APPENDIX B. PROJECT TEAM MEMBERS' *CURRICULUM VITAE*

McCallum Environmental Ltd.

Meghan Milloy, BSc. (Bio), MES
meghan@mccallumenvironmental.com
Vice President

Years in Practice
21

Certifications

Nova Scotia Advanced Wetlands Delineator and Evaluator

Memberships

Nova Scotia Wetlands Delineation, Maritime College of Forest Technology

Education

- Master in Environmental Studies (MES), York University, Toronto, Ontario, 1997-1999
- BSc. (Biology), Dalhousie University, 1992-1997
- BA (Political Science), Honours, Dalhousie University, 1992-1997

Training

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

Summary

Ms. Milloy oversees, manages, and executes regulatory and environmental projects. She provides project management for Federal and provincial environmental assessment processes and is an experienced EA practitioner. She manages and completes environmental baseline surveys including habitat surveys, species at risk and wildlife surveys, botany and bird surveys, wetland and watercourse delineations, characterizations and functional assessment, fish habitat evaluation, HADD authorizations, and bat hibernacula identification. Ms. Milloy also completes watershed evaluations, and guides clients through the environmental and permitting stages of mining, industrial, alternative energy, and development projects.

Ms. Milloy supports clients through provincial and federal environmental assessment requirements and supports project teams to identify and evaluate project environmental risk. Ms. Milloy has completed several Federal and Provincial environmental assessment registration documents in the past two years and is currently preparing two Impact Assessment Agency of Canada (IAAC) environmental impact statements (EIS) for two mining projects in Nova Scotia. Ms. Milloy consults regularly with federal and provincial regulatory agencies, First Nation communities and local landowners and stakeholder groups.

Ms. Milloy regularly completes applications for wetland, watercourse alteration and HADD authorizations across Atlantic Canada, and has developed and implemented wetland compensation programs, fish habitat offsetting projects, and wetland and fish habitat restoration projects. Ms. Milloy is a trained wetland evaluator, biologist, and restoration professional. Ms. Milloy regularly implements species at risk, habitat and biodiversity mitigation planning, permitting, monitoring plans and offsetting.

Project Experience

- Project Manager and Team Lead for two Environmental Impact Statements (EIS) for submission to the Impact Assessment Agency of Canada (IAAC) (2017-2021).
- Biophysical Lead for Nova Scotia Environmental Assessment Registration Document (EARD) for a gold mining project in Nova Scotia, with planned submission in 2021.
- Provision of biophysical project management and coordination of field surveys to support the IAAC environmental assessment process for three proposed mining projects in Nova Scotia (2014-current).
- Completion of biophysical field surveys to support expansion efforts for several mines in Nova Scotia (2014-2017) and aggregate quarries (2017-2020) to meet requirements under the provincial environmental assessment process.
- Completion of provincial environmental assessments for multiple quarry expansions in Nova Scotia (2016-2020).
- Completion of environmental baseline surveys for the provincial environmental assessment process for a proposed re-development of a gold mine in eastern Nova Scotia in 2013.
- Completion of four provincial environmental assessments for community wind projects in Nova Scotia from 2013-2018.

Meghan Milloy, BSc. (Bio), MES
meghan@mccallumenvironmental.com
Vice President

- Watershed evaluation for wetlands and watercourses at a 500 hectares golf and residential development and associated wetland alteration permitting, compensation planning, wetland restoration activities, and enhancement of several wetlands to increase functionality.
- Surface water assessment and functional assessment, wetland permitting, watercourse permitting, and compensation planning and implementation at an 18 hole golf course and residential development along the south shore of Nova Scotia in 2014. Provision of environmental project management and regulatory lead role for the Project.
- Completed the Provincial Environmental Assessment for the 80 MW Glen Dhu South Wind Power Project, Nova Scotia, for Shear Wind Inc.
- Project Management of regulatory permitting and environmental assessments for a 50 MW Wind Power Project in Nova Scotia for Sprott Power Corp.
- Evaluation of the Musquodoboit River Watershed for wetland restoration opportunities (GIS based and ecology/field based study).
- Evaluation of the Sackville River Watershed for wetland restoration opportunities (GIS based and ecology/field based study).
- Completion of 35-45 projects involving watershed evaluation, land use classification, wetland delineation and alteration and infill, and compensation planning for numerous residential and commercial large-scale developments across Nova Scotia and New Brunswick.

Work Experience

McCallum Environmental Ltd., Nova Scotia, 2010-Present

Vice President/Senior Project Manager - Provides project management expertise for site and/or route selection, constraints mapping, regulatory consultation, environmental assessments, environmental baseline surveys, wetland alteration and restoration planning, environmental protection plan development, regulatory applications, construction monitoring, and reclamation for small and large scale industrial projects. Other responsibilities include marketing, budget management, report preparation and client service.

Strum Environmental Services Ltd., Nova Scotia 2000-2010

Project Manager- From 2000- 2010, provided project management expertise for development clients across Atlantic Canada. Projects included environmental assessment, large scale commercial and residential developments, wetland alteration projects, wetland compensation planning and implementation, wetland restoration and creation projects, phased site assessments, and risk assessment and management.

Environmental Sciences Group, Kingston, ON 1998

Environmental Scientist- in 1998, provided contaminant and project management expertise to Department of National Defense in the Canadian Arctic in support of remediation of several remote military sites. Identified areas required for remediation and completed associated boundary soil and sediment confirmatory sampling and analysis.

Jeff Bonazza, BSc., M.Env.Sci
Jeffb@mccallumenvironmental.com

Years in Practice
7

Education
Master of Environmental Science, *Memorial University of Newfoundland,* 2015

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

Certifications
- Wetland Plants and Delineation, Fern Hill Institute
- Backpack Electrofishing, Canadian Rivers Institute
- Project Management Planning Course, Environmental Project Management & Sustainability Solutions

Training
- Brook Floater Virtual Workshop, Fisheries and Oceans Canada Species at Risk Program, Jan. 19-20, 2021
- Land Bird Species at Risk in Forested Wetlands Workshop, Jan. 2018
- Technical Writing for Professionals, Natural Resource Training Group, July 2019
- Fish and Fish Habitat Characterization, Natural Resource Training Group, July 2019
- Standard First Aid AED CPR "A", St.

Experience

Mr. Jeff Bonazza has been in the environmental consulting professions since 2015, after completing a master's degree in environmental science. He has managed projects, authored reports, and conducted regulatory consultation and First Nations engagement. Mr. Bonazza has worked as a field biologist on projects throughout Atlantic Canada as well as in western Canada and Ontario. Mr. Bonazza has conducted surveys including; bird surveys, wildlife surveys, evaluation for Species at Risk, herpetofaunal and reptile evaluations, wetland functional assessment, wetland delineation, fish habitat characterization and electrofishing.

McCallum Environmental Ltd., Halifax, NS
Project Manager
Feb. 2022 – present
- Project management
- Report writing
  - Federal Environmental Impact Statements, Provincial Environmental Assessments, Species at Risk permitting, wetland alteration applications etc.
- Regulatory consultation and First Nations engagement
- Design and lead field programs
  - Flora and fauna surveys, Species at Risk assessments, wetland delineation, wetland functional assessment (WESP-AC completed on >50 wetlands in NS), etc.
- Create maps using ArcGIS
- Projects:
  - Dexter Construction Company Limited
    - Environmental assessment registration
  - Cabot Gypsum
    - Environmental assessment registration

McCallum Environmental Ltd., Halifax, NS
Project Coordinator
Dec. 2016 – Feb. 2022
- Project management
- Report writing
  - Federal Environmental Impact Statements, Provincial Environmental Assessments, Species at Risk permitting, wetland alteration applications etc.
- Regulatory consultation and First Nations engagement
- Design and lead field programs
  - Flora and fauna surveys, Species at Risk assessments, wetland delineation, wetland functional assessment (WESP-AC completed on >50 wetlands in NS), etc.
- Create maps using ArcGIS
- Projects:
  - NextBridge Infrastructure LP.
    - Species at Risk permitting.
  - Atlantic Mining Nova Scotia
    - EIS reporting, wetland alteration applications, field surveys.
  - Zutphen Resources

Jeff Bonazza, BSc., M.Env.Sci
Jeffb@mccallumenvironmental.com

John Ambulance, Dec. 2017
- Geographic Information System (GIS) Training, ESRI, Feb. 2015
- WHMIS, CCOHS, March 2018
- PADI Open Water certified scuba diver, Nov. 2010
- MED A1, Canadian Sailing Expeditions Inc. and Transport Canada, May 2008

        - Environmental Protection Plan, reporting and permitting requirements.
    - Bio Design Earth Products
        - Environmental Assessment registration.

McCallum Environmental Ltd., Halifax, NS
Environmental Coordinator
Sept. 2015 – Dec. 2016
- Environmental monitoring
    - Regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring, and reporting on construction activity.
- Provided field support for flora and fauna surveys, Species at Risk assessments, and wetland delineation/functional assessment.
- Report writing (monitoring reports, wetland alteration applications).
- Created maps using ArcGIS
- Projects
    - Valard Construction
        - Environmental coordinator for Muskrat Falls Transmission Line in Newfoundland and Labrador.
    - Terra Firma Development Corp
        - Reporting and permitting requirements.

Memorial University of Newfoundland, St. John's, NL
Research Assistant
2014- 2015
- Conducted a literature review investigating the role of predator/prey interactions of freshwater fish in Ontario.
- Developed a food web of piscivorous fish species in Ontario.

Agriculture and Agri-Food Canada, Truro, NS
Research Technician
2011- 2014
- Entered and analyzed scientific data
- Conducted quadrat sampling and botanical separation
- Prepared samples for analysis
- Operated specialized laboratory instruments
- Supervised and trained laboratory visitors and volunteers
- Assisted research scientists and graduate students in their research

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

Years in Practice
17

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

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

Training
- Icthyology, 2021
- Fish Habitat Restoration, In-stream Techniques, 2021
- Technical Writing Workshop, 2019
- Fish Habitat Assessments, 2019
- eDNA Methods, 2019
- Freshwater & Diadromous Fishes of New England, 2019
- Saint John Ambulance Standard First Aid, AED, CPR(C), 2019
- Field Hike Leader Certification, Basic and Winter modules, Outdoor Council of Canada, 2015 & 2018
- Wetland Ecosystem Services Protocol (WESP-AC) training, 2017
- WHMIS, 2017
- Electrofishing Crew Leader, 2015
- Wetland Delineation Certification, 2013

(continued)

Summary
Ms. MacDonald has been in the environmental consulting profession since 2005. She has worked on both project and research related field assessments primarily in Nova Scotia and Alberta. She is responsible for completing biophysical assessments and ecological inventories, including flora and fauna surveys, avian surveys, and species at risk evaluations, primarily for clients in the energy, mining, and commercial development sectors.

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

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

Selected Project Experience
- Completion of environmental baseline surveys for the federal environmental assessment process for proposed development of four separate gold mines in eastern Nova Scotia from 2015-2020.
- Completed more than 50 fish rescues in the past two years to support various transportation projects throughout Nova Scotia.
- Completed baseline fish and fish habitat survey study design and analysis for four proposed gold mines in eastern Nova Scotia. Three of these projects have triggered the federal EIS process, and three will require authorization for Harmful Alteration, Disruption and Destruction of fish habitat under the *Fisheries Act*, and associated offsetting. The evaluations completed at each of these sites involved detailed evaluations of fish passage barriers, and detailed evaluation of the Projects potential direct and indirect effects on fish and fish habitat.

McCallum Environmental Ltd.

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

- Small Vessel Operator Proficiency & Marine Emergency Duties A3 certified, 2006

Experience

McCallum Environmental Ltd., Halifax, Nova Scotia

Senior Ecologist & Project Manager
May 2011-Present

- Completing biophysical assessments, including flora and fauna surveys, with emphasis on species at risk.
- Leading a team to complete wetland and watercourse delineations and functions assessments.
- Extensive fish and fish habitat assessments to support *Fisheries Act* authorization applications and associated offsetting programs.
- Communicating field survey results and effects assessments for Environmental Assessments and other Provincial regulatory applications.
- Instructed Wetland Delineation course with Fern Hills Institute, Summer 2016-2019.

Amec Colt, Shell/Albian Sands Expansion 1 - Fort McMurray, Alberta.

Environmental Specialist and Area Environmental Lead
July 2008 – October 2009.

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

Canadian Natural Resources Ltd. - Fort McMurray, Alberta

Regulatory and Environmental Specialist October 2005 – July 2008

- Conducted extensive field work in various fish and wildlife programs. Communicated issues with government agencies, contractors and external stakeholders. Performed on-call duties, spill response, and non-compliance reporting and response. Expanded upon site wide procedures for protection of water, wildlife and waterbirds.
- Chaired the regional 'Oil Sands Bird and Wildlife Protection Committee'.
- Acted as the clients' field lead in planning & completion of a fish salvage of 38 km of the Tar River, and in construction of a 77 hectare fish habitat compensation lake (Wapan Sakihigan, Horizon Lake). Horizon Lake earned the CAPP Steward of Excellence Award for Environmental Performance (2009).

McCallum Environmental Ltd.

Sarah Scarlett, M.Sc.
sarah@mccallumenvironmental.com

Years in Practice
8

Education
M.Sc, Wetland Hydrology, *University of Waterloo,* 2015

B.ES, Geomatics Option, *University of Waterloo,* 2013

Memberships
- Society for Ecological Restoration – Eastern Canada Chapter Board Member

Certifications
- Certificate of Indigenous Relations Program, Government of Manitoba

Training
- Electrofishing Training – Crew Supervisor, NRTC, 2021
- Wetland Delineation Training, Co-Instructor and Participant, MEL, 2021
- Indigenous Relations Program, Apr. 2017 – Jan. 2018
- Writing Effective Briefings, Government of Manitoba, Aug. 2016
- Online Geographic Information System (GIS) Training, ESRI, Ongoing
- WHMIS 2015, CCOHS, Apr. 2020
- Standard First Aid, May 2020

Experience

Sarah Scarlett has been in the environmental profession since 2014, specializing in wetland and biophysical sciences. Sarah holds an MSc in wetland restoration. She has worked across Canada in as an academic researcher, provincial regulator, private industry representative and environmental consultant. She has experience in developing and implementing field/research programs, wetland and biological surveys, project management, regulatory permitting, policy development, and Indigenous engagement and consultation.

McCallum Environmental Ltd., Halifax, NS
Project Coordinator
May 2020 - Present
- Project management, reporting, field programs and regulatory consultation
- Field program design, implementation, and management
- Trained on the utilization of the WESP-AC wetland functional assessment tool, with in-field experience across Nova Scotia in support of regulatory wetland alteration permitting, provincial and federal environmental assessment and wetland monitoring.
- Conduct wetland delineation and functional assessments
- Preform various biophysical assessments (e.g., flora surveys, nest sweeps, turtle surveys, fish habitat surveys), including species at risk
- Reporting for provincial and federal environmental assessments, regulatory applications (e.g. wetland and watercourse alterations), permits and proposals
- Map production and spatial analyses (ArcGIS and QGIS)
- Primary Projects:
    - Dexter Nova Alliance – Hwy 104 Twinning Project
        - Project management and implementation of wetland and wildlife surveys
        - Species at risk assessments and permit support
        - Wetland impact assessment and monitoring
    - NS Transportation and Active Transit Highway Projects
        - Project management, development and implementation of wetland monitoring programs
    - WESP-AC Calibration Study
        - Study support, site selection and implementation
        - Coordination and consultation with provincial and academic project partners
    - Atlantic Mining Nova Scotia
        - Federal EIS reporting and project management
        - Emphasis on species at risk and impact assessments
    - Valard Construction – ON EWT Transmission Project
        - Field program management

Sunterra Horticulture Inc., Winnipeg, MB
Director of Environmental Affairs
Jan. 2018 – Apr. 2020
- Ensure corporate compliance with regulatory requirements and environmental standards for the peat harvesting industry
- Manage environmental reporting, monitoring and peatland restoration programs
- Complete regulatory applications and permitting

Sarah Scarlett, M.Sc.
sarah@mccallumenvironmental.com

- Participate in regulatory consultation and program advisement
- Upkeep environment, health and safety program
- In-field biological assessments, sample collection and laboratory processing

Government of Manitoba, Winnipeg, MB
Peatland Specialist
Jan. 2016 – Dec. 2017

- Lead the implementation of Manitoba's peatland management Act and regulations
- Manage provincial peatland program, peat resources, harvesting industry operations
- Develop best-management-practices and restoration policies in partnership with industry and public stakeholders
- Participate in public and Indigenous consultations
- Seek out and manage collaborative research partnerships

University of Waterloo, Waterloo, ON
Research and Teaching Associate
2011 – 2015

- Participated in a variety of multidisciplinary research projects in wetland ecosystems across Canada
- Research projects focused on the hydrology of natural, disturbed and restored wetlands
- Taught wetland ecosystem functions through lectures and hands-on field and laboratory classes
- Supervised and trained research assistants
- Primary Projects:
    - Nikanotee Fen: Oil Sands Reclamation Project, Alberta
    - Bic-St. Fabien Peatland Restoration Project, Quebec

Amber Stoffer, BSc., MREM
amber@mccallumenvironmental.com

Years in Practice
7

Education

B.Sc. (Honours, Biology), University of Ottawa, 2009-2013

Master of Resource and Environmental Management, Dalhousie University, 2013-2015

Training

- Canadian Red Cross Emergency First Aid & CPR/AED (C) - 2021
- Technical Writing Workshop - 2019
- Fish Habitat Assessment - 2019
- Backpack Electrofishing - 2018
- At-Risk Landbird Identification Workshop - 2018
- Fish Habitat Restoration Watercourse Alteration Installer - 2017
- Marine Emergency Duties – A1, 2014
- W.H.M.I.S – 2013
- PADI Open Water Certified Suba Diver - 2013

Summary

Ms. Stoffer has worked in environmental consulting and research since 2014. She has worked on both project related and research related field assessments in Nova Scotia, Alberta, and Quebec.

Ms. Stoffer has a range of experience in biophysical assessments, including fish and fish habitat surveys, wetland delineation and functional assessments, flora surveys, avian surveys, and species at risk evaluations. She has also performed environmental monitoring for a variety of large and small-scale development and exploration initiatives across Nova Scotia. Ms. Stoffer has prepared technical documents for multiple federal and provincial level environmental assessments and regulatory applications.

Selected Project Experience

- Led the planning and implementation of large-scale fish and fish habitat field programs for multiple federal and provincial mining projects.
- Performed wetland delineation and functional wetland assessments for multiple small- and large-scale developments in Nova Scotia.
- Utilization of the Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC) wetland functional assessment tool in > 100 wetlands across Nova Scotia in support of regulatory wetland alteration permitting, provincial and federal environmental assessment and wetland monitoring (2017 - 2021).
- Led the planning, coordination, and implementation of watershed-level fish habitat restoration projects.
- Conducted migratory bird surveys, winter wildlife assessments, marine mammal surveys, and species at risk searches for federal and provincial infrastructure projects.
- Prepared technical reports for multiple federal and provincial level Environmental Assessments.

McCallum Environmental Ltd. - Halifax, Nova Scotia

Intermediate Environmental Scientist:
July 2017-Present

- Leading aquatic field programs including watercourse identification, fish habitat surveys, fish collection, benthic invertebrate surveys, periphyton sampling, and sediment sampling.
- Completing fish rescues for multiple provincial transportation and infrastructure projects.
- Completing wetland delineation and functional assessments.
- Performing various biophysical assessments (avian surveys, winter wildlife surveys, flora surveys) with emphasis on species at risk.
- Conducting water quality sampling and flow monitoring.

- Providing construction monitoring for mining and infrastructure projects.
- Preparing technical reports for federal and provincial environmental assessments and regulatory applications.
- Performing GIS analysis and map creation.

Clean Annapolis River Project – Annapolis Royal, Nova Scotia

Project Leader and Fisheries Technician:
July 2016 – July 2017

- Led the planning, coordination, and implementation of fish passage and in-stream restoration work within the Annapolis River watershed.
- Conducted data collection through field surveys, ecological monitoring, and community and stakeholder consultation.
- Prepared watershed management plans.
- Provided staff and student training in fish habitat and fish passage assessments.

Stantec – Dartmouth, Nova Scotia

Environmental Scientist:
April – September 2014 (Student Contract)

- Conducted and coordinated field studies as part of environmental impact assessments, including on-shore and vessel-based marine mammal surveys.
- Developed project work plans and training documents for field surveys.
- Compiled, processed, and analyzed data for technical reports.
- Performed statistical analysis using R software.

McCallum Environmental Ltd.

Emma Halupka MSc.
EHalupka@mccallumenvironmental.co

Years in Practice
2

Education

M.Sc. Ecological Restoration, 2017-2019
Simon Fraser University & BC Institute of Technology

B.Sc. Hons. Environmental Science, 2011-2015
Dalhousie University

Training

- St John's Ambulance, Wilderness First Aid level 3. (2019)
- ATV Training Course (2019)
- Pleasure Craft Operator Card
- WHMIS (GHS) Training (2019)
- Cornell Lab of Ornithology: Duck & Waterfowl Identification certificate (2021)
- Class 2 Electrofishing Recertification (2017)
- Turtle handling, care, and incubation.

Summary

Emma is an environmental professional with a wide range of skills in tree and vegetation surveys, habitat restoration, and species at risk conservation planning. She has a background in non-profit work, designing restoration strategies for birds and reptiles, and working with the public to organize citizen science projects and promote environmental stewardship. Emma studied Ecological Restoration in graduate school, with a focus in forest restoration. She has a wide variety of field work experience and understands the different biotic and abiotic ecological components required to support wildlife populations.

Selected Project Experience

- **Haliburton Habitat Health Check-up Program.**

  Developed an assessment and mentorship program to help private landowners improve the quality of wildlife habitat on their properties.

- **Deas Island Regional Park wetland construction: A habitat enhancement plan**
  Worked with a team to produce a technical restoration report completed in conjunction with BCIT and Metro Vancouver Regional Parks.

- **Restoring habitat heterogeneity to former floodplain farmland: Wetland construction at Colony Farm Regional Park, Coquitlam, B.C.**
  Produced technical restoration plan with a team at BCIT

- **Restoring Old-Growth Attributes: Quantifying physical attributes in two CWHdm site series in the Fraser Valley, British Columbia**
  MSc applied research project in partnership with UBC's Malcolm Knapp Research Forest and BC Parks. Conducted a literature review, methods design, data collection and analysis, and report with forest management recommendations.

McCallum Environmental Ltd.

Emma Halupka MSc.
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Experience

McCallum Environmental Ltd. Halifax, NS.
Junior Environmental Scientist
April 2021-Present.

- Wetland delineation and functional assessments
- Flow monitoring in freshwater streams
- Electrofishing, fish rescues, and fish habitat assessments.

The Land Between Charity. Haliburton, ON.
Project Manager and Conservation Technician
November 2019 – October 2020.

- Helped to develop and implement regional conservation strategies for species at risk in Central Ontario, especially birds and turtles. Projects included citizen science programs, public educational events, field work, webinars, and direct population recovery.
- Managed partnerships with Birds Canada, the Kawartha Land Trust, Couchiching Conservancy, post-secondary researchers, and volunteers.
- Led educational tours and presentations for kids and the general public.
- Encouraged local stewardship by developing a Habitat Health Check-up program to help interested landowners manage their property in an ecologically-friendly manner.

Toronto and Region Conservation Authority. Vaughn, ON.
Restoration Field Crew
September 2019 – November 2019.

- Worked with a field crew to implement restoration initiatives on the ground throughout the Rouge, Humber, and Don River watersheds.
- Followed moisture and nutrient codes to plant a range of native vascular plants in appropriate microsites.
- Gained an understanding of native species and ecosystems in Southern Ontario and the challenges of ecological work in urban areas.

Alberta Biodiversity Monitoring Institute. Lac La Biche, AB.
Vegetation Field Technician
May 2019 – August 2019

- Followed government-issued protocols to establish plots and track biodiversity in remote sites across Northern Alberta.
- Assessed vascular plant coverage, moss and lichen diversity, measured trees, and collected soil cores within one-hectare plots.
- Navigated to sites via helicopter, truck, and ATV, and navigated to remote locations using GPS units. Set up plots using compass and measuring tape.
- Practiced in-lab taxonomic classification for several bryophyte genera and species.

McCallum Environmental Ltd.

Nicholas Doane, BSc.
Nick@mccallumenvironmental.com

Years in Practice
8

Education

B.Sc. Major in Biology, Minor in Management
Dalhousie *University*, 2012

Certifications

- Class 5 driver's licence (2005)
- Class 6 Motorcycle licence (2011)
- Workplace Hazardous Materials Information System (2009)
- Rescue S.C.U.B.A. Diver Certification (2009)
- Pleasure Craft/Boating licence (2008)
- St. John Ambulance First Aid and CPR (2018)
- ATV/OHV safety certificate (2010)

Technical Skills

- Mechanical Repair
- Computer and Electronic Repair
- Machining/Fabrication
- Equipment Calibration
- Laboratory Analysis
- ArcGIS
- MS Access
- Python
- Linux
- Excel

Experience

Nicholas Doane has been in the environmental and biological professions since 2012, after completing a Bachelor's degree in biological sciences. He has managed projects, authored reports, developed methods, and patented an apparatus for controlled ecology. Nicholas has worked as a field biologist on projects throughout Atlantic Canada as well as in western Canada. Nicholas has conducted surveys including; bird surveys, wildlife surveys, evaluation for Species at Risk, wetland functional assessment, wetland delineation, and electrofishing.

McCallum Environmental Ltd., Halifax, NS
Project Coordinator
May 2022 - Present

- Project Coordination
- Report writing
  - Provincial Environmental Assessments
- Design and lead field programs
  - Flora and fauna surveys, Species at Risk assessments, wetland delineation, wetland functional assessments
- Create maps using ArcGIS
- Projects:
  - Antrim Gypsum Mine

Oberland Agriscience Inc., Halifax, NS
Operations Manager
Sept. 2017 - Mar. 2021

- Managed daily operations, staffing schedules, and equipment/materials procurement
- Supervised teams of technical staff and contractors
- Led research and development projects including design, logistics, synthesis of background
- information, definition of data/sample collection requirements, data/sample analysis, and presented results to improve existing practices and equipment
- Inventor/builder of Apparatus and Method for Breeding Black Soldier Fly. Pat No.WO 2021/195775
- Initiated and managed educational outreach to support middle school STEM programs
- Prepared and presented technical/scientific reports and protocols to a variety of audiences

Coastal and Oceans Information Network, Halifax, NS
Biological Data Manager/GIS Analyst
Nov. 2016 - Sept. 2017

- Digitized historical paper publication datasets for re-publication as web site content
- Re-formatted existing datasets and assigned metadata according to international standards
- Authored an interactive publication on the biodiversity of the Sydney Harbour in Cape Breton
- Used ArcGIS to analyse large datasets

McCallum Environmental Ltd.

Nicholas Doane, BSc.
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Buchanan Environmental Inc., Fredericton, NB

Lead Laboratory Analyst

Jan. 2014 – July 2016

- Aquatic toxicology analysis and research to ISO 17025 laboratory standards
- Primary RM/13 lab analyst, document manager, and client care
- Lead equipment calibration, care, and maintenance technician

Atlantic Sea Smolt Ltd., Souris, PE

Biological Technician

Nov. 2012 - May 2013

- Tracked and adjusted culture characteristics according to standard procedures
- Produced, tested, and standardized new hatchery equipment
- Consulted with colleagues on development and improvement of existing systems and practices

Katrina Ferrari, B.Sc.
katrina@mccallumenvironmental.com

Years in Practice
2

Education
Bachelor of Science with Major in Biology, *Saint France Xavier,* 2019

Training
- Emergency First Aid and CPR "A", Nova Scotia Lifesaving Society,
- WHMIS, CCOHS,
- Electrofishing
- Pleasure Craft Operator
- Advanced Open Water Diver

Experience

Ms. Katrina Ferrari has been in the environmental consulting profession since June 2020. She primarily performs environmental monitoring for a variety of large and small-scale development, construction and exploration initiatives, as well as project related field assessments across Nova Scotia, Canada.

Since beginning with McCallum Environmental Ms. Ferrari has completed wetland delineation, watercourse assessments, fish and fish habitat assessments, and construction monitoring for environmental compliance for a 1300km transmission line project.

Ms. Ferrari is certified in electrofishing.

McCallum Environmental Ltd., Halifax, NS
Junior Environmental Scientist
June 2020 - Present
- Environmental monitoring of transmission line construction project
  - Regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring, and reporting on construction activity.
- Report writing
  - Monitoring reports, Crown Land use applications, wetland alteration applications, water withdrawal applications
- Conducted fauna surveys, water quality sampling and surface water flow sampling
- Conducted watercourse assessments
- Conducted fish and fish habitat assessments including electrofishing and fish rescue during construction.
- Completion of wetland boundary determination and characterizations for regulatory wetland alteration permitting.

Jessica Lohnes, B.Sc.
jessica@mccallumenvironmental.com

Years in Consulting
2

Education
Bachelor of Science, Biology (honours and co-op programs) and Environment, Sustainability and Society, *Dalhousie University*, 2016

Training
- Emergency First Aid AED CPR "C", Red Cross
- Electrofishing Certification – Crew Supervisor
- WHMIS
- OHS training for multiple work environments
- Introduction to the Care and Use of Wildlife
- Avid bird watcher since 2014: skilled in identifying bird species by sight and sound. Also skilled in identifying nests
- Participates in the Christmas Big Count yearly through the Audubon Society

Experience

Ms. Jessica Lohnes has been in the environmental consulting profession since May 2021. She primarily performs environmental monitoring for a variety of large and small-scale development, construction and exploration initiatives, as well as project related field assessments across Nova Scotia, Canada.

Since beginning with McCallum Environmental Ms. Lohnes has completed avifauna spring migration and breeding surveys, nest sweeps, wetland delineation, watercourse assessments, fish and fish habitat assessments, fish rescues and construction monitoring.

McCallum Environmental Ltd., Halifax, NS
Environmental Scientist
May 2020 - Present
- Environmental monitoring of transmission line construction project:
  - Regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring, and reporting on construction activity,
- Report writing:
  - Monitoring reports, Crown Land use applications, wetland alteration applications, water withdrawal applications,
- Conducted fauna surveys, water quality sampling and surface water flow sampling,
- Species at risk surveys,
- Conducted watercourse assessments,
- Conducted fish and fish habitat assessments including electrofishing and fish rescue during construction,
- Completion of wetland boundary determination and characterizations for regulatory wetland alteration permitting,
- Avifauna surveys: nest sweeps, spring migration surveys and breeding bird surveys,
- Company mentor for bird identification and nest sweeps.

Jessica Lohnes, B.Sc.
jessica@mccallumenvironmental.com

Noble Grape, Burnside, Dartmouth, NS
Full Time Sales Associate/Winery Worker - Team Lead - Manager
August 2016 – April 2021

- Running sales floor and assisting customers with their hobbies regarding anything to do with brewing,
- Working the cashier and the POS system and organizing customer databases and information,
- Starting wines and beer for on-site wine making and assisting in winery tasks when needed (checking gravities, racking and stabilizing, grape skins, chaptalizations, filtering, etc.),
- Assisting in outreach programs for the store such as beer education posters, brewing in store to showcase machinery and tradeshows (Saltscapes 2017 and 2018 and The Guy Show 2017 in Halifax),
- Assisting customers with creating beer and wine recipes for at home brewers. Assisted customers with weighing grains and hops in the bulk grain section for recipes,
- Placing, accepting and putting away orders for store inventory
- Working at the hub store meant dealing and helping all other stores with stock, information, transfers, questions and more,
- Worked on a lot of machines in the store and the mechanics of them such as brewing machines ("The Grainfather" for example) and bottle fillers for on-site wine makers,
- WHMIS training for chemicals used in the winery (Sulphites, PBW, Star San, Chlorinated cleaner and more),
- Data on overstock and all transfers of product between stores and the affiliated wholesale company "Best Case Wholesale",
- Kept track of sales numbers and made reports relating to sales, movement of product and more to help aid the company with future endeavors,
- Deposits, schedules and ordering for the store.

Canadian Wildlife Service (Atlantic Region), Environmental Stewardship Branch (ESB), Environment Canada (Environment and Climate Change Canada) through Dalhousie University Science Co-op (Biology), Queen Square, Dartmouth, NS
Wildlife Technician/Biologist
May 2015 – Aug 2015

- Support and assistance in mapping the distribution of marine and coastal birds in New Brunswick and Nova Scotia through research, fieldwork, data compilation and analysis,
- Aiding with advancing the knowledge on bird species and their occurrence and abundance in the Maritimes for the purpose of landscape planning and the conversation and management of birds (e.g., SARA),

Jessica Lohnes, B.Sc.
jessica@mccallumenvironmental.com

- Development and query of wildlife databases for monitoring and management,
- Data collection/management, synthesis and report writing related to avian monitoring,
- Assistance with fieldwork relating to birds (e.g., colonial bird census/surveys, banding, deploying tags (GPS and VHF tags) on wild birds, telemetry studies, collecting blood/feather samples from wild birds, weighing wild birds, aerial/vessel-based surveys and studies at bird colonies),
- Training in driving company (Environment Canada) vehicles, general field operations, camp and workstations on an isolated island, GPS and GIS mapping and devices,
- Avifauna population assessments and monitoring (e.g., nests with chicks, adults in a colony, species at risk, etc.),
- Avifauna surveys: bird population and nest census,
- Working in the field in multiple conditions and in remote locations with bird colonies (e.g., Important Bird and Biodiversity Areas (IBA)),
- Project creation, development and management within the Canadian Wildlife Service (based on seabird monitoring and conservation),
- Worked with my supervisor to develop an honours research project for my undergraduate degree at Dalhousie University (*Foraging ecology and diving behaviour of the black guillemot (Cepphus grylle) during nesting season from Country Island, Nova Scotia, Canada*).

Maritime Brain Tissue Bank, Department of Medical Neuroscience, Sir Charles Tupper Building, Dalhousie University through Dalhousie University Science Co-op (Biology), Halifax, NS

Technician and Research Assistant

Sep 2014 – Dec 2014

- Studying the cholinergic neurotransmitter system in the cetacean brain to compare and contrast to the human brain. The aim of the research is to provide information on cholinergic control of cognition and consciousness and how this system may be altered in a species that can "sleep" with one brain hemisphere at a time,
- Work focused on gaining a greater understanding of the cholinergic system and its role in cognition and consciousness,
- Developing a strong foundation in neuroanatomy and a greater understanding of the cholinergic system and its importance in the brain,
- Technical duties involved:
    - Carrying out immunohistochemical and histochemical staining reactions in dolphin and human brain tissue,

- Gaining a greater understanding of the cholinergic system and its importance in the brain (role in cognition and consciousness),
- Learning about neuroanatomy and performing work in a neuroscience-based laboratory,
- Tissue sectioning of dolphin and human brain tissue on a freezing microtome,
- Analysis of stained tissue using photomicroscopy and digital imaging software tools.

