoenoprasum</i>	Wild Chives				S2	5	26.5 ± 0.0	NS
P	<i>Allium schoenoprasum</i> var. <i>sibiricum</i>	Wild Chives				S2	2	75.9 ± 7.0	NS
P	<i>Lilium canadense</i>	Canada Lily				S2	45	4.9 ± 7.0	NS
P	<i>Najas gracillima</i>	Thread-Like Naiad				S2	21	62.2 ± 0.0	NS
P	<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Yellow Lady's-slipper				S2	23	14.5 ± 5.0	NS
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper				S2	13	5.2 ± 0.0	NS
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S2	23	56.9 ± 0.0	NS
P	<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S2	93	17.3 ± 0.0	NS
P	<i>Platanthera flava</i>	Southern Rein-Orchid				S2	36	57.2 ± 0.0	NS
P	<i>Platanthera flava</i> var. <i>flava</i>	Southern Rein Orchid				S2	17	28.8 ± 7.0	NS
P	<i>Platanthera flava</i> var. <i>herbiola</i>	Pale Green Orchid				S2	24	26.2 ± 0.0	NS
P	<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid				S2	14	39.7 ± 1.0	NS
P	<i>Spiranthes casei</i>	Case's Ladies'-Tresses				S2	2	79.0 ± 0.0	NS
P	<i>Spiranthes casei</i> var. <i>novaescotiae</i>	Case's Ladies'-Tresses				S2	2	34.6 ± 0.0	NS
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	12	22.0 ± 0.0	NS
P	<i>Calamagrostis stricta</i>	Slim-stemmed Reed Grass				S2	7	66.5 ± 0.0	NB
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S2	16	8.2 ± 1.0	NS
P	<i>Piptatheropsis canadensis</i>	Canada Ricegrass				S2	13	60.2 ± 0.0	NS
P	<i>Piptatheropsis pungens</i>	Slender Ricegrass				S2	14	69.3 ± 0.0	NS
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S2	10	12.4 ± 2.0	NS
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S2	7	5.0 ± 1.0	NS
P	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern				S2	1	85.6 ± 1.0	NB
P	<i>Dryopteris fragrans</i>	Fragrant Wood Fern				S2	72	37.9 ± 0.0	NS
P	<i>Woodsia glabella</i>	Smooth Cliff Fern				S2	69	55.8 ± 1.0	NS
P	<i>Symphotrichum boreale</i>	Boreal Aster				S2?	11	35.6 ± 7.0	NS
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S2?	2	70.3 ± 0.0	NS
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2?	21	19.3 ± 1.0	NS
P	<i>Rumex persicarioides</i>	Peach-leaved Dock				S2?	1	65.3 ± 0.0	NS
P	<i>Crataegus submollis</i>	Quebec Hawthorn				S2?	5	51.7 ± 1.0	NS
P	<i>Carex peckii</i>	White-Tinged Sedge				S2?	6	53.9 ± 5.0	NS
P	<i>Eleocharis ovata</i>	Ovate Spikerush				S2?	12	18.8 ± 0.0	NS
P	<i>Scirpus pedicellatus</i>	Stalked Bulrush				S2?	3	99.3 ± 0.0	NS
P	<i>Potamogeton pulcher</i>	Spotted Pondweed			Vulnerable	S2S3	24	64.4 ± 0.0	NS
P	<i>Hieracium robinsonii</i>	Robinson's Hawkweed				S2S3	12	65.6 ± 0.0	NB
P	<i>Iva frutescens</i>	Big-leaved Marsh-elder				S2S3	32	22.4 ± 0.0	NS
P	<i>Senecio pseudoarnica</i>	Seabeach Ragwort				S2S3	1	94.4 ± 0.0	NS
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch				S2S3	57	70.1 ± 0.0	NS
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S2S3	30	82.8 ± 3.0	NS
P	<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S2S3	16	21.5 ± 3.0	NS
P	<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort				S2S3	7	76.5 ± 0.0	NS
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2S3	29	53.2 ± 0.0	NS
P	<i>Shepherdia canadensis</i>	Soapberry				S2S3	143	26.0 ± 0.0	NS
P	<i>Empetrum atropurpureum</i>	Purple Crowberry				S2S3	2	80.4 ± 7.0	NS

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P	<i>Euphorbia polygonifolia</i>	Seaside Spurge				S2S3	11	72.6 ± 3.0	NS
P	<i>Halenia deflexa</i>	Spurred Gentian				S2S3	3	94.1 ± 0.0	NS
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2S3	20	6.7 ± 0.0	NS