Compliance Promotion, Export Support and Environment Effects Monitoring Section – Environmental Protection Operations Directorate (Atlantic Region), Environmental Stewardship Branch (ESB), Environment Canada (Environment and Climate Change Canada) through Dalhousie University Science Co-op (Biology), Queen Square, Dartmouth, NS

Co-op Student

Jan 2014 – Apr 2014

- Assisting Environment Canada with its efforts to improve compliance with federal environmental laws and regulations (under the Canadian Environmental Protection Act and the Fisheries Act),
- Creating, verifying and updating various electronic databases (e.g., Microsoft Dynamics CRM),
- Entering data from various reports into electronic databases and conducting quality assessments of electronic data,
- Analyzing specific industry sectors and contacting identified businesses to ensure the company still exists, verify contact information and confirm types of activities undertaken by that facility,
- Formatting data for use by compliance promotion program staff,
- Provide support to compliance promotion officers on the development and delivery of compliance promotion material,
- Assisting with decisions regarding enforcement,
- Contacting specific businesses or staff from other federal departments to inform them about specific regulations that may apply as well as upcoming workshops that may be of interest,
- Aided with the creation of formal reports for Environment Canada.

Jessica Lohnes, B.Sc.
jessica@mccallumenvironmental.com

Aquaculture Association of Nova Scotia through Dalhousie University Science Co-op (Biology), Halifax, NS

Outreach Biologist

May 2013 – Aug 2013

- Organizing, coordinating and delivering/representing the "Summer Outreach Program" for 2013 and working with the staff of the Aquaculture Association of Nova Scotia (the executive director, public engagement coordinator and the research and development coordinator),
- Aiding in contacting and supporting the members of the association, which include small to medium sized businesses that are usually family owned,
- Educating and spreading positive awareness to Nova Scotians about the sustainable (socially, economically and environmentally) aquaculture industry that the AANS supports and providing the public an opportunity to discuss a controversial subject face-to-face,
- Building public confidence in the industry by disproving common misconceptions and showing people what the media does not show,
- Exposing the public to NS aquaculture products by giving out food samples and providing them information on where to find them, approximate costs, etc.
- Traveling to events around Nova Scotia to represent the association and communicate with the public by answering questions, discussing various topics relating to AANS, etc. (festivals, home shows, Saltscapes, farmer's markets, farm open houses, school presentations and summer camp presentations),
- School and summer camp presentations included AANS videos, PowerPoint presentations, a touch tank with live shellfish, games, crafts, etc. depending on age groups. The interactive booth for festivals, markets, open houses and other events included posters, pamphlets, recipes, a fish tank with live locally farmed fish/shellfish, activity books for kids and more,
- Creating strong public engagement material through social media, social networking, presentations, pamphlets, information booklets and more,
- Receiving the training to handle food samples and care for and travel with live shellfish and finfish species.

Jose Mulino, B.Sc., B.I.T.
jose@mccallumenvironmental.com

Years in Practice
3

Education
B Sc in Environmental Science, *Mount Royal University, 2020*

Environmental Coop Diploma, *Keyano College, 2014*

B Sc in Veterinary Medicine, *Universidad Central de Venezuela, 2010 (not completed)*

Memberships
- Alberta Society of professional Biologists

Training
- Bear Awareness and Avoidance
- Electrofishing Certification
- Emergency First Aid
- Swiftwater rescue
- Transportation of Dangerous Goods
- Standard First Aid, Aug 2019
- Pleasure Craft Operator
- Supervising Ground Disturbance
- Supervising for Safety
- Pipeline Construction Safety Training (PCST)
- Navigation Through Environmental Law (2015)

Experience

Jose Mulino has been in the environmental profession since 2015. Mr. Mulino coordinated and supported projects related to water quality monitoring, air quality, geotechnical construction monitoring, geotechnical sampling, and wildlife surveys. He was responsible for collecting data and documentation related to field activities. He is a detailed-oriented and organized individual with experience in report writing and statistical data analysis through excel and SPSS. Mr. Mulino has also worked in field activities where driving an ATV and trailering was necessary. Jose's tenure in the oil and gas industry also gives him a sound experience in health and safety standards and procedures.

McCallum Environmental Ltd., Halifax, NS
Environmental Scientist
January 2021 - Present
- Project Coordination responsibilities
- Water quality and water quantity data collection and monitoring
- Wildlife surveying activities
- Environmental and Geotechnical construction monitoring responsibilities, including pre-, during, and post- drilling activities
- Permit application and approvals for drilling monitoring activities
- Map production and spatial analyses (ArcGIS and QGIS)

Triton Environmental Consultants., Calgary, AB
Environmental Professional I
July. 2020 – January 2021
- Monitored drinking water parameters through data collection and analysis
- Assisted in water quality reporting, identifying sampling locations in the field, deploying, and retrieving water quality monitoring equipment.
- Liaise with clients to improve water quality monitoring on drilling activities

Wood Buffalo Environmental Association, Fort McMurray, AB
Terrestrial Environmental Effects Monitoring Technician
May. 2019 – Aug. 2019
- Prepared, deployed/retrieved, and maintained air and deposition sampling equipment (i.e. PASS, Denuder, IER's, PM_{10} and $PM_{2.5}$).
- Conducted maintenance of meteorological equipment and site infrastructure (access trails, helipads, plot markers, sampling equipment, etc.).
- Aided in data collection and maintenance of continuous air quality sampling equipment.
- Assisted scientists perform field experiments and studies in air quality, including a community engagement presentation in "Forest Health Monitoring in the Oil Sands"

Jose Mulino, B.Sc., B.I.T.
jose@mccallumenvironmental.com

Terracon Geotechnique, Fort McMurray, AB
Intermediate Environmental Technician
June 2015 – August 2018

- Project coordination of water quality monitoring activities
- Collected and analyzed Slope Inclinometers and vibrating wire piezometer data
- Monitored and reported tailings dyke stability to senior engineers
- Conducted pre-construction bird sweeps and amphibian salvage
- Analyzed data and prepared various records and reports related to water quality regulatory monitoring
- Monitored drinking water parameters using field equipment, such as pH, conductivity, and total dissolved solids meters

McCallum Environmental Ltd.

Lucas Bonner, B.Sc.
lucas@mccallumenvironmental.com

Years in Practice
< 1

Education
Master of Environmental Management, *University of New Brunswick,* Present

Bachelor of Science with Major in Ecology and Conservation Biology, *Memorial University of Newfoundland,* 2020

Training
- Canadian Red Cross Standard First Aid & CPR / AED

Experience

Mr. Lucas Bonner has recently entered the environmental consulting profession, beginning in May 2022. He is diligently working to broaden his professional field skills and familiarizing himself with various aspects of professional field biology and environmental sciences.

During his time with McCallum Environmental Ltd., Mr. Bonner has been involved with watercourse and wetland delineation, detailed fish habitat assessments, nest sweeps, and fish rescues including participation in electrofishing across Nova Scotia, Canada.

McCallum Environmental Ltd., Halifax, NS
Junior Environmental Scientist
May 2022 - Present
- Conducted fish and fish habitat assessments including electrofishing and fish rescue during construction.
- Completion of wetland and watercourse boundary determination and characterizations for regulatory wetland alteration permitting.
- Participated in nest sweeps during construction.

CULTURAL RESOURCE MANAGEMENT GROUP LTD.

KYLE G. CIGOLOTTI, BA

Managing Partner - Archaeologist

Education: Bachelor of Arts – Anthropology, Saint Mary's University, 2009

Affiliations: Nova Scotia Archaeology Society (Member 2012 – present; Treasurer 2018 – present)
Canadian Archaeology Association (Conference Chairperson; Safety Committee Chairperson)
Ontario Archaeological Research License Holder, R1281

Awards: Placide Rivette Family Archaeology Award, 2009

REPRESENTATIVE ARCHAEOLOGICAL EXPERIENCE

2022

Principal Investigator during the Archaeological Resource Impact Assessments of a series of proposed mining projects for Atlantic Mining Nova Scotia;

Licensed Field Director during the Stage 2 Archaeological Assessment of a proposed mixed commercial/residential development in Kincardine, Ontario.

Principal Investigator during the Archaeological Resource Impact Assessment of a directional drilling program in Shubenacadie East;

Principal Investigator during Archaeological Monitoring at the Fort Belcher Marsh Aboiteau project for the Nova Scotia Department of Agriculture;

Principal Investigator during Archaeological Monitoring of the directional drilling operations in at Shipyard Landing for the Municipality of Bridgewater;

2021

Principal Investigator during the Archaeological Resource Impact Assessment of the proposed Tote Road Quarry Expansion project in Halifax Regional Municipality, Nova Scotia for GHD;

Principal Investigator and Archaeological Monitor for the Sallyport Upgrade project at the Nova Scotia Law Courts in Halifax Regional Municipality, Nova Scotia for Nova Scotia Department of Transportation and Infrastructure Renewal;

Principal Investigator and Archaeological Monitor for the Canadian Forces Housing Agency garage project at the Halifax Dockyard in Halifax Regional Municipality, Nova Scotia for Bell Multi Construction Inc;

Principal Investigator during the Archaeological Resource Impact Assessment of the proposed Westchester Wind Farm project in Colchester County, Nova Scotia for Dillon;

Principal Investigator during the Archaeological Resource Impact Assessment of the proposed expansion of the Touquoy Gold project in Halifax Regional Municipality, Nova Scotia for Nova Scotia Mining Inc;

Archaeological Monitor during the Fort Needham services upgrade project in Halifax Regional Municipality, Nova Scotia for Halifax Regional Municipality;

Archaeological Monitor during the Summer Street Parking Garage project in Halifax Regional Municipality, Nova Scotia for the Nova Scotia Department of Transportation and Infrastructure Renewal;

Principal Investigator during the archaeological testing program at the Fifteen Mile Stream Gold project in Halifax Regional Municipality, Nova Scotia for Nova Scotia Mining Inc.;

2020

Principal Investigator during the archaeological testing program at the Fifteen Mile Stream Gold Project in Halifax Regional Municipality, Nova Scotia for Nova Scotia Mining Inc;

Assistant Field Director during the archaeological testing program at the Beaver Dam Gold Project in Halifax Regional Municipality, Nova Scotia for Nova Scotia Mining Inc;

Principal Investigator during the Archaeological Resource Impact Assessment of the Allain River Marsh project in Annapolis County, Nova Scotia for the Nova Scotia Department of Agriculture;

Principal Investigator during the Archaeological Resource Impact Assessment of the St. Mary's Bay Marsh project in Digby County, Nova Scotia for the Nova Scotia Department of Agriculture;

Project Coordinator for the Stage 3 Archaeological Assessment during the 849 Front Road development project in Amherstburg, Ontario for Dillon;

Project supervisor for the development of GIS archaeological potential modeling for Mineral Exploration Claims throughout Nova Scotia;

2019

Principal Investigator during the archaeological monitoring at St. Paul's Church in Halifax, Nova Scotia for Halifax Regional Municipality;

Principal Investigator during the Archaeological Resource Impact Assessment of the proposed Gabarus Quarry Expansion project in Cape Breton Regional Municipality, Nova Scotia for Dexter;

Principal Investigator during the Archaeological Resource Impact Assessment of the proposed Sporting Mountain Quarry Expansion project in Richmond County, Nova Scotia for GHD;

Principal Investigator during the Archaeological Resource Impact Assessment of the proposed Isgonish Aboiteau infrastructure upgrade project in Colchester County, Nova Scotia for the Nova Scotia Department of Agriculture;

Principal Investigator during the Archaeological Resource Impact Assessment of the proposed Nappan Dam infrastructure upgrade project in Colchester County, Nova Scotia for the Nova Scotia Department of Agriculture;

Project Coordinator and Archaeological Field Director during the Stage 3 Archaeological Assessment of the 849 Front Road development in Amherstburg, Ontario;

Principal Investigator during the Archaeological Resource Impact Assessment of the Beaver Dam Gold Mine redevelopment project in Halifax Regional Municipality, Nova Scotia for Nova Scotia Mining Inc;

Principal Investigator during the Archaeological Resource Impact Assessment of the Fifteen Mile Stream redevelopment project in Halifax Regional Municipality, Nova Scotia for Nova Scotia Mining Inc;

Principal Investigator during the Archaeological Monitoring of the St. Andrew's Community Centre redevelopment project in Halifax Regional Municipality, Nova Scotia for Halifax Regional Municipality;

Project Coordinator and Assistant Field Director during the Stage 2 Archaeological Assessment of the Sandwich and Mill development project in Sandwich, Ontario for Dillon;

Assistant Field Director during the Stage 1 Archaeological Assessment of the Sandwich South Master Servicing Report in Windsor, Ontario for Dillon;

2018

Principal Investigator during the archaeological monitoring at St. Paul's Church in Halifax, Nova Scotia for Halifax Regional Municipality;

Principal Investigator during the archaeological monitoring at the Canal Greenway development in Dartmouth, Nova Scotia for Halifax Regional Municipality;

Principal Investigator during the archaeological monitoring at the St. Andrew's Community Centre Redevelopment project in Halifax, Nova Scotia for Halifax Regional Municipality;

Principal Investigator during the archaeological screening and reconnaissance at the Beaver Dam Gold Mine Haul Road project in Beaver Dam, Nova Scotia for GHD;

Principal Investigator during the archaeological screening and reconnaissance at the Beaver Dam Gold Mine Waste Rock Storage Pile project in Beaver Dam, Nova Scotia for GHD;

Principal Investigator during the archaeological screening and reconnaissance at the Cochrane Hill Gold Mine development project in Guysborough County, Nova Scotia for McCallum Environmental;

2017

Principal Investigator during archaeological screening and reconnaissance of the Louisdale Water Treatment Plant in Richmond County, Nova Scotia for Dillon Halifax;

Principal Investigator during archaeological monitoring at the Canal Greenway Project in Dartmouth, Nova Scotia for Halifax Regional Municipality;

Principal Investigator during the archaeological monitoring at St. Paul's Church in Halifax, Nova Scotia for Halifax Regional Municipality;

Principal Investigator during the archaeological screening and reconnaissance of the proposed quarry in Sheet Harbour for Dexter Construction Company Limited;

Principal Investigator during the archaeological screening and shovel testing of the Lake William Trail development for the Shubenacadie Watershed Environmental Protection Society;

2016	Principal Investigator during archaeological screening and reconnaissance of the Brazil Lake Quarry in Yarmouth County, Nova Scotia for GHD;
	Principal Investigator during archaeological screening and reconnaissance of the Duncan Gillis Quarry in Victoria County, Nova Scotia for Municipal Enterprises Limited;
2015	Archaeological Field Supervisor during the archaeological impact assessment of the proposed Sisson Mine for the Government of New Brunswick and the Maliseet Communities of New Brunswick;
2014	Field Technician in the archaeological and cultural/heritage landscape screening of 317 hectares of private land in Port Wallace, HRM, for a consortium of landowners;
	Archaeological Technician during design and coordination of the Canal Greenway in Dartmouth undertaken with CBCL on behalf of Halifax Regional Municipality;
2013	Field/GIS Technician during archaeological reconnaissance and testing of the Maritime Link Project for EMERA Newfoundland and Labrador Incorporated; Identified and evaluated archaeological potential on transmission lines on Cape Breton Island;
2012-2013	Archaeological Technician during archaeological mitigation of seven Precontact habitation sites for a dam replacement project at the outlet of Gaspereau Lake, Kings County for Nova Scotia Power Incorporated;
2011	Data Entry/Report Preparation for the San Felice Field School in Gravina, Italy through Saint Mary's University;
2010	Archaeological Field Technician in the San Felice Archaeological Field School in Gravina, Italy, through Mount Allison University;
2009	Participant in Grand Pré Archaeological Field School in Wolfville, Kings County;

EMPLOYMENT HISTORY

Cultural Resource Management Group Limited, Halifax, Nova Scotia

2012-present Managing Partner, Project Manager, Principle Investigator, addressing archaeological projects throughout Atlantic Canada and Southern Ontario.

Saint Mary's University, Halifax, Nova Scotia

2011 Data Entry/Report Preparation for the San Felice Field School in Gravina, Italy.

CERTIFICATIONS

Red Cross Standard First Aid; CPR Level C
CCOHS Hazard Identification, Assessment, & Control; Accident Investigation
WHMIS 2015

CULTURAL RESOURCE MANAGEMENT GROUP Ltd.

ROBERT H. J. SHEARS, MA, RPA

Partner | Archaeologist

Education: Master of Arts - Atlantic Canada Studies, Saint Mary's University, 2013
Bachelor of Arts (Adv.) - History/Anthropology, Saint Mary's University, 2004
Bachelor of Science - Biology, Saint Mary's University, 2000

Affiliations: Member of the Registry of Professional Archaeologists
Nova Scotia Archaeology Society (Director 2003-2016; President 2007-2009)
Canadian Archaeological Association (Member of Organizing Committee 2011 Annual Conference, Halifax)
Council of Northeast Historical Archaeology
Association of Professional Archaeologists of New Brunswick
Gorsebrook Research Institute (Graduate Research Fellow, 2010)

REPRESENTATIVE ARCHAEOLOGICAL EXPERIENCE

2022 Principal Investigator during the Preliminary Investigation of the Glenvale Gypsum Project, in Glenvale, NB, for Dillon Consulting;

Principal Investigator during an Archaeological Impact Assessment (Initial Assessment) for the Fundy Nation Park Dickson Trail Pedestrian Bridge in New Brunswick, for Parks Canada via CBCL Limited;

Principal Investigator during archaeological monitoring for the Dugau-Ryerson Marsh Upgrade Project, located in Annapolis County, for the Department of Agriculture;

Principal Investigator during archaeological screening and reconnaissance of the Birch Plain Dredging Material Management Site in Victoria County, Nova Scotia, for the Department of Fisheries and Oceans Small Craft Harbours Branch via GHD;

Principal Investigator during the Preliminary Investigation of the Hampton Multiuse Centre Project, in Hampton NB, for Dillon Consulting;

Principal Investigator during archaeological screening and reconnaissance of the 760 Maplewood Lane Infilling Project, for the Landowner;

Principal Investigator during archaeological screening and reconnaissance of the 1454 Birchdale Avenue Infilling Project, for McCallum Construction;

2021 Principal Investigator during archaeological assessment of the Plains Road Water Valve Removal Project within the Debert Business Park, for the Municipality of the Colchester County;

Principal Investigator during archaeological assessment of the Debert Low Pressure Sewer within the Debert Business Park, for the Municipality of the Colchester County;

Principal Investigator during the Preliminary Investigation of the Nepisiguit Dam Life Extension Project, for New Brunswick Power;

Principal Investigator during archaeological screening and reconnaissance of the Kiwanis Grove Park Upgrade Project, located in Dartmouth, for Halifax Regional Municipality;

Principal Investigator during archaeological screening and reconnaissance of 287 Old Post Road in Grand Pre, for the Landowner and Landscape Grand Pre Inc.;

Principal Investigator during archaeological assessment of the Benjamins Mill Wind Project, for Dillon Consulting;

Principal Investigator during archaeological screening and reconnaissance of Lot 5 Grand Pre Road in Grand Pre, for the Landowner and Landscape Grand Pre Inc.;

Principal Investigator during archaeological screening and reconnaissance of 131 King Street in Hortonville, for the Landowner and Landscape Grand Pre Inc.;

2020-2021 Principal Investigator during archaeological monitoring for the Brigadoon Village Phase II, Expansion in Aylesford, Nova Scotia, for Grey Cardinal;

2020 Principal Investigator during an archaeological screening and reconnaissance for the Welshtown Quarry in Welshtown, Nova Scotia for Municipal Construction;

Principal Investigator during an archaeological screening and reconnaissance for Black Duck Brook 9Phase 7-3A/B in West Bedford, Nova Scotia for Clayton Development;

Principal Investigator during an archaeological screening and reconnaissance for the Fort View Golf Course Expansion in Lequille, Nova Scotia, for 3314197 Nova Scotia Limited;

Principal Investigator during an archaeological screening and reconnaissance for the Panuke Road Quarry Expansion in Windsor, Nova Scotia, for Nova Construction;

Principal Investigator during an archaeological screening and reconnaissance for the Shot Rock Property – Piedmont Land in Pictou County, Nova Scotia, for Northern Shield Resources Inc.;

Principal Investigator during an archaeological screening and reconnaissance for the Sheet Harbour Lands in Sheet Harbour, Nova Scotia, for Halifax Regional Municipality;

2019-2020 Principal Investigator during an archaeological impact assessment for the Canadian Centre for Climate Change and Adaptation in Saint Peters, PEI for UPEI;

2019 Principal Investigator during an archaeological screening and reconnaissance for the Pocologan Sand and Gravel project in Pocologan, New Brunswick for Amkis Resources;

Principal Investigator during preliminary investigation for the Milltown Generating Station Decommissioning Project in Milltown, New Brunswick for NB Power (via Dillon Consulting);

2018-2020 Principal Investigator during archaeological impact assessment of the Town of Woodstock Water Supply project in Woodstock, New Brunswick, for the Town of Woodstock (via Dillon Consulting);

2018-2019 Principal Investigator during archaeological impact assessment of the Upham East Gypsum Quarry project in Upham, New Brunswick, for Hammond River Holdings Ltd. (via Dillon Consulting);

2018 Principal Investigator during archaeological assessment of the Debert Well 1C Connection project within the Debert Air Industrial Park, for the Municipality of the County of Colchester;

Principal Investigator during archaeological assessment of the Kohltech Expansion Property within the Debert Air Industrial Park, for the Municipality of the County of Colchester;

Principal Investigator during archaeological screening and reconnaissance of the Greenwood Subdivision Wastewater Upgrade project in Saint John, New Brunswick, for the City of Saint John (via Dillon Consulting);

Principal Investigator during archaeological screening and reconnaissance of the Morna Heights Subdivision Wastewater Upgrade project in Saint John, New Brunswick, for the City of Saint John (via Dillon Consulting);

2017 Principal Investigator during archaeological screening and reconnaissance, monitoring and mitigation of the Proposed Irving Parking Garage project in Saint John, New Brunswick for Irving (via CBCL);

Principal Investigator during archaeological assessment of two lots within the Debert Air Industrial Park, for the Municipality of the County of Colchester;

Principal Investigator during archaeological shovel testing of the Canada 150 Shannon Park Observation Deck, in Halifax Regional Municipality for Canada Lands Company;

Principal Investigator during additional archaeological reconnaissance of the Truro Salt Marsh Dyke Restoration and Habitat project, for the Department of Transportation and Infrastructure Renewal;

2016 Principal Investigator during archaeological screening and reconnaissance of the Scots Bay Small Craft Harbour in Scots Bay, Kings County, Nova Scotia for GHD;

Principal Investigator during the archaeological assessment of seven lots (7 hectares) within the Debert Air Industrial Park, for the Municipality of the County of Colchester;

Field Director during archaeological mitigation for a dam replacement project amid three Precontact and historic sites at the outlet of Gaspereau Lake, Kings County for Nova Scotia Power Inc;

2015 Principal Investigator during archaeological screening and reconnaissance of the Seabrook Quarry in Digby County, Nova Scotia for Dexter Construction;

Field Director during the archaeological assessment of three commercial lots (15.6 hectares) within the Debert Air Industrial Park, for the Municipality of the County of Colchester;

2014 Principal Investigator during archaeological screening and monitoring of the redevelopment of the Roy Building in Halifax, Nova Scotia, for Starfish Properties;

Principal Investigator during archaeological screening and reconnaissance of the proposed water treatment and wastewater treatment facilities in Oromocto, New Brunswick, for Defence Construction Canada;

Field Director during the archaeological assessment of three lots (7.4 hectares) within the Debert Air Industrial Park, for the Municipality of the County of Colchester;

Principal Investigator during archaeological screening of the Prince Albert Road Option of the Sullivan's Pond Storm Sewer Renewal Project, Dartmouth, Nova Scotia, for CBCL Limited;

2013-2014 Principal Investigator during archaeological monitoring at the Nova Scotia Fisheries Museum of the Atlantic Inshore Fisheries Display Building Renovation and Stabilization Project (BcDb-8) for the Nova Scotia Department of Transportation and Infrastructure Renewal;

2013 Principal Investigator during archaeological screening and reconnaissance of the Hankinson Quarry, Annapolis County, the James River Quarry, Antigonish County, the Irish Cove Quarry, Victoria County and the Porters Lake Quarry, Halifax Regional Municipality, Nova Scotia, for Dexter Construction;

Principal Investigator during archaeological assessment of the Department of Fisheries - Canadian Coast Guard Base, Dartmouth, Nova Scotia, for Public Works and Government Services Canada;

Principal Investigator during archaeological reconnaissance and screening of the preferred pipeline alignment in Pictou County, Nova Scotia, for Heritage Gas;

Principal Investigator during archaeological shovel testing at four sites along the preferred pipeline alignment in Pictou County, Nova Scotia, for Heritage Gas;

2012-2013 Principal Investigator during archaeological monitoring for the Storm Water Easement for South Queens School in Liverpool, for the Nova Scotia Department of Transportation and Infrastructure Renewal;

Field Director during archaeological mitigation for a dam replacement project amid seven Precontact and historic sites at the outlet of Gaspereau Lake, Kings County for Nova Scotia Power Inc.;

Researcher for the Archaeological Resource Impact Assessment of Lovett Lake Estates in Beechville, Nova Scotia, for Armco Capital Inc.;

2012 Researcher for the Archaeological Screening and Reconnaissance of the Red Bridge Replacement in Baddeck Bridge, for the Nova Scotia Department of Transportation and Infrastructure Renewal;

2011-2012 Principal Investigator during archaeological monitoring at the Nova Scotia Fisheries Museum of the Atlantic Wharf Repair Project (BcDb-8) for the Nova Scotia Department of Transportation and Infrastructure Renewal;

2011 Field Archaeologist during archaeological assessment and testing for the Route 2, St. Jacques to Quebec: Heritage Resource Impact Assessment Testing Program, near Edmonston, for the New Brunswick Department of Transportation and Infrastructure;

2010-2011 Principal Investigator during archaeological survey and testing at the Lawrencetown Township (BdCu-8) and Green Estate (BdCu-9) Sites in Lawrencetown, Nova Scotia, related to graduate research conducted as part of a Master of Arts degree with the Atlantic Canada Studies program at Saint Mary's University;

2004-2011 Archaeological Site Supervisor at the Grand Pré Archaeological Field School at Grand Pré National Historic Site, for Saint Mary's University;

2010 Field Archaeologist during archaeological testing on the proposed Mi'kmawey Debert Cultural Centre Site, in Debert, Nova Scotia, for the Confederacy of Mainland Mi'kmaq;

Field Archaeologist during archaeological survey of a proposed 70 kilometre extension of Provincial Highway 11, Pokemouche to Janeville, for the New Brunswick Department of Transportation and Infrastructure;

2009 Principal Investigator during a geophysical survey of residential properties in Grand Desert, Nova Scotia, related to research as part of a Master of Arts degree with the Atlantic Canada Studies program at Saint Mary's University;

2004-2008 Collections Specialist (Assistant to the Archaeology Collections Manager) at the Parks Canada Archaeology Lab in Halifax, for Parks Canada Agency;

EMPLOYMENT HISTORY

Cultural Resource Management Group Limited, Halifax, Nova Scotia

2011-date Archaeological Technician (Casual) to Company Partner & Archaeologist, involved in all aspects of assessment and mitigation, including: research; survey, excavation and recording; supervision of field and lab personnel; and, report writing;

Saint Mary's University, Halifax, Nova Scotia

2004-2011 Archaeological Site Supervisor (Seasonal) at the Grand Pré Archaeological Field School, involved in the instruction of undergraduate students in archaeological field and laboratory techniques.

Parks Canada Agency, Halifax, Nova Scotia

2009-2010 Archaeological Site Assistant and Field Archaeologist (Contract), responsible for archaeological excavation on a mitigation project at Grand Pré NHS; and site assessment, excavation, recording and report writing for a monitoring and mitigation project on George's Island National Historic Site;

Parks Canada Agency, Halifax, Nova Scotia

2004-2008 Collections Specialist (Term), performing a variety of collections management duties including: processing of artifacts from point of excavation to final storage; compilation of electronic databases of archaeological site records, research library and map collection; and, material culture research.

NON-ACADEMIC COURSES

WHMIS 2015 (workplace hazardous materials) training
St. John Ambulance Standard First Aid / CPR Level A

DATE AWARDED PROFESSIONAL DESIGNATIONS

Nova Scotia Heritage Research Permits held since 2009
New Brunswick Archaeological Field Research Permits held since 2014
Member of the Registry of Professional Archaeologists since 2014

CULTURAL RESOURCE MANAGEMENT GROUP LIMITED

SARAH J. INGRAM, MA, RPA
Partner - Archaeologist

Education: Master of Arts (Historical Archaeology) – Archaeology, Memorial University, 2015
Honours in Archaeology – Memorial University, 2011
Bachelor of Arts – Anthropology and Classics, Saint Mary's University, 2010

Affiliations: Nova Scotia Archaeology Society (Member 2014 - present; President 2018 - present)
Newfoundland and Labrador Archaeology Society (Secretary 2013-2014)
Canadian Archaeology Association
APANB – Association of Professional Archaeologists of New Brunswick
Register of Professional Archaeologists – RPA 37843942
Ontario Archaeological Professional Licence Holder, P1116

Awards: Master's Fellowship Award, Memorial University, 2011-2013

REPRESENTATIVE ARCHAEOLOGICAL EXPERIENCE

2021 Principal Investigator during the archaeological shovel testing at Silver's Hill in Dartmouth, Nova Scotia for Halifax Regional Municipality;

Project Manager during the Stage 2 property assessment of the Howard and South Cameron Intersection Improvements in Windsor, Essex County, Ontario for Dillon Consulting;

Project Manager during the Stage 1 & 2 archaeological assessment of 511 Brock Street in Windsor, Essex County, Ontario for AMD Construction Group;

Principal Investigator during the Stage 4 archaeological mitigation of AaHs-34 Small Eastern Shore Site on Boblo Island, Essex County, Ontario for Amico Properties;

Project Manager during the Stage 3 site specific assessment of AbHr-56 in Windsor, Essex County, Ontario for Habib;

Principal Investigator during the archaeological monitoring of the Fort Needham Memorial Park Washroom Installation in Halifax County, Nova Scotia for Halifax Regional Municipality;

Principal Investigator during the archaeological monitoring of the RA9 – Royal Artillery Park Development in Halifax County, Nova Scotia for Bell Multi Construction;

Principal Investigator during the Sheet Harbour Geomechanical and Environmental Shovel Testing in Halifax County, Nova Scotia for Halifax Regional Municipality;

2020 Project Manager during the Stage 2 property assessment of Cabana Road Corridor Improvements in Windsor, Essex County, Ontario for Dillon Consulting;

Principal Investigator during the archaeological screening and reconnaissance of Stoney Island Small Craft Harbour in Shelburne County, Nova Scotia for GHD;

Principal Investigator during the archaeological screening and reconnaissance of the Lantz Quarry Expansion in Hants County, Nova Scotia for Municipal Enterprises Limited;

Principal Investigator during the archaeological screening and reconnaissance of Whycocomagh Quarry Expansion in Inverness County, Nova Scotia for Dexter Construction Company Limited;

Project Manager for the Stage 3: site specific assessment of AaHs-11 (Matthew Elliott Site), AaHs-20 (Duff II Site), and AaHs-128 (Front Road 2) in Amherstburg, Essex County, Ontario for Dillon Consulting Limited;

2019 Field Director for the Stage 1: archaeological impact assessment of Rinad – Disputed Road Subdivision in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Field Director for the Stage 1: archaeological impact assessment of the Leptis Magna Development in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Project Manager for the Stage 1: archaeological impact assessment of the Former Leonhardt Property Subdivision in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Project Manager for the Stage 1: archaeological impact assessment of Holmolka and Holmolka IIA in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Project Manager for the Stage 1: archaeological impact assessment of the Holmolka IIB Subdivision in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Project Manager for the Stage 1: archaeological impact assessment of the Former Klingbyle Property Subdivision in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Project Manager for the Stage 1: archaeological impact assessment of the Tuscany II Subdivision in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Project Manager for the Stage 2: property assessment of Sandwich and Mill in Windsor, Essex County, Ontario for Dillon Consulting Limited;

Field Director of the Stage 3: site specific assessment of AbHs-67 (Location 1) in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Field Director of the Stage 3: site specific assessment of AbHs-68 (Location 2) in LaSalle, Essex County, Ontario for Dillon Consulting Limited;

Project Manager during the Stage 1: archaeological impact assessment of Midwood Acres in Chatham, Chatham Kent County, Ontario for Baird AE;

2018 Principal Investigator during the archaeological screening and reconnaissance of the Northern Pulp Effluent Treatment Plant Revised Outfall Route Alignment in Pictou County, Nova Scotia for Dillon Consulting;

Field Director during Stage 1: archaeological impact assessment of the Holiday Inn Express in Lakeshore, Essex County, Ontario for Petretta Construction Inc.;

Field Director during Stage 1 & 2: archaeological impact assessment of 849 Front Road in Amherstburg, Essex County, Ontario for Dillon Consulting;

Field Director during Stage 1: archaeological impact assessment of Tecumseh Golf Lands in Tecumseh, Essex County, Ontario for Dillon Consulting;

Field Director during Stage 1: archaeological impact assessment of Martin Lane Development Property in LaSalle, Essex County, Ontario for Dillon Consulting;

Field Director during Stage 1: archaeological impact assessment of Sandwich Street & Mill Street in Windsor, Essex County, Ontario for Dillon Consulting;

Field Director during Stage 2: property assessment of 6550 & 6560 Wyandotte Street in Windsor, Essex County, Ontario for Dillon Consulting;

Field Director during Stage 1 & 2: archaeological impact assessment of the Riverview Estates Subdivision in Chatham, Essex County, Ontario for Henry Heyink Excavation Ltd.;

Field Director during Stage 1 & 2: archaeological impact assessment of the Harmony Lakes Subdivision in LaSalle, Essex County, Ontario for Dillon Consulting;

Assistant Field Director during Stage 1 & 2: archaeological impact assessment of the Canterbury College development in Windsor, Essex County, Ontario for Dillon Consulting;

Principal Investigator during archaeological test unit excavation of the Truro Salt Marsh Restoration & Habitat Bank Project in Pictou County, Nova Scotia for the Department of Agriculture and Nova Scotia Department of Transportation and Infrastructure Renewal;

Field Director during Stage 1: archaeological impact assessment of Queen Street Lands, Kincardine, Bruce County, Ontario for Ontario Peninsula Farms;

Assistant Field Director during Stage 3: site specific assessment of South Lands 3 (BbHj-51) in Kincardine, Bruce County, Ontario for Stantec Inc.;

Assistant Field Director during Stage 3: site specific assessment of South Lands 1 (BbHj-49) in Kincardine, Bruce County, Ontario for Stantec Inc.;

Field Director during Stage 3: site specific assessment of South Lands 4 (BbHj-52) in Kincardine, Bruce County, Ontario for Stantec Inc.;

Field Director during Stage 3: site specific assessment of South Lands 2 (BbHj-50) in Kincardine, Bruce County, Ontario for Stantec Inc.;

Field Director during Stage 2: property assessment of the Sterling Lakes Subdivision in LaSalle, Essex County, Ontario for Dillon Consulting;

Principal Investigator during archaeological shovel testing of the Truro Salt Marsh Restoration & Habitat Bank Project in Pictou County, Nova Scotia for the Department of Agriculture and Nova Scotia Department of Transportation and Infrastructure Renewal;

2017 Principal Investigator during archaeological shovel testing of the Northern Pulp Effluent Treatment Plant Replacement in Pictou County, Nova Scotia for Dillon Consulting;

Field Director during Stage 1: archaeological impact assessment of the Former Howard Business Park in LaSalle, Essex County, Ontario for Fanelli Group;

Field Director during Stage 1 & 2: archaeological impact assessment of Freddy's Redevelopment in Leamington, Essex County, Ontario for Dillon Consulting;

Field Director during Stage 1 & 2: archaeological impact assessment of the Golfwood Estates Subdivision in Leamington, Essex County, Ontario for Dillon Consulting;

Field Director during Stage 1 & 2: archaeological impact assessment of the River Ridge Subdivision in Lakeshore, Essex County, Ontario for Dillon Consulting;

Field Director during Stage 2: property assessment of 3129 Lauzon Road in Windsor, Essex County, Ontario for Dillon Consulting;

Principal Investigator during archaeological screening and reconnaissance of the Northern Pulp Effluent Treatment Plant Replacement in Pictou County, Nova Scotia for Dillon Consulting;

Principal Investigator during archaeological shovel testing of the proposed Links at Crowbush Cove expansion in Kings County, Prince Edward Island for the Department of Finance;

Field Supervisor during archaeological shovel testing of a commercial lot located within the Debert Air Industrial Park in Colchester County for the Municipality of the County of Colchester;

Field Supervisor during Stage 1 & 2: archaeological impact assessment of 849 Front Road in Amherstburg, Essex County, Ontario for Dillon Consulting Limited;

Field Supervisor for the monitoring of construction on the Queen's Marque property in Halifax County, Nova Scotia for Armour Group;

2016 Field Supervisor during archaeological mitigation of the Gaspereau Lake Reservoir in Kings County, Nova Scotia for Nova Scotia Power Inc.;

Principal Investigator and Permit Holder during archaeological screening and reconnaissance of the Williamsdale Quarry in Cumberland County, Nova Scotia for Dexter Construction;

Field Director during Stage 3: site specific assessment of the Western Shore Historic Site on Bob-Lo Island, Essex County, Ontario for AMICO Properties Inc.;

2015 Archaeological Supervisor during archaeological shovel testing of the proposed Sisson mine in Sisson Brook, New Brunswick for the Government of New Brunswick;

Archaeological Technician and Supervisor during archaeological shovel testing of two commercial lots located within the Debert Air Industrial Park in Colchester County for the Municipality of the County of Colchester;

Archaeological Technician during testing at the Highway 103 Interchange and Connector in Ingramport for the Nova Scotia Department of Transportation & Infrastructure Renewal;

Assistant Field Director during Stage 2 and 3 archaeological impact assessment of five sites identified on Bob-Lo Island, Essex County, Ontario for AMICO Properties Inc.;

Archaeological Technician during the re-exposure of the turbine chamber and surrounding features associated with the Shubenacadie Canal and Starr Manufacturing in Halifax County for Halifax Regional Municipality;

2014 Archaeological Technician during archaeological screening and shovel testing along Barry's Run in the Port Wallace area, Halifax County for Clayton Development Limited;

Archaeological Technician during archaeological shovel testing of three commercial lots (7.4 hectares) within the Debert Air Industrial Park in Colchester County for the municipality of the County of Colchester;

2013 Archaeological Technician during archaeological excavation of a seventeenth-century winter home in

Sunnyside, Newfoundland with Dr. Barry Gaulton;

2011-2013 Archaeological Technician during archaeological excavation of the seventeenth-century Ferryland colony in Ferryland, Newfoundland, for the Colony of Avalon and Memorial University;

2008 Archaeological Technician on the San Felice Archaeological Field School in Gravina, Italy, through Mount Allison University;

EMPLOYMENT HISTORY

Cultural Resource Management Group Limited, Halifax, Nova Scotia
2020-present Partner and Archaeologist addressing archaeological projects throughout Nova Scotia, New Brunswick, Prince Edward Island, and Ontario.

Cultural Resource Management Group Limited, Halifax, Nova Scotia
2014-2020 Principal Investigator and Field Director addressing archaeological projects throughout Nova Scotia, New Brunswick, Prince Edward Island, and Ontario.

Carbonear Heritage Society, Carbonear, Newfoundland
2014 Intangible Cultural Heritage independent researcher.

Heritage Foundation of Newfoundland and Labrador, St. John's, Newfoundland
2013-2014 Intangible Cultural Heritage Officer, leading special heritage projects and conference facilitation, as well as community outreach and heritage preservation projects.

Memorial University of Newfoundland and Labrador, St, John's, Newfoundland
2011-2013 Field and Lab Technician at the seventeenth-century site at Ferryland, Newfoundland, and graduate/research assistant to Dr. Barry Gaulton, Archaeology Department.

Saint Mary's University, Halifax, Nova Scotia
2008-2009 Tutor/ Assistant for Dr. Myles McCallum, Classics Department.

CERTIFICATIONS

St. John Ambulance Standard First Aid AED CPR Level C
CCOHS WHMIS 2015 for Workers
CCOHS Accident Investigation Training
CCOHS Personal Protective Equipment Training

PROFESSIONAL DESIGNATIONS

Register of Professional Archaeologists (RPA) since 2015
Ontario Archaeological Research License (R1116) held since 2016

APPENDIX C. PRIORITY SPECIES LIST

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Avifauna							
Phalacrocorax carbo	Great Cormorant	S2S3	-	-	-	Habitat is mainly over shallow waters close to shore, especially in sheltered bay areas. Nests on rocky sea cliffs of coasts and islands. In recent years, as population has increased, has been found in winter on large rivers inland. Breeds throughout the year, but mostly spring to late summer (April to August) (Audubon and The Cornell Lab)	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Botaurus lentiginosus	American Bittern	S3S4B	-	-	-	Found in marshes and reedy lakes. Breeds in freshwater marshes, mainly large, shallow wetlands with a large amount of tall marsh vegetation (cattails, grasses and sedges) and areas of open shallow water. Sometimes feeds in dry grassy fields. They are rarely seen out in the open, prefers vegetation cover. Breeds between April and July (Audubon and The Cornell Lab)	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Ixobrychus exilis	Least Bittern	SUB	T	T	-	The Least bittern has been observed in every Province in Canada. However, it is only probable to be located in Nova Scotia. The Least Bittern breeds strictly in marshes dominated by emergent vegetation surrounded by areas of open water. Most breeding grounds in Canada are dominated by cattails, but breeding also occurs in areas with other robust emergent plants and in shrubby swamps. The presence of stands of dense vegetation is essential for nesting because the nests of Least Bittern sit on platforms of stiff stems. The nests are almost always within 10 m of open water. This small heron prefers large marshes that have relatively stable water levels throughout the nesting period. Needs for wintering habitat are less specific, and appear to be met by a wide variety of wetlands—not only emergent marshes like those used for breeding, but also brackish and saline swamps (Environment Canada Recovery Strategy)	Environment Canada. 2014. Recovery Strategy for the Least Bittern (Ixobrychus exilis) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada. Ottawa. vi + 41 pp.

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Accipiter cooperii	Cooper's Hawk	S1?B	Not at Risk	-	-	Not common in Nova Scotia but does breed in the province. Found in mature forest, open woodlands, wood edges and river groves. Nests in coniferous, deciduous and mixed woods, typically those with tall trees and with openings or edge habitat nearby. Also found among trees along rivers through open country, and increasingly in suburbs and cities where tall trees exist for nesting (e.g. parks, open fields and even backyards with feeders). Breeds between April and July (Audubon and The Cornell Lab)	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Accipiter gentilis	Northern Goshawk	S3S4	Not at Risk	-	-	Found in coniferous and mixed forests. Generally restricted to wooded areas (along riparian corridors), but may be in relatively open woods or along edges. Often more common as a breeding bird in mixed woods (e.g. mature and old-growth forests with more than 60% closed canopy). In the East, goshawks seek out nest sites in mixed-hardwood forests where beeches, birch, hemlock and maples dominate. Goshawks often build nests near breaks in the canopy, such as a forest trail, road or opening created by a downed tree and prefer sites with a creek, pond or lake nearby. Breeds between April and July. May mate for life (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Charadrius vociferus	Killdeer	S3B	-	-	-	Favours fields, sandbars, lawns, river banks, coastal estuaries, mudflats and shores. Often found on open ground, such as pastures, plowed fields and large lawns, even at a great distance from water. This species does well in areas disturbed by humans and is commonly spotted on roads, lawns, airports, parking lots, golf courses, fields and in gravel areas. Most successful nesting areas have some shallow water close by or other good feeding area for the chicks. Generally the vegetation in fields inhabited by Killdeer is no taller than one inch. You can find Killdeer near water, but unlike many other shorebirds, they are also common in dry areas. Spring migration is very early, returning to some northern areas in February or March. Breeds between March and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Actitis macularius	Spotted Sandpiper	S3S4B	-	-	-	Common near fresh and saltwater. Habitat includes pebbly lake shores, ponds and stream sides (and seashores in the winter). Spotted Sandpipers spend the winter along the coasts of North America. During migration and winter, this species is found along the coast on mudflats, beaches and breakwaters (also found in inland habitats such as sewage ponds and irrigation ditches). Breeds near the edge of fresh water in a wide variety of settings, including lakes, ponds, rivers and streams (in either open or wooded country). Breeding territories generally need to have a shoreline, a semi-open area for the nest and patches of dense vegetation to conceal the chicks. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Calidris minutilla	Least Sandpiper	S1B,S3M	-	-	-	Common migrant (generally in flocks) in Nova Scotia. In Nova Scotia, Least Sandpipers are known to nest in sand dunes. During migration they stop on coastal mudflats, rocky shorelines and inland habitats including wet meadows, flooded fields, and muddy edges of lakes, ponds and ditches. On the coast they usually avoid sandy beaches and wide-open tidal flats, preferring narrow tidal creeks and the edges of salt marshes. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Gallinago delicata	Wilson's Snipe	S3B	-	-	-	Common across Nova Scotia during breeding and also known as a permanent resident in the southern areas of the province. Wilson's Snipes can be found in all types of wet, marshy settings, including wet fields, bogs, fens, swamps, wet meadows and along muddy edges of rivers and ponds. They avoid areas with tall, dense vegetation, but need patches of cover to hide in and to provide a safe lookout for predators. During the breeding season they are mainly found around fresh marshes and bogs, shrubby stream sides and northern tundra. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Tringa melanoleuca	Greater Yellowlegs	S3B,S3S4M	-	-	-	Common migrant in Nova Scotia (migrates in flocks). During migration and throughout the winter, Greater Yellowlegs use a wide variety of fresh and brackish wetlands, including mudflats, estuaries, beaches, marshes, lake and pond edges, wet meadows, sewage ponds and flooded agricultural fields. Breeds in boggy and marshes places within northern coniferous forest. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Asio otus	Long-eared Owl	S2S3	-	-	-	Known to breed throughout Nova Scotia. They occur at elevations ranging from near sea level to above 6,500 feet. May be nomadic at times, moving about in response to changing food supplies. Favored habitat includes dense trees for nesting and roosting and open country (e.g. grasslands and shrublands) for hunting. Inhabits a wide variety of such settings, including forest with extensive meadows to groves of conifers or deciduous trees. Generally avoids unbroken forest. Known to be an early breeder. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Antrostomus vociferus	Eastern Whip-Poor-Will	S1?B	-	-	-	Roughly 50% of home ranges consisted of open habitats, used primarily for foraging. Common habitat choices include rock or sand barrens with scattered trees, savannahs, old burns or other disturbed sites in a state of early to mid-forest succession, or open conifer plantations. Accordingly, pine (barrens and plantations), oak (barrens and savannahs), and aspen and birch (early to mid-succession) are common tree species associations. Individuals will often feed in nearby shrubby pastures or wetlands where perches, and power-line and roadway corridors are also occupied. Other necessary habitat elements are thought to involve ground-level vegetation and woodland size. Areas with little ground cover are preferred.	OSEWIC. 2009. COSEWIC assessment and status report on the Whip-poor-will Caprimulgus vociferus in Canada. Committee on the Status of E Wildlife in Canada. Ottawa. vi + 28 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Chordeiles minor	Common Nighthawk	S2B	T	T	T	Common Nighthawk breeds in a range of open and partially open habitats, including forest openings and post-fire habitats, prairies, bogs, and rocky or sandy natural habitats, as well as disturbed areas. It is also found in settled areas that meet its habitat needs, those with open areas for foraging and bare or short-cropped surfaces for nesting. The species use of a wide range of habitats makes it difficult to estimate trends in habitat availability, except in urban habitats, where their main nesting sites – flat graveled roofs – are disappearing.	https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/common-nighthawk-2018.html
Chaetura pelagica	Chimney Swift	S2B,S1M	T	T	E	The chimney swift is associated with urban and rural areas where chimneys are available for nesting and roosting. In their northern breeding range, Chimney Swifts look for sites with a relatively constant ambient temperature.	COSEWIC 2007. COSEWIC assessment and status report on the Chimney Swift Chaetura pelagica in Canada. Committee on the Status of E Wildlife in Canada. Ottawa. Vii + 49 pp. (www.sararegistry.gc.ca/status/status_e.cfm)
Picoides arcticus	Black-backed Woodpecker	S3S4	-	-	-	Known throughout Nova Scotia year-round. Not strictly migratory, but may move around in response to changing conditions (e.g. destruction of habitat). Eastern birds occasionally stage southward irruptions in winter, with scattered individuals showing up well south of breeding range. Habitat includes boreal forests of firs and spruces (pine, Douglas-fir, hemlock, tamarack and spruce, especially spruce bogs). Favours areas of dead or dying trees (coniferous and deciduous), and may concentrate at burned or flooded areas with many standing dead trees. Frequents lowlands in the North and mountains in the West. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Contopus cooperi	Olive-sided Flycatcher	S2B	T	T	T	Olive-sided Flycatcher has been widely observed in open coniferous or mixed coniferous forests, often located near water or wetlands with the presence of tall snags or trees from which the species sallies for prey and advertises its territory. Mature conifer stands within patchy landscapes influenced by natural disturbance (e.g., recent burns) support the highest densities of Olive-sided Flycatcher. Nests are generally placed toward the tip of coniferous branches (although other tree types have been used).	Nova Scotia Department of Lands and Forestry. 2021. Recovery Plan for the Olivesided Flycatcher (Contopus cooperi) in Nova Scotia [Final]. Nova Scotia E Species Act Recovery Plan Series.
Contopus virens	Eastern Wood-Pewee	S3S4B	SC	SC	V	The Eastern Wood-pewee is mostly associated with the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in forest stands of intermediate age and in mature stands with little understory vegetation. During migration, a variety of habitats are used, including forest edges, early and successional clearings.	Species Profile (Eastern Wood-pewee) - Species at Risk Public Registry (canada.ca)
Empidonax flaviventris	Yellow-bellied Flycatcher	S3S4B	-	-	-	Common breeder throughout Nova Scotia. Yellow-bellied Flycatchers breed in boreal coniferous forests, bogs, swamps, and peatlands with a thick cover of moss and an understory of shrubs and saplings (e.g. muskegs). In Canada they frequent stands of black spruce with heath, blueberries, laurel and Labrador tea in the understory, but they also use wet boreal forests and deciduous patches near streams. During migration they use deciduous forests, thickets and forest edges. Spring migration is notably late, with most northbound migrants passing through in mid to late May. Almost all migration is through the east. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Empidonax traillii	Willow Flycatcher	S2B	-	-	-	Uncommon breeder throughout mainland Nova Scotia, not Cape Breton (MBBA, as of July 2021). In winter, they use shrubby clearings, pastures and woodland edges often near water. Migrates relatively late in spring and early in fall. Breeds in thickets of deciduous trees and shrubs, especially willows, or along woodland edges. Often near streams or marshes and may be found in drier habitats than the Alder Flycatcher. Breeds between April and July (Audubon and The Cornell Lab).	Maritime Breeding Bird Atlas (MBBA): https://www.mba-aom.ca/jsp/map.jsp, Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Myiarchus crinitus	Great Crested Flycatcher	S1B	-	-	-	Uncommon breeder throughout mainland Nova Scotia, not Cape Breton (MBBA, as of July 2021). Migrates mostly at night. Breeds mainly in deciduous forest or mixed forest, but avoids pure stands of conifers. May be found in either continuous deep forest or in more open wooded areas, around edges of clearings or abandoned orchards. Dead snags and dying trees are important sources of the cavities they need for nesting (will even search out cavities in old orchards and in woody urban areas like parks, cemeteries and golf courses). If there are enough trees, they will claim territories in pastures, along streams and rivers, and in swamps and wetlands. Breeds between April and July (Audubon and The Cornell Lab).	Maritime Breeding Bird Atlas (MBBA): https://www.mba-aom.ca/jsp/map.jsp, Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Petrochelidon pyrrhonota	Cliff Swallow	S2S3B	-	-	-	Breeds throughout Nova Scotia. A long-distance migrant that migrates in flocks, traveling by day. Typically nests in colonies, sometimes with hundreds of nests crowded close together. These colonies are close to a water source, open fields or pastures for foraging, and a source of mud for nest building. Nest site is usually on vertical surface with some overhead shelter. Natural sites were on cliffs. Most sites today are on the sides of buildings, under bridges, in culverts or similar places. They now live in grasslands, towns, broken forest and river edges, but avoid heavy forest and deserts (e.g. open to semi-open land, farms, river bluffs and lakes). Still unaccountably scarce or missing in some seemingly suitable areas. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Riparia riparia	Bank Swallow	S2S3B	T	T	E	Bank Swallows live in low areas along rivers, streams, ocean coasts, and reservoirs. Their territories usually include vertical cliffs or banks where they nest in colonies. Most commonly found around natural bluffs or eroding streamside banks, they now often nest in human-made sites, such as sand and gravel quarries or road cuts. They forage in open areas and avoid places with tree cover.	Bank Swallow Life History, All About Birds, Cornell Lab of Ornithology

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Perisoreus canadensis	Canada Jay	S3	-	-	-	Year-round resident throughout Nova Scotia and commonly referred to as the Gray Jay. No regular migration. On rare occasions, small invasions of Canada Jays will move a short distance out of boreal forest in winter. Prefers boreal and subalpine forests across northern North America, usually where black or white spruce trees are common (also aspen, white birch, balsam fir, sugar maple, jack pine, red spruce, eastern white cedar, etc.). Found in various kinds of coniferous and mixed forest, but rarely occurs where there are no spruce trees. Mated pairs stay together all year and defend permanent territories. Breeding and nesting for this species begins very early, during late winter, with breeding grounds still snow-covered. Breeds until, approximately, July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Poecile hudsonicus	Boreal Chickadee	S3	-	-	-	Year-round resident throughout Nova Scotia. Occasional small southward invasions in fall, with a few appearing south of breeding range (similar to Black-capped Chickadees invasions). Boreal Chickadees inhabit mostly mature coniferous forests (sometimes mixed forests), usually spruce and balsam fir, often near water. During late fall and winter irruptions, they tend to be found mostly in areas dominated by coniferous trees. Occurs in low stunted spruces as far North as treeline (e.g. spruce bogs). May mate for life, the birds remaining together all year. Nests in a hole in a tree, either a natural cavity or one they created (or from another species). Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Sitta canadensis	Red-breasted Nuthatch	S3	-	-	-	Year-round resident throughout Nova Scotia. Red-breasted Nuthatches live mainly in coniferous forests of spruce, fir, pine, hemlock, larch and western red cedar. Eastern populations use more deciduous woods, including aspen, birch, poplar, oak and maple. During irruptive winters, nuthatches may use habitats such as orchards, scrub, parks, plantations and shade trees. Winter range varies from year to year, especially in the East (but conifers always chosen if available). Big Southward invasions occur in fall of some years, perhaps mainly when cone crops are poor in the North (but will remain year-round on nesting territory during years with good food supply). Nesting habitat almost always has many conifers, such as spruce, fir and hemlock, either in pure stands or mixed with deciduous trees. Mature forest preferred, due to old decaying wood for nest sites. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Cistothorus palustris	Marsh Wren	S1B	-	-	-	Uncommon breeder in Nova Scotia and only possible sightings in certain counties on mainland Nova Scotia. Only confirmed sighting has been in Cumberland County (MBBA, as of July 2021). Probably migrates at night. Migrants sometimes stop over in odd habitats, away from water. Marsh Wrens occupy wetlands filled with cattails, sedges, bulrushes and Phragmites as well as cordgrass-filled saltmarshes year-round (fresh and brackish water, also in other kinds of low rank growth along shallow water). In the winter they also use brushy thickets near wetlands, tidal saltmarshes and weedy ponds or agricultural canals (large or small). Breeds between April and July (Audubon and The Cornell Lab).	Maritime Breeding Bird Atlas (MBBA): https://www.mba-aom.ca/jsp/map.jsp, Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Catharus fuscescens	Veery	S3S4B	-	-	-	Breeds across Nova Scotia, but more common on the mainland (especially Southern Nova Scotia). Migrates mostly at night. During spring and fall migration, they favour mainly deciduous forest edges and second-growth woodlands. Males tend to arrive on breeding grounds first. Veeries breed in dense, damp, mostly deciduous woodlands, often near rivers, streams and swampy areas (trees include oak, maple, cherry, aspen, birch, alder, spruce and fir, among other trees and shrubs). Veeries gravitate toward disturbed forests, where dense understory provides protected nest sites (but generally along streams and other openings). Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Catharus ustulatus	Swainson's Thrush	S3S4B	-	-	-	Breeds throughout Nova Scotia. Spring migration relatively late and spread over a long period (sometimes still migrating at the beginning of June). Breed mainly in coniferous forests, deciduous streamside woodlands, alder or willow thickets and occasionally in coastal scrub. These birds range from sea level up to about 8,500 feet in elevation. During migration, Swainson's Thrushes occupy a wide variety of habitats, seeking mainly areas with dense undergrowth. Look for migrants especially in forests (various types), canyon bottoms, young woodland, swamp forests, lake edges and parks. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Hylocichla mustelina	Wood Thrush	SUB	T	T	-	It breeds in the Northern Highlands of Cape Breton Island as well as nearby St. Paul and Scaterie Islands. In coastal areas St. Paul and Scaterie Islands (NS), cool sea breezes and higher precipitation levels maintain dense spruce-fir stands selected locally by Bicknell's Thrush. In general, the Bicknell's Thrush is a coniferous habitat specialist, often associated with undisturbed dense habitats or disturbed areas undergoing vigorous succession (mid-successional). The highest densities are typically found in chronically and naturally disturbed stands. The species ranges from altitudes of 1,000 m elevation at the southern end of the range to 450 m asl (above sea level) at the northern end of its range. This altitudinal gradient closely matches the inland spruce-fir/deciduous forest ecotone habitat distribution in eastern North America (COSEWIC Assessment and Status Report).	COSEWIC. 2009. COSEWIC assessment and status report on the Bicknell's Thrush Catharus bicknelli in Canada. Committee on the Status of E Wildlife in Canada. Ottawa. vii + 44 pp. (www.sararegistry.gc.ca/status/status_e.cfm).
Regulus calendula	Ruby-crowned Kinglet	S3S4B	-	-	-	Breeds throughout Nova Scotia. Migrates a little earlier in fall and later in spring compared to the Golden-crowned Kinglet. In many areas, peak migration periods are October and April. In summer, Ruby-Crowned Kinglets are common in spruce-fir forests (also fir and pine). They also live in mixed woods, isolated trees in meadows, coniferous and deciduous forests, mountain-shrub habitat and floodplain forests of oak, pine, spruce or aspen. These birds nest high in trees, and so prefer older, taller and denser stands. During migration and winter they are common in various woods and thickets (e.g. open deciduous woods, also in coniferous and mixed woods, mesquite brush and streamside thickets). Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Sialia sialis	Eastern Bluebird	S3B	Not at Risk	-	-	Uncommon breeder throughout Nova Scotia. In the north, arrives quite early in spring, and lingers late in fall. These birds live in semi-open country with scattered trees, but with little understory and sparse ground cover. Original habitats probably included open, frequently burned pine savannas, beaver ponds, mature (but open) woods and forest clearings/openings. Today, they are most common along pastures, roadsides, agricultural fields, suburban parks, backyards and golf courses. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Dumetella carolinensis	Gray Catbird	S3B	-	-	-	Known to breed all through Nova Scotia but seems to be more common in the Southern counties. Gray Catbirds live amid dense undergrowth, shrubs, vine tangles and thickets of young trees in shrubby swamps and along forests and streams in both summer and winter (dense, low growth). Human disturbance and development often create these habitats in the form of suburban gardens, clearings, roadsides, fencerows, abandoned farmland and residential areas. Avoids unbroken forest and coniferous woods. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Mimus polyglottos	Northern Mockingbird	S1B	-	-	-	Year-round resident throughout Nova Scotia, less common in Cape Breton. Found year-round in areas with open ground and shrubby vegetation (e.g. dense, low shrubs - hedges, fruiting bushes and thickets). When foraging on the ground, it prefers grassy areas, rather than bare spots. Common places include roadsides, parkland, cultivated land, suburban areas, woodland edges and in second-growth habitat at low elevations. Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Toxostoma rufum	Brown Thrasher	S1B	-	-	-	Not common and rarely seen in Nova Scotia, with no recorded sightings in Cape Breton (MBBA, as of July 2021). In eastern North America, Brown Thrashers nest in thickets, brush, shrubbery, hedgerows, forest edges and overgrown clearings in deciduous forest. On rare occasions they breed in backyards and gardens with shrubs and hedges (but in general - areas of dense low growth, especially thickets around edges of deciduous or mixed woods, shrubby edges of swamps or undergrowth in open pine woods). Breeds between April and July (Audubon and The Cornell Lab).	Audubon: https://www.audubon.org/bird-guide, The Cornell Lab - All About Birds: https://www.allaboutbirds.org
Vireo gilvus	Warbling Vireo	S1B	-	-	-	Occurs in deciduous and mixed woods, aspen groves, poplars, shade trees. Breeds in open deciduous or mixed woodland; also in orchards, shade trees of towns (Audubon). They stay high in deciduous treetops (Cornell Lab). Breeds between April and July (Audubon and The Cornell Lab).	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Vireo philadelphicus	Philadelphia Vireo	S2?B	-	-	-	Occurs in second growth; poplars, willows, alders. Breeds in deciduous and mixed woodlands, especially near their edges, or in the young growth of overgrown pastures. Also nests in willows and alders along streams, lakes, and ponds. Breeds between April and July (Audubon).	Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Dolichonyx oryzivorus	Bobolink	S3S4B	T	T	V	Bobolink has nested in forage crops (e.g., hayfields and pastures dominated by a variety of species, such as clover, Timothy, Kentucky Bluegrass, and broadleaved plants). The Bobolink occurs in various grassland habitats including wet prairie, graminoid peatlands and abandoned fields dominated by tall grasses, remnants of uncultivated virgin prairie (tall-grass prairie), no-till cropland, small-grain fields, restored surface mining sites and irrigated fields in arid regions. It is generally not abundant in short-grass prairie, Alfalfa fields, or in row crop monocultures (e.g., corn, soybean, wheat), although its use of Alfalfa may vary by region.	Species Profile (Bobolink) - Species at Risk Public Registry (canada.ca)

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Euphagus carolinus	Rusty Blackbird	S2B	SC	SC	E	Breeding habitat is characterized by coniferous-dominated forests adjacent to wetlands, such as slow-moving streams, peat bogs, sedge meadows, marshes, swamps and beaver ponds. On migration, the Rusty Blackbird is primarily associated with wooded wetlands. In winter, it occurs primarily in lowland forested wetlands, cultivated fields and pecan groves. Suitable habitat for the species appears to be decreasing on its breeding range and wintering grounds, due mainly to the loss and degradation of wetlands by human activities.	https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=907
Icterus galbula	Baltimore Oriole	S2S3B	-	-	-	Baltimore Orioles are often very common in open woods and groves in summer. Found in open woods, riverside groves, elms, shade trees. Breeds in deciduous or mixed woodland, generally in open woods or edges rather than interior of dense forest. May be common in trees in towns (Audubon). Breeds between April and July (Audubon and The Cornell Lab).	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Oreothlypis peregrina	Tennessee Warbler	S3S4B	-	-	-	Found in deciduous and mixed forests; in migration, groves, brush. Breeds in bogs, swamps, and forests. Prefers openings in second growth balsam-tamarack bogs, or aspen and pine woods, or edges of dense spruce forest, but can be found in many types of wooded habitats in eastern North America. Nests near slight depressions of boggy ground. Breeds between April and July (Audubon and The Cornell Lab).	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Passerella iliaca	Fox Sparrow	S3S4B	-	-	-	Found year round in Cape Breton, and throughout the migration season (late March and early November) in the rest of the province. Migrates at night. Found in wooded areas, undergrowth, brush. Breeds in brushy areas including woodland edges and clearings, streamside thickets, scrubby second growth, stunted coastal forest. Winters in similar habitats, also in brushy fields, chaparral, well-vegetated suburbs and parks. Breeds from April to July (The Cornell Lab, Audubon)	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Passerina cyanea	Indigo Bunting	S1?B	-	-	-	This species favors brushy edges rather than unbroken forest. Indigo Buntings breed in brushy and weedy areas. They're common on the edges of woods and fields; along roads, streams, rivers, and powerline cuts; in logged forest plots, brushy canyons, and abandoned fields where shrubby growth is returning. They are also in clearings within deciduous woods, edges of swamps. Breeds between April and July (Audubon and The Cornell Lab).	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Pheucticus ludovicianus	Rose-breasted Grosbeak	S2S3B	-	-	-	Look for these birds in forest edges and woodlands. Rose-breasted Grosbeaks breed in moist deciduous forests, deciduous-coniferous forests, thickets, and semi open habitats. They gravitate toward second-growth woods, suburban areas, parks, gardens, and orchards, as well as shrubby forest edges next to streams, ponds, marshes, roads, or pastures. They favor edges or openings with combination of shrubs and tall trees, rather than unbroken forest. Breeds from April to July (The Cornell Lab, Audubon)	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Piranga olivacea	Scarlet Tanager	S2B	-	-	-	These birds can be found in oak forests in summer, but they often remain out of sight as they forage in the leafy upper branches. Nest site is in tree (usually deciduous), typically 20-30' above ground. Found in forests and shade trees (especially oaks). Breeds mostly in deciduous forest, predominately oaks but also in maple, beech, mixed pine-oak woods, and coniferous woods dominated by pine or hemlock. Breeding Scarlet Tanagers prefer large forest tracts with large trees. During spring and fall they use similar forest habitats as well as open spaces such as parks and gardens. Breeds between April and July (The Cornell Lab, Audubon)	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Pooecetes gramineus	Vesper Sparrow	S2B	-	-	-	Vesper Sparrows breed in open areas with short, sparse grass, areas where there are a few taller plants for use as song perches, and scattered shrubs including, old fields, pastures, weedy fence lines and roadsides, hayfields, and native grasslands. Can be found in meadows, fields, prairies, roadsides, open grassy or weedy fields. May be in weedy roadsides, gravel pits, stubble fields, grassy areas just above sandy beaches. Breeds from April to July (The Cornell Lab, Audubon).	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Setophaga castanea	Bay-breasted Warbler	S3S4B	-	-	-	Bay-breasted warblers are found in woodlands, conifers in summer. Usually breeds in northern coniferous forest, in thick stands of spruce and fir. They are predators of spruce budworm, and are abundant in spruce forests during outbreaks. Where spruce is not found, will nest in deciduous or mixed second-growth woods of birches, maples, firs, and pines. Breed from April to July, typically in the latter half of the breeding window (The Cornell Lab, Audubon)	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Coccothraustes vespertinus	Evening Grosbeak	S3S4B, S3N	SC	No Status	V	Evening Grosbeak breeding habitat generally includes open, mature mixedwood forests, where fir species and/or White Spruce are dominant, and Spruce Budworm is abundant. Outside the breeding season, the species seems to depend largely on seed crops from various trees such as firs and spruces in the boreal forest, but is also attracted to ornamental trees that produce seeds or fruit, and bird feeders stocked with sunflower seeds.	Species at Risk Public Registry - The COSEWIC Summaries of Terrestrial Species Eligible for Addition or Reclassification on Schedule 1 - January 2018 (sararegistry.gc.ca).
Loxia curvirostra	Red Crossbill	S3S4	-	-	-	Found throughout the entire province year-round. Red Crossbills can be found in conifer forests and groves, and breeds in pines (predominately), spruce, hemlock, Douglas-fir, or other evergreens. Breeding occurs from April to July (The Cornell Lab, Audubon)	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Pinicola enucleator	Pine Grosbeak	S2S3B, S5N	-	-	-	Found throughout the province year-round. Pine grosbeaks can be found in conifers; in winter, other trees. Breeds in open coniferous forest, especially of spruce and fir. In winter often found in deciduous trees (especially fruiting trees), also in groves of pines and other conifers. Breeding occurs from April to July (The Cornell Lab, Audubon).	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird
Spinus pinus	Pine Siskin	S2S3	-	-	-	Found throughout the province year-round. Pine Siskins can be found in conifers, mixed woods, alders, weedy areas. Breeds mostly in coniferous and mixed woods, often around edges or clearings; sometimes in deciduous woods, isolated conifer groves. In migration and winter occurs in many kinds of semi-open areas, woodland edges, weedy fields. Breeding occurs from April to July (The Cornell Lab, Audubon)	The Cornell Lab - All About Birds: https://www.allaboutbirds.org, Audubon Guide to North American Birds: https://www.audubon.org/field-guide/bird

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Hylocichla mustelina	Wood Thrush	SUB	T	T	-	It breeds in the Northern Highlands of Cape Breton Island as well as nearby St. Paul and Scaterie Islands. In coastal areas St. Paul and Scaterie Islands (NS), cool sea breezes and higher precipitation levels maintain dense spruce-fir stands selected locally by Bicknell's Thrush. In general, the Bicknell's Thrush is a coniferous habitat specialist, often associated with undisturbed dense habitats or disturbed areas undergoing vigorous succession (mid-successional). The highest densities are typically found in chronically and naturally disturbed stands. The species ranges from altitudes of 1,000 m elevation at the southern end of the range to 450 m asl (above sea level) at the northern end of its range. This altitudinal gradient closely matches the inland spruce-fir/deciduous forest ecotone habitat distribution in eastern North America (COSEWIC Assessment and Status Report).	COSEWIC. 2009. COSEWIC assessment and status report on the Bicknell's Thrush Catharus bicknelli in Canada. Committee on the Status of E Wildlife in Canada. Ottawa. vii + 44 pp. (www.sararegistry.gc.ca/status/status_e.cfm).
Fish							
Anguilla rostrata	American Eel	S2	T	-	-	In freshwater habitats, preferred habitat can be found in both lentic and lotic waters including all waters extending from the high-water mark down to at least 10 m depth for all reaches currently or formerly used by the American Eel. During their oceanic migrations, eels occupy salt water and in their continental phase (growth in continental waters), they use all salinity zones (COSEWIC Assessment and Status Report).	COSEWIC. 2012. COSEWIC assessment and status report on the American Eel Anguilla rostrata in Canada. Committee on the Status of E Wildlife in Canada. Ottawa. xii + 109 pp.
Alosa pseudoharengus	Alewife	S3	-	-	-	A marine fish that uses freshwater streams for spawning, and is now landlocked in many inland lakes. They have been known to enter Grand, Shubenacadie Lake, as well as Fletcher Run and Rawdon rivers. In the Maritime provinces, spawning commences in May and continues until late in June (Scott and Crossman, 1973).	Scott and Crossman, 1973. Freshwater fishes of Canada