P	<i>Polygonum aviculare</i> ssp. <i>buxiforme</i>	Box Knotweed				S2S3	8	26.4 ± 1.0	NS
P	<i>Polygonum oxyspermum</i> ssp. <i>raii</i>	Ray's Knotweed				S2S3	3	67.8 ± 1.0	NS
P	<i>Polygonum oxyspermum</i>	Sharp-fruit Knotweed				S2S3	1	84.1 ± 0.0	NS
P	<i>Amelanchier fernaldii</i>	Fernald's Serviceberry				S2S3	3	65.9 ± 7.0	NS
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S2S3	8	79.0 ± 0.0	NS
P	<i>Galium aparine</i>	Common Bedstraw				S2S3	20	5.5 ± 2.0	NS
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw				S2S3	8	34.3 ± 0.0	NS
P	<i>Salix pellita</i>	Satiny Willow				S2S3	5	28.1 ± 7.0	NS
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	6	57.5 ± 0.0	NS
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2S3	19	54.2 ± 0.0	NS
P	<i>Carex houghtoniana</i>	Houghton's Sedge				S2S3	10	79.6 ± 0.0	NS
P	<i>Eleocharis flavescens</i> var. <i>olivacea</i>	Bright-green Spikerush				S2S3	14	54.2 ± 0.0	NS
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S2S3	12	16.5 ± 0.0	NS
P	<i>Coeloglossum viride</i>	Long-bracted Frog Orchid				S2S3	20	13.8 ± 0.0	NS
P	<i>Cypripedium parviflorum</i>	Yellow Lady's-slipper				S2S3	546	16.5 ± 1.0	NS
P	<i>Poa glauca</i>	Glaucous Blue Grass				S2S3	25	32.5 ± 0.0	NS
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	1	76.5 ± 7.0	NS
P	<i>Botrychium lanceolatum</i> ssp. <i>angustisegmentum</i>	Narrow Triangle Moonwort				S2S3	12	17.3 ± 0.0	NS
P	<i>Botrychium simplex</i>	Least Moonwort				S2S3	3	21.0 ± 1.0	NS
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	10	21.7 ± 0.0	NS
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	122	50.8 ± 7.0	NS
P	<i>Hieracium paniculatum</i>	Panicled Hawkweed				S3	44	13.6 ± 3.0	NS
P	<i>Bidens beckii</i>	Water Beggarticks				S3	24	60.2 ± 0.0	NS
P	<i>Packera paupercula</i> var. <i>paupercula</i>	Balsam Groundsel				S3	1	54.0 ± 0.0	NS
P	<i>Packera paupercula</i>	Balsam Groundsel				S3	85	48.7 ± 0.0	NS
P	<i>Alnus serrulata</i>	Smooth Alder				S3	696	63.0 ± 0.0	NS
P	<i>Betula pumila</i> var. <i>pumila</i>	Bog Birch				S3	1	72.8 ± 1.0	NS
P	<i>Campanula aparinoides</i>	Marsh Bellflower				S3	18	13.8 ± 1.0	NS
P	<i>Mononeuria groenlandica</i>	Greenland Stitchwort				S3	125	66.1 ± 0.0	NS
P	<i>Viburnum edule</i>	Squashberry				S3	14	64.8 ± 0.0	NB
P	<i>Empetrum eamesii</i>	Pink Crowberry				S3	10	70.2 ± 0.0	NS
P	<i>Vaccinium boreale</i>	Northern Blueberry				S3	4	48.8 ± 0.0	NS
P	<i>Vaccinium cespitosum</i>	Dwarf Bilberry				S3	104	19.6 ± 6.0	NS
P	<i>Bartonia virginica</i>	Yellow Bartonia				S3	22	48.9 ± 0.0	NS
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill				S3	25	2.6 ± 2.0	NS
P	<i>Proserpinaca palustris</i>	Marsh Mermaidweed				S3	44	14.4 ± 0.0	NS
P	<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed				S3	65	48.4 ± 3.0	NS
P	<i>Teucrium canadense</i>	Canada Germander				S3	54	47.1 ± 0.0	NS
P	<i>Decodon verticillatus</i>	Swamp Loosestrife				S3	154	68.9 ± 7.0	NS
P	<i>Epilobium hornemannii</i>	Hornemann's Willowherb				S3	4	63.7 ± 0.0	NB
P	<i>Epilobium strictum</i>	Downy Willowherb				S3	11	15.8 ± 3.0	NS
P	<i>Polygala sanguinea</i>	Blood Milkwort				S3	18	7.9 ± 1.0	NS
P	<i>Persicaria pensylvanica</i>	Pennsylvania Smartweed				S3	29	5.5 ± 0.0	NS
P	<i>Fallopia scandens</i>	Climbing False Buckwheat				S3	15	11.9 ± 5.0	NS
P	<i>Plantago rugelii</i>	Rugel's Plantain				S3	12	13.8 ± 0.0	NS
P	<i>Primula laurentiana</i>	Laurentian Primrose				S3	69	13.5 ± 2.0	NS