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Salmo salar pop. 1	Atlantic Salmon - Inner Bay of Fundy pop.	S1	E	E	-	When Atlantic Salmon are in fresh water they prefer natural stream channels with rapids and pools, gravel bottoms, and cool water that is free from chemical and organic pollution. Spewing occurs in natal rivers in October and November. In 2010, 10 rivers in New Brunswick and Nova Scotia were identified as containing fresh water critical habitat for the iBoF Salmon: Gaspereau, Stewiacke, Debert, Folly, Great Village, Portapique, Economy, Upper Salmon, Point Wolfe and Big Salmon (Fisheries and Oceans Canada, 2019)	Fisheries and Oceans Canada, 2019: https://www.dfo-mpo.gc.ca/species-especes/profiles-profils/salmon-atl-saumon-eng.html
Salvelinus fontinalis	Brook Trout	S3	-	-	-	Most common in cool well-oxygenated waters of lakes and streams. In autumn, brook trout move into smaller, shallower streams and require free passage along streams to move between areas of use. Spawning occurs from October - early December (Gilhen, 1974)	Gilhen, J. 1974. The fishes of Nova Scotia's lakes and streams
Margariscus margarita	Pearl Dace	S3	-	-	-	Cool, clear headwater streams in the south, bog drainage streams, ponds and small lakes in the north, and in stained, peaty waters of beaver ponds.. Spawning occurs in clear water over sand or gravel in weak or moderate current (Scott and Crossman 1973).	Scott and Crossman, 1973. Freshwater fishes of Canada
Culaea inconstans	Brook Stickleback	S3	-	-	-	Inhabits clear, cold, densely vegetated waters of small streams and spring-fed ponds, and is found along the swampy margins of beach ponds of larger lakes. They are tolerant of salt water for short periods of time. Spawning occurs in shallow water from late April to July, depending on the water temperature (Scott and Crossman, 1973)	Scott and Crossman, 1973. Freshwater fishes of Canada

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Morone saxatilis pop. 2	Striped Bass- Bay of Fundy pop.	S1B	E	-	-	Shubenacadie River, Saint John River (historically), and Annapolis River (historically). In most Striped Bass populations, spawning, incubation and early larval development occur in fresh or slightly brackish waters. The Shubenacadie River population, however, spawns in a section of its major tributary, the Stewiacke River, affected by a tidal bore. At the juvenile and adult stages, Striped Bass use coastal and estuarine habitats and saltwater systems. Eelgrass plays an important role for several species of fish at different stages of their life cycle, including the Striped Bass for rearing, feeding and sheltering. Young and adult Striped Bass populations undertake a fall migration to estuaries or freshwater habitats to overwinter (see Dispersal and Migration section). This behaviour is considered to enable them to avoid the low winter ocean temperatures. Wintering and spawning sites do not necessarily overlap in distribution or occur in the same drainage (COSEWIC Assessment and Status Report).	COSEWIC. 2012. COSEWIC assessment and status report on the Striped Bass Morone saxatilis in Canada. Committee on the Status of E Wildlife in Canada. Ottawa. iv + 82 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).
Herpetofauna							

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Chelydra serpentina	Snapping Turtle	S3	SC	SC	V	They are common in southwestern Nova Scotia and less common on the northeastern mainland. Although Snapping Turtles occupy a wide variety of habitats, the preferred habitat for this species is characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation. Established populations are most often found in ponds, marshes, swamps, peat bogs, shallow bays, river and lake edges, and slow-moving streams. turtles appear to prefer the following characteristics for their hibernacula: water shallow enough to let the turtle reach the surface to breathe, but deep enough so the water will not freeze to the bottom; a location that is likely to freeze over later in the season and thaw earlier in the spring; a thick layer of mud in which the turtle can bury itself; and additional submerged cover, such as a floating mat of vegetation, roots, stumps, branches or logs, a muskrat dwelling or an overhanging bank.	Environment and Climate Change Canada. 2016. Management Plan for the Snapping Turtle (Chelydra serpentina) in Canada [Proposed]. Species at Risk Act Management Plan Series. Ottawa, Environment and Climate Change Canada, Ottawa, iv + 39 p

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Chrysemys picta picta	Eastern Painted Turtle	S4S5	SC	-	-	Eastern Painted Turtle is found in New Brunswick, Nova Scotia, and the Atlantic coastal states east of the Appalachian Mountains. Painted Turtles occupy slow moving, relatively shallow and well-vegetated wetlands (e.g., swamps, marshes, ponds, fens, bogs, and oxbows) and water bodies (e.g., lakes, rivers, creeks, and streams) with abundant basking sites and organic substrate. These turtles are found in association with submergent aquatic plants, which are used for cover and feeding. The species is semi-tolerant of human-altered landscapes and may occasionally be found occupying urban ponds and lands subject to anthropogenic disturbance (e.g., farm ponds, impoundments, water treatment facilities). Suitable nesting habitat includes open, often south-facing, and sloped areas with sandy-loamy and/or gravel substrate usually within 1200 m of aquatic active season habitats. Painted Turtles overwinter in shallow water with deep sediment (COSEWIC Assessment and Status Report).	COSEWIC. 2018. COSEWIC assessment and status report on the Midland Painted Turtle Chrysemys picta marginata and the Eastern Painted Turtle Chrysemys picta picta in Canada. Committee on the Status of E Wildlife in Canada. Ottawa. xvi + 107 pp. (http://www.registrelepsararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1).
Glyptemys insculpta	Wood Turtle	S2	T	T	T	Wood Turtles are strongly associated with meandering, shallow rivers with sand, gravel, and/or cobble bottoms; these rivers are typically clear, with moderate current and frequent oxbows. Wood Turtles hibernate aquatically in streams and rivers (October to April, depending on location). Overwintering sites are usually on the bottom of deep pools, often with fallen debris that provides structure and prevents dislodging during high flow events. Found throughout the Province with concentrations in Guysborough and Annapolis Counties. Local plants include alders, chokecherry, hawthorn and mixed wood stands of deciduous and coniferous trees. Females lay their eggs in sandy bars along rivers and other gravel areas (driveways, roadsides, borrow pits) in June.	Species at Risk in Nova Scotia: Identification & Information Guide
Lichen							

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Collema leptaleum	Crumpled Bat's Wing Lichen	S2S3	-	-	-	-	-
Collema nigrescens	Blistered Tarpaper Lichen	S3	-	-	-	-	-
Heterodermia leucomela	Elegant Fringe Lichen	S1	-	-	-	-	-
Leptogium teretiusculum	Beaded Jellyskin Lichen	S2?	-	-	-	-	-
Pannaria lurida	Wrinkled Shingle Lichen	S1S2	T	-	T	The Wrinkled Shingle Lichen colonizes mature deciduous trees, most often Red Maple that grow near, but not usually within, imperfectly drained habitats. Hence, this lichen is found on trees close to the edge of treed swamps or floodplains. The Wrinkled Shingle Lichen most frequently inhabits sites near imperfectly drained, humid habitats dominated by deciduous trees. Such sites are close to the edge of treed swamps or riparian floodplains, or are at the base of moderate to steep slopes. A few occurrences are known from upland hardwood stands at the tops of slopes that are less than 100m in elevation. Only two occurrences are within a few kilometres of the coast. Canopy density is moderately open. The lichen grows on the rough bark of mature trees, mainly on the more sun-exposed sides. Red maple is the main host species, with poplar the second most frequent species. It is also known from Black and White Ash, Sugar Maple, Red Oak and American Beech.	COSEWIC. 2016. COSEWIC assessment and status report on the Wrinkled Shingle Lichen Pannaria lurida in Canada. Committee on the Status of E Wildlife in Canada. Ottawa. xi + 41 pp. (http://www.registrelep-sararegistry.gc.ca/default_e.cfm)
Solorina saccata	Woodland Owl Lichen	S2S3	-	-	-	-	-
Sticta fuliginosa	Peppered Moon Lichen	S3	-	-	-	-	-
Usnea flavocardia	Blood-splattered	S2?	-	-	-	-	-

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
	Beard Lichen						
Erioderma mollissimum	Graceful Felt Lichen	S1S2	E	E	E	As of January 2012, Vole Ears Lichen was known from two populations at 29 sites along the Atlantic Coast of Nova Scotia totaling 153 adults and 23 juveniles. Vole Ears Lichen is often found in, or very near to, wetlands. It is found at the following specific sites: Blandford, Bon Mature Lake, Canada Hill/Mackenzies Barren, Clyde River Road1, Clyde River Road2, Duck Hole, Four Mile Brook, Fresh Water Brook, Haley Lake, Johnstons Pond, Jones Harbour, Jordan River, Lake John Road, Martin Brook, Misery Lake, Misery Lake Brook, Oakhill, Port L'Herbert, Pumpkinvine Brook, Robarts Pond, Robs Lake, Thomas Radall, Provincial Park, and Tidney.	Environment Canada. 2014. Recovery Strategy for the Vole Ears Lichen (Erioderma mollissimum) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. v + 27 pp.
Fuscopannaria sorediata	a Lichen	S3	-	-	-	-	-
Heterodermia galactophylla	Branching Fringe Lichen	S1S3	-	-	-	-	-
Heterodermia speciosa	Powdered Fringe Lichen	S3	-	-	-	-	-
Leptogium corticola	Blistered Jellyskin Lichen	S3	-	-	-	-	-
Leptogium lichenoides	Tattered Jellyskin Lichen	S3	-	-	-	-	-
Leptogium milligranum	Stretched Jellyskin Lichen	S2S3	-	-	-	-	-
Sclerophora peronella (Nova Scotia pop.)	Frosted Glass-whiskers Lichen - Nova Scotia pop.	S1?	SC	SC	-	-	-
Physcia tenella	Fringed Rosette Lichen	S3S4	-	-	-	-	-

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Mammal							
Sorex maritimensis	Maritime Shrew	S3	-	-	-	Often found in marshes and wet meadows The most favoured habitat is the edges of freshwater swamps and marshes which have become overgrown with tangled grass and rushes.	Canadian Wildlife Federation: https://cwf-fcf.org/en/news/articles/the-tracking-of-the-shrew.html, Biogeographic and Conservation Significance of the Occurrence of the Canadian Endemic Sorex maritimensis (Maritime Shrew) in Northern New Brunswick (D. McAlpine)
Lasiurus borealis	Eastern Red Bat	S1S2B, S1M	-	-	-	Lives in forests, forest edges, and hedgerows. It roosts among foliage, usually in deciduous trees, but sometimes roosts in coniferous trees. Rare in heavily urbanized areas.	Nature Works: https://nhpbs.org/natureworks/redbat.htm Animal Diverity: https://animaldiversity.org/accounts/Lasiurus_borealis/
Lasiurus cinereus	Hoary Bat	S1S2B, S1M	-	-	-	They prefer deciduous and coniferous trees at the edge of clearings, but have been found in trees in heavy forests, open wooded glades, and shade trees along urban streets and in city parks.	Animal Diversity: https://animaldiversity.org/accounts/Lasiurus_cinereus/
Myotis lucifugus	Little Brown Myotis	S1	E	E	E	Little Brown Myotis is one of the few bat species that uses buildings and other anthropogenic structures (e.g., bat boxes, bridges, and barns) to roost (particularly for maternity roosting), but it will also use cavities of canopy trees, foliage, tree bark, crevices on cliffs, and other structures.	Nova Scotia Department of Lands and Forestry. 2020. Recovery Plan for Little brown myotis (Myotis lucifugus) in Nova Scotia [Final]. Nova Scotia E Species Act Recovery Plan Series.
Invertebrate							

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Danaus plexippus	Monarch	S2?B,S3M	E	SC	E	The breeding habitat of the Eastern and Western populations in Canada is confined to where milkweeds grow, since leaves of these plants are the sole food of the caterpillars. The different species of milkweeds grow in a variety of environments, including meadows in farmlands, along roadsides and in ditches, open wetlands, dry sandy areas, short and tall grass prairie, river banks, irrigation ditches, arid valleys, and south-facing hillsides. Milkweeds are also often planted in gardens. The Monarch is known to breed on native milkweeds within their natural ranges. The most commonly used other sources of nectar are goldenrods (Solidago spp.), asters (Doellingeria, Eurybia, Oclemena, Symphyotrichum and Virgulus), the introduced Purple Loosestrife (Lythrum salicaria), and various clovers (Trifolium spp. and Melilotus spp.)	Monarch (Danaus plexippus) (sararegistry.gc.ca)
Alasmidonta undulata	Triangle Floater	S2S3	-	-	-	They prefer small, steady-flowing streams close to headwaters. It is sometimes found in lakes or ponds, and most often found in gravelly sand, mud, or between large stones. (Vermont Atlas, 2021a)	Vermont Atlas of Life, 2021a. Accessed at: https://val.vtecostudies.org/projects/vermont-freshwater-mussel-atlas/alasmidonta-undulata/
Lampsilis radiata	Eastern Lampmussel	S3S4	-	-	-	They can be found in sand and gravel substrates of rivers, streams, lakes, and ponds in cool or warmwater habitats. Rarely found in small, cold water streams. (Vermont Atlas, 2021b)	Vermont Atlas of Life, 2021b. Access at: https://val.vtecostudies.org/projects/vermont-freshwater-mussel-atlas/lampsilis-radiata/
Strophitus undulatus	Creeper	S1	-	-	-	Shallow freshwater. Riffles, moderate-low gradient, creek, pool (Nature Serve Explorer, 2021).	Nature Serve Explorer, 2021. Accessed at: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.107752/Strophitus_undulatus
Vascular Plants							
Zizia aurea	Golden Alexanders	S1	-	-	-	Found in meadows, shores, thickets and wooded swamps. Flowers May and June. Occasionally reported in: Pomquet and South River, Antigonish County, Upper Musquodoboit, Halifax County (Munro, Newell and Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Baccharis halimifolia	Eastern Baccharis	S1	T	T	T	The species is most often found in the upland fringe of salt marshes, in or near the transition zone to coastal forest, where soil salinity is lower and vegetation cover is predominantly graminoids and low shrubs. These habitats include both halophytic and non-halophytic species commonly including Saltwater Cordgrass, Freshwater Cordgrass, Tick Quackgrass, New Belgium Aster, Seaside Goldenrod, Virginia Rose, Black Huckleberry, Bayberry, Winterberry Holly, Red Maple and Red or White Spruce.	https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=7E4856E0-1
Erigeron hyssopifolius	Hyssop-leaved Fleabane	S3	-	-	-	Limited to gypsum outcrops or damp stream banks and ledges in calcareous regions. Hants Co.; near Antigonish and in northern Cape Breton. Flowers during July and August (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Hieracium paniculatum	Panicled Hawkweed	S3	-	-	-	Mixed forest on dryish soils, especially oak. Occasional from Yarmouth east to Kings and Halifax counties. Common about Kentville and at Keji. Flowers August and September (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Lactuca hirsuta	Hairy Lettuce	S2	-	-	-	Grows in dryish soils in open forest and cut-overs. Scattered in the western part of NS. Flowers from July through September (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Packera paupercula	Balsam Groundsel	S3	-	-	-	Confined to calcareous or gypsum soils, on cliffs, talus and outcrops. Flowers in July. Abundant where found but local to Hants Co. north to northern Inverness Co. (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Rudbeckia laciniata	Cut-Leaved Coneflower	S1S2	-	-	-	Grows in wet fertile soils along the edge of swamps, swales or streams. Often colonial. Flowers in August. Common in Kings Co., isolated colonies from Annapolis and Cumberland counties to Guysborough (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Solidago latissimifolia	Elliott's Goldenrod	S3S4	-	-	-	Favours clearings, thickets and bogs, swales and lakeshores. Flowers in August and September. Common in Yarmouth Co., east to Halifax Co. (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Symphyotrichum boreale	Boreal Aster	S2?	-	-	-	Favours lacustrine gravels, streamsides and edges of peatlands. Flowers during August and September . Scattered from Yarmouth to Cape Breton uncommon (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Symphyotrichum ciliolatum	Fringed Blue Aster	S2	-	-	-	Favours open fields, lawns and edges. Flowers during August and September. Scattered from Hants and Colchester counties to Cumberland, Pictou and Inverness counties (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Symphyotrichum undulatum	Wavy-leaved Aster	S2	-	-	-	Favours edges of fields and forests. Flowers during August and September. Scattered about Lunenburg Co, Queens, Hants, Kings, and Halifax (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Caulophyllum thalictroides	Blue Cohosh	S2	-	-	-	Shade-tolerant, restricted to river floodplain deciduous forests. Appears in April, until beginning of June. A wide and patchy distribution over the northern portion of the province from Annapolis River to River Denys in Cape Breton (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Betula pumila var. pumila	Bog Birch	S3	-	-	-	Favours bogs and meadows amongst alders. Flowers in May and June. In NS it is limited to the Northern plateau of Inverness and Victoria Counties (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Barbarea orthoceras	American Yellow Rocket	S1	-	-	-	It inhabits ice-scoured river shores on high-pH bedrock or till, and on wet talus in the subalpine zone.	Nova Scotia Plants by Munro, Newell & Hill (2014).
Campanula aparinoides	Marsh Bellflower	S3	-	-	-	Flowers in August. Rare, known from river banks, meadows and ditches. Northern, from Hants and Cumberland counties to Antigonish, with a single Cape Breton station. part shade, sun; wet meadows, swamps, along shores	https://www.minnesotawildflowers.info/flower/marsh-bellflower
Silene antirrhina	Sleepy Catchfly	S1	-	-	-	Flowers June to September. A plant of disturbed soils and sand barrens. Recently found at CFB Greenwood. Unclear whether it is native or introduced. It can be found in a wide range of habitat types, including disturbed and recently burned areas. It is sometimes weedy. rock outcrops, jack pine forest, prairies, along railroads, roadsides.	https://inaturalist.ca/taxa/58780-Silene-antirrhina.Nova Scotia Plants by Munro, Newell & Hill (2014)

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Stellaria crassifolia	Fleshy Stitchwort	S1	-	-	-	Flowers during July and August. Frequents pond edges and wet seepy slopes. The plant has not been studied in Nova Scotia. Known from Liverpool, Queens Co. where it was found in 1936. May be overlooked or misidentified	Nova Scotia Plants by Munro, Newell & Hill (2014).
Clethra alnifolia	Coast Pepper-Bush	S1	T	SC	V	Sweet Pepperbush is typically found in the shrub zone along lake shorelines. Sweet Pepperbush is a species of acidic upper lakeshores and lakeshore forest margins. It also occurs locally along shrubby and semi-forested stream margins and to a limited extent under Red Maple dominated swamp forest canopy within about 20 m of shorelines. It has not been observed to flower when under dense forest canopy. Sweet Pepperbush occurs in gravelly, sandy, peat and muck soils, sometimes within the zone of shoreline boulders pushed up by ice. It is considered an obligate wetland plant, and can grow in sites with shallow standing water for most of the summer, although it is more often in sites just above the low summer water level. Flowers between mid-August and mid-October.	https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Sweet%20Pepperbush_2014_e.pdf Species at Risk in Nova Scotia: Identification & Information Guide
Hypericum majus	Large St John's-wort	S2	-	-	-	Flowers July to September. Wet or dry open soil. Wet or dry open soil in bogs, marshes, ditches, meadows, woodlands, and other damp habitats.[4] It prefers elevations between 0–1,200 m Widely scattered locations. Until recently, only known from Halifax area and Big Baddeck, Victoria County, and thought to be historic.	0
Humulus lupulus var. lupuloides	Common Hop	S1?	-	-	-	Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), forests, shrublands or thickets	0
Triosteum aurantiacum	Orange-fruited Tinker's Weed	S2S3	-	-	-	Flowers in July. Fertile soils along intervales, riparian zones and limestone slopes. Local in NS. Rare. Kemptown intervale along the Salmon River and near New Glasgow. Occasional in Hants Co and in northern Cape Breton	Nova Scotia Plants by Munro, Newell & Hill (2014).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Shepherdia canadensis	Soapberry	S2S3	-	-	-	Flowers from April to June throughout its range. Found on talus slopes, especially on gypsum soils. Local in NS but abundant where found: northern Cape Breton and around Brooklyn and Windsor, Hants Co.	0
Elatine americana	American Waterwort	S1	-	-	-	Brackish or salt marshes and flats, lacustrine (in lakes or ponds), riverine (in rivers or streams), shores of rivers or lakes	https://gobotany.nativeplanttrust.org/species/elatine/americana/
Empetrum eamesii	Pink Crowberry	S3	-	-	-	flower early, producing fruit from July until frost. Habitat includes sands and gravels of headlands, bogs and barrens. Recently found at South Canoe Lake a Corema community on granite. Collected from Halifax to Peggys Cove and in northern Cape Breton, with both subspecies having similar distribution in the province	Nova Scotia Plants by Munro, Newell & Hill (2014).
Vaccinium uliginosum	Alpine Bilberry	S3	-	-	-	Wide tolerance of moisture and fertility, but generally acidic soils. bedrock outcrops, alpine thickets. Flowers in June. Ranges from Halifax and Digby along the east coast to Baleine; northern Cape Breton.	0
Bartonia virginica	Yellow Bartonia	S3	-	-	-	Flowers July to September. Dry barrens, sandy or peaty soils, bogs, lakeshores. Common in the southwestern counties becoming scarcer east to Annapolis and Halifax; St. Peter's area of Cape Breton.	Nova Scotia Plants by Munro, Newell & Hill (2014).
Myriophyllum verticillatum	Whorled Water Milfoil	S2	-	-	-	Found in shallows, especially in fine, often calcareous sediments, as in oxbow ponds. Flowers late June until September	(Munro, Newell & Hill, 2014)
Proserpinaca palustris	Marsh Mermaidweed	S3	-	-	-	Found in lakeshore fens and streamsides. It is only known in Lunenburg and Yarmouth counties, but it may be more widespread. The variation creba is abundant from southwestern NS to Cumberland, and less frequent in Cape Breton. Flowers July to September	(Munro, Newell & Hill, 2014)

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Trichostema dichotomum	Forked Bluecurls	S1	-	-	-	Relatively new to Nova Scotia. Found in anthropogenic/disturbed habitats, grasslands, meadows and fields, sandplains and barrens (GoBotany, nd). Flowers from August to October (Peterson & McKenny, 1968).	0
Pinguicula vulgaris	Common Butterwort	S1	-	-	-	Grows in moist habitats as on rock ledges and streamsides, especially of basic rocks. Limited in NS to northern Cape Breton: Saint Paul Island, near the mouth of the Cheticamp River, Corney Brook gorge and along Southwest Brook, amongst other places. Flowers from June throughout July	(Munro, Newell & Hill, 2014)
Utricularia ochroleuca	Yellowish-white Bladderwort	S1	-	-	-	Shallow (generally <30cm) acidic waters. Flowers June - September (Jepson Herbarium, 2021)	Jepson Herbarium, 2021. https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=47610
Fraxinus nigra	Black Ash	S1S2	-	-	T	Black ash is typically found in poorly drained areas that are often seasonally flooded. It is most common on peat and muck soils, but also grows on fine sands over sands and loams. Although this species can tolerate still semi-stagnant conditions, there is a preference for swampy woodland stream and river banks with moving water. It is often associated with species such as Red maple, Speckled alder, Balsam poplar, and Black spruce. The species is shade intolerant, and seedlings, saplings and sprouts tend to regenerates only in partially opened forest canopies.	Recovery and Action Plan for Black ash (Fraxinus nigra) in Nova Scotia.
Fraxinus pennsylvanica	Red Ash	S1	-	-	-	Flowers May - June. Found in riparian and upland forest and shelter belts (Minnesota Wildflowers, nd)	Minnesota Wildflowers https://www.minnesotawildflowers.info/tree/green-ash
Epilobium coloratum	Purple-veined Willowherb	S2?	-	-	-	Scattered from Digby to Guysborough counties - Found in low grounds and seepy soils - Flowers from July through October (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Epilobium strictum	Downy Willowherb	S3	-	-	-	Scattered through throughout Cape Breton Island, infrequently elsewhere - Found in bogs and other peatlands - Flowers July to September (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Oenothera fruticosa	Narrow-leaved Evening Primrose	S2	-	-	-	Scattered from Yarmouth to the Northumberland Strait - Found in dry open soil habitats such as old fields, edges of thickets and roadsides - Flowers from June to August (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Sanguinaria canadensis	Bloodroot	S3S4	-	-	-	Rare in Kings and Hants, common in Colchester, and scattered from Cumberland to Cape Breton - Found streamside or on alluvial terraces, in the shade, just above high water - Flowers in early May (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Persicaria amphibia var. emersa	Long-root Smartweed	S3?	-	-	-	Bloom on moist soil and are terrestrial-adapted. Flower June - September (Flora of North America)	Flora of North America: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242100087
Rumex persicarioides	Peach-leaved Dock	S2?	-	-	-	Infrequently found around the coast from Amherst and Advocate to Queens county, Abundant on Sable Island; scattered in western Cape Breton Island - Found in open, organic coastal microsites, particularly of saltmarshes and barrachois - Flowers from July to October (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Plantago rugelii	Rugel's Plantain	S3	-	-	-	Grows in anthropogenic (man-made or disturbed habitat), grassland, meadows, fields (GoBotany, nd)	https://gobotany.nativeplanttrust.org/species/plantago/rugelii/
Lysimachia quadrifolia	Whorled Yellow Loosestrife	S1	-	-	-	Anthropogenic (man-made or disturbed habitats), grassland, woodlands, fens, moist prairies (GoBotany, n.d.). Flowers from July - August (LBJ Wildflower Centre, nd).	Go Botany: https://gobotany.nativeplanttrust.org/species/lysimachia/quadrifolia/ , Lady Bird Johnson Wildflower Center https://www.wildflower.org/plants/result.php?id_plant=LYQU2
Pyrola asarifolia	Pink Pyrola	S3	-	-	-	Found in fertile calcareous woodlands and thickets. Flowers late June to early August (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Anemone multifida	Cut-leaved Anemone	S1	-	-	-	Known from a single locality in Cape Breton Highlands National Park, below the waterfall at Corney Brook gorge, south of French Lake, Inverness Co. Flowers May to June (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Anemone virginiana	Virginia Anemone	S2	-	-	-	Calcareous and slate ledges along streams. Intervals and thickets of same. Flowers in early July (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Ranunculus pensylvanicus	Pennsylvania Buttercup	S1	-	-	-	Found in wet fields, ditches, marshes, along shores. Flowers June - August (Minnesota Wildflowers, nd)	Minnesota Wildflowers: https://www.minnesotawildflowers.info/flower/pennsylvania-buttercup
Ranunculus sceleratus	Cursed Buttercup	S1S2	-	-	-	Anthropogenic (man-made or disturbed habitats), fresh tidal marshes or flats, marshes, swamps (GoBotany, n.d.). Flowers May - September (Minnesota Wildflowers, nd)	Go Botany: https://gobotany.nativeplanttrust.org/species/ranunculus/sceleratus/
Amelanchier nantucketensis	Nantucket Serviceberry	S1	-	-	-	Found in disturbed habitats such as roadsides, fields, sand plains, riparian meadows and barrens (Munro, Newell & Hill, 2014). Bloom time April to May (Missouri Botanical Garden, nd)	Nova Scotia Plants by Munro, Newell & Hill (2014). Missouri Botanical Garden: https://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=293434&isprofile=0&
Fragaria vesca	Woodland Strawberry	S3S4	-	-	-	Forming dense patches in shady forests, ravines. Flowers in June. A white-berried form of this species persists in a number of locations within the province: White Rock, Wolfville, Grand Pré and Barrington. (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Potentilla canadensis	Canada Cinquefoil	S2S3	-	-	-	Found on dry rock barrens and other open areas. Flowers in June. (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Rosa acicularis	Prickly Rose	S1	-	-	-	Found in thickets and rocky shaded slopes on acidic soil. Reported only from Beaverbank, Halifax Co. Flowers mid-June to July (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Galium aparine	Common Bedstraw	S2S3	-	-	-	Composts, ballast and waste soils. Flowers from May until July (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Salix sericea	Silky Willow	S2	-	-	-	Low-lying ground as in riparian zones. Flowers in late March until May. Rare and only reported from western NS. Parr Lake and Lake Fanning, Yarmouth Co.; Queens and Lunenburg counties to Halifax County,. (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Salix serissima	Autumn Willow	S1	-	-	-	Fens, meadows and fields, swamps (GoBotany, nd). Also found in brackish marshy strands, marly lakeshores, treed bogs, gravelly stream banks, lakeshores. Flowers from early June to early July (Flora of North America, nd).	Go Botany: https://gobotany.nativeplanttrust.org/species/salix/serissima/, Flora of North America http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242445867
Geocaulon lividum	Northern Comandra	S3	-	-	-	Damp sands and other sterile soils, especially in acid or peaty sites. Flowers from late May to early August (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Rhinanthus minor ssp. groenlandicus	Little Yellow Rattle	S1	-	-	-	Grows on disturbed, compacted soils as on roadsides, abandoned fields and the like. Flowers from mid-June through July (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Dirca palustris	Eastern Leatherwood	S1	-	-	-	Associated with calcareous soils in deciduous or mixed forest, streamsides. Flowers near mid-May (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Boehmeria cylindrica	Small-spike False-nettle	S1	-	-	-	Understory herb of moist deciduous forests in Nova Scotia. Flowers from July - September. Elsewhere found in swamps. locally very abundant on the LaHave R from New Germany to Bridgewater , local on the Annapolis R at Kingston and there's one record from the Shubenacadie Wildlife Park (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Laportea canadensis	Canada Wood Nettle	S3	-	-	-	Limited to fertile loam or alluvium in deciduous forests and within floodplains. Flowers from July to September (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Pilea pumila	Dwarf Clearweed	S1	-	-	-	Usually grows in cool shady habitats as found on forested slopes of maple-beech, in the centre of the Province. Flowers from July - October. So far only known from West Branch, Pictou Co.; Little River, near Brookfield, Halifax Co.; and along the Herbert River, Hants Co. at Woodville.	Nova Scotia Plants by Munro, Newell & Hill (2014).
Viola sagittata	Arrow-Leaved Violet	S3S4	-	-	-	Sterile woods, clearing and fields. Flowers April - May (Munro, Newell & Hill 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex alopecoidea	Foxtail Sedge	S1	-	-	-	secondary successional forest. Flowers in June and July. Collected from St. George's Bay area, Antigonish Co. (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex bebbii	Bebb's Sedge	S2	-	-	-	Flowers from June through August. Alkaline soils in northern areas, usually in poorly drained sites (wet) (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex chordorrhiza	Creeping Sedge	S1	-	-	-	wetlands: bogs, fens and marshes. Fruits in early summer. Only in Cumberland Co. Rare throughout its range (Minnesota Wildflowers, nd)	https://www.minnesotawildflowers.info/grass-sedge-rush/creeping-sedge#:~:text=Carex%20chordorrhiza%20is%20a%20circumboreal,about%20half%20of%20Minnesota's%20counties. Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex eburnea	Bristle-leaved Sedge	S3	-	-	-	Grows in cliffs and talus, ridges, bluffs, especially in calcareous soils, under conifers. Can form dense carpets. Yellow status. Flowers in late spring, early summer (NatureServe, nd)	https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.131509/Carex_eburnea; Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex granularis	Limestone Meadow Sedge	S1	-	-	-	moist, open areas including meadows, fens, ditches, and edges of woods and swamps and tolerates alkaline soils, hence the "limestone" in the common name. Only confirmed in Paradise, Annapolis Co. Fruits in late spring, early summer (Minnesota Wildflowers, nd)	https://www.minnesotawildflowers.info/grass-sedge-rush/limestone-meadow-sedge; Nova Scotia Plants by Munro, Newell & Hill (2014).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Carex grisea	Inflated Narrow-leaved Sedge	S1	-	-	-	floodplain forest and deciduous woods (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex haydenii	Hayden's Sedge	S1	-	-	-	open, wet places such as meadows, marshes and prairie swales, less often on shores and river banks, and usually in sandy soil. OFTEN CONFUSED WITH TUSSOCK SEDGE! Starts flowering in late spring. Orange listed. Known from two localities, Saint Paul Island and near Lake Ainslie in CB (GoBotany, nd)	https://gobotany.nativeplanttrust.org/species/carex/haydenii/; https://www.minnesotawildflowers.info/grass-sedge-rush/haydens-sedge; Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex hirtifolia	Pubescent Sedge	S2S3	-	-	-	calcareous regions in thickets, deciduous forests and floodplains, forest openings (Illinois Wildflowers, nd). Scattered around the lowlands in the central counties as at Shubenacadie and Brookfield. Also along the Meander and Herbert rivers, Hants Co (Munro, Newell & Hill, 2014)	https://www.illinoiswildflowers.info/grasses/plants/hairy_sedge.htm#:~:text=Habitats%20include%20upland%20deciduous%20woodlands,same%20area%20as%20this%20sedge. Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex lapponica	Lapland Sedge	S1?	-	-	-	Sphagnum bogs, wet, nutrient-poor areas, mostly lowlands. Fruiting early summer. (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex laxiflora	Loose-Flowered Sedge	S1	-	-	-	damp clearings and open rocky forests. Fruits until early summer. Collected from Annapolis to Hants County and Isle Haute. Flowers March to June (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014). https://www.wildflower.org/plants/result.php?id_plant=cala19
Carex peckii	White-Tinged Sedge	S2?	-	-	-	Dry or mesic slopes, mixed deciduous forests, rocky outcrops, old quarry. Flowering and fruiting from May - mid-July. So far known from White Rock, Kings Co., Rhodes Co., Lunenburg Co. and Halifax and the Pennants area, Halifax Co. (DAL herbarium only) (Munro, Newell & Hill 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Carex plantaginea	Plantain-Leaved Sedge	S1	-	-	-	Rich, moist, deciduous or mixed deciduous-evergreen forests, on slopes along streams or along edges of moist depressions, southward in mountain gorges. Fruiting in spring (Flora of North America, nd)	Flora of North America: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242357409
Carex prairea	Prairie Sedge	S1	-	-	-	Grows in habitats such as cat-tail swamps. A single record is extant from Centreville, Kings Co. Fruiting from late May to July (Munro, Newell & Hill 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
Carex tribuloides	Blunt Broom Sedge	S3	-	-	-	Found in wet forest soils and swales. Flowers and fruits from June to September. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Carex tuckermanii	Tuckerman's Sedge	S2	-	-	-	Associated with vernal pools near streams. It has been collected at Sweets Corner, Hants Co. and along the Wallace and Pugwash Rivers, both in Cumberland Co. Fruiting from July to August. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Carex vacillans	Estuarine Sedge	S1S3	-	-	-	Saline, brackish shores, swales, salt and intertidal marshes. Fruiting in June to August (Flora of North America).	Carex vacillans in Flora of North America @ efloras.org
Cyperus lupulinus	Hop Flatsedge	S1	-	-	-	Fruiting from August to October. Known only on the Northumberland shores and Victoria CB. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Eleocharis erythropoda	Red-stemmed Spikerush	S1	-	-	-	Non-calcareous or calcareous fresh or brackish shores. Fruiting occurs in the summer (Flora North America).	Eleocharis erythropoda - FNA (floranorthamerica.org)
Eleocharis ovata	Ovate Spikerush	S2?	-	-	-	Grows on muddy streamsides, streambeds, and lakeshores often in subsiding water. Fruiting from May through October. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Eriophorum gracile	Slender Cottongrass	S2S3	-	-	-	Grows in wet peat and inundated shores. Flowers and fruits during early summer. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Scirpus pedicellatus	Stalked Bulrush	S2?	-	-	-	Recently collected from river inhabitants in Inverness Co. Grows in lowlands such as marshes, swales, and swamps. Fruiting in July. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Lachnanthes caroliniana	Redroot	S2	SC	SC	V	Redroot is only known from two large lakes (Ponhook and Molega Lakes) and several immediately adjacent smalled lakes (Little Ponhook, First Christopher, Beartrap, Cameron, Hog and	Species at Risk in Nova Scotia: Identification & Information Guide

Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
						Beavertail Lakes) in Queens and Lunenburg Counties in southern Nova Scotia. In Nova Scotia, it is found on lakeshores on boulder, cobble, gravel, sand and peat substrates where seasonal flooding, wave action and ice–scour limit the establishment of more competitive species. Redroot tends to be most abundant on windward (west and south–facing) shores where wave action and ice scour are greatest. Although it can occur in areas remaining shallowly inundated throughout most years, flowering occurs primarily toward the landward limit of its shoreline distribution. The plant flowers in August and September	
Elodea canadensis	Canada Waterweed	S3	-	-	-	Located in clam sluggish waters. Calcareous. Supposedly flowering throughout the summer, rarely seen in our material. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Vallisneria americana	Wild Celery	S2	-	-	-	Locally abundant: Shorts Lake, Colchester Co. Along the Musquodoboit River, Halifax Co.; Lake Killarney, Cumberland Co. Reported from northern Cape Breton. Found only in quiet waters. Flowers from July to October. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Juncus acuminatus	Sharp-Fruit Rush	S3S4	-	-	-	Frequents sand and mud flats, clay soils as in sterile meadows or ditches. Flowers and fruit produced from late May until August. (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Juncus dudleyi	Dudley's Rush	S3	-	-	-	A generalist in habitat. Flowers and fruits midsummer. (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Juncus subcaudatus	Woods-Rush	S3	-	-	-	Conifer woods and spruce swamps, where substrate is soggy. Flowers and fruits produced from July through October. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Allium schoenoprasum	Wild Chives	S2	-	-	-	Wet meadows, rocky or gravelly stream banks and lake shores. Flowering June to August (Flora North America).	Allium schoenoprasum - FNA (floranorthamerica.org)
Allium tricoccum	Wild Leek	S1	-	-	-	Found along north mountain ridge in Digby, Brooklyn Corner, Kings Co, and Kemptown Colchester Co. Limited to the fertile deciduous forests and alluvium on intervales. Flowering in late July. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Lilium canadense	Canada Lily	S2	-	-	-	Meadows, floodplains, and streamsides. Flowers in July. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Najas gracillima	Thread-Like Naiad	S2	-	-	-	Mud, peat or sand substrates of ponds, pools, and lakes. Flowers and fruit from July to October. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Cypripedium arietinum	Ram's-Head Lady's-Slipper	S1	-	-	E	Located in Angevine Lake, Cogmagun River, Gypsum Mines, Meadow Pond, Poplar Grove, and St. Croix River. This species is strongly associated with gypsum bedrock, and is found growing in moderately open, mesic woods on outcrops, shaded tops of cliffs, terraces, moderate to steep wooded slopes and in sinkholes. Occurrences of Ram's-head lady slipper are usually found in fine, moist mineral soil of a pH between 5.41 to 6.12, except for the Angevine Lake site which has coarser soils and a pH of 4.14 to 4.26. Forest cover composed of a mix of shade-tolerant and shade-intolerant tree species, the presence of moist fine soil, and more exposed sites in or near sinkholes, outcrops, and open areas, are all factors that suggest that wind disturbances may be enough to sustain appropriate forest cover for Ram's-head lady slipper across the landscape and in the long term. Ram's Head Lady Slipper has only been found in Hants and Cumberland Counties - it flowers in late May to early June	Nova Scotia Department of Lands and Forestry 2020. Recovery Plan for Ram's-head lady slipper (Cypripedium arietinum R. Br.) in Nova Scotia [Final]. Nova Scotia E Species Act Recovery Plan Series. 53 pp
Cypripedium parviflorum var. makasin	Small Yellow Lady's-Slipper	S2	-	-	-	Mesic to wet fens, prairies, meadows, thickets, open coniferous, and mixed forest. Flowering in May to August (Flora of North America).	Cypripedium parviflorum var. makasin in Flora of North America @ efloras.org
Cypripedium parviflorum var. pubescens	Yellow Lady's-slipper	S2	-	-	-	Grows in calcareous soils, outcrops of gypsum or limestone and occasionally under mixed deciduous trees. Flowers in first half of June. (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Cypripedium reginae	Showy Lady's-Slipper	S2	-	-	-	Found at Meander River in Hants Co., Musquodoboit River Valley, Halifax Co. Lives in alkaline swamps and bogs. Flowers from June to August (Munro, et al. 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Goodyera pubescens	Downy Rattlesnake-Plantain	S2	-	-	-	Forms in large colonies in woodlands and thickets. Flower in July and August (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Liparis loeselii	Loesel's Twayblade	S3S4	-	-	-	Cool, moist ravines, bogs, or fens, wet peaty or sandy meadows, and exposed sand along edges of lakes, often colonizing previously open and disturbed habitats during early and middle stages of reforestation. Flowering May-August (Go Botany).	Liparis loeselii - FNA (floranorthamerica.org)
Neottia bifolia	Southern Twayblade	S3	-	-	-	Bogs and swamps (Go Botany)	Neottia bifolia (southern twayblade): Go Botany (nativeplanttrust.org)
Platanthera flava var. herbiola	Pale Green Orchid	S2	-	-	-	Known from a variety of habitats: sandy, gravelly or peaty shorelines of lakes or streams; bogs, swamps and meadows. Found along the Tusket River, Yarmouth Co., Medway River, Queens County and north to Kings and Colchester Co. (Kemptown) (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
Platanthera grandiflora	Large Purple Fringed Orchid	S3	-	-	-	Found in north-central and Southwestern NS. Favours wet meadows and riparian habitats. Flowers in July.	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Platanthera macrophylla	Large Round-Leaved Orchid	S2	-	-	-	Grows in deciduous or mixed deciduous forests. Flowers in August (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Spiranthes ochroleuca	Yellow Ladies'-tresses	S3	-	-	-	Located in the western half of the province, northwest to Hants Co. Found in driest sand barrens, roadsides, and fields. Autumn-flowering from Sept-Oct (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Bromus latiglumis	Broad-Glumed Brome	S1	-	-	-	Floodplain (River or stream floodplains), forest, shores of rivers or lakes (Go Botany)	Bromus latiglumis (flanged brome): Go Botany (nativeplanttrust.org)
Dichanthelium clandestinum	Deer-tongue Panic Grass	S3	-	-	-	Found in open areas of alluvial soil. Flowering and fruiting from July to November (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Hordeum brachyantherum	Meadow Barley	S1	-	-	-	Grows in pastures and along streams and lake shores (Flora of North America).	Hordeum brachyantherum subsp. brachyantherum - FNA (floranorthamerica.org)
Trisetum spicatum	Narrow False Oats	S3S4	-	-	-	Grows in rocky soils on outcrops, cliffs, streamsides. Flowers and fruits from June through August (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Potamogeton nodosus	Long-leaved Pondweed	S1	-	-	-	Found in freshwaters of ponds and streams. Flowers and fruits later than other species, in August and September (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Potamogeton pulcher	Spotted Pondweed	S2S3	-	-	V	Scattered in the southern half of Nova Scotia. The species is mainly found growing on muddy substrates at depths of approximately 10 cm to about 2 m, often within fairly dense stands composed of several submersed and emergent species. Plants at some sites (Carrigan Lake and Rhodenizer Lake) have been observed near shores within zones where water has receded entirely in the late summer, stranding plants on mud and peaty organic soil. An ability to tolerate extreme water level fluctuations is also suggested by Spotted Pondweed's occurrence on the Raynards Lake reservoir.	https://sararegistry.gc.ca/default.asp?lang=En&n=3B4A8847-1&offset=4&toc=show#_03_13
Potamogeton zosteriformis	Flat-stemmed Pondweed	S3	-	-	-	Grows in less acidic conditions and deep water. Flowers and fruit July until September (Munro, et al., 2014).	Munro M.C., Newell R.E., and Hill N.M. 2014. Nova Scotia Plants.
Cystopteris bulbifera	Bulblet Bladder Fern	S3S4	-	-	-	Specifically in Kings and Cumberland counties to eastern Cape Breton. Found in fertile or calcareous soils, where it forms dense colonies in forested gypsum sinkholes. Spores produced from June to September (Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014
Equisetum palustre	Marsh Horsetail	S1	-	-	-	A single collection each from Kings County and Halifax Counties. Found in edges of wetlands, marshes, swamps and shores of rivers or lakes. Flowers in summer (Minnesota Environment and Natural Resources Trust Fund, Go Botany and Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014, https://www.minnesotawildflowers.info/, https://gobotany.nativeplanttrust.org/
Equisetum pratense	Meadow Horsetail	S3	-	-	-	Known to be in several streams in Hants, Colchester and Cumberland counties, in addition to Victoria and Inverness Counties. Uncommon and limited to alluvial thickets, pastures and treed streamsides, including gravelly bars. Flowers mid to late spring (Minnesota Environment and Natural Resources Trust Fund and Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014, https://www.minnesotawildflowers.info/

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Equisetum variegatum	Variegated Horsetail	S3	-	-	-	Wide-ranging in NS, with disjunct localities: Halifax County, Cumberland County and Victoria County. Found in wetlands or wet seeps. Anthropogenic habitats (man-made or disturbed habitats), shores of rivers or lakes. Flowers in summer (Minnesota Environment and Natural Resources Trust Fund, Go Botany and Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014, https://www.minnesotawildflowers.info/, https://gobotany.nativeplanttrust.org/
Isoetes acadiensis	Acadian Quillwort	S3	-	-	-	Scattered from Yarmouth County to northern Cape Breton. Very common in Lake Kejimkujik, near exit of Grafton Brook. In water up to depth of 1m, bordering lakes, ponds or along rivers. No sources that state specific flowering time, most likely during the general growing season in Nova Scotia: June to September (Go Botany and Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014, https://gobotany.nativeplanttrust.org/
Ophioglossum pusillum	Northern Adder's-tongue	S2S3	-	-	-	Known from Yarmouth and Digby Counties; scattered east to Halifax and Amherst; a single Cape Breton record from George River. Found in sterile soils, swamps and sandy or cobbly lakeshores. Anthropogenic habitats (man-made or disturbed habitats), marshes, meadows, fields and edges of wetland margins. Spores produced May to August (Go Botany and Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014, https://gobotany.nativeplanttrust.org/
Polypodium appalachianum	Appalachian Polypody	S3	-	-	-	Nova Scotia distribution still remains unclear. Habitat is restricted to cliffs, rocky slopes, balds, ridges or ledges and talus. No sources that state specific spore production time, most likely during the general growing season in Nova Scotia: June to September (Go Botany and Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014, https://gobotany.nativeplanttrust.org/
Schizaea pusilla	Little Curlygrass Fern	S3S4	-	-	-	Scattered throughout the Atlantic counties and frequent in the northern plateau of Cape Breton. Found in sphagnous wet areas, upper peaty lakeshores and undrained depressions. Spores produced throughout the summer, from July (Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014

APPENDIX D. ACCDC REPORT

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada atlantique

DATA REPORT 7251: Lantz, NS

Prepared 25 April 2022
by J. Pender, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; 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	Contents
LantzNS_7251ob.xls	Rare or legally-protected Flora and Fauna in your study area
LantzNS_7251ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
LantzNS_7251ff_py.xls	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

Animals (Fauna)
John Klymko
Zoologist
(506) 364-2660
john.klymko@accdc.ca

Data Management, GIS
James Churchill
Conservation Data Analyst / Field Biologist
(902) 679-6146
james.churchill@accdc.ca

Billing
Jean Breau
Financial Manager / Executive Assistant
(506) 364-2657
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

Western: Sarah Spencer
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Eastern: Elizabeth Walsh
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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

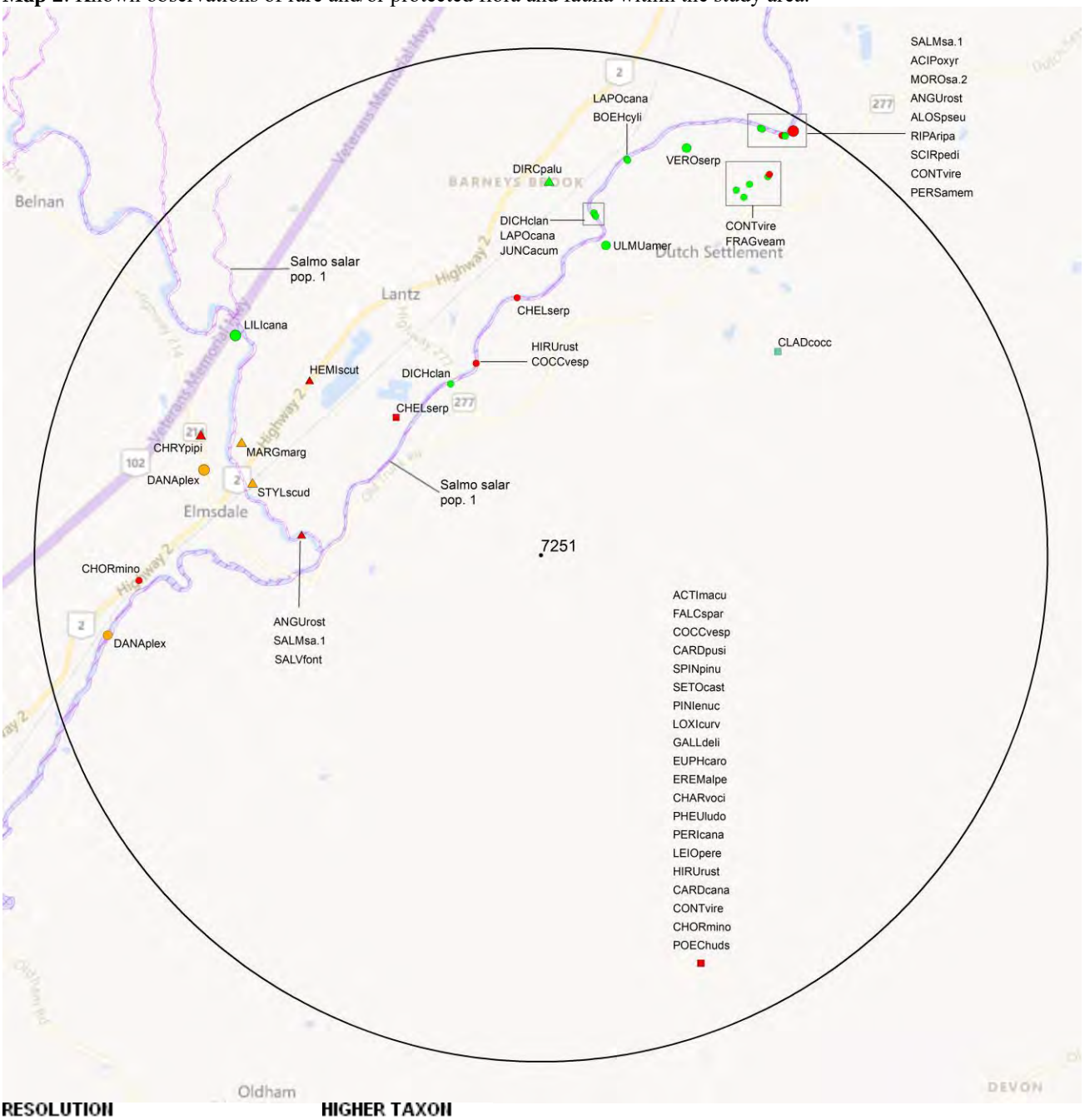
2.1 FLORA

The study area contains 19 records of 11 vascular, 1 record of 1 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 FAUNA

The study area contains 51 records of 30 vertebrate, 4 records of 3 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List), excluding 'location-sensitive' species. 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

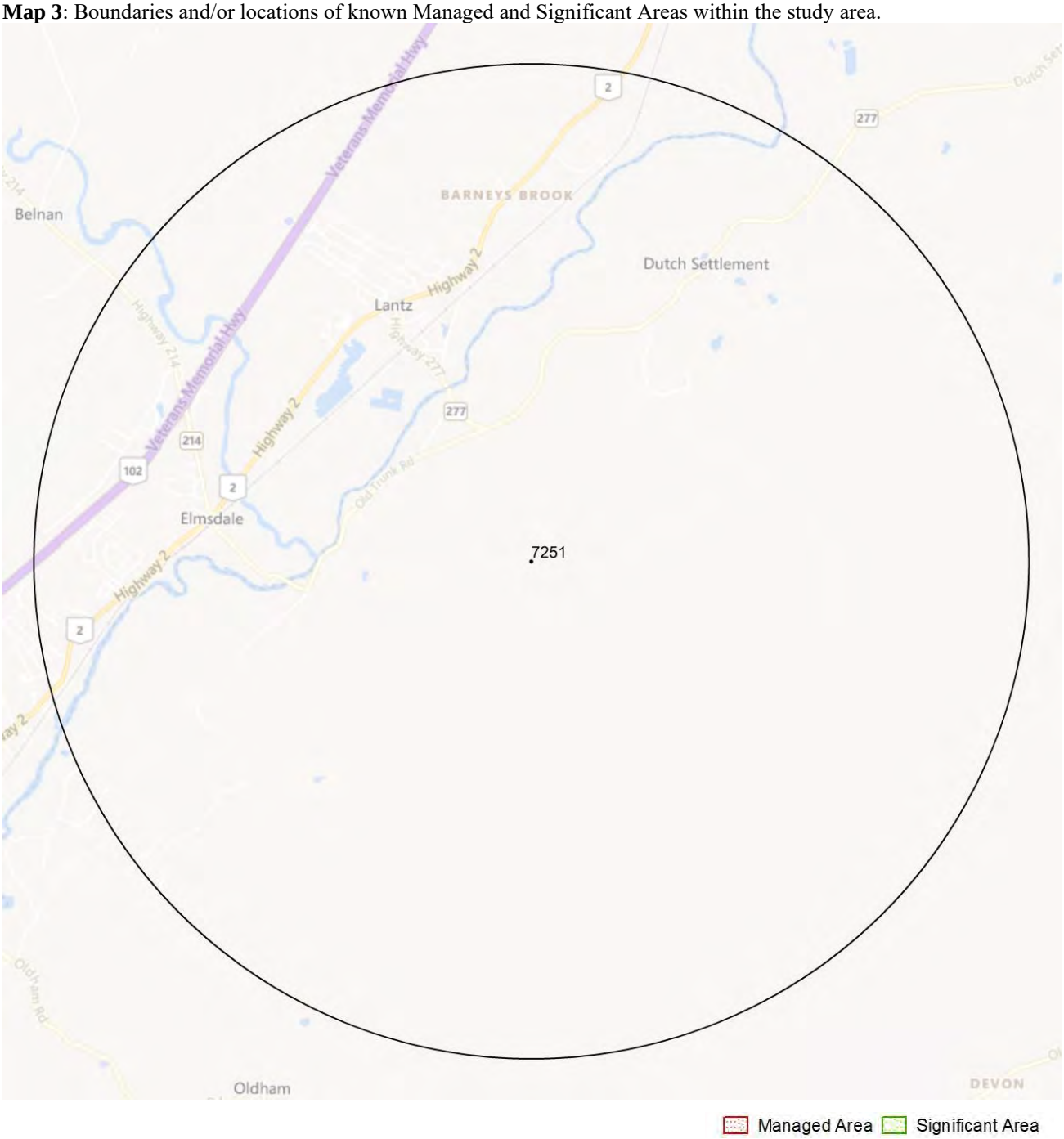
- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

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.



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 (± 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	*Cladonia coccifera*	Eastern Boreal Pixie-cup Lichen				S2S3	1	3.1 ± 4.0
P	*Dirca palustris*	Eastern Leatherwood				S2	1	3.7 ± 1.0
P	*Lilium canadense*	Canada Lily				S2	1	3.7 ± 0.0
P	*Boehmeria cylindrica*	Small-spike False-nettle				S2S3	2	4.0 ± 0.0
P	*Scirpus pedicellatus*	Stalked Bulrush				S2S3	3	4.7 ± 0.0
P	*Laportea canadensis*	Canada Wood Nettle				S3	2	3.4 ± 0.0
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S3?	1	4.8 ± 0.0
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	4	4.1 ± 0.0
P	*Veronica serpyllifolia*	Thyme-Leaved Speedwell				S3S4	1	4.3 ± 0.0
P	*Ulmus americana*	White Elm				S3S4	1	3.1 ± 0.0
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	1	3.4 ± 0.0
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3S4	2	1.9 ± 0.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered		S1	2	2.4 ± 0.0
A	*Morone saxatilis pop. 2*	Striped Bass - Bay of Fundy population	Endangered			S2S3B,S2S3N	1	4.9 ± 0.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	1	4.9 ± 0.0
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2S3N	1	4.9 ± 0.0
A	*Anguilla rostrata*	American Eel	Threatened			S3N	2	2.4 ± 0.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	1	4.3 ± 7.0
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	2	2.0 ± 6.0
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	3	2.0 ± 0.0
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	3	4.3 ± 7.0
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B	2	4.0 ± 0.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	2	2.0 ± 0.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	4	4.3 ± 7.0
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	7	3.6 ± 1.0
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	1	2.9 ± 0.0
A	*Perisoreus canadensis*	Canada Jay				S3	1	4.3 ± 7.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3	4.3 ± 7.0
A	*Spinus pinus*	Pine Siskin				S3	2	4.3 ± 7.0
A	*Salvelinus fontinalis*	Brook Trout				S3	1	2.4 ± 0.0
A	*Charadrius vociferus*	Killdeer				S3B	1	4.3 ± 7.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	1	4.3 ± 7.0
A	*Alosa pseudoharengus*	Alewife				S3B	1	4.9 ± 0.0
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	1	4.3 ± 7.0
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	1	4.3 ± 7.0
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	1	4.3 ± 7.0
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	1	4.3 ± 7.0
A	*Loxia curvirostra*	Red Crossbill				S3S4	1	4.3 ± 7.0
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	1	4.3 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	1	4.3 ± 7.0
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	1	4.3 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N,S5M	1	4.3 ± 7.0
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	2	3.4 ± 0.0
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	1	3.2 ± 1.0
I	*Stylurus scudderi*	Zebra Clubtail				S2S3	1	2.9 ± 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?
Fraxinus nigra	Black Ash		Threatened	No
Emydoidea blandingii	*Blanding's Turtle - Nova Scotia pop.*	Endangered	Vulnerable	No
Glyptemys insculpta	**Wood Turtle**	**Threatened**	**Threatened**	**YES**
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Vulnerable	No
Bat hibernaculum or bat species occurrence		**[Endangered][1]**	**[Endangered][1]**	**YES**

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

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the 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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1	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
1	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 28926 records of 147 vertebrate and 1365 records of 67 invertebrate fauna; 7398 records of 276 vascular, 3139 records of 185 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 (± 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	*Coregonus huntsmani*	Atlantic Whitefish	Endangered	Endangered	Endangered	S1	1	87.7 ± 1.0	NS
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	209	4.2 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Myotis	Endangered	Endangered	Endangered	S1	18	4.2 ± 0.0	NS
A	*Perimyotis subflavus*	Tricolored Bat	Endangered	Endangered	Endangered	S1	17	4.2 ± 0.0	NS
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered		S1	39	2.4 ± 0.0	NS
A	*Salmo salar pop. 6*	Atlantic Salmon - Nova Scotia Southern Upland population	Endangered			S1	36	22.1 ± 0.0	NS
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	437	34.1 ± 7.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	68	37.2 ± 0.0	NS
A	*Dermochelys coriacea pop. 2*	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered		S1S2N	3	57.8 ± 5.0	NS
A	*Morone saxatilis pop. 2*	Striped Bass - Bay of Fundy population	Endangered			S2S3B,S2S3N	4	4.9 ± 0.0	NS
A	*Melanerpes erythrocephalus*	Red-headed Woodpecker	Endangered	Threatened		SNA	1	55.8 ± 0.0	NS
A	*Protonotaria citrea*	Prothonotary Warbler	Endangered	Endangered		SNA	1	55.4 ± 0.0	NS
A	*Icteria virens*	Yellow-Breasted Chat	Endangered	Endangered		SNA	5	31.1 ± 0.0	NS
A	*Colinus virginianus*	Northern Bobwhite	Endangered	Endangered			4	13.2 ± 0.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	12	22.2 ± 0.0	NS
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern		S1B	13	35.1 ± 7.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	1046	1.2 ± 0.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	1540	4.9 ± 0.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	357	9.3 ± 7.0	NS
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S2S3M	58	34.4 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2S3N	7	4.9 ± 0.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3B	762	6.2 ± 7.0	NS
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S3B	56	38.0 ± 0.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	646	30.4 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S3N	49	2.4 ± 0.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	2	60.6 ± 7.0	NS
A	*Melanerpes lewis*	Lewis's Woodpecker	Threatened	Threatened		SNA	1	51.8 ± 0.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	37	12.3 ± 7.0	NS
A	*Salmo salar pop. 12*	Atlantic Salmon - Gaspe - Southern Gulf of St. Lawrence population	Special Concern			S1	28	77.0 ± 50.0	NS
A	*Passerculus sandwichensis princeps*	Ipswich Sparrow	Special Concern	Special Concern		S1B	5	35.9 ± 0.0	NS
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	3	72.0 ± 2.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	242	4.3 ± 7.0	NS
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	1	93.8 ± 0.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	5	34.4 ± 0.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S2S3N,SUM	46	38.9 ± 0.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	142	2.0 ± 6.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	1232	2.0 ± 0.0	NS
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	954	4.3 ± 7.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B	458	4.0 ± 0.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B	858	6.2 ± 7.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	709	2.0 ± 0.0	NS
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern		S3N,SUM	5	53.2 ± 0.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	946	4.3 ± 7.0	NS
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern			S4	4	35.6 ± 0.0	NS
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	235	3.6 ± 1.0	NS
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	7	38.1 ± 0.0	NS
A	*Zonotrichia querula*	Harris's Sparrow	Special Concern			SNA	1	34.6 ± 0.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	5	28.2 ± 0.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	12	25.2 ± 0.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Vulnerable	S1B,SUM	96	37.7 ± 0.0	NS
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	2	60.7 ± 0.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B,SUM	8	22.0 ± 7.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	2	35.3 ± 0.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	28	2.9 ± 0.0	NS
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	1	69.8 ± 0.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	275	9.3 ± 7.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	71	6.2 ± 7.0	NS
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	1	41.0 ± 0.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	140	6.2 ± 7.0	NS
A	*Glaucomys volans*	Southern Flying Squirrel	Not At Risk			S3S4	6	70.3 ± 10.0	NS
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	6	49.0 ± 2.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	138	9.3 ± 7.0	NS
A	*Calidris canutus rufa*	Red Knot rufa subspecies - Tierra del Fuego / Patagonia wintering population	E,SC	Endangered	Endangered	S2M	162	31.3 ± 0.0	NS
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3B,S2S3N	8	14.6 ± 0.0	NS
A	*Gadus morhua*	Atlantic Cod	E,SC,DD			SNR	2	59.1 ± 0.0	NS
A	*Alces alces americana*	Moose			Endangered	S1	87	21.4 ± 3.0	NS
A	*Uria aalge*	Common Murre				S1?B	1	36.3 ± 0.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B,SUM	22	16.1 ± 7.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	1	33.8 ± 0.0	NS
A	*Gallinula galeata*	Common Gallinule				S1B	8	48.8 ± 7.0	NS
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	29	25.5 ± 7.0	NS
A	*Cistothorus palustris*	Marsh Wren				S1B	1	99.4 ± 0.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	48	30.3 ± 7.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	18	35.1 ± 7.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S4M	823	31.3 ± 0.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S4M	627	31.3 ± 0.0	NS
A	*Anas acuta*	Northern Pintail				S1B,SUM	28	16.1 ± 7.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B,SUM	29	12.5 ± 0.0	NS
A	*Vespertilionidae sp.*	bat species				S1S2	198	4.0 ± 0.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S1S2B,SUM	49	10.1 ± 0.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B,SUM	52	7.5 ± 0.0	NS
A	*Alca torda*	Razorbill				S2B	17	79.4 ± 0.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S2B	22	78.8 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	31	12.3 ± 7.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	160	6.2 ± 7.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B,SUM	15	12.3 ± 7.0	NS
A	*Mareca strepera*	Gadwall				S2B,SUM	28	30.2 ± 6.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B,SUM	42	25.5 ± 7.0	NS
A	*Calidris alba*	Sanderling				S2N,S3M	413	31.3 ± 0.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	27	13.0 ± 7.0	NS
A	*Rallus limicola*	Virginia Rail				S2S3B	28	9.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Rissa tridactyla*	Black-legged Kittiwake				S2S3B	8	68.3 ± 0.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	325	6.2 ± 7.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3B,S2S3N	61	35.6 ± 0.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	29	13.2 ± 0.0	NS
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	22	27.6 ± 0.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	135	25.5 ± 7.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B,SUM	79	6.2 ± 7.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	99	33.9 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Whimbrel				S2S3M	74	34.4 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	3	34.4 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	561	4.3 ± 7.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	666	4.3 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S3	526	4.3 ± 7.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	69	2.4 ± 0.0	NS
A	*Salvelinus namaycush*	Lake Trout				S3	2	12.3 ± 0.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	1	78.4 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	5	65.5 ± 0.0	NS
A	*Calcarius lapponicus*	Lapland Longspur				S3?N,SUM	3	39.6 ± 0.0	NS
A	*Spatula discors*	Blue-winged Teal				S3B	101	13.0 ± 7.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	563	4.3 ± 7.0	NS
A	*Tringa semipalmata*	Willet				S3B	912	12.3 ± 7.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	66	35.9 ± 7.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	78	6.2 ± 7.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	253	6.2 ± 7.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	501	4.3 ± 7.0	NS
A	*Alosa pseudoharengus*	Alewife				S3B	30	4.9 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3B,S3M,S3N	581	32.3 ± 7.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S4M	1040	26.0 ± 7.0	NS
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	376	4.3 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	707	4.3 ± 7.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3B,S5M	124	12.3 ± 7.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	90	4.3 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	143	4.3 ± 7.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S3B,SUM	203	9.3 ± 7.0	NS
A	*Branta bernicla*	Brant				S3M	2	66.1 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	785	31.3 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	307	31.3 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	769	31.3 ± 0.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	122	34.4 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	618	30.3 ± 0.0	NS
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	7	32.3 ± 7.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	185	6.2 ± 7.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	211	4.3 ± 7.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B,S4S5M	280	6.2 ± 7.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	553	4.3 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	708	4.3 ± 7.0	NS
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	544	4.3 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	105	6.2 ± 7.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	136	8.5 ± 0.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3S4N	41	25.0 ± 0.0	NS
A	*Lanius borealis*	Northern Shrike				S3S4N	1	10.3 ± 0.0	NS
A	*Morus bassanus*	Northern Gannet				SHB	14	34.4 ± 0.0	NS
A	*Aythya americana*	Redhead				SHB	2	34.1 ± 0.0	NS
A	*Leucophaeus atricilla*	Laughing Gull				SHB	9	36.2 ± 0.0	NS
A	*Progne subis*	Purple Martin				SHB	5	36.2 ± 0.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N,S5M	9	4.3 ± 7.0	NS
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	23	13.4 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	336	3.4 ± 0.0	NS
I	*Danaus plexippus plexippus*	Monarch	Endangered	Special Concern		S2?B,S3M	1	43.9 ± 0.0	NS
I	*Gomphurus ventricosus*	Skillet Clubtail	Endangered	Endangered		SH	2	6.6 ± 0.0	NS
I	*Barnea truncata*	Atlantic Mud-piddock	Threatened	Threatened		S1	1	54.6 ± 1.0	NS
I	*Bombus suckleyi*	Suckley's Cuckoo Bumble Bee	Threatened			SH	1	46.9 ± 5.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Threatened	S3	9	9.6 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	85	14.9 ± 5.0	NS
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern		Endangered	SH	8	37.1 ± 2.0	NS
I	*Cicindela formosa*	Big Sand Tiger Beetle				S1	1	80.6 ± 1.0	NS
I	*Erora laeta*	Early Hairstreak				S1	1	38.4 ± 1.0	NS
I	*Pachydiplax longipennis*	Blue Dasher				S1	4	30.2 ± 0.0	NS
I	*Atlanticoncha ochracea*	Tidewater Mucket				S1	10	92.1 ± 1.0	NS
I	*Polygonia comma*	Eastern Comma				S1?	19	36.9 ± 0.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	7	39.1 ± 2.0	NS
I	*Euphyes bimacula*	Two-spotted Skipper				S1S2	1	87.0 ± 0.0	NS
I	*Boloria chariclea*	Arctic Fritillary				S1S2	3	69.0 ± 2.0	NS
I	*Somatochlora brevicincta*	Quebec Emerald				S1S2	1	28.9 ± 0.0	NS
I	*Tharsalea dospassosi*	Maritime Copper				S2	28	86.4 ± 0.0	NS
I	*Satyrium acadica*	Acadian Hairstreak				S2	13	52.2 ± 2.0	NS
I	*Neurocordulia michaeli*	Broad-tailed Shadowdragon				S2	10	77.9 ± 0.0	NS
I	*Coenagrion resolutum*	Taiga Bluet				S2	2	20.9 ± 1.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	126	3.2 ± 1.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	6	37.2 ± 1.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S2S3	18	19.5 ± 2.0	NS
I	*Aglais milberti*	Milbert's Tortoiseshell				S2S3	21	27.6 ± 2.0	NS
I	*Aglais milberti milberti*	Milbert's Tortoise Shell				S2S3	1	95.4 ± 0.0	NS
I	*Lanthus vernalis*	Southern Pygmy Clubtail				S2S3	4	92.0 ± 0.0	NS
I	*Somatochlora kennedyi*	Kennedy's Emerald				S2S3	3	32.6 ± 1.0	NS
I	*Williamsonia fletcheri*	Ebony Boghaunter				S2S3	4	85.6 ± 0.0	NS
I	*Stylurus scudderi*	Zebra Clubtail				S2S3	6	2.9 ± 1.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	33	9.6 ± 0.0	NS
I	*Strophiona nitens*	Chestnut Bark Long-horned Beetle				S3	2	35.6 ± 0.0	NS
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	1	38.4 ± 0.0	NS
I	*Naemia seriata*	Seaside Lady Beetle				S3	13	33.8 ± 0.0	NS
I	*Chilocorus stigma*	Twice-stabbed Lady Beetle				S3	3	40.4 ± 0.0	NS
I	*Trachysida aspera*	Rough Flower Longhorn Beetle				S3	1	29.4 ± 0.0	NS
I	*Astylopsis sexguttata*	Six-speckled Long-horned Beetle				S3	1	21.5 ± 0.0	NS
I	*Satyrium calanus*	Banded Hairstreak				S3	64	5.6 ± 2.0	NS
I	*Callophrys lanoraieensis*	Bog Elfin				S3	20	22.7 ± 2.0	NS
I	*Strymon melinus*	Gray Hairstreak				S3	12	39.1 ± 1.0	NS
I	*Phanogomphus descriptus*	Harpoon Clubtail				S3	4	80.0 ± 0.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S3	6	45.0 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S3	14	74.4 ± 0.0	NS
I	*Ophiogomphus rupinsulensis*	Rusty Snaketail				S3	29	6.4 ± 0.0	NS
I	*Epitheca princeps*	Prince Baskettail				S3	20	8.8 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4	36.5 ± 1.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	6	30.0 ± 0.0	NS
I	*Strophitus undulatus*	Creeper				S3	6	90.2 ± 0.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	164	12.4 ± 1.0	NS
I	*Cecropterus pylades*	Northern Cloudywing				S3S4	18	51.4 ± 2.0	NS
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S3S4	30	5.6 ± 2.0	NS
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	21	30.6 ± 1.0	NS
I	*Argynnis aphrodite*	Aphrodite Fritillary				S3S4	38	31.8 ± 2.0	NS