P	<i>Samolus parviflorus</i>	Seaside Brookweed				S3	40	76.8 ± 0.0	NS
P	<i>Pyrola asarifolia</i>	Pink Pyrola				S3	12	32.6 ± 1.0	NS
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	6	9.6 ± 7.0	NS
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup				S3	45	45.2 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Endotropis alnifolia</i>	alder-leaved buckthorn				S3	49	11.6 ± 0.0	NS
P	<i>Agrimonia gryposepala</i>	Hooked Agrimony				S3	147	4.7 ± 5.0	NS
P	<i>Amelanchier spicata</i>	Running Serviceberry				S3	62	3.4 ± 2.0	NS
P	<i>Cephalanthus occidentalis</i>	Common Buttonbush				S3	1939	70.8 ± 0.0	NS
P	<i>Geocaulon lividum</i>	Northern Comandra				S3	9	15.0 ± 1.0	NS
P	<i>Limosella australis</i>	Southern Mudwort				S3	2	79.0 ± 0.0	NS
P	<i>Lindernia dubia</i>	Yellow-seeded False Pimperel				S3	21	5.5 ± 1.0	NS
P	<i>Laportea canadensis</i>	Canada Wood Nettle				S3	35	7.5 ± 0.0	NS
P	<i>Verbena hastata</i>	Blue Vervain				S3	117	0.3 ± 0.0	NS
P	<i>Carex cryptolepis</i>	Hidden-scaled Sedge				S3	18	48.6 ± 0.0	NS
P	<i>Carex eburnea</i>	Bristle-leaved Sedge				S3	24	64.4 ± 0.0	NB
P	<i>Carex lupulina</i>	Hop Sedge				S3	51	3.4 ± 1.0	NS
P	<i>Carex rosea</i>	Rosy Sedge				S3	46	8.4 ± 0.0	NS
P	<i>Carex swanii</i>	Swan's Sedge				S3	25	15.2 ± 2.0	NS
P	<i>Carex tribuloides</i>	Blunt Broom Sedge				S3	19	22.0 ± 0.0	NS
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	21	51.0 ± 0.0	NS
P	<i>Carex foenea</i>	Fernald's Hay Sedge				S3	18	52.9 ± 0.0	NS
P	<i>Eleocharis nitida</i>	Quill Spikerush				S3	21	16.9 ± 5.0	NS
P	<i>Elodea canadensis</i>	Canada Waterweed				S3	11	4.8 ± 0.0	NS
P	<i>Juncus marginatus</i>	Grassleaf Rush				S3	14	29.2 ± 2.0	NS
P	<i>Juncus subcaudatus</i>	Woods-Rush				S3	15	24.4 ± 0.0	NS
P	<i>Juncus dudleyi</i>	Dudley's Rush				S3	25	33.2 ± 0.0	NS
P	<i>Goodyera repens</i>	Lesser Rattlesnake-plantain				S3	28	19.4 ± 1.0	NS
P	<i>Neottia bifolia</i>	Southern Twayblade				S3	117	8.3 ± 0.0	NS
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	38	4.7 ± 1.0	NS
P	<i>Platanthera hookeri</i>	Hooker's Orchid				S3	30	1.3 ± 1.0	NS
P	<i>Platanthera orbiculata</i>	Small Round-leaved Orchid				S3	52	55.6 ± 5.0	NS
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S3	38	19.0 ± 7.0	NS
P	<i>Alopecurus aequalis</i>	Short-awned Foxtail				S3	13	17.6 ± 0.0	NS
P	<i>Dichanthelium clandestinum</i>	Deer-tongue Panic Grass				S3	282	26.7 ± 0.0	NS
P	<i>Coleataenia longifolia</i>	Long-leaved Panicgrass				S3	1589	66.4 ± 0.0	NS
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	6	62.4 ± 0.0	NS
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S3	3	16.6 ± 1.0	NS
P	<i>Potamogeton zosteriformis</i>	Flat-stemmed Pondweed				S3	8	13.4 ± 1.0	NS
P	<i>Sparganium natans</i>	Small Burreed				S3	8	27.0 ± 5.0	NS
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S3	32	19.1 ± 0.0	NS
P	<i>Asplenium viride</i>	Green Spleenwort				S3	20	54.6 ± 5.0	NS
P	<i>Lorinseria areolata</i>	Netted Chain Fern				S3	10	91.0 ± 7.0	NS
P	<i>Equisetum pratense</i>	Meadow Horsetail				S3	9	18.2 ± 1.0	NS
P	<i>Equisetum variegatum</i>	Variiegated Horsetail				S3	35	29.0 ± 0.0	NS
P	<i>Isoetes tuckermanii</i> ssp. <i>acadiensis</i>	Acadian Quillwort				S3	13	49.1 ± 0.0	NS
P	<i>Diphasiastrum sitchense</i>	Sitka Ground-cedar				S3	5	26.3 ± 1.0	NS
P	<i>Huperzia appressa</i>	Mountain Firmoss				S3	53	25.2 ± 1.0	NS
P	<i>Sceptridium dissectum</i>	Dissected Moonwort				S3	8	21.4 ± 1.0	NS
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	44	13.4 ± 2.0	NS