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I	*Polygonia faunus*	Green Comma				S3S4	18	6.1 ± 5.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3S4	7	32.5 ± 2.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3S4	11	9.4 ± 0.0	NS
I	*Aeshna constricta*	Lance-Tipped Darner				S3S4	21	11.9 ± 1.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3S4	6	39.9 ± 1.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3S4	8	6.8 ± 0.0	NS
I	*Somatochlora franklini*	Delicate Emerald				S3S4	2	32.6 ± 1.0	NS
I	*Erythrodiplax berenice*	Seaside Dragonlet				S3S4	1	88.1 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3S4	16	26.5 ± 1.0	NS
I	*Enallagma vesperum*	Vesper Bluet				S3S4	2	97.3 ± 1.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3S4	2	46.9 ± 1.0	NS
I	*Icaricia saepiolus*	Greenish Blue				SH	4	37.3 ± 2.0	NS
I	*Polygonia gracilis*	Hoary Comma				SH	2	47.4 ± 2.0	NS
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1	31	27.4 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	466	27.3 ± 0.0	NS
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened	Threatened	S1	87	28.9 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S2S3	128	11.5 ± 0.0	NS
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened	Threatened	S3	39	6.8 ± 0.0	NS
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S3	9	35.7 ± 0.0	NS
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	184	6.8 ± 0.0	NS
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S3S4	28	15.5 ± 0.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	15	31.1 ± 0.0	NS
N	*Fissidens exilis*	Pygmy Pocket Moss	Not At Risk			S3	13	30.9 ± 0.0	NS
N	*Chaenotheca servitii*	Flexuous Golden Stubble	Data Deficient			S1	1	70.2 ± 1.0	NS
N	*Aloina brevirostris*	Short-Beaked Rigid Screw Moss				S1	1	45.0 ± 2.0	NS
N	*Sematophyllum demissum*	a Moss				S1	1	19.9 ± 2.0	NS
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				S1	1	70.3 ± 0.0	NS
N	*Blennothallia crispa*	Crinkled Jelly Lichen				S1	1	52.7 ± 0.0	NS
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1	1	43.1 ± 5.0	NS
N	*Usnea perplexans*	Powdered Beard Lichen				S1	1	59.4 ± 0.0	NS
N	*Scytinium dactylinum*	Brown-buttoned Jellyskin Lichen				S1	1	90.3 ± 0.0	NS
N	*Lathagrium cristatum*	Fingered Jelly Lichen				S1	3	49.2 ± 0.0	NS
N	*Ephebe perspinulosa*	Thread Lichen				S1	1	90.3 ± 1.0	NS
N	*Fuscopannaria praetermissa*	Moss Shingles Lichen				S1	1	50.5 ± 0.0	NS
N	*Scytinium schraderi*	Wrinkled Jellyskin Lichen				S1	1	31.5 ± 0.0	NS
N	*Lichina confinis*	Marine Seaweed Lichen				S1	4	55.4 ± 0.0	NS
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S1	1	50.2 ± 0.0	NS
N	*Sticta limbata*	Powdered Moon Lichen				S1	4	63.4 ± 3.0	NS
N	*Leptogium hibernicum*	Hibernia Jellyskin Lichen				S1	1	53.7 ± 0.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	4	49.0 ± 0.0	NS
N	*Bryoria nitidula*	Tundra Horsehair Lichen				S1	2	51.1 ± 0.0	NS
N	*Hypogymnia hultenii*	Powdered Honeycomb Lichen				S1	14	37.6 ± 0.0	NS
N	*Calypogeia neogaea*	Common Pouchwort				S1?	1	47.3 ± 0.0	NS
N	*Aloina rigida*	Aloe-Like Rigid Screw Moss				S1?	4	45.0 ± 2.0	NS
N	*Imbribryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1?	2	68.2 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	1	62.9 ± 2.0	NS
N	*Tortula obtusifolia*	a Moss				S1?	3	45.4 ± 0.0	NS
N	*Didymodon tophaceus*	Olive Beard Moss				S1?	1	52.6 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	3	40.1 ± 0.0	NS
N	*Physcomitrium immersum*	a Moss				S1?	1	77.4 ± 0.0	NS
N	*Schistostega pennata*	Luminous Moss				S1?	1	32.0 ± 0.0	NS

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N	*Syntrichia ruralis*	a Moss				S1?	1	23.2 ± 0.0	NS
N	*Melanelia culbersonii*	Appalachain Camouflage Lichen				S1?	1	67.6 ± 0.0	NS
N	*Arrhenopterum heterostichum*	One-sided Groove Moss				S1S2	2	45.0 ± 2.0	NS
N	*Hypnum pratense*	Meadow Plait Moss				S1S2	1	93.0 ± 3.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	1	50.0 ± 2.0	NS
N	*Tortula acaulon*	Cuspidate Earth Moss				S1S2	1	92.6 ± 2.0	NS
N	*Plagiothecium latebricola*	Alder Silk Moss				S1S2	2	74.5 ± 3.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	1	49.2 ± 0.0	NS
N	*Sematophyllum marylandicum*	a Moss				S1S2	2	11.3 ± 6.0	NS
N	*Timmia megapolitana*	Metropolitan Timmia Moss				S1S2	3	65.1 ± 1.0	NS
N	*Tortula mucronifolia*	Mucronate Screw Moss				S1S2	1	76.3 ± 3.0	NS
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	2	58.6 ± 0.0	NS
N	*Haplocladium microphyllum*	Tiny-leaved Haplocladium Moss				S1S2	1	39.5 ± 5.0	NS
N	*Enchylium bachmanianum*	Bachman's Jelly Lichen				S1S2	1	49.5 ± 0.0	NS
N	*Placidium squamulosum*	Limy Soil Stipplescale Lichen				S1S2	1	44.1 ± 6.0	NS
N	*Peltigera ponojensis*	Pale-bellied Pelt Lichen				S1S2	1	80.4 ± 0.0	NS
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	1	62.5 ± 3.0	NS
N	*Rhizoplaca subdiscrepans*	Scattered Rock-posy Lichen				S1S2	1	69.2 ± 1.0	NS
N	*Parmotrema reticulatum*	Netted Ruffle Lichen				S1S2	5	85.0 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1S2	9	27.7 ± 0.0	NS
N	*Lecanora polytropa*	a lichen				S1S3	1	55.2 ± 1.0	NS
N	*Heterodermia galactophylla*	Branching Fringe Lichen				S1S3	1	69.5 ± 0.0	NS
N	*Xylopsora friesii*	a Lichen				S1S3	2	38.7 ± 0.0	NS
N	*Stereocaulon grande*	Grand Foam Lichen				S1S3	1	61.5 ± 0.0	NS
N	*Stereocaulon intermedium*	Pacific Brain Foam Lichen				S1S3	2	35.1 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2	2	36.2 ± 30.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S2	2	15.6 ± 3.0	NS
N	*Sphagnum subnitens*	Lustrous Peat Moss				S2	1	50.5 ± 2.0	NS
N	*Usnea flavocardia*	Blood-splattered Beard Lichen				S2	1	44.1 ± 4.0	NS
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S2	2	35.5 ± 0.0	NS
N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S2	1	68.8 ± 0.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2	1	46.5 ± 1.0	NS
N	*Nephroma resupinatum*	a lichen				S2	11	21.7 ± 1.0	NS
N	*Placynthium flabellosum*	Scaly Ink Lichen				S2	1	18.6 ± 17.0	NS
N	*Riccardia multifida*	Delicate Germanderwort				S2?	1	35.2 ± 0.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	1	78.5 ± 5.0	NS
N	*Weissia muhlenbergiana*	a Moss				S2?	5	50.0 ± 1.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	2	54.2 ± 2.0	NS
N	*Ptychostomum pendulum*	Drooping Bryum				S2?	1	45.0 ± 2.0	NS
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2?	4	19.9 ± 2.0	NS
N	*Pseudocampylium radicale*	Long-stalked Fine Wet Moss				S2?	1	93.0 ± 3.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	3	56.7 ± 0.0	NS
N	*Ditrichum rhynchostegium*	a Moss				S2?	1	35.0 ± 1.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	1	83.2 ± 1.0	NS
N	*Kiaeria starkei*	Starke's Fork Moss				S2?	1	37.3 ± 10.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	1	54.7 ± 2.0	NS
N	*Philonotis marchica*	a Moss				S2?	2	53.7 ± 0.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	1	11.6 ± 0.0	NS
N	*Saelania glaucescens*	Blue Dew Moss				S2?	1	76.6 ± 0.0	NS
N	*Cyrtomnium*	Short-pointed Lantern Moss				S2?	2	33.6 ± 5.0	NS

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	hymenophylloides								
N	*Platylomella lescurii*	a Moss				S2?	4	28.2 ± 0.0	NS
N	*Phylliscum demangeonii*	Black Rock-wafer Lichen				S2?	1	59.6 ± 0.0	NS
N	*Oxyrrhynchium hians*	Light Beaked Moss				S2S3	4	21.3 ± 25.0	NS
N	*Platydictya subtilis*	Bark Willow Moss				S2S3	1	74.5 ± 3.0	NS
N	*Scorpidium revolvens*	Limprichtia Moss				S2S3	2	40.1 ± 0.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S2S3	58	24.8 ± 0.0	NS
N	*Moelleropsis nebulosa ssp. frullaniae*	Blue-gray Moss Shingle Lichen				S2S3	3	33.3 ± 0.0	NS
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S2S3	12	26.2 ± 0.0	NS
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2S3	59	9.8 ± 0.0	NS
N	*Usnea ceratina*	Warty Beard Lichen				S2S3	1	66.3 ± 0.0	NS
N	*Usnea hirta*	Bristly Beard Lichen				S2S3	2	37.7 ± 0.0	NS
N	*Usnea rubicunda*	Red Beard Lichen				S2S3	4	46.0 ± 0.0	NS
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S2S3	15	20.4 ± 0.0	NS
N	*Usnocetraria oakesiana*	Yellow Band Lichen				S2S3	12	29.4 ± 0.0	NS
N	*Cladonia incrassata*	Powder-foot British Soldiers Lichen				S2S3	1	95.6 ± 0.0	NS
N	*Cladonia mateocyatha*	Mixed-up Pixie-cup				S2S3	3	36.4 ± 5.0	NS
N	*Cladonia parasitica*	Fence-rail Lichen				S2S3	3	28.2 ± 0.0	NS
N	*Chaenotheca gracilenta*	a lichen				S2S3	1	37.7 ± 0.0	NS
N	*Scytinium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	8	35.7 ± 0.0	NS
N	*Melanohalea septentrionalis*	Northern Camouflage Lichen				S2S3	1	59.2 ± 0.0	NS
N	*Myelochroa aurulenta*	Powdery Axil-bristle Lichen				S2S3	4	48.0 ± 0.0	NS
N	*Parmelia fertilis*	Fertile Shield Lichen				S2S3	8	56.5 ± 0.0	NS
N	*Hypotrachyna minarum*	Hairless-spined Shield Lichen				S2S3	1	37.1 ± 0.0	NS
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	3	38.6 ± 0.0	NS
N	*Racodium rupestre*	Rockhair Lichen				S2S3	3	29.3 ± 1.0	NS
N	*Umbilicaria polyphylla*	Petalled Rocktripe Lichen				S2S3	1	75.4 ± 2.0	NS
N	*Usnea cavernosa*	Pitted Beard Lichen				S2S3	2	59.4 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	1	59.5 ± 0.0	NS
N	*Fuscopannaria sorediata*	a Lichen				S2S3	4	29.3 ± 1.0	NS
N	*Stereocaulon condensatum*	Granular Soil Foam Lichen				S2S3	1	85.8 ± 0.0	NS
N	*Physcia subtilis*	Slender Rosette Lichen				S2S3	1	25.4 ± 0.0	NS
N	*Dimelaena oreina*	Golden Moonglow Lichen				S2S3	2	43.6 ± 0.0	NS
N	*Cetraria arenaria*	Sand-loving Icelandmoss Lichen				S2S3	1	89.4 ± 0.0	NS
N	*Cladonia coccifera*	Eastern Boreal Pixie-cup Lichen				S2S3	3	3.1 ± 4.0	NS
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S2S3	3	66.0 ± 4.0	NS
N	*Cladonia phyllophora*	Felt Lichen				S2S3	2	87.4 ± 4.0	NS
N	*Usnea flammea*	Coastal Bushy Beard Lichen				S2S3	1	55.2 ± 1.0	NS
N	*Ephemerum serratum*	a Moss				S3	3	35.1 ± 0.0	NS
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S3	9	35.1 ± 0.0	NS
N	*Anomodon tristis*	a Moss				S3	10	45.6 ± 15.0	NS
N	*Sphagnum contortum*	Twisted Peat Moss				S3	3	47.9 ± 0.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3	2	50.5 ± 2.0	NS
N	*Rostania occultata*	Crusted Tarpaper Lichen				S3	2	89.7 ± 0.0	NS
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	26	13.4 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S3	10	11.3 ± 2.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	89	20.2 ± 0.0	NS
N	*Heterodermia squamulosa*	Scaly Fringe Lichen				S3	74	41.4 ± 0.0	NS
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	27	31.4 ± 0.0	NS
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S3	7	25.6 ± 3.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	8	23.5 ± 5.0	NS

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N	*Placynthium nigrum*	Common Ink Lichen				S3	2	45.4 ± 0.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	1	53.8 ± 0.0	NS
N	*Punctelia appalachensis*	Appalachian Speckleback Lichen				S3	100	76.4 ± 0.0	NS
N	*Viridothelium virens*					S3	3	33.3 ± 2.0	NS
N	*Ephebe lanata*	Waterside Rockshag Lichen				S3	2	18.6 ± 17.0	NS
N	*Phaeophyscia adiastola*	Powder-tipped Shadow Lichen				S3	1	36.9 ± 0.0	NS
N	*Phaeophyscia pusilloides*	Pompom-tipped Shadow Lichen				S3	11	11.6 ± 7.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S3	13	31.2 ± 0.0	NS
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3?	2	49.1 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	2	40.4 ± 3.0	NS
N	*Drummondia prorepens*	a Moss				S3?	1	56.0 ± 5.0	NS
N	*Elodium blandowii*	Blandow's Bog Moss				S3?	6	34.2 ± 7.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	3	44.5 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3?	1	62.2 ± 0.0	NS
N	*Sphagnum riparium*	Streamside Peat Moss				S3?	2	31.9 ± 0.0	NS
N	*Cladonia stygia*	Black-footed Reindeer Lichen				S3?	3	25.3 ± 0.0	NS
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	2	77.4 ± 0.0	NS
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S3S4	3	23.9 ± 3.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	1	62.4 ± 0.0	NS
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	2	76.4 ± 3.0	NS
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	1	76.6 ± 0.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	2	32.2 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	7	72.4 ± 4.0	NS
N	*Tomentypnum nitens*	Golden Fuzzy Fen Moss				S3S4	2	40.1 ± 0.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	2	43.8 ± 0.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	1	38.5 ± 0.0	NS
N	*Enchylium tenax*	Soil Tarpaper Lichen				S3S4	7	11.8 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3S4	68	8.7 ± 0.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	63	35.5 ± 0.0	NS
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	9	11.3 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	29	15.3 ± 0.0	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3S4	21	11.2 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	3	51.5 ± 0.0	NS
N	*Vahliella leucophaea*	Shelter Shingle Lichen				S3S4	10	75.1 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3S4	44	15.2 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3S4	78	9.8 ± 0.0	NS
N	*Melanohalea olivacea*	Spotted Camouflage Lichen				S3S4	3	59.4 ± 0.0	NS
N	*Parmeliopsis hyperopta*	Gray Starburst Lichen				S3S4	3	65.6 ± 0.0	NS
N	*Parmotrema perlatum*	Powdered Ruffle Lichen				S3S4	10	36.4 ± 0.0	NS
N	*Peltigera hymenina*	Cloudy Pelt Lichen				S3S4	2	51.5 ± 2.0	NS
N	*Sphaerophorus fragilis*	Fragile Coral Lichen				S3S4	7	38.4 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	682	6.8 ± 0.0	NS
N	*Physcia caesia*	Blue-gray Rosette Lichen				S3S4	2	55.2 ± 1.0	NS
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	5	33.0 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	112	6.8 ± 0.0	NS
N	*Evernia prunastri*	Valley Oakmoss Lichen				S3S4	31	29.7 ± 0.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	112	26.8 ± 0.0	NS
P	*Clethra alnifolia*	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S2	2	39.3 ± 0.0	NS
P	*Juglans cinerea*	Butternut	Endangered	Endangered		SNA	12	33.4 ± 0.0	NS
P	*Fraxinus nigra*	Black Ash	Threatened		Threatened	S1S2	480	8.8 ± 0.0	NS
P	*Liatris spicata*	Dense Blazing Star	Threatened	Threatened		SNA	3	29.3 ± 0.0	NS
P	*Bartonia paniculata ssp. paniculata*	Branched Bartonia	Threatened	Threatened		SNA	1	57.8 ± 10.0	NS

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P	*Lilaeopsis chinensis*	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	S3	16	92.8 ± 1.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S3	13	63.5 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2S3	37	50.8 ± 7.0	NS
P	*Acer saccharinum*	Silver Maple				S1	11	84.8 ± 0.0	NS
P	*Osmorhiza depauperata*	Blunt Sweet Cicely				S1	1	72.5 ± 5.0	NS
P	*Andersonglossum boreale*	Northern Wild Comfrey				S1	5	46.2 ± 1.0	NS
P	*Turritis glabra*	Tower Mustard				S1	1	93.3 ± 0.0	NS
P	*Cochlearia tridactylites*	Limestone Scurvy-grass				S1	1	100.0 ± 0.0	NS
P	*Lobelia spicata*	Pale-Spiked Lobelia				S1	10	46.7 ± 7.0	NS
P	*Ribes americanum*	Wild Black Currant				S1	4	31.3 ± 1.0	NS
P	*Fraxinus pennsylvanica*	Red Ash				S1	13	13.9 ± 0.0	NS
P	*Persicaria careyi*	Carey's Smartweed				S1	1	30.5 ± 3.0	NS
P	*Phytolacca americana*	Common Pokeweed				S1	1	30.9 ± 0.0	NS
P	*Montia fontana*	Water Blinks				S1	1	38.6 ± 1.0	NS
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	1	44.9 ± 0.0	NS
P	*Ranunculus pensylvanicus*	Pennsylvania Buttercup				S1	31	78.2 ± 0.0	NS
P	*Amelanchier nantucketensis*	Nantucket Serviceberry				S1	1	83.8 ± 1.0	NS
P	*Salix myrtillifolia*	Blueberry Willow				S1	1	22.6 ± 0.0	NS
P	*Salix serissima*	Autumn Willow				S1	2	22.7 ± 0.0	NS
P	*Carex garberi*	Garber's Sedge				S1	4	54.9 ± 0.0	NS
P	*Carex laxiflora*	Loose-Flowered Sedge				S1	2	78.2 ± 1.0	NS
P	*Carex ormostachya*	Necklace Spike Sedge				S1	1	97.9 ± 5.0	NS
P	*Carex plantaginea*	Plantain-Leaved Sedge				S1	4	50.4 ± 0.0	NS
P	*Carex prairea*	Prairie Sedge				S1	2	86.3 ± 1.0	NS
P	*Carex viridula var. saxilittoralis*	Greenish Sedge				S1	5	62.9 ± 2.0	NS
P	*Scirpus atrovirens*	Dark-green Bulrush				S1	5	10.2 ± 0.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	1	89.5 ± 100.0	NS
P	*Juncus secundus*	Secund Rush				S1	1	92.2 ± 0.0	NS
P	*Juncus vaseyi*	Vasey Rush				S1	3	55.5 ± 0.0	NS
P	*Trillium grandiflorum*	White Trillium				S1	3	86.3 ± 1.0	NS
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	5	66.8 ± 10.0	NS
P	*Spiranthes casei var. casei*	Case's Ladies'-Tresses				S1	1	75.8 ± 0.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	12	19.6 ± 1.0	NS
P	*Adiantum pedatum*	Northern Maidenhair Fern				S1	11	40.4 ± 0.0	NS
P	*Dryopteris goldieana*	Goldie's Woodfern				S1	1	92.6 ± 1.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	1	82.7 ± 5.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	8	36.2 ± 0.0	NS
P	*Selaginella rupestris*	Rock Spikemoss				S1	1	45.4 ± 0.0	NS
P	*Solidago hispida*	Hairy Goldenrod				S1?	2	35.1 ± 7.0	NS
P	*Suaeda rolandii*	Roland's Sea-Blite				S1?	5	46.5 ± 2.0	NS
P	*Carex pensylvanica*	Pennsylvania Sedge				S1?	3	11.6 ± 0.0	NS
P	*Bolboschoenus robustus*	Sturdy Bulrush				S1?	2	95.0 ± 5.0	NS
P	*Allium schoenoprasum*	Wild Chives				S1?	5	47.1 ± 10.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S1?	1	47.4 ± 7.0	NS
P	*Crocanthemum canadense*	Long-branched Frostweed			Endangered	S1S2	2	42.8 ± 1.0	NS
P	*Cypripedium arietinum*	Ram's-Head Lady's-Slipper			Endangered	S1S2	291	42.1 ± 2.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1S2	13	31.7 ± 10.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1S2	2	76.9 ± 0.0	NS
P	*Proserpinaca intermedia*	Intermediate Mermaidweed				S1S2	2	13.6 ± 0.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	5	47.4 ± 7.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1S2	3	48.1 ± 1.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	1	38.9 ± 10.0	NS
P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S1S2	3	88.1 ± 7.0	NS

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P	*Carex vacillans*	Estuarine Sedge				S1S3	2	58.0 ± 0.0	NS
P	*Zizia aurea*	Golden Alexanders				S2	38	44.9 ± 1.0	NS
P	*Antennaria parlinii ssp. fallax*	Parlin's Pussytoes				S2	14	24.4 ± 7.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S2	18	40.9 ± 7.0	NS
P	*Rudbeckia laciniata var. laciniata*	Cut-Leaved Coneflower				S2	9	71.0 ± 0.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S2	1	67.6 ± 0.0	NS
P	*Cardamine maxima*	Large Toothwort				S2	1	87.4 ± 0.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	129	35.1 ± 7.0	NS
P	*Desmodium canadense*	Canada Tick-trefoil				S2	22	47.0 ± 5.0	NS
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S2	20	39.1 ± 0.0	NS
P	*Conopholis americana*	American Cancer-root				S2	3	80.3 ± 1.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	9	37.1 ± 0.0	NS
P	*Hepatica americana*	Round-lobed Hepatica				S2	62	12.4 ± 0.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S2	22	27.2 ± 0.0	NS
P	*Galium boreale*	Northern Bedstraw				S2	7	58.6 ± 1.0	NS
P	*Gratiola neglecta*	Clammy Hedge-Hyssop				S2	4	35.3 ± 2.0	NS
P	*Dirca palustris*	Eastern Leatherwood				S2	65	3.7 ± 1.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S2	2	22.7 ± 0.0	NS
P	*Carex pellita*	Woolly Sedge				S2	12	44.5 ± 10.0	NS
P	*Carex livida*	Livid Sedge				S2	13	29.3 ± 0.0	NS
P	*Juncus greenei*	Greene's Rush				S2	5	31.2 ± 1.0	NS
P	*Allium tricoccum*	Wild Leek				S2	57	63.4 ± 0.0	NS
P	*Lilium canadense*	Canada Lily				S2	114	3.7 ± 0.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	22	23.2 ± 7.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	12	43.3 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	50	22.4 ± 7.0	NS
P	*Platanthera flava var. flava*	Southern Rein Orchid				S2	1	70.3 ± 7.0	NS
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S2	12	63.5 ± 0.0	NS
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	14	57.5 ± 1.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S2	33	39.1 ± 0.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S2	20	39.3 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S2	21	35.1 ± 7.0	NS
P	*Festuca subverticillata*	Nodding Fescue				S2	13	31.0 ± 5.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	1	96.0 ± 10.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S2	3	53.2 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	3	57.8 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	1	73.5 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	6	10.3 ± 7.0	NS
P	*Carex peckii*	White-Tinged Sedge				S2?	4	11.4 ± 0.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S2S3	961	26.8 ± 7.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2S3	33	43.2 ± 0.0	NS
P	*Bidens hyperborea*	Estuary Beggarticks				S2S3	2	93.6 ± 0.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2S3	2	44.7 ± 1.0	NS
P	*Lactuca hirsuta*	Hairy Lettuce				S2S3	3	26.7 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2S3	3	34.7 ± 0.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2S3	93	8.4 ± 0.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2S3	12	53.3 ± 0.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2S3	13	77.0 ± 0.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2S3	5	48.6 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2S3	4	62.9 ± 2.0	NS
P	*Hypericum majus*	Large St John's-wort				S2S3	8	27.3 ± 0.0	NS
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	3	23.3 ± 0.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	5	34.8 ± 7.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	2	87.6 ± 3.0	NS

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P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2S3	9	19.7 ± 7.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	17	26.3 ± 5.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2S3	8	47.4 ± 7.0	NS
P	*Polygala polygama*	Racemed Milkwort				S2S3	1	36.5 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	8	47.4 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	1	70.5 ± 1.0	NS
P	*Polygonum oxyspermum*	Sharp-fruit Knotweed				S2S3	1	29.3 ± 0.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2S3	10	31.0 ± 0.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2S3	16	46.7 ± 1.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2S3	14	19.4 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	6	32.8 ± 0.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	5	27.2 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	8	24.9 ± 4.0	NS
P	*Tiarella cordifolia*	Heart-leaved Foamflower				S2S3	232	16.1 ± 0.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S2S3	2	87.5 ± 0.0	NS
P	*Boehmeria cylindrica*	Small-spike False-nettle				S2S3	2	4.0 ± 0.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	8	33.8 ± 7.0	NS
P	*Carex capillaris*	Hairlike Sedge				S2S3	1	75.2 ± 0.0	NS
P	*Carex comosa*	Bearded Sedge				S2S3	4	47.6 ± 0.0	NS
P	*Carex houghtoniana*	Houghton's Sedge				S2S3	5	28.2 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2S3	8	63.3 ± 1.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2S3	9	43.9 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2S3	7	4.7 ± 0.0	NS
P	*Vallisneria americana*	Wild Celery				S2S3	3	19.1 ± 1.0	NS
P	*Najas gracillima*	Thread-Like Naiad				S2S3	2	36.4 ± 0.0	NS
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S2S3	14	8.9 ± 1.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2S3	28	9.2 ± 1.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2S3	10	48.5 ± 5.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2S3	2	60.1 ± 1.0	NS
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	8	26.9 ± 5.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	5	40.3 ± 0.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	6	23.2 ± 7.0	NS
P	*Potamogeton pulcher*	Spotted Pondweed			Vulnerable	S3	3	43.8 ± 2.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	1	41.9 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S3	3	31.0 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S3	3	45.8 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S3	33	45.5 ± 0.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S3	24	37.3 ± 0.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S3	6	12.4 ± 5.0	NS
P	*Symphyotrichum undulatum*	Wavy-leaved Aster				S3	7	30.3 ± 7.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S3	20	21.3 ± 1.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S3	30	9.2 ± 0.0	NS
P	*Betula pumila*	Bog Birch				S3	3	20.9 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S3	13	58.4 ± 50.0	NS
P	*Palustricodon aparinoides*	Marsh Bellflower				S3	39	40.8 ± 1.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	82	19.1 ± 0.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S3	39	34.7 ± 2.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S3	10	57.8 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S3	12	24.3 ± 0.0	NS
P	*Ceratophyllum echinatum*	Prickly Hornwort				S3	14	43.2 ± 0.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S3	65	40.0 ± 0.0	NS
P	*Viburnum edule*	Squashberry				S3	2	78.1 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Crassula aquatica*	Water Pygmyweed				S3	1	63.5 ± 0.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	93	34.8 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	3	50.1 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S3	3	60.2 ± 0.0	NS
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	13	52.8 ± 3.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	3	32.6 ± 7.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	6	26.8 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	22	27.4 ± 0.0	NS
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S3	16	20.5 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	11	28.0 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	18	80.0 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	9	34.7 ± 5.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	3	49.8 ± 0.0	NS
P	*Anemone virginiana*	Virginia Anemone				S3	17	36.0 ± 7.0	NS
P	*Cephalanthus occidentalis*	Common Buttonbush				S3	6	38.4 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S3	79	19.5 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S3	58	24.5 ± 0.0	NS
P	*Salix sericea*	Silky Willow				S3	1	9.3 ± 1.0	NS
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S3	4	73.2 ± 7.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	41	38.6 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	57	3.4 ± 0.0	NS
P	*Pilea pumila*	Dwarf Clearweed				S3	6	26.8 ± 0.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S3	10	26.3 ± 1.0	NS
P	*Carex bebbii*	Bebb's Sedge				S3	25	43.3 ± 0.0	NS
P	*Carex castanea*	Chestnut Sedge				S3	26	20.5 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	13	11.5 ± 6.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	10	31.4 ± 1.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S3	53	14.1 ± 7.0	NS
P	*Carex lupulina*	Hop Sedge				S3	46	6.2 ± 1.0	NS
P	*Carex rosea*	Rosy Sedge				S3	41	24.6 ± 0.0	NS
P	*Carex swanii*	Swan's Sedge				S3	3	29.3 ± 0.0	NS
P	*Carex tenera*	Tender Sedge				S3	11	34.5 ± 0.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	15	16.0 ± 0.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	34	38.0 ± 0.0	NS
P	*Carex atratiformis*	Scabrous Black Sedge				S3	3	80.9 ± 0.0	NS
P	*Eleocharis nitida*	Quill Spikerush				S3	11	28.4 ± 5.0	NS
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S3	5	16.0 ± 0.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S3	13	35.9 ± 7.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S3	13	59.7 ± 0.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S3	546	39.0 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	114	12.0 ± 0.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	113	9.1 ± 0.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	28	38.3 ± 0.0	NS
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S3	7	48.8 ± 7.0	NS
P	*Piptatheropsis canadensis*	Canada Ricegrass				S3	8	14.4 ± 1.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S3	8	39.1 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	8	36.6 ± 5.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	9	31.1 ± 0.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	15	11.4 ± 0.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	12	66.8 ± 7.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3	15	60.0 ± 7.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	7	64.3 ± 0.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	17	16.3 ± 0.0	NS
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S3?	2	4.8 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3?	15	28.7 ± 1.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	6	48.3 ± 0.0	NS
P	*Bidens vulgata*	Tall Beggarticks				S3S4	7	35.5 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3S4	24	28.8 ± 0.0	NS
P	*Hieracium paniculatum*	Panicled Hawkweed				S3S4	20	51.2 ± 11.0	NS
P	*Bidens beckii*	Water Beggarticks				S3S4	9	11.3 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3S4	92	31.0 ± 0.0	NS
P	*Packera paupercula var. paupercula*	Balsam Groundsel				S3S4	1	43.9 ± 0.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	14	53.2 ± 0.0	NS
P	*Shepherdia canadensis*	Soapberry				S3S4	101	38.6 ± 7.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3S4	3	42.1 ± 0.0	NS
P	*Vaccinium cespitosum*	Dwarf Bilberry				S3S4	60	34.0 ± 0.0	NS
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	2	27.2 ± 0.0	NS
P	*Fagus grandifolia*	American Beech				S3S4	251	9.9 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3S4	26	9.3 ± 7.0	NS
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3S4	6	35.1 ± 1.0	NS
P	*Nuphar microphylla*	Small Yellow Pond-lily				S3S4	4	54.0 ± 0.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3S4	33	10.3 ± 7.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	29	35.1 ± 0.0	NS
P	*Rumex pallidus*	Seabeach Dock				S3S4	1	36.7 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3S4	10	24.2 ± 50.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3S4	167	8.7 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3S4	15	43.1 ± 3.0	NS
P	*Crataegus succulenta*	Fleshy Hawthorn				S3S4	1	27.7 ± 0.0	NS
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	68	4.1 ± 0.0	NS
P	*Fragaria vesca*	Woodland Strawberry				S3S4	1	94.8 ± 0.0	NS
P	*Galium aparine*	Common Bedstraw				S3S4	26	37.7 ± 0.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3S4	7	41.9 ± 0.0	NS
P	*Limosella australis*	Southern Mudwort				S3S4	21	38.6 ± 3.0	NS
P	*Veronica serpyllifolia*	Thyme-Leaved Speedwell				S3S4	74	4.3 ± 0.0	NS
P	*Ulmus americana*	White Elm				S3S4	72	3.1 ± 0.0	NS
P	*Verbena hastata*	Blue Vervain				S3S4	207	12.1 ± 0.0	NS
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S3S4	15	28.6 ± 0.0	NS
P	*Viola selkirkii*	Great-Spurred Violet				S3S4	5	35.0 ± 4.0	NS
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3S4	3	39.1 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	9	58.3 ± 1.0	NS
P	*Sisyrinchium atlanticum*	Eastern Blue-Eyed-Grass				S3S4	2	90.4 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	21	60.2 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	6	3.4 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3S4	24	6.0 ± 1.0	NS
P	*Luzula parviflora ssp. melanocarpa*	Black-fruited Woodrush				S3S4	4	59.4 ± 0.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3S4	7	46.9 ± 0.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	7	11.5 ± 0.0	NS
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	7	28.2 ± 1.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3S4	26	35.0 ± 4.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3S4	23	8.8 ± 0.0	NS
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3S4	116	1.9 ± 0.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	13	38.6 ± 0.0	NS
P	*Koeleria spicata*	Narrow False Oats				S3S4	17	27.3 ± 0.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3S4	15	67.9 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3S4	16	38.3 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	14	35.6 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3S4	2	54.9 ± 5.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3S4	18	36.9 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Sceptridium multifidum*	Leathery Moonwort				S3S4	11	26.0 ± 10.0	NS
P	*Botrychium matricariifolium*	Daisy-leaved Moonwort				S3S4	7	36.2 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	2	48.0 ± 0.0	NS
P	*Greeneochloa coarctata*	Small Reedgrass				SH	1	38.9 ± 6.0	NS

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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.