P	<i>Bidens vulgata</i>	Tall Beggarticks				S3?	2	47.3 ± 0.0	NS
P	<i>Persicaria amphibia</i> var. <i>emersa</i>	Long-root Smartweed				S3?	29	49.0 ± 0.0	NS
P	<i>Diphasiastrum x sabinifolium</i>	Savin-leaved Ground-cedar				S3?	14	31.5 ± 0.0	NS
P	<i>Solidago latissimifolia</i>	Elliott's Goldenrod				S3S4	15	83.0 ± 1.0	NS
P	<i>Atriplex glabriuscula</i> var. <i>franktonii</i>	Frankton's Saltbush				S3S4	17	13.9 ± 0.0	NS
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	11	35.7 ± 0.0	NS
P	<i>Vaccinium corymbosum</i>	Highbush Blueberry				S3S4	7	70.1 ± 0.0	NS
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	1	88.9 ± 0.0	NS
P	<i>Rhexia virginica</i>	Virginia Meadow Beauty				S3S4	1214	38.3 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Nuphar microphylla</i>	Small Yellow Pond-lily				S3S4	6	57.6 ± 0.0	NS
P	<i>Sanguinaria canadensis</i>	Bloodroot				S3S4	86	46.5 ± 0.0	NS
P	<i>Polygonum fowleri</i>	Fowler's Knotweed				S3S4	8	44.0 ± 0.0	NS
P	<i>Rumex fueginus</i>	Tierra del Fuego Dock				S3S4	40	24.7 ± 1.0	NS
P	<i>Crataegus succulenta</i>	Fleshy Hawthorn				S3S4	1	90.6 ± 0.0	NS
P	<i>Fragaria vesca ssp. americana</i>	Woodland Strawberry				S3S4	46	27.6 ± 0.0	NS
P	<i>Fragaria vesca</i>	Woodland Strawberry				S3S4	4	61.2 ± 0.0	NB
P	<i>Salix petiolaris</i>	Meadow Willow				S3S4	25	2.3 ± 0.0	NS
P	<i>Agalinis neoscotica</i>	Nova Scotia Agalinis				S3S4	44	25.4 ± 0.0	NS
P	<i>Viola sagittata var. ovata</i>	Arrow-Leaved Violet				S3S4	58	5.0 ± 5.0	NS
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S3S4	8	98.4 ± 0.0	NS
P	<i>Carex argyrantha</i>	Silvery-flowered Sedge				S3S4	28	5.1 ± 2.0	NS
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	23	27.2 ± 5.0	NS
P	<i>Sisyrinchium atlanticum</i>	Eastern Blue-Eyed-Grass				S3S4	109	56.2 ± 5.0	NS
P	<i>Triglochin gaspensis</i>	Gasp Arrowgrass				S3S4	15	61.0 ± 0.0	NB
P	<i>Juncus acuminatus</i>	Sharp-Fruit Rush				S3S4	16	12.2 ± 2.0	NS
P	<i>Luzula parviflora ssp. melanocarpa</i>	Black-fruited Woodrush				S3S4	14	22.1 ± 7.0	NS
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3S4	6	25.0 ± 5.0	NS
P	<i>Panicum philadelphicum</i>	Philadelphia Panicgrass				S3S4	29	19.6 ± 0.0	NS
P	<i>Trisetum spicatum</i>	Narrow False Oats				S3S4	24	27.1 ± 0.0	NS
P	<i>Cystopteris bulbifera</i>	Bulblet Bladder Fern				S3S4	90	14.8 ± 0.0	NS
P	<i>Equisetum hyemale ssp. affine</i>	Common Scouring-rush				S3S4	103	0.3 ± 0.0	NS
P	<i>Equisetum scirpoides</i>	Dwarf Scouring-Rush				S3S4	62	8.9 ± 1.0	NS
P	<i>Diphasiastrum complanatum</i>	Northern Ground-cedar				S3S4	18	12.1 ± 1.0	NS
P	<i>Schizaea pusilla</i>	Little Curlygrass Fern				S3S4	149	37.0 ± 0.0	NS
P	<i>Bidens discoidea</i>	Swamp Beggarticks				SH	1	85.5 ± 0.0	NS
P	<i>Viola canadensis</i>	Canada Violet				SH	1	49.6 ± 0.0	NS
P	<i>Calamagrostis cinnoides</i>	Small Reedgrass				SH	1	95.4 ± 6.0	NS
P	<i>Dichanthelium meridionale</i>	Matting Witchgrass				SH	1	93.4 ± 10.0	NS

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120	McNeil, J.A. 2018. Wood Turtle records, 2018. Mersey Tobeatic Research Institute, 68 recs.
115	Richardson, Leif. 2018. Maritimes Bombus records from various sources. Richardson, Leif.
114	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
108	McNeil, J.A. 2020. Blanding's Turtle records, 2020. Mersey Tobeatic Research Institute.
106	Porter, Caitlin. 2021. Field data for 2020 in various locations across the Maritimes. Atlantic Canada Conservation Data Centre, 3977 records.
104	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-05-25]. Mersey Tobeatic Research Institute, 668 recs.
102	iNaturalist. 2020. iNaturalist butterfly records selected for the Maritimes Butterfly Atlas. iNaturalist.
100	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
99	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
97	Roland, A.E. 1976. The Coastal Plain Flora of Kejimikujik National Park. Parks Canada Report, 238 pp.
95	Breen, A. 2019. 2019 Atlantic Whitefish observations. Coastal Action, 95 recs.
95	McNeil, J.A. 2019. Eastern Painted Turtle trapping records, 2017. Mersey Tobeatic Research Institute.
92	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.
89	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
89	Blaney, C.S. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
88	McNeil, J.A. 2020. Snapping Turtle and Eastern Painted Turtle records, 2020. Mersey Tobeatic Research Institute.
86	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
85	Blaney, C.S. 2019. Sean Blaney 2019 field data. Atlantic Canada Conservation Data Centre, 4407 records.
85	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
84	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
83	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
80	Belliveau, A. 2013. Rare species records from Nova Scotia. Mersey Tobeatic Research Institute, 296 records. 296 recs.
80	Blaney, C.S. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2018. Atlantic Canada Conservation Data Centre.
80	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
78	Herman, T.B. & Power, T.D.; Eaton, B. 1995. Population status of Blanding's Turtle ( <i>Emydoidea blandingii</i> ) in Nova Scotia. Can. Field-Nat., 109: 182-191. 79 recs.
76	Parks Canada. 2021. Species at Risk observations from 2019-2020 in Kejimikujik National Park and Historic Site. Parks Canada, 76 records.
73	Patrick, A.; Horne, D.; Noseworthy, J. et al. 2017. Field data for Nova Scotia and New Brunswick, 2015 and 2017. Nature Conservancy of Canada.
71	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
69	Churchill, J.L. 2020. Atlantic Canada Conservation Data Centre Fieldwork 2020. Atlantic Canada Conservation Data Centre, 1083 recs.
69	Riley, J. 2019. Digby County lichen observations. Pers. comm. to J.L. Churchill, 50 recs.
69	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs. <a href="https://doi.org/10.1037/arc0000014">https://doi.org/10.1037/arc0000014</a> .
68	McNeil, J.A. 2017. Updates to Blanding's Turtle database, 1984-2014. Mersey Tobeatic Research Institute.
67	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
66	Churchill, J.L.; Klymko, J.D. 2015. Chignecto and Tintamarre National Wildlife Area Bird Surveys 2015. Atlantic Canada Conservation Data Centre, 2238 recs.
63	Stantec. 2014. Energy East Pipeline Corridor Species Occurrence Data. Stantec Inc., 4934 records.
62	McNeil, J.A. 2013. Ribbonsnake ( <i>Thamnophis sauritus</i> ) sightings, 2012. Parks Canada, 63 records of 26+ individuals.
59	Sollows, M.C., 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
56	Belliveau, A.G., Churchill, J.L. 2019. Compilation of flora and fauna observation records from Isle Haute, Nova Scotia. Acadia University; Atlantic Canada Conservation Data Centre, 522 recs.
56	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
53	Bayne, D.M. 2007. Atlantic Coastal Plain Flora record, 2004-06. Nova Scotia Nature Trust. Pers. comm. to C.S. Blaney, 57 recs.
53	McLean, K. 2020. Species occurrence records from Clean Annapolis River Project fieldwork in 2020. Clean Annapolis River Project, 206 records.
52	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
52	Cowie, F. 2007. Electrofishing Population Estimates 1979-98. Canadian Rivers Institute, 2698 recs.
52	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
50	Wallace, S. 2020. Stewardship Department species occurrence data on NTNB preserves. Nature Trust of New Brunswick.
48	Mersey Tobeatic Research Institute. 2021. 2020 Monarch records from the MTRI monitoring program. Mersey Tobeatic Research Institute, 72 records.
48	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
48	Richardson, D., Anderson, F., Cameron, R., McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen ( <i>Anzia colpodis</i> ). COSEWIC.
48	Riley, J. 2020. Digby County lichen observations. Pers. comm. to J.L. Churchill.
47	Blaney, C.S & Spicer, C.D.; Popma, T.M.; Basquill, S.P. 2003. Vascular Plant Surveys of Northumberland Strait Rivers & Amherst Area Peatlands. Nova Scotia Museum Research Grant, 501 recs.
46	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.