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44	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
43	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
42	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
42	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
42	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
42	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
42	Stewart, J.I. 2010. Peregrine Falcon Surveys in New Brunswick, 2002-09. Canadian Wildlife Service, Sackville, 58 recs.
40	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
40	Cameron, E. 2007. Canadian Gypsum Co. survey 2005-07. Dillon Consulting Ltd, 40 recs.
38	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
38	Mersey Tobetic Research Institute. 2021. 2020 Monarch records from the MTRI monitoring program. Mersey Tobetic Research Institute, 72 records.
38	Nova Scotia Nature Trust. 2013. Nova Scotia Nature Trust 2013 Species records. Nova Scotia Nature Trust, 95 recs.
38	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
36	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre, 2318 recs.
36	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
34	Blaney, C.S. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2018. Atlantic Canada Conservation Data Centre.
34	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
33	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
33	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
31	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
31	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
30	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
30	Westwood, A., Staicer, C. 2016. Nova Scotia landbird Species at Risk observations. Dalhousie University.
28	Pepper, Chris. 2012. Observations of breeding Canada Warbler's along the Eastern Shore, NS. Pers. comm. to S. Blaney, Jan. 20, 28 recs.
27	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
27	Cameron, R.P. 2018. Degelia plumbea records. Nova Scotia Environment.
27	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.

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26	Porter, Caitlin. 2021. Field data for 2020 in various locations across the Maritimes. Atlantic Canada Conservation Data Centre, 3977 records.
25	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
25	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
24	Belliveau, A.G. 2021. New Black ash site records near Kentville, NS. Acadia University, 47 records.
24	McNeil, J.A. 2016. Blandings Turtle (Emydoidea blandingii), Eastern Ribbonsnake (Thamnophis sauritus), Wood Turtle (Glyptemys insculpta), and Snapping Turtle (Chelydra serpentina) sightings, 2016. Mersey Tobeatic Research Institute, 774 records.
24	Neily, T.H. & Pepper, C. 2020. Nova Scotia SMP lichen surveys 2020. Mersey Tobeatic Research Institute.
24	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
23	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
23	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
23	Powell, B.C. 1967. Female sexual cycles of Chrysemy spicta & Clemmys insculpta in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
22	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
22	Nelly, T.H. 2006. Cypripedium arietinum in Hants Co. Pers. comm. to C.S. Blaney. 22 recs, 22 recs.
21	Belliveau, A. 2013. Rare species records from Nova Scotia. Mersey Tobeatic Research Institute, 296 records. 296 recs.
20	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
19	Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
19	Cameron, R.P. 2014. 2013-14 rare species field data. Nova Scotia Department of Environment, 35 recs.
19	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
18	Blaney, C.S.; Mazerolle, D.M.; Klymko, J; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
17	Richardson, D., Anderson, F., Cameron, R, McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen (Anzia colpodes). COSEWIC.
16	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
15	Basquill, S.P. 2011 vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
15	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
14	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
13	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
13	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
13	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
13	Neily, T.H. 2012. 2012 Erioderma pedicellatum records in Nova Scotia.
13	Nova Scotia Nature Trust. 2014. Ladyslipper records from Saint Croix Nova Scotia, JLC Ed. Nova Scotia Nature Trust.
13	Robinson, S.L. 2015. 2014 field data.
12	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
12	Cameron, R.P. 2017. 2017 rare species field data. Nova Scotia Environment, 64 recs.
12	Hill, N.M. 1994. Status report on the Long's bulrush Scirpus longii in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
11	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
10	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
10	Belliveau, A.G. & Vail, Cole; King, Katie. 2020. New Allium tricoccum locations, Cornwallis River. Chapman, C.J. (ed.) Acadia University.
10	Churchill, J.L.; Walker, J. 2017. Species at Risk Surveys at Correctional Services Canada Properties in Nova Scotia and New Brunswick. Atlantic Canada Conservation Data Centre.
10	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
10	Neily, T. H. 2018. Lichen and Bryophyte records, AEI 2017-2018. Tom Neily; Atlantic Canada Conservation Data Centre.
10	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-05-25]. Mersey Tobeatic Research Institute, 668 recs.
10	Patrick, Allison. 2021. Animal and plant records from NCC properties from 2019 and 2020. Nature Conservancy Canada.
10	Richardson, D., Anderson, F., Cameron, R, Pepper, C., Clayden, S. 2015. Field Work Report on the Wrinkled Shingle lichen (Pannaria lurida). COSEWIC.
9	Benjamin, L.K. 2006. Cypripedium arietinum. Pers. comm. to D. Mazerolle. 9 recs, 9 recs.
9	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
9	Cameron, R.P. 2005. Erioderma pedicellatum unpublished data. NS Dept of Environment, 9 recs.
9	Cameron, R.P. 2006. Erioderma pedicellatum 2006 field data. NS Dept of Environment, 9 recs.
9	Chapman, C.N. (Cody). 2020. Nova Scotia Black Ash (Fraxinus nigra) field observations by Confederacy of Mainland Mi'kmaq. Forestry Program, Confederacy of Mainland Mi'kmaq.
9	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
9	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
9	MacDonald, E.C. 2018. CWS Piping Plover Census, 2010-2017. Canadian Wildlife Service, 672 recs.
9	Phinney, Lori; Toms, Brad; et. al. 2016. Bank Swallows (Riparia riparia) in Nova Scotia: inventory and assessment of colonies. Merset Tobeiatc Research Institute, 25 recs.
9	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
9	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.
8	Blaney, C.S. 2020. Sean Blaney 2020 field data. Atlantic Canada Conservation Data Centre, 4407 records.
8	Doucet, D.A. 2009. Census of Globally Rare, Endemic Butterflies of Nova Scotia Gulf of St Lawrence Salt Marshes. Nova Scotia Dept of Natural Resources, Species at Risk, 155 recs.
8	King, Katie; Jean, Samuel. 2021. Black ash observations near Booklyn, NS. E.C. Smith Herbarium.
8	Klymko, J. Butterfly records at the Nova Scotia Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2017.
8	Neily, T.H. & Anderson, F. 2011. Lichen observations from NRC site at Sandy Cove. , 97.
7	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.

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7	Cameron, B. 2006. Hepatica americana Survey at Scotia Mine Site in Gays River, and Discovery of Three Yellow-listed Species. Conestoga-Rovers and Associates, (a consulting firm), october 25. 7 recs.
7	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
7	O'Neil, S. 1998. Atlantic Salmon: Northumberland Strait Nova Scotia part of SFA 18. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-08. 9 recs.
6	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
6	Brazner, J.; Hill, N. 2018. Plant observations along the Cornwallis River, Nova Scotia. Nova Scotia Department of Lands and Forestry.
6	Clayden, S.R. 2005. Confidential supplement to Status Report on Ghost Antler Lichen (Pseudevernia cladonia). Committee on the Status of Endangered Wildlife in Canada, 27 recs.
6	Gallop, John. 2021. Sheet Harbour rare lichen observations. McCallum Environmental.
6	Hall, R. 2008. Rare plant records in old fieldbook notes from Truro area. Pers. comm. to C.S. Blaney. 6 recs, 6 recs.
6	Matthew Smith. 2010. Field trip report from Avon Caving Club outlining the discovery of Cyrpipedium arietinum and Hepatica nobilis populations. Public Works and Government Services Canada.
6	Mazerolle, D.M. 2020. Atlantic Canada Conservation Data Centre botanical fieldwork 2019. Atlantic Canada Conservation Data Centre.
6	Neily, T.H. Tom Neily NS Sphagnum records (2009-2014). T.H. Neily, Atlantic Canada Conservation Data Centre. 2019.
6	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
6	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
6	White, S. 2019. Notable species sightings, 2018. East Coast Aquatics.
6	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
5	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
5	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
5	Cameron, R.P. 2012. Additional rare plant records, 2009. , 7 recs.
5	Carter, Jeff; Churchill, J.; Churchill, I.; Churchill, L. 2020. Bank Swallow colony Scots Bay, NS. Atlantic Canada Conservation Data Centre.
5	Holder, M.L.; Kingsley, A.L. 2000. Kinglsey and Holder observations from 2000 field work.
5	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
5	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
5	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
5	Towell, C. 2014. 2014 Northern Goshawk and Common Nighthawk email reports, NS. NS Department of Natural Resources.
5	Walker, J. 2017. Bird inventories at French River, NS, and Memramcook, NB, for Nature Conservancy of Canada. Pers. comm. to AC CDC.
4	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
4	Bredin, K.A. 2002. NS Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centere, 30 recs.
4	Cameron-MacMillan, Maureen. 2020. Northern Goshawk Nests in Eastern Nova Scotia, as of November, 2020. Nova Scotia Department of Lands and Forestry.
4	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
4	Cody, W.J. 2003. Nova Scotia specimens of Equisetum pratense at the DAO herbarium in Ottawa. , Pers. comm. to C.S. Blaney. 4 recs.
4	Forsythe, B. 2006. Cypripedium arietinum at Meadow Pond, Hants Co. Pers. comm. to C.S. Blaney. 4 recs, 4 recs.
4	Klymko, J. Dataset of butterfly records at the New Brunswick Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2016.
4	Mills, Pamela. 2007. Iva frutescens records. Nova Scotia Dept of Natural Resources, Wildlife Div. Pers. comm. to S. Basquil, 4 recs.
4	Newell, R. & Neily, T.; Toms, B.; Proulx, G. et al. 2011. NCC Properties Fieldwork in NS: August-September 2010. Nature Conservancy Canada, 106 recs.
4	O'Neil, S. 1998. Atlantic Salmon: Eastern Shore Nova Scotia SFA 20. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-10. 4 recs.
3	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
3	Basquill, S.P. 2009. 2009 field observations. Nova Scotia Dept of Natural Resources.
3	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
3	Blaney, C.S. Miscellaneous specimens received by ACCDC (botany). Various persons. 2001-08.
3	Brunelle, P.-M. (compiler). 2010. ADIP/MDDS Odonata Database: NB, NS Update 1900-09. Atlantic Dragonfly Inventory Program (ADIP), 935 recs.
3	Calhoun, J.C. Butterfly records databased at the McGuire Center for Lepidoptera and Biodiversity. Calhoun, J.C. 2020.
3	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
3	Chapman, Cody. Unreported Species at Risk Records across Nova Scotia. Chapman, Cody, 5 records.
3	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
3	Doubt, J. 2013. Email to Sean Blaney with Nova Scotia records of Fissidens exilis at Canadian Museum of Nature. pers. comm., 3 records.
3	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
3	Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
3	Hill, N. and D. Patriquin. 2013. 2013 rare plant observations in Williams Lake Backlands area. Fern Hill Institute of Plant Conservation, Berwick, Nova Scotia, 3 records.
3	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
3	McNeil, J.A. 2020. Snapping Turtle and Eastern Painted Turtle records, 2020. Mersey Tobeatic Research Institute.
3	Nova Scotia Department of Lands and Forestry. 2018. Wood Turtle observations in, or near, the cornwallis River watershed. NS DLF, pers. comm. to AC CDC.
3	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
3	Parker, M. 2016. Wood turtle (Glyptemys insculpta) Visual Surveys at Black, Wallace, Musquodobit and Sackville Rivers, Nova Scotia. East Coast Aquatics Inc., 3 records.
3	Sabine, M. 2016. NB DNR staff incidental Black Ash observations. New Brunswick Department of Natural Resources.
3	Standley, L.A. 2002. Carex haydenii in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
3	Thompson, R. 2018. Williamsdale Quarry Expansion Project, NS, Environmental Assessment rare plants. Dexter Construction Company Limited.
2	Amiro, Peter G. 1998. Atlantic Salmon: Inner Bay of Fundy SFA 22 & part of SFA 23. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-12. 4 recs.
2	Basquill, S.P. 2011. Field observations & specimen collections, 2010. Nova Scotia Department of Natural Resources, Pers. comm. , 8 Recs.
2	Blaney, C.S. 2019. Sean Blaney 2019 field data. Atlantic Canada Conservation Data Centre, 4407 records.

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2	Cameron, B. 2005. C. palmicola, E. pedicellatum records from Sixth Lake. Pers. comm. to C.S. Blaney. 3 recs, 3 recs.
2	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
2	COSEWIC (Committee on the Status of Wildlife in Canada). 2013. COSEWIC Assessment and Status Report on the Eastern Waterfan Peltigera hydrothyria in Canada. COSEWIC, 46 pp.
2	Klymko, J.J.D. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 3 recs.
2	LaPaix, R.; Parker, M. 2013. email to Sean Blaney regarding Listera australis observations near Kearney Lake. East Coast Aquatics, 2.
2	Lock, A.R., Brown, R.G.B. & Gerriets, S.H. 1994. Gazetteer of Marine Birds in Atlantic Canada. Canadian Wildlife Service, Atlantic Region, 137 pp.
2	Macaulay, M. Notes on newly discovered Hepatica nobilis var. obtusa population in Cumberland Co. NS. Pers. comm. to S. Blaney, 1 rec.
2	Mazerolle, David. 2021. Botanical fieldwork 2019-20200. Parks Canada.
2	McLean, K. 2019. Species At Risk observations. Clean Annapolis River Project.
2	McLean, K. 2020. Species occurrence records from Clean Annapolis River Project fieldwork in 2020. Clean Annapolis River Project, 206 records.
2	Munro, M. 2003. Caulophyllum thalictroides & Carex hirtifolia at Herbert River, Brooklyn, NS. , Pers. comm. to C.S. Blaney. 2 recs.
2	Munro, M. 2003. Dirca palustris & Hepatica nobilis var. obtusa at Cogmagun River, NS. , Pers. comm. to C.S. Blaney . 2 recs.
2	Neily, T.H.; Smith, C.; Whitman, E. 2011. NCC Logging Lake (Halifax Co. NS) properties baseline survey data. Nature Conservancy of Canada, 2 recs.
2	Newell, R. E., MacKinnon, C. M. & Kennedy, A. C. 2006. Botanical Survey of Boot Island National Wildlife Area, Nova Scotia, 2004. Canadian Wildlife Service, Atlantic Region, Technical Report Series Number 450. 3 recs.
2	Newell, R.E. 2006. Rare plant observations in Digby Neck. Pers. comm. to S. Blaney, 6 recs.
2	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
2	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
2	Sabine, D.L. 2013. Dwaine Sabine butterfly records, 2009 and earlier.
2	Shafer, A.B.A., D.T. Stewart. 2006. A Disjunct Population of Sorex dispar (Long-Tailed Shrew) in Nova Scotia. Northeastern Naturalist, 13(4): 603-608.
2	Sollows, M.C,. 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
2	White, S. 2018. Notable species sightings, 2016-2017. East Coast Aquatics.
1	Amirault, D.L. 2003. 2003 Peregrine Falcon Survey. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
1	Amirault, D.L. 2005. 2005 Peregrine Falcon Survey. Canadian Wildlife Service, Sackville, unpublished data. 27 recs.
1	Anon. Dataset of butterfly records for the Maritime provinces. Museum of Comparative Zoology, Harvard University. 2017.
1	Basquill, S. P. 2008. Nova Scotia Dept of Natural Resources.
1	Basquill, S.P. 2004. C. americana and Sedum sp records, 2002. Pers. comm. to C.S. Blaney. 2 recs, 2 recs.
1	Basquill, S.P. 2012. 2012 Bryophyte specimen data. Nova Scotia Department of Natural Resources, 37 recs.
1	Basquill, S.P.; Quigley, E. 2006. New Minuartia groenlandica record for NS. Pers. comm. to C.S. Blaney, Oct 6, 1 rec.
1	Basset, I.J. & Crompton, C.W. 1978. The Genus Suaeda (Chenopodiaceae) in Canada. Canadian Journal of Botany, 56: 581-591.
1	Belliveau, A.G. E.C. Smith Herbarium Specimen Database 2019. E.C. Smith Herbarium, Acadia University. 2019.
1	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
1	Benjamin, L.K. 2003. Cypripedium arietinum in Cogmagun River NS. Pers. comm. to S. Blaney, 1 rec.
1	Blaney, C.S. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 6719 recs.
1	Blaney, C.S. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
1	Brach, A.R. 2019. Correspondence to Sean Blaney regarding Calamagrostis cinnoides specimen from Halifax NS. pers. comm., Harvard University Herbaria, 1 record.
1	Bruce, J. 2014. 2014 Wood Turtle email report, Nine Mile River, NS. NS Department of Natural Resources.
1	Clayden, S.R. 2006. Pseudevernia cladonia records. NB Museum. Pers. comm. to S. Blaney, Dec, 4 recs.
1	Clayden, S.R. 2020. Email to Sean Blaney regarding Pilophorus cereus and P. fibula at Fidele Lake area, Charlotte County, NB. pers. comm., 2 records.
1	Crowell, A. 2004. Cypripedium arietinum in Weir Brook, Hants Co. Pers. comm. to S. Blaney, 1 rec.
1	Crowell, M. 2013. email to Sean Blaney regarding Listera australis at Bear Head and Mill Cove Canadian Forces Station. Jacques Whitford Environmental Ltd., 2.
1	deGooyer, K. 2019. Snapping Turtle and Eastern White Cedar observations. Nova Scotia Environment.
1	Eastman, A. 2019. Snapping Turtle observation at Brookfield, Colchester Co. NS. Halifax Field Naturalists Nova Scotia Nature Archive Facebook Page, 1 record.
1	Edge, Thomas A. 1984. Status report on the Atlantic Whitefish (Coregonus huntsmani). Committee on the Status of Endangered Wildlife in Canada.
1	Golder Associates Ltd. 2021. Black Ash location from Goff's Quarry Expansion Environment Assessment, 2017. Golder Associates Ltd., 1 record.
1	Haughian, S. 2019. Pannaria lurida observations in Nova Scotia and New Brunswick. Nova Scotia Museum.
1	Haughian, S.R. 2018. Description of Fuscopannaria leucosticta field work in 2017. New Brunswick Museum, 314 recs.
1	Hill, N.; Manning, I. 2020. Wild Leek observation, Cornwallis River, NS, floodplain. pers. comm. to J. Churchill.
1	Hill, N.M. 2013. email communications to Sean Blaney and David Mazerolle regarding the discovery of Listera australis populations at Black River Lake and Middlewood. , 2.
1	Honeyman, K. 2019. Unique Areas Database, 2018. J.D. Irving Ltd.
1	Jacques Whitford Ltd. 2003. Cananda Lily location. Pers. Comm. to S. Blaney. 2pp, 1 rec, 1 rec.
1	Klymko, J. Henry Hensel's Butterfly Collection Database. Atlantic Canada Conservation Data Centre. 2016.
1	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.
1	Lautenschlager, R.A. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 2 recs.
1	Macauley, M. 2008. Email to Sean Blaney regarding rich hardwood floodplain site at Howards Pool, Wallace River, NS.
1	MacAuley, M. 2020. Email to Sean Blaney regarding Agalinis paupercula var. parviflora at Malagash Station, NS. pers. comm., 2 records.
1	MacKinnon, D.; Wright, P.; Smith, D. 2014. 2014 Common Tern email report, Eastern Passage, NS. NS Department of Environment.
1	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.
1	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.

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1	McKendry, Karen. 2016. Rare species observations, 2016. Nova Scotia Nature Trust, 19 recs.
1	NatureServe Canada. 2018. iNaturalist Butterfly Data Export . iNaturalist.org and iNaturalist.ca.
1	Neily, P.D. Plant Specimens. Nova Scotia Dept Natural Resources, Truro. 2006.
1	Neily, T.H. & Pepper, C.; Toms, B. 2019. Boreal Felt Lichen Observation, April 2019. Mersey Tobeatic Research Institute.
1	Neily, T.H. 2004. Hepatica nobilis var. obtusa record for Falmouth NS. Pers. comm. to C.S. Blaney, 1 rec.
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1	Newell, R.E. 2004. Hepatica nobilis var. obtusa record. Pers. comm. to S. Blaney, 1 rec.
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APPENDIX E. WATER BALANCE ASSESSMENT

Water Balance Assessment

Lantz Quarry Expansion Project

McCallum Environmental Ltd.

7 September 2022

→ The Power of Commitment

Project name		McCallum Lantz Quarry - WBA, ON					
Document title		Water Balance Assessment | Lantz Quarry Expansion Project					
Project number		11228008					
File name		11228008-RPT-1-Water Balance Assessment-Final					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
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1. Introduction

1.1 Purpose of this report

GHD Limited (GHD) was retained by McCallum Environmental Ltd. (McCallum) to perform a Water Balance Assessment for the development of the Lantz Quarry Expansion (Project) in Lantz, Halifax County, Nova Scotia (Site). The Project Site location can be seen on **Figure 1.1**. The Water Balance Assessment was performed in two phases: Initial Contributing Drainage Area Assessment, and Hydrologic Modelling Assessment. The methodology and results from the two phases will be discussed in this report.

1.2 Scope and limitations

This report: has been prepared by GHD for McCallum Environmental Ltd. and may only be used and relied on by McCallum Environmental Ltd. for the purpose agreed between GHD and McCallum Environmental Ltd. as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than McCallum Environmental Ltd. arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

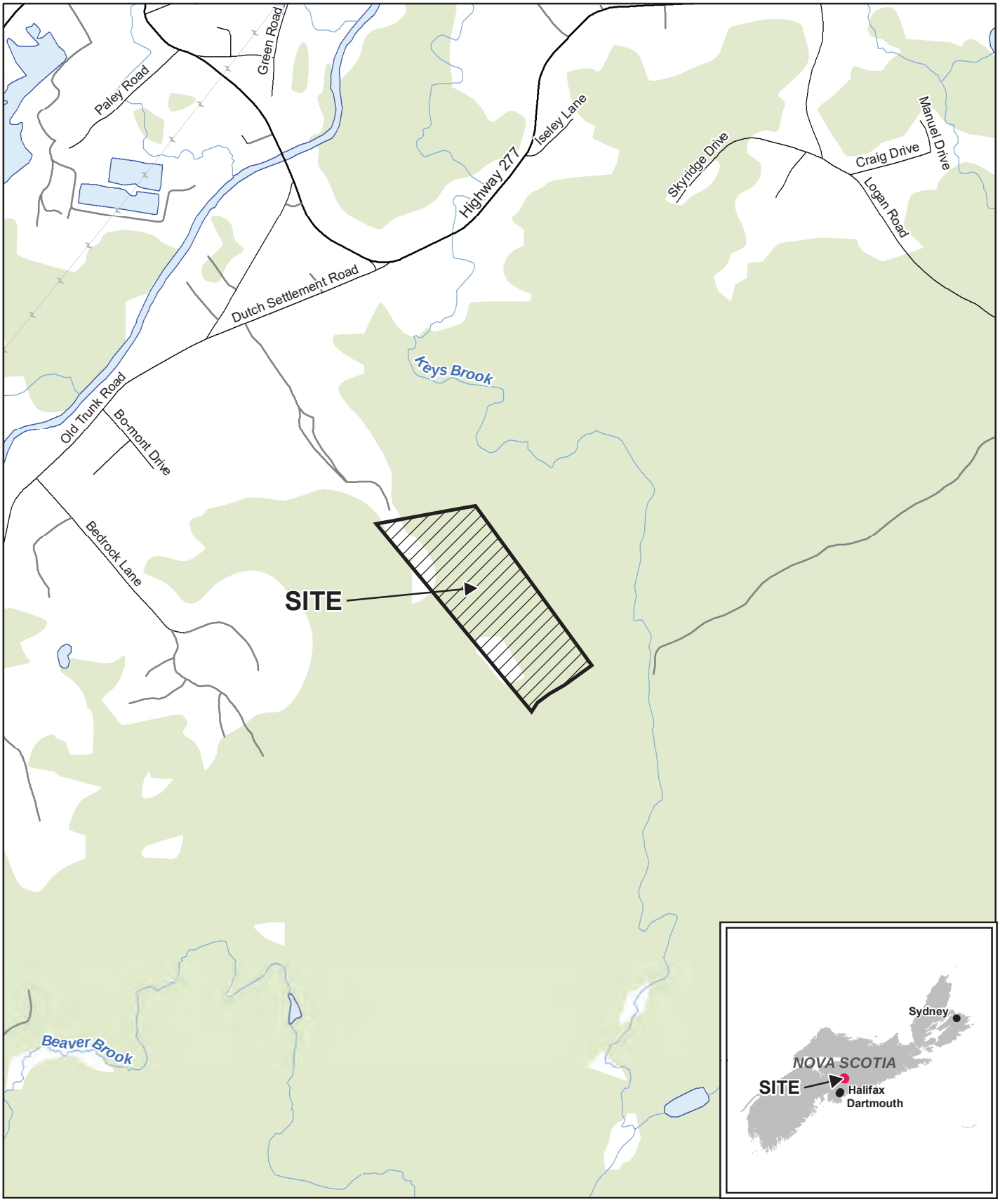
1.3 Background Information & Assumptions

The proposed Project Site has a footprint of approximately 12.5 hectares (ha) and is surrounded by wetlands, streams, and forested lands. Approximately 2.6 ha of the Site has already been developed as an existing quarry. The Project is an expansion of this existing aggregate quarry to continue to mine and produce aggregate material.

As per the Environmental Assessment Regulations, a quarry with a footprint greater than 4 ha with the purpose of extracting ordinary stone, building or construction stone, sand, gravel, or ordinary soil is classified as a Class 1 undertaking. The Project is expected to take place in three phases: Phase 1, Phase 2 and Phase 3. Phase 1 is expected to begin in 2023 and last 10 years. Phase 2 will commence following the completion of Phase 1 and will last 10 years. Phase 3 will commence following Phase 2 and will last 20 years for a total time of development of 40 years. Once mining of aggregate material has been completed the Site will be reclaimed to more natural conditions.

The objective of the Water Balance Assessment is to quantify the potential impacts of the quarry development on the surface water runoff to the surrounding watercourses. The Water Balance Assessment was performed for 5 stages of mine life: Existing Conditions, Phase 1 Conditions, Phase 2 Conditions, Phase 3 Conditions and Reclamation Conditions. Phase 1, 2 and 3 conditions assumed full development of each area of the Site designated to be developed during each respective phase while Reclamation Conditions assumed all Site infrastructure has been removed and the Site has been returned to natural conditions.

Local watercourses surrounding the Site include Keys Brook (northeast of the Site) and Watercourse 1. As a part of the Water Balance Assessment GHD determined Points of Interest (POI) where impacts of quarry development were investigated. The changes to surface water volumes and runoff at each POI were determined and discussed.



Paper Size ANSI A

0 150 300 450

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 20N

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MCCALLUM ENVIRONMENTAL LTD.
LANTZ QUARRY EXPANSION
WATER BALANCE ASSESSMENT

PROJECT SITE LOCATION

Project No. 11228008
Revision No. -
Date Sep 7, 2022

FIGURE 1.1

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2. Contributing Drainage Area Assessment

2.1 Point of Interest Assessment

After an investigation of the drainage pathways of the Project Site it was determined all runoff from the Site will ultimately drain towards Keys Brook. Six POIs were identified for the surrounding watershed and are shown in **Table 2.1**.

Table 2.1 Points of Interest for Lantz Quarry

Watershed	Sub-watershed/POI	Watercourse
Keys Brook	WC-1A	Watercourse 1
	WC-1B	Watercourse 1
	WC-1C	Watercourse 1
	WC-1D	Watercourse 1
	Keys Brook-DS	Keys Brook
	Keys Brook-US	Keys Brook

The total contributing drainage area to Keys Brook (Including the Project Site and natural areas surrounding the Site) is approximately 1,818 ha. The existing Site contributing drainage areas and POIs can be seen on **Figure 2.1** and **Figure 2.2**.

Keys Brook

Old Guysborough Road

McMullin Meadow Brook

Turf Lake Road

Beaver Brook

Richard Street

Legend

- Watercourse
- Wetlands
- Existing IA Approved Area
- Study Area
- WC-1D
- WC-1C
- WC-1B
- WC-1A
- KeysBrook-DS
- KeysBrook-US
- WC-1D (~49.9 ha)
- WC-1C (~43.0 ha)
- WC-1B (~39.4 ha)
- WC-1A (~39.0 ha)
- KeysBrook-DS (~1817.8 ha)
- KeysBrook-US (~1757.3 ha)

Paper Size ANSI B

0 150 300 450 600

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 20N

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WATER BALANCE ASSESSMENT

EXISTING CONTRIBUTING DRAINAGE AREAS

Project No. 11228008
Revision No. -
Date Sep 7, 2022

FIGURE 2.1

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Print date: 07 Sep 2022 - 12:12

Data source: -

Keys Brook

Legend

- Watercourse
- Wetlands
- Existing IA Approved Area
- Study Area
- WC-1D
- WC-1C
- WC-1B
- WC-1A
- KeysBrook-DS
- KeysBrook-US
- WC-1D (~49.9 ha)
- WC-1C (~43.0 ha)
- WC-1B (~39.4 ha)
- WC-1A (~39.0 ha)
- KeysBrook-DS (~1817.8 ha)
- KeysBrook-US (~1757.3 ha)

Paper Size ANSI B

0 30 60 90 120

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 20N

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WATER BALANCE ASSESSMENT

EXISTING CONTRIBUTING DRAINAGE AREAS (DETAILED VIEW)

Project No. 11228008
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Date Sep 7, 2022

FIGURE 2.2

Q:\GIS\PROJECTS\11228000s\11228008\Layouts\202206_WaterBalanceAssessment\11228008_202206_WaterBalanceAssessment_GIS003.mxd
Print date: 07 Sep 2022 - 12:15

Data source: .

As a preliminary assessment of the potential impacts of quarry development, the percent change to contributing drainage areas under each phase of quarry development at each POI was determined. Based off this percent change, and the characteristics of each individual watercourse, it was determined if additional modelling was required. This assessment allows for a preliminary quantitative understanding of the potential impacts to the surrounding watercourses. Based on this quantitative assessment additional modelling was required for specific POIs. See **Section 3** for further details.

The Site consists of two main sections: northwest of Watercourse 1 and southeast of Watercourse 1. The area to be developed northwest of Watercourse 1 is to be used as a laydown area with no quarry activity to be conducted in this portion of the Site. The area southeast of Watercourse 1 is where all quarry activity is to take place.

Stormwater runoff from the laydown (northwest) portion of the Site will runoff into Watercourse 1 as is currently occurring based on available contour data. As such, water from the laydown portion of the Site will enter Watercourse 1 both upstream and downstream of POI WC-1C. All runoff from the laydown area will enter Watercourse 1 upstream of the POI WC-1D.

The discharge point from the quarry (southeastern portion of the Site) is currently on the north side of the Site, into Watercourse 1, downstream of the WC-1C POI and upstream of the WC-1D POI. During quarry expansion it was assumed all Site surface water from the quarry would be continuing to be directed to the WC-1D POI. If the discharge point changes during quarry development the contributing drainage area assessment will be updated accordingly.

The contributing drainage areas for each POI under Phase 1, Phase 2, Phase 3 and Reclamation phases of Site development can be seen on **Figure 2.3**, **Figure 2.4**, and **Figure 2.5** respectively.

Phase 1

Laydown Area

Keys Brook

Legend

- Quarry Discharge Location
- Watercourse
- Wetlands
- Existing IA Approved Area
- Phase Expansions
- Study Area
- WC-1D
- WC-1C
- WC-1B
- WC-1A
- KeysBrook-DS
- KeysBrook-US
- WC-1D (~51.1 ha)
- WC-1C (~42.4 ha)
- WC-1B (~39.7 ha)
- WC-1A (~38.4 ha)
- KeysBrook-DS (~1817.8 ha)
- KeysBrook-US (~1756.6 ha)

Paper Size ANSI B

0 30 60 90 120

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 20N

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LANTZ QUARRY EXPANSION
WATER BALANCE ASSESSMENT

PHASE ONE CONTRIBUTING DRAINAGE AREAS (DETAILED VIEW)

Project No. 11228008
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Date Sep 7, 2022

FIGURE 2.3

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Print date: 07 Sep 2022 - 12:12

Data source: .

Phase 1

Phase 2

Laydown Area

Keys Brook

Legend

- Quarry Discharge Location
- Watercourse
- Wetlands
- Existing IA Approved Area
- Phase Expansions
- Study Area
- WC-1D
- WC-1C
- WC-1B
- WC-1A
- KeysBrook-DS
- KeysBrook-US
- WC-1D (~52.8 ha)
- WC-1C (~42.3 ha)
- WC-1B (~39.6 ha)
- WC-1A (~38.3 ha)
- KeysBrook-DS (~1817.8 ha)
- KeysBrook-US (~1754.9 ha)

Paper Size ANSI B

0 30 60 90 120

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 20N

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WATER BALANCE ASSESSMENT

PHASE TWO CONTRIBUTING DRAINAGE AREAS (DETAILED VIEW)

Project No. 11228008
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Date Sep 7, 2022

FIGURE 2.4

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Print date: 07 Sep 2022 - 12:12

Data source: .

Phase 3
Phase 2
Phase 1
Keys Brook
Laydown Area

Legend

- Quarry Discharge Location
- Watercourse
- Wetlands
- Existing IA Approved Area
- Phase Expansions
- Study Area
- WC-1D
- WC-1C
- WC-1B
- WC-1A
- KeysBrook-DS
- KeysBrook-US
- WC-1D (~55.2 ha)
- WC-1C (~42.3 ha)
- WC-1B (~39.6 ha)
- WC-1A (~38.3 ha)
- KeysBrook-DS (~1817.8 ha)
- KeysBrook-US (~1752.5 ha)

Paper Size ANSI B

0 30 60 90 120

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 20N

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WATER BALANCE ASSESSMENT

PHASE THREE AND RECLAMATION CONTRIBUTING DRAINAGE AREAS (DETAILED VIEW)

Project No. 11228008
Revision No. -
Date Sep 7, 2022

FIGURE 2.5

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Print date: 07 Sep 2022 - 12:16

Data source: .

The results of the contributing drainage area assessment can be found in Table 2.2.

Table 2.2 Contributing Drainage Area Assessment

Subcatchment	Existing Area (ha)	Phase 1 Area (ha)	Phase 2 Area (ha)	Phase 3 + Reclamation Area (ha)	Phase 1 Difference	Phase 2 Difference	Phase 3 + Reclamation Difference
WC-1A	39	38.4	38.3	38.3	-1.60%	-1.81%	-1.81%
WC-1B	39.4	39.7	39.7	39.7	0.78%	0.57%	0.57%
WC-1C	43.1	42.4	42.3	42.3	-1.47%	-1.66%	-1.66%
WC-1D	49.9	51.1	52.8	55.3	2.45%	5.85%	10.71%
Keys Brook-US	1,759	1,758	1,756	1,754	-0.04%	-0.13%	-0.27%
Keys Brook-DS	1,819	1,819	1,819	1,819	0.00%	0.00%	0.00%

As demonstrated in **Table 2.2** WC-1A, WC-1B, WC-1C, Keys Brook-DS and Keys Brook-US contributing drainage areas experience minimal changes to contributing drainage area due to quarry development activities while the WC-1D point of interest experiences a larger change in contributing drainage area during development of the quarry.

WC-1C and WC-1D points of interest were selected to require additional hydrologic modelling due to the large changes in contributing drainage area (WC-1D) and the potential for changes in land use within the contributing drainage area itself (both WC-1C and WC-1D). All other POIs are predicted to see minimal impacts due to quarry development and require no further analysis.

3. Hydrologic Water Balance

In order to determine the potential impacts of quarry development during Phase 1, Phase 2, Phase 3 and Reclamation conditions on WC-1C and WC-1D POIs, GHD developed a predictive water balance model (WBM). The WBM was developed using the GoldSim software.

GoldSim is a highly graphical program used for carrying out dynamic, probabilistic simulations to support decision making (**https://www.goldsim.com/Web/Home/**, last accessed 4 August 2022). GoldSim is especially well-suited to simulating dynamic, computationally intensive, but well-defined network models such as water balances. GoldSim permits inputs to be entered as probability distributions, performs Monte Carlo simulations, tracks outputs from those simulations and provides a graphical interface to facilitate the review and identification of interactions between system components.

The WBM takes into account surficial interactions between precipitation, baseflow and baseflow recharge. However, this WBM does not perform an in-depth analysis on groundwater flows on the Project Site. The WBM results are used to quantify the changes in surface runoff and do not account for baseflow entering or leaving the watercourse.

Observations of Watercourse 1 during summer months (ie. July and August) indicate the watercourse is ephemeral indicating that there may be little to no streamflow in the months were there is minimal runoff from the site due to a negative baseflow flux to the watercourse.

The WBM was developed to utilized climate inputs at a daily time-step; allowing the results to be summarized at monthly or annual intervals. The WBM was employed to calculate runoff at 2 POIs for Existing Conditions, Phase 1 Conditions, Phase 2 Conditions, Phase 3 Conditions and Reclamation Conditions.

3.1 Climate Data Inputs

Average monthly temperature values and monthly precipitation totals were obtained from the Environment Canada Halifax Stanfield International Airport Climate Station (Station ID: 8202250) based on Climate Normals from 1981 to

2010. The station was selected based on its proximity to the Project Site. The Halifax Stanfield International Airport Climate Station is 9.7 kilometers (km) south of the Site. Monthly lake evaporations normals were obtained from the Environment Canada Truro Climate Station (Station ID: 8205990) based on Climate Normals from 1981 to 2010. The Truro Climate Station was selected as the closest climate station to the Site which records lake evaporation data.

Monthly potential evapotranspiration (PET) normals were calculated using the Hamon equation (1961). The Hamon equation requires monthly average hours of daylight and monthly average temperature as input. Monthly average hours of daylight were calculated for Lantz, Nova Scotia using the Sunrise and Sunset Calculator (**https://www.timeanddate.com/sun/**, last accessed 4 August 2022).

Table 3.1 summarizes the monthly precipitation totals, average temperatures, lake evaporation rates and potential evapotranspiration rates used in the analysis:

Table 3.1 Climate Normals (Data from Halifax Stanfield International Airport and Truro, Nova Scotia Environment Canada Climate Stations)

	January	February	March	April	May	June	July	August	September	October	November	December
Average Temperature (°C)	-5.9	-5.2	-1.3	4.4	10.0	15.1	18.8	18.7	14.6	8.7	3.5	-2.4
Precipitation (mm)	134.3	105.8	120.1	114.5	111.9	96.2	95.5	93.5	102.0	124.9	154.2	143.3
Lake Evaporation (mm/day)	0.00	0.00	0.00	0.00	2.90	3.40	3.80	3.10	2.30	1.30	0.00	0.00
PET (mm/day)	0.37	0.46	0.71	1.21	1.95	2.72	3.25	2.92	2.01	1.21	0.77	0.47

The WBM sought to model the interaction between climate inputs and the hydrologic response. In order to capture the inherent uncertainty of daily climate, the climate input parameters were modelled stochastically. The use of stochastic climate inputs allows the user to consider the uncertainties of the system when making decisions related to water management. The model was constructed in such a way to assess each of the two POIs during existing conditions, Phase 1 conditions, Phase 2 conditions, Phase 3 conditions and reclamation conditions.

Temperature was determined stochastically, using normal probability distributions, through the use of the mean and standard deviation of monthly temperatures measured at the Halifax Stanfield International Airport Climate Station. The temperature then partitioned precipitation into rainfall and snowfall while also simulating the snowmelt process. Precipitation was included as an input to the water balance calculations.

Monthly precipitation totals from the Halifax Stanfield International Airport Climate Station Climate Normals were used in this analysis. These monthly precipitation totals were represented in the model stochastically, using lognormal probability distributions. Rainfall occurrence was modelled using a second-order Markov Chain. Monthly precipitation values are sampled from their respective probability distributions on wet days and divided by the number of days and the fraction of wet days per month to calculate daily precipitation totals. The fraction of wet days per month was determined from the observed daily precipitation record of the Halifax Stanfield International Airport Climate Station from 1961 to 2022.

Lake evaporation and potential evapotranspiration normals were input as constant and discrete monthly values to the WBM.

3.2 Modelling Hydrological Processes

This section describes the hydrological processes represented in the WBM including rainfall, snowmelt generation and rainfall-runoff modelling.

3.2.1 Rainfall and Snowmelt Generation

The WBM partitions daily precipitation totals into rainfall and snowfall based on the average daily temperature simulated by the WBM. Precipitation that occurs on a day with an average daily temperature less than 0 degrees Celsius is represented as snowfall, otherwise, precipitation is represented as rainfall

When snowfall occurs it accumulates in a 'snowpack' that is modelled as a storage element in the WBM. Input to the snowpack is snowfall, and output form the snowpack is snowmelt. Snowmelt occurs when the average daily temperature is greater than 0 degrees Celsius, and it is calculated using the degree-day method (USDA, 2004).

3.2.2 Rainfall-Runoff Modelling

The contributing drainage areas present under existing and reclamation conditions were classified based on the three predominate land uses within the catchments, wetland area, natural area and impervious area. Impervious area is relatively scare under existing and reclamation conditions, other than the presences of several local roadways as the catchments largely consist of wetland area and natural area.

In addition to these three land uses, under quarry expansion conditions, the Site will consist of a gravel quarry floor. The quarry floor is anticipated to consist of blasted rock for up to 3 meters (m) below the floor level of the quarry floor. Fractured rock due to blasting will likely be present across the quarry floor, allowing for significant amounts of infiltration in certain areas of the quarry. During Phase 1, 2 and 3 of quarry expansion the runoff coefficient for the quarry floor was assumed to be 0.4 to account for the high levels of infiltration occurring in certain portions of the site while also factoring in the compacted pathways the haul trucks and other equipment will travel along.

In order to account for baseflow storage and recharge in the natural areas of the Site a modified Australian Water Balance Model (AWBM) was used to calculate runoff depths from rainfall/snowmelt (Boughton, 2004). The modified AWBM is a conceptual model that is used to estimate runoff from rainfall based on the 'surplus' of water from the soil storage after losses (i.e., evapotranspiration) have been subtracted. The AWBM generally does not represent snow accumulation/snowmelt processes; however, GHD incorporated these processes into the methodology as previously described to better represent hydrologic processes in Nova Scotia. This modified version of the AWMB can be used to approximate hydrologic processes in Nova Scotia, reported at a monthly time step.

Runoff and snowmelt are added to the soil storage element as inputs, and potential evapotranspiration is subtracted from the soil storage element as output. Actual evapotranspiration equals potential evapotranspiration when there is a sufficient amount of water within the soil storage element to meet the evapotranspiration demand. Otherwise, actual evapotranspiration equals the depth of available water within the storage element. Daily runoff is calculated based on the surplus of rainfall/snowmelt from the soil storage element, after it has reached its storage capacity or 'available water capacity'. Surplus is calculated as the overflow rate (in millimeters (mm) per day) from the soil storage element. Surplus flow will occur when the available water capacity has been exceeded. An available water capacity of 225 mm was assigned to the soil storage element. This soil storage capacity was estimated based of Table 3.1 in the SWM Planning & Design Manual (MOE, 2003). Table 3.1 estimates the water holding capacity for mature forest silt loam of 225 mm.

Surplus is partitioned into surface runoff and baseflow recharge according to the baseflow index (BFI). A BFI of 0.17 was estimated for the Site from the local geology (Kennedy, 2010). The BFI represents the fraction of surplus that recharges the baseflow storage element, and (1-BFI) represents the fraction of the surplus that discharges as surface runoff. Baseflow recharge and baseflow discharge represent the input to and output from the baseflow storage element. Baseflow recharge is calculated as the product of surplus and the BFI. Baseflow discharge is calculated using a recession constant (Kb) of 0.95 as estimated for the area around the Site (Beck et al., 2013). Baseflow

discharge is computed daily as the product of (1-Kb) and the available water within the baseflow storage element. Runoff totals equal the sum of surface runoff and baseflow runoff rates (mm/day), multiplied by the catchment area, non-inclusive of the lake area.

The wetlands present around the Site were assumed to act similar to a lake in that evaporation rates from the wetland areas were assumed to be equal to lake evaporation rates and direct precipitation onto the wetlands bypasses the AWBM to produce runoff as a result of the combination of rainfall and snowmelt rates. The runoff rate from the wetland area is calculated to be the sum of the daily rainfall and snowmelt rates multiplied by the area of the wetlands less the lake evaporation rate.

Figure 3.1 shows how the rainfall-runoff modelling process was represented in the WBM. **Figure 3.2** shows the inputs to and outputs from the soil storage elements in units of depth per time. The inputs are rainfall and snowmelt, the output is actual evapotranspiration, and the overflow is surplus. The processes shown in **Figure 3.1** and **Figure 3.2** do not change for existing conditions versus operating and reclamation conditions.

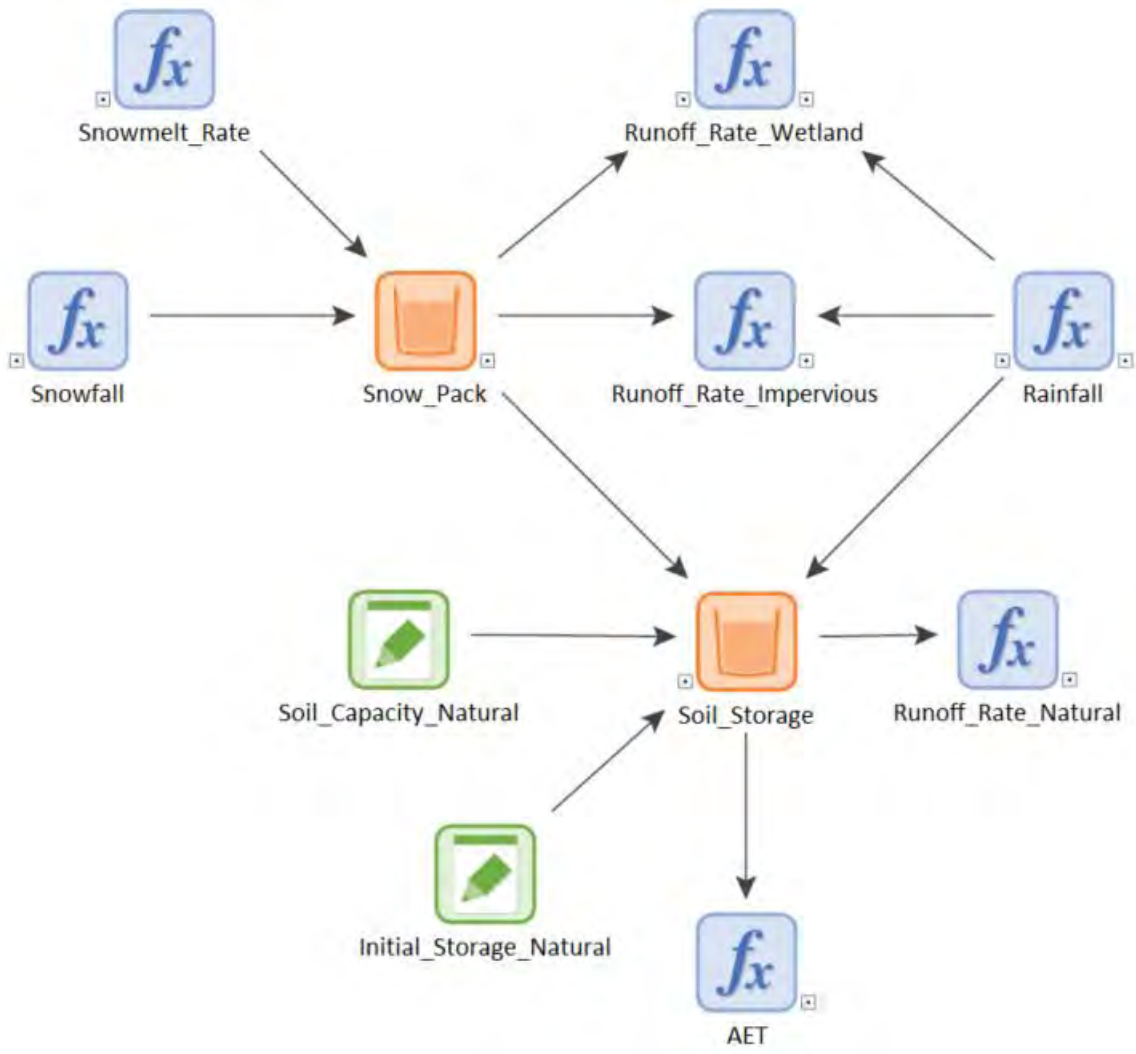

Figure 3.1 GoldSim Rainfall-Runoff Model Diagram

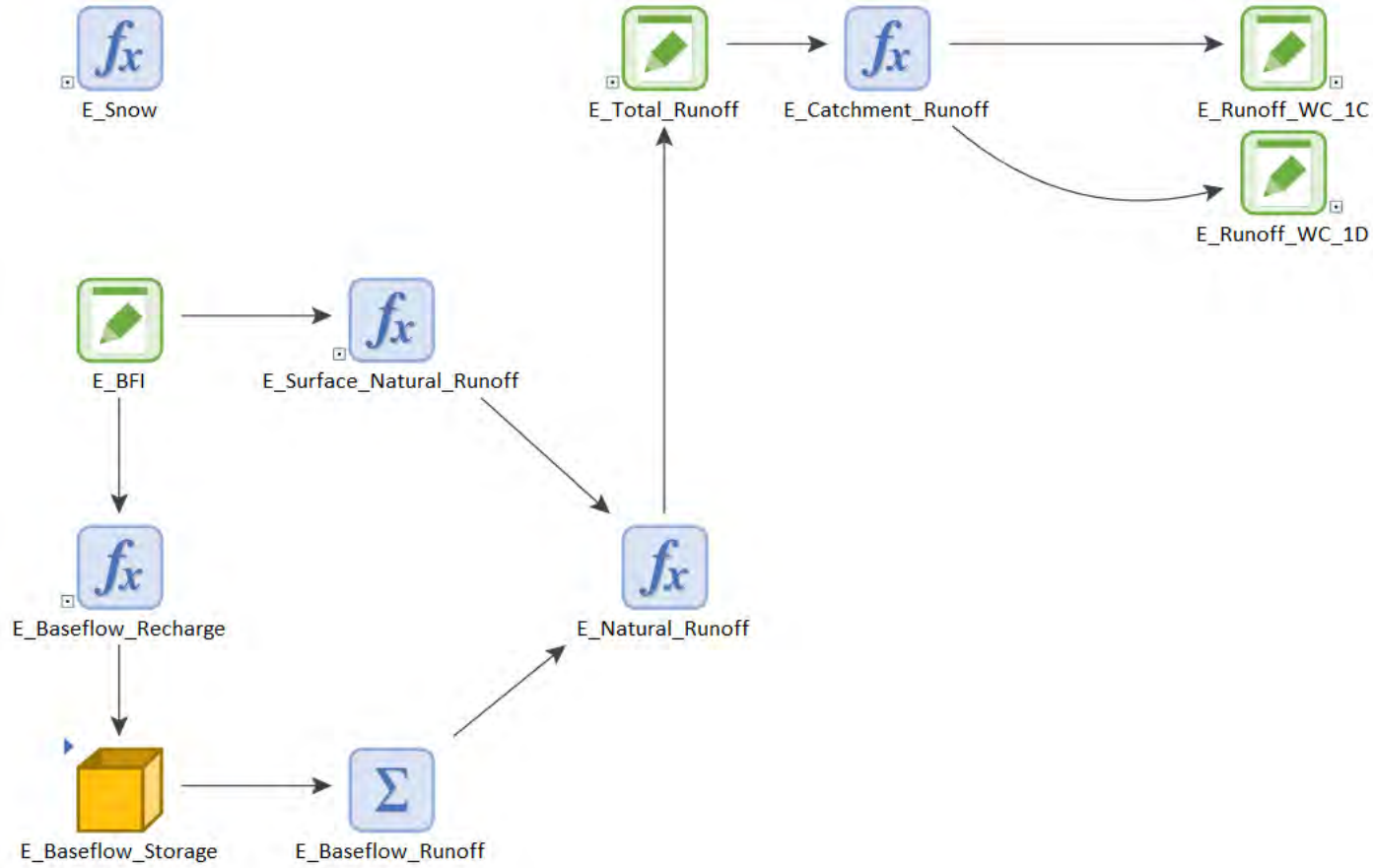

Figure 3.2 GoldSim Hydrology Diagram

3.3 Water Balance Results

This section presents a summary of the results of the water balance analysis for the Project Site during existing, Phase 1, Phase 2, Phase 3 and reclamation conditions. The purpose of the water balance analysis is to assess the impact of quarry development on the 2 POIs identified in Section 2. This is done by assessing the forecasted runoff to each POI on a monthly basis and comparing the resulting change in monthly storage volumes for existing, operating and reclamation conditions. Full results for each POI under each phase can be found in **Appendix A – Water Balance Results**.

A conservation check was performed on a yearly time scale for each scenario to ensure all incoming precipitation was accounted for in either evaporation or runoff. The conservation check demonstrated the inputs to the model (precipitation) and the outputs form the model (lake evaporation, actual evapotranspiration, and runoff) are within 0.68% of each other with regards to total yearly volume. As such, the model is accurately accounting for all inputs and outputs.

3.3.1 WC-1C Water Balance Model Results

Table 3.2 presents a summary of the predicted annual Runoff volume for WC-1C POI under each scenario along with the percent change from existing conditions and the maximum monthly percent change.

Table 3.2 WC-1C Results

Scenario	Annual Runoff (m^3)	% Change in Annual Flow	Max. Monthly % Change	Month of Maximum Change
Existing Conditions	363,014	-	--	--
Phase 1 Conditions	357,645	-1.48%	-1.49%	January
Phase 2 Conditions	356,962	-1.67%	-1.68%	January
Phase 3 Conditions	356,962	-1.67%	-1.68%	January
Reclamation Conditions	357,582	-1.50%	-1.70%	January

The WBM results shown in **Table 3.2** demonstrate there are potential reductions in annual runoff for the WC-1C POI during all phases of mine development of up to 1.67%. Maximum monthly changes in runoff do not vary greatly from the predicted annual change in flow as only a small portion of the contributing drainage area experiences a change in land use during quarry expansion and reclamation. Reduction in flow rates is largely due to a reduction in contributing drainage area.

3.3.2 WC-1D Water Balance Model Results

Table 3.3 presents a summary of the predicted annual runoff volume for WC-1D POI under each scenario along with the percent change from existing conditions and the maximum monthly percent change.

Table 3.3 WC-1D Results

Scenario	Annual Runoff (m^3)	% Change in Annual Flow	Max. Monthly % Change	Month of Maximum Change
Existing Conditions	410,638	-		--
Phase 1 Conditions	415,542	1.19%	14.95%	August
Phase 2 Conditions	424,479	3.37%	30.48%	August
Phase 3 Conditions	438,592	6.81%	49.44%	August
Reclamation Conditions	464,107	13.02%	14.84%	January

The WBM results shown in **Table 3.3** demonstrate there are potential increases in annual runoff for the WC-1D POI during all phases of mine development of up to 13.02%. The increase in runoff is largely due to increased contributing drainage area (up to 10.71% during Phase 3 and Reclamation conditions).

The predicted monthly runoff experiences greater fluctuations from Existing conditions than the annual runoff due to changes in land use for the catchment. The WC-1D POI contributing drainage area collects water from the entire Site. The quarry area is expected to consist of a quarry stone floor which will allow for significant infiltration while also allowing for runoff to exit the Site quicker due to channelization of the flow through the Site.

In addition, as modelled in the WBM, the Site results in more runoff and lower evaporation rates than natural areas, lake or wetlands. In months where there is less rainfall, higher temperatures, and more daytime hours (July, August), the WBM predicts increases in runoff for these months during Phase 1, Phase 2 and Phase 3 conditions due to the change of land use from natural conditions to the proposed quarry. During reclamation conditions it is anticipated that nearly all of the impervious area on Site will be removed and restored back to natural conditions leading to a maximum monthly percent change in runoff similar to the yearly predicted change in flow.

3.3.3 Runoff Impact Mitigation Measures

The WC-1D POI is predicted to see increases in runoff from Existing conditions of up to 6.81% (annually) and 49.44% (monthly) during quarry expansion. In addition, during reclamation conditions, the annual runoff is predicted to increase by 13.02 % while the monthly runoff for WC-1D is predicted to increase by a maximum of 14.84% (January).

There are several mitigation measures which could be implemented during design of the stormwater management infrastructure for the Site to mitigate the impacts of quarry development on the downstream watercourses.

During quarry development (Phase 1, Phase 2 and Phase 3 conditions) the downstream watercourse at POI WC-1D is predicted to experience an increase in both annual and monthly runoff due to decreased evaporation and increased runoff. While the quarry flow will consist of a permeable base, these impacts of increased runoff could be further reduced by incorporating additional infiltration trenches or soakaways with the intention of allowing for infiltration or evaporation of stormwater runoff. Additional information such as groundwater table elevations is required to determine which option is the most feasible to mitigate increases in runoff. These measures would be particularly applicable during the summer months (July and August) when the water balance is governed by short, high intensity rainfall events. These rainfall events would be captured by the prescribed mitigation measure, allowing for an increase in infiltration and evaporation of stormwater runoff and a reduction of total runoff back to a value closer to Existing conditions.

During Reclamation conditions the downstream watercourse at POI WC-1D is predicted to experience a increase in monthly runoff due to an increase in contributing drainage area. The potential increase in runoff predicted can be mitigated during the design of the restoration plan by incorporating infiltration measures or wetland features to reduce the amount of runoff which will enter the downstream watercourse.

4. Conclusions and Future Recommendations

The results presented in this Water Balance Assessment demonstrate that impacts of quarry development on the WC-1A, WC-1B, WC-1C, Keys Brook-US and Keys Brook-DS POIs are minimal as predicted in the contributing drainage area assessment and WBM. WC-1D POI will experience increases in annual and monthly runoff during quarry development and a decrease in monthly runoff during reclamation conditions as predicted in the WBM.

WC-1D will experience increases in annual runoff of 1.19%, 3.37%, 6.84% and 13.02% during Phase 1, Phase 2, Phase 3 and Reclamation conditions respectively while experiencing maximum changes in monthly runoff of 14.95%, 30.48%, 49.44% and 14.84% during these conditions. Due to the magnitude of these potential changes in runoff to Watercourse 1 at the WC-1D POI, mitigation measures may need to be incorporated into the design of stormwater infrastructure for the Site.

In addition, due to the timeline of development of the quarry (up to 40 years before full development) it is recommended that the water balance model be revisited upon the completion of Phase 2. Monitoring data collected during Phase 1 and Phase 2 could be used to calibrate the WBM and allow for more accurate predictions of potential impacts to the downstream receiving waterbodies during Phase 3 and Reclamation conditions.

5. References

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All of Which is Respectfully Submitted,

GHD

Chris Muirhead, P. Eng.
Engineer

Appendices

Appendix A

Water Balance Results

Table 1: Monthly and Annual Water Balance Results for WC-1C

Existing Conditions														Change in Annual Runoff from Existing Conditions
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
Precipitation (m3)	57,555	45,637	51,687	49,495	48,665	41,762	41,105	40,205	43,902	53,944	66,800	61,800	602,558	
Evaporation (m3)	5,300	5,837	9,740	15,793	26,090	35,025	43,248	38,821	25,938	16,380	10,264	6,552	238,988	
Runoff (m3)	2,603	463	11,858	178,113	32,776	12,259	4,087	2,896	10,107	33,216	54,017	20,618	363,014	
Conservation Check (m3)	49,653	39,336	30,089	-144,411	-10,200	-5,522	-6,230	-1,513	7,857	4,348	2,519	34,631	556	
Phase 1 Conditions														**Change in Annual Runoff from Existing Conditions**
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**	
Precipitation (m3)	56,707	44,964	50,926	48,766	47,948	41,146	40,499	39,612	43,255	53,149	65,816	60,890	593,678	
Evaporation (m3)	5,226	5,755	9,600	15,562	25,706	34,507	42,608	38,247	25,556	16,142	10,118	6,460	235,486	
Runoff (m3)	2,564	456	11,684	175,474	32,290	12,078	4,028	2,856	9,960	32,725	53,217	20,312	357,645	-1.48%
Conservation Check (m3)	48,917	38,753	29,642	-142,271	-10,048	-5,439	-6,137	-1,490	7,739	4,283	2,481	34,117	547	
% Change to Runoff	-1.49%	-1.47%	-1.47%	-1.48%	-1.48%	-1.47%	-1.43%	-1.40%	-1.46%	-1.48%	-1.48%	-1.48%	-1.48%	
Phase 2 Conditions														**Change in Annual Runoff from Existing Conditions**
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**	
Precipitation (m3)	56,599	44,879	50,829	48,673	47,857	41,068	40,422	39,537	43,173	53,048	65,691	60,774	592,548	
Evaporation (m3)	5,217	5,744	9,582	15,533	25,657	34,441	42,526	38,174	25,507	16,111	10,099	6,448	235,040	
Runoff (m3)	2,559	455	11,662	175,138	32,228	12,056	4,021	2,851	9,941	32,663	53,115	20,273	356,962	-1.67%
Conservation Check (m3)	48,823	38,679	29,585	-141,998	-10,028	-5,429	-6,125	-1,488	7,724	4,274	2,477	34,052	546	
% Change to Runoff	-1.68%	-1.66%	-1.65%	-1.67%	-1.67%	-1.66%	-1.62%	-1.58%	-1.65%	-1.67%	-1.67%	-1.67%	-1.67%	
Phase 3 Conditions														**Change in Annual Runoff from Existing Conditions**
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**	
Precipitation (m3)	56,599	44,879	50,829	48,673	47,857	41,068	40,422	39,537	43,173	53,048	65,691	60,774	592,548	
Evaporation (m3)	5,217	5,744	9,582	15,533	25,657	34,441	42,526	38,174	25,507	16,111	10,099	6,448	235,040	
Runoff (m3)	2,559	455	11,662	175,138	32,228	12,056	4,021	2,851	9,941	32,663	53,115	20,273	356,962	-1.67%
Conservation Check (m3)	48,823	38,679	29,585	-141,998	-10,028	-5,429	-6,125	-1,488	7,724	4,274	2,477	34,052	546	
% Change to Runoff	-1.68%	-1.66%	-1.65%	-1.67%	-1.67%	-1.66%	-1.62%	-1.58%	-1.65%	-1.67%	-1.67%	-1.67%	-1.67%	
Reclamation Conditions														**Change in Annual Runoff from Existing Conditions**
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**	
Precipitation (m3)	56,599	44,879	50,829	48,673	47,857	41,068	40,422	39,537	43,173	53,048	65,691	60,774	592,548	
Evaporation (m3)	4,835	5,440	9,235	15,197	25,320	34,144	42,228	37,884	25,202	15,746	9,653	6,037	230,920	
Runoff (m3)	2,559	456	11,699	175,320	32,276	12,107	4,076	2,906	9,997	32,718	53,175	20,293	357,582	-1.50%
Conservation Check (m3)	49,206	38,982	29,894	-141,844	-9,739	-5,183	-5,883	-1,253	7,974	4,585	2,863	34,443	4,046	
% Change to Runoff	-1.70%	-1.43%	-1.34%	-1.57%	-1.52%	-1.24%	-0.25%	0.32%	-1.09%	-1.50%	-1.56%	-1.57%	-1.50%	

Table 2: Monthly and Annual Water Balance Results for WC-1D

Existing Conditions														Change in Annual Runoff from Existing Conditions
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
Precipitation (m3)	66,739	52,919	59,935	57,393	56,430	48,425	47,663	46,620	50,907	62,552	77,459	71,661	698,702	
Evaporation (m3)	8,605	8,579	13,075	19,464	30,533	39,785	48,591	43,778	30,116	20,345	14,404	10,164	287,439	
Runoff (m3)	2,825	531	13,841	198,590	36,852	14,569	5,762	4,466	12,355	37,539	60,351	22,958	410,638	
Conservation Check (m3)	55,309	43,809	33,019	-160,661	-10,956	-5,929	-6,689	-1,624	8,436	4,668	2,705	38,539	625	
Phase 1 Conditions														**Change in Annual Runoff from Existing Conditions**
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**	
Precipitation (m3)	68,377	54,218	61,406	58,802	57,815	49,614	48,833	47,764	52,157	64,087	79,361	73,420	715,854	
Evaporation (m3)	10,054	9,701	14,297	20,530	31,415	40,340	48,997	44,231	30,873	21,521	16,019	11,706	299,682	
Runoff (m3)	2,799	541	14,211	199,460	37,196	15,115	6,426	5,133	12,974	37,968	60,677	23,043	415,542	1.19%
Conservation Check (m3)	55,525	43,976	32,898	-161,188	-10,795	-5,840	-6,590	-1,600	8,310	4,598	2,665	38,671	630	
% Change to Runoff	-0.93%	1.84%	2.68%	0.44%	0.93%	3.75%	11.53%	14.95%	5.01%	1.14%	0.54%	0.37%	1.19%	
Phase 2 Conditions														**Change in Annual Runoff from Existing Conditions**
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**	
Precipitation (m3)	70,646	56,017	63,443	60,753	59,734	51,260	50,453	49,349	53,887	66,213	81,994	75,856	739,605	
Evaporation (m3)	11,546	10,878	15,615	21,763	32,580	41,283	49,886	45,116	31,913	22,868	17,733	13,305	314,485	
Runoff (m3)	2,802	556	14,711	202,324	37,905	15,793	7,130	5,826	13,699	38,766	61,607	23,360	424,479	3.37%
Conservation Check (m3)	56,297	44,583	33,118	-163,335	-10,751	-5,816	-6,562	-1,593	8,275	4,579	2,653	39,192	641	
% Change to Runoff	-0.81%	4.63%	6.29%	1.88%	2.86%	8.40%	23.74%	30.48%	10.88%	3.27%	2.08%	1.75%	3.37%	
Phase 3 Conditions														**Change in Annual Runoff from Existing Conditions**
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**	
Precipitation (m3)	73,889	58,588	66,356	63,541	62,476	53,613	52,770	51,614	56,361	69,253	85,758	79,339	773,557	
Evaporation (m3)	13,361	12,323	17,266	23,374	34,211	42,739	51,359	46,541	33,395	24,620	19,858	15,257	334,304	
Runoff (m3)	2,832	578	15,417	207,453	39,064	16,714	8,001	6,673	14,655	40,034	63,235	23,936	438,592	6.81%
Conservation Check (m3)	57,697	45,687	33,673	-167,286	-10,799	-5,840	-6,590	-1,600	8,310	4,598	2,665	40,146	660	
% Change to Runoff	0.24%	8.78%	11.39%	4.46%	6.00%	14.73%	38.86%	49.44%	18.62%	6.65%	4.78%	4.26%	6.81%	
Reclamation Conditions														**Change in Annual Runoff from Existing Conditions**
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**	
Precipitation (m3)	73,889	58,588	66,356	63,541	62,476	53,613	52,770	51,614	56,361	69,253	85,758	79,339	773,557	
Evaporation (m3)	7,764	8,181	13,139	20,588	33,364	44,289	54,465	48,954	33,066	21,428	14,104	9,402	308,742	
Runoff (m3)	3,244	597	15,461	225,697	41,745	16,162	6,019	4,534	13,566	42,442	68,535	26,105	464,107	13.02%
Conservation Check (m3)	62,881	49,810	37,756	-182,744	-12,632	-6,837	-7,714	-1,873	9,728	5,383	3,119	43,831	708	
% Change to Runoff	14.84%	12.44%	11.71%	13.65%	13.27%	10.93%	4.47%	1.53%	9.81%	13.06%	13.56%	13.71%	13.02%	


GHD

APPENDIX F. MBBA RESULTS

Maritimes Breeding Bird Atlas - Summary Sheet for Square 20MQ67 (page 2 of 3)

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

This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #20 (Chebucto - Musquodoboit). Underlined species are those that you should try to add to this square (20MQ67). They have not yet been reported during the 2nd atlas, but were found during the 1st atlas in this square or have been reported in more than 50% of the squares in this region during the 2nd atlas so far. "Code" is the code for the highest breeding evidence for that species in square 20MQ67 during the 2nd and 1st atlas respectively. The % columns give the percentage of squares in that region where that species was reported during the 2nd and 1st atlas (this gives an idea of the expected chance of finding that species in region #20). Rare/Colonial Species Report Forms should be completed for species marked: § (Colonial), ‡ (regionally rare), † (rare in the Maritimes) or ¤ (rare in the Maritimes, documentation only required for confirmed records). Current as of 6/05/2021. An up-to-date version of this sheet is available from http://www.mba-aom.ca/jsp/summaryform.jsp?squareID=20MQ67?lang=en

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ATLAS DES OISEAUX NICHEURS DES MARITIMES
BREEDING BIRD ATLAS

Square Summary (20MQ67)

#species (1st atlas)				#species (2nd atlas)				#hours		#pc done	
poss	prob	conf	total	poss	prob	conf	total	1st	2nd	road	offrd
9	41	18	68	35	16	19	70	11	18.6	0	0

Region summary (#20: Chebucto - Musquodoboit)

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

Target number of point counts in this square: 14 road side, 1 off road (1 in Mature coniferous). Please try to ensure that each off-road station is located such that the entire 100m radius circle is within the prescribed habitat.

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

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