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45	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
45	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
44	McLean, K. 2019. Wood Turtle observations . Clean Annapolis River Project.
43	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
43	Bryson, I. 2020. Nova Scotia and Newfoundland rare species observations, 2018-2020. Nova Scotia Environment.
43	Epworth, W. 2012. Species at Risk records, 2009-11. Fort Folly Habitat Recovery Program, 162 recs.
43	Godbout, V. 2002. SAR Inventory: Birds in Fort Beauséjour NHS. Parks Canada, Atlantic, SARINV02-01. 202 recs.
42	Mazerolle, D.M. 2020. Atlantic Canada Conservation Data Centre botanical fieldwork 2019. Atlantic Canada Conservation Data Centre.
41	Atlantic Canada Conservation Data Centre. 2020. Cape LaHave Island observations from August 2020. Atlantic Canada Conservation Data Centre, 605 records.
41	East Coast Aquatics Inc. 2021. Species at Risk records from Spicer North Mountain Quarry Expansion Environmental Assessment. East Coast Aquatics, 44 records.
40	Cameron, E. 2007. Canadian Gypsum Co. survey 2005-07. Dillon Consulting Ltd, 40 recs.
39	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
39	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
38	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
38	Thomas, P. 2018. CSC Dorchester Bobolink Survey. Environment Canada, Canadian Wildlife Service.
37	Newell, R.E. 2019. Crocanthemum canadense records compiled for provincial status report. pers. comm. from Ruth Newell to AC CDC.
37	Roland, A.E. 1980. Checklist of Vascular Plants of Kejimikujik National Park in Lichens, Liverworts, Mosses and Flowering Plants of Kejimikujik National Park. Roland, A.E. (ed.) Parks Canada Report, pp. 52-140, 160 pp.
36	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
36	McNeil, J.A. 2017. Eastern Ribbonsnake ( <i>Thamnophis sauritus</i> ) sightings, 2017. Mersey Tobeatic Research Institute, 36 recs.
33	Chapman, C.J. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 11171 recs.
31	Jobin, C. & Clow, A., Van Dijk, J. 2019. Eastern Waterfan data, Mount Allison Fundy Field Camp 2019. Chapman, C.J. (ed.) Fundy National Park and Mount Allison University, 31 recs.
30	Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
29	Hall, R.A. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 189 recs.
29	Honeyman, K. 2019. Unique Areas Database, 2018. J.D. Irving Ltd.
28	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
28	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
28	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
28	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
28	Pepper, C. 2013. 2013 rare bird and plant observations in Nova Scotia. , 181 records.
26	Benedict, B. Connell Herbarium Specimen Database Download 2004. Connell Memorial Herbarium, University of New Brunswick. 2004.
26	McLean, K. 2020. Wood Turtle observations . Clean Annapolis River Project.
25	Burnie, B. 2013. 2013 <i>Scirpus longii</i> field data. Mount Saint Vincent University, 51 recs.
25	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
25	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
25	McNeil, J.A. 2019. Snapping Turtle records, 2017. Mersey Tobeatic Research Institute.
24	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
24	Broders, H.G. 2006. Unpublished data. , 24 recs.
24	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
23	McLean, K. 2019. Species At Risk observations. Clean Annapolis River Project.
22	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
22	Belliveau, A.G. 2021. New Black ash site records near Kentville, NS. Acadia University, 47 records.
22	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
22	Breen, A. 2018. 2018 Atlantic Whitefish observations. Coastal Action.
22	Nelly, T.H. 2006. <i>Cyrtopodium arietinum</i> in Hants Co. Pers. comm. to C.S. Blaney. 22 recs, 22 recs.
21	Mackinnon, D.S. & O'Brien, M.K.H.; Cameron, R.P. 2002. Fieldwork 2000. Dept of Environment & Labour, Protected Areas Branch, 252 recs.
21	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
20	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
20	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
20	O'Grady, Sally. 2010. Water Pennywort in Kejimikujik National Park, 2010. Parks Canada, 20 shapefiles.
20	Richardson, D., Anderson, F., Cameron, R., Pepper, C., Clayden, S. 2015. Field Work Report on the Wrinkled Shingle lichen ( <i>Pannaria lurida</i> ). COSEWIC.
19	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
19	Erskine, A.J. 1999. Maritime Nest Records Scheme (MNRS) 1937-1999. Canadian Wildlife Service, Sackville, 313 recs.
19	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J.; ONHIC, 487 recs.
19	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
18	Basquill, S.; Sam, D. 2019. <i>Crocantthemum canadense</i> observations near Greenwood, NS, 2015-2019. pers. commun. from Nova Scotia Department of Lands and Forestry to AC CDC, 18 recs.
18	Thomas, A.W. 1996. A preliminary atlas of the butterflies of New Brunswick. New Brunswick Museum.
17	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
17	Cameron, R.P. 2018. <i>Degelia plumbea</i> records. Nova Scotia Environment.

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17	Neily, T.H. 2013. Email communication to Sean Blaney regarding <i>Listera australis</i> observations made from 2007 to 2011 in Nova Scotia. , 50.
16	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort ( <i>Isoetes prototypus</i> ). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
16	Hunsinger, J. 2021. Species at Risk records from Medway Community Forest Cooperative monitoring plots and baited game cameras, 2019-2020. Medway Community Forest Cooperative, 16 records.
15	Basquill, S.P. 2011 vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
15	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
15	Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs.
15	Klymko, J. 2019. Atlantic Canada Conservation Data Centre zoological fieldwork 2018. Atlantic Canada Conservation Data Centre.
15	Klymko, J.J.D. 2012. Odonata specimens & observations, 2010. Atlantic Canada Conservation Data Centre, 425 recs.
14	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
14	Blaney, C.S.; Mazerolle, D.M.; Klymko, J; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
14	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
14	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2009. New Brunswick Dept Natural Resources, 19 recs (14 active).
14	McNeil, J.A. 2018. Snapping Turtle records, 2018. Mersey Tobeatic Research Institute.
14	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
13	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
13	Holder, M. 2003. Assessment and update status report on the Eastern Liliaeopsis ( <i>Liliaeopsis chinensis</i> ) in Canada. Committee on the Status of Endangered Wildlife in Canada, 16 recs.
13	MacKinnon, D.S. 1998. Ponhook Lake survey map & notes. Dept of Environment and Labour, Protected Areas Branch, 13 recs.
13	Nova Scotia Nature Trust. 2014. Ladyslipper records from Saint Croix Nova Scotia, JLC Ed. Nova Scotia Nature Trust.
12	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of <i>C. insculpta</i> sightings. Acadia University, Wolfville NS, 88 recs.
12	Caissie, A. Herbarium Records. Fundy National Park, Alma NB. 1961-1993.
12	Cowie, Faye. 2007. Surveyed Lakes in New Brunswick. Canadian Rivers Institute, 781 recs.
12	Holder, M.L.; Kingsley, A.L. 2000. Kinglsey and Holder observations from 2000 field work.
12	McAlpine, D.F. 1983. Status & Conservation of Solution Caves in New Brunswick. New Brunswick Museum, Publications in Natural Science, no. 1, 28pp.
12	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
12	Spicer, C.D. & Harries, H. 2001. Mount Allison Herbarium Specimens. Mount Allison University, 128 recs.
11	Askanas, H. 2016. New Brunswick Wood Turtle Database. New Brunswick Department of Energy and Resource Development.
11	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.
11	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
11	Nature Trust of New Brunswick. 2021. Nature Trust of New Brunswick site inventory data submitted in April 2021. Nature Trust of New Brunswick, 2189 records.
11	Nova Scotia Nature Trust. 2013. Nova Scotia Nature Trust 2013 Species records. Nova Scotia Nature Trust, 95 recs.
11	Pike, E., Tingley, S. & Christie, D.S. 2000. Nature NB Listserve. University of New Brunswick, listserv.unb.ca/archives/naturenb. 68 recs.
10	Belliveau, A.G. & Vail, Cole; King, Katie. 2020. New Allium tricoccum locations. Cornwallis River. Chapman, C.J. (ed.) Acadia University.
10	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
10	Epworth, W. 2013. Species at Risk records, 2013. Fort Folly Habitat Recovery Program, 27 recs.
10	Goltz, J.P. 2012. Field Notes, 1989-2005. , 1091 recs.
10	Haughian, S.R. 2018. Description of <i>Fuscopannaria leucosticta</i> field work in 2017. New Brunswick Museum, 314 recs.
10	Hinds, H.R. 1999. Connell Herbarium Database. University New Brunswick, Fredericton, 131 recs.
10	NatureServe Canada. 2018. iNaturalist Butterfly Data Export . iNaturalist.org and iNaturalist.ca.
10	Neily, T. H. 2018. Lichen and Bryophyte records, AEI 2017-2018. Tom Neily; Atlantic Canada Conservation Data Centre.
10	Parker, M.S.R. 2011. Hampton Wind Farm 2010: significant floral/faunal observations. , 13 recs.
10	Phinney, L. 2019. Little Brown Myotis maternal colony counts and birdSAR, 2019. Mersey Tobeatic Research Institute.
10	Phinney, Lori; Toms, Brad; et. al. 2016. Bank Swallows ( <i>Riparia riparia</i> ) in Nova Scotia: inventory and assessment of colonies. Mersset Tobeiatc Research Institute, 25 recs.
10	Speers, L. 2008. Butterflies of Canada database: New Brunswick 1897-1999. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 2048 recs.
9	Basquill, S.P. 2009. 2009 field observations. Nova Scotia Dept of Natural Resources.
9	Brunelle, P.-M. (compiler). 2010. ADIP/MDDS Odonata Database: NB, NS Update 1900-09. Atlantic Dragonfly Inventory Program (ADIP), 935 recs.
9	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
9	Sollows, M.C., 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
9	Toms, Brad. 2011. Species at Risk data from 2011 field surveys. Mersey Tobeatic Research Institute, 17 recs.
9	Wissink, R. 2000. Rare Plants of Fundy: maps. Parks Canada, 20 recs.
8	Bryson, I. 2013. Nova Scotia rare plant records. CBCL Ltd., 180 records.
8	Hinds, H.R. 1992. Rare Vascular Plants of Fundy National Park. , 10 recs.
8	Kennedy, B.; Cron, C. 2019. observations of Poison Sumac and Buttonbush, Nova Scotia. pers. commun to AC CDC.
8	Klymko, J. Butterfly records at the Nova Scotia Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2017.
8	MacDonald, E.C. 2018. CWS Piping Plover Census, 2010-2017. Canadian Wildlife Service, 672 recs.
8	McAlpine, D.F. 1998. NBM Science Collections: Wood Turtle records. New Brunswick Museum, Saint John NB, 329 recs.
8	Powell, B.C. 1967. Female sexual cycles of <i>Chrysemy spicta</i> & <i>Clemmys insculpta</i> in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
8	Tingley, S. (compiler). 2001. Butterflies of New Brunswick. , Web site: www.geocities.com/Yosemite/8425/butrflry. 142 recs.
8	Wissink, R. 2006. Fundy National Park Digital Database. Parks Canada, 41 recs.



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7	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
7	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.
7	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
7	Cameron, R.P. 2014. 2013-14 rare species field data. Nova Scotia Department of Environment, 35 recs.
7	MacDonald, E.C. 2018. Piping Plover nest records from 2010-2017. Canadian Wildlife Service.
7	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.
7	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
6	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
6	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
6	Benjamin, L.K. 2006. <i>Cyripedium arietinum</i> . Pers. comm. to D. Mazerolle. 9 recs, 9 recs.
6	Brazner, J.; Hill, N. 2018. Plant observations along the Cornwallis River, Nova Scotia. Nova Scotia Department of Lands and Forestry.
6	Bredin, K.A. 2002. NS Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centre, 30 recs.
6	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
6	Golder Associates. 2018. Dorchester wind turbine bat detections. Owens, Luke, Firman, Mitch, Melcher, Heather (ed.) Golder Associates Ltd.
6	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2010. New Brunswick Dept Natural Resources, 16 recs (11 active).
6	Klymko, J. 2021. Atlantic Canada Conservation Data Centre zoological fieldwork 2020. Atlantic Canada Conservation Data Centre.
6	Matthew Smith. 2010. Field trip report from Avon Caving Club outlining the discovery of <i>Cyripedium arietinum</i> and <i>Hepatica nobilis</i> populations. Public Works and Government Services Canada.
5	Cameron, R.P. 2009. <i>Erioderma pedicellatum</i> database, 1979-2008. Dept Environment & Labour, 103 recs.
5	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
5	Cameron, R.P. 2012. Additional rare plant records, 2009. , 7 recs.
5	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
5	Carter, Jeff; Churchill, J.; Churchill, L.; Churchill, L. 2020. Bank Swallow colony Scots Bay, NS. Atlantic Canada Conservation Data Centre.
5	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
5	Klymko, J. Dataset of butterfly records at the New Brunswick Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2016.
5	Klymko, J.J.D. 2011. Insect fieldwork & submissions, 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 742 recs.
5	Majka, C.G. & McCorquodale, D.B. 2006. The Coccinellidae (Coleoptera) of the Maritime Provinces of Canada: new records, biogeographic notes, and conservation concerns. Zootaxa. Zootaxa, 1154: 49-68. 7 recs.
5	McKendry, Karen. 2016. Rare species observations, 2016. Nova Scotia Nature Trust, 19 recs.
5	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
5	Speers, L. 2001. Butterflies of Canada database. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 190 recs.
5	Webster, R.P. 2004. Lepidopteran Records for National Wildlife Areas in New Brunswick. Webster, 1101 recs.
5	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
4	Anon. Dataset of butterfly records for the Maritime provinces. Museum of Comparative Zoology, Harvard University. 2017.
4	Basset, I.J. & Crompton, C.W. 1978. The Genus <i>Suaeda</i> (Chenopodiaceae) in Canada. Canadian Journal of Botany, 56: 581-591.
4	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
4	Cameron, R.P. 2017. 2017 rare species field data. Nova Scotia Environment, 64 recs.
4	Catling, P.M. 1981. Taxonomy of autumn-flowering <i>Spiranthes</i> species of southern Nova Scotia in Can. J. Bot. , 59:1250-1273. 30 recs.
4	Clerc, P. 2011. Notes on the genus <i>Usnea</i> Adanson (lichenized Ascomycota). III. Bibliotheca Lichenologica, 106, 41-51.
4	Cody, W.J. 2003. Nova Scotia specimens of <i>Equisetum pratense</i> at the DAO herbarium in Ottawa. , Pers. comm. to C.S. Blaney. 4 recs.
4	Forsythe, B. 2006. <i>Cyripedium arietinum</i> at Meadow Pond, Hants Co. Pers. comm. to C.S. Blaney. 4 recs, 4 recs.
4	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
4	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.
4	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
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