Grant of Access and Use & Disclaimer

This draft report was prepared by a third-party consultant for Halifax Regional Municipality ("**HRM**"). It is a work-in-progress and is anticipated to become a component of a consolidated report as part of HRM's "Future Serviced Communities" study. Because the report is in draft and does not provide the full picture of land suitability pending flood risk, watershed, and other study components, it is subject to change without notice after further review and analysis by HRM staff.

This draft report was created to support municipal purposes and activities related to HRM's "Future Serviced Communities" study. The grant of access and use is for the limited purpose of informing (and inviting feedback from) study area property owners and other interested parties about technical issues and findings associated with these initiatives (the "**Purpose**"). HRM has sole and exclusive intellectual property rights (including copyright), title, and interest in and to the attached draft report. Persons are authorized to access and use this draft report solely (i) in furtherance of the Purpose, and (ii) in compliance with the terms of this Grant of Access and Use & Disclaimer.

A person may not access, use, create derived works from, license, reproduce, publish, or otherwise distribute the draft report, or any part thereof, for an objective unrelated to the Purpose without first receiving the written consent of HRM, which consent may be withheld for any reason or no reason. Any decision by a person accessing the draft report to use or rely on the data therein for their own purposes is taken at that person's sole risk and without recourse or remedy of any kind or nature whatsoever against HRM.

HRM is a municipal permitting authority that regularly receives and processes applications for permits, approvals, and licenses. HRM may issue, place conditions on, or refuse to issue permits, approvals, and licenses. HRM's provisioning of access to the data in the draft report does not constitute, nor will it be construed as, permission for a person to use this data in a permit, approval or license; nor will it result in a person's application for a permit, approval or license to be processed in a manner that differs from HRM's normal practices and procedures as a permitting authority. Should a person, at their own risk and without the written consent of HRM, incorporate information from the attached draft report into an application for a permit, approval or license, that person acknowledges

(i) this data may not be accepted by HRM because it is erroneous or incomplete, not relevant to the application, or does not comply with development/planning requirements; and

(ii) HRM's authority to issue, place conditions on, or refuse to issue such permit, approval or license is and will remain absolute and unfettered, subject to the operation of applicable legislation and by-laws.

The draft report is provided on an "as is, where is" basis. HRM, its officials, representatives, agents, and consultants, along with their respective employees,

(i) make no representations or warranty, either express or implied, in respect of the accuracy, completeness, or usefulness of the data in the attached draft report;

(ii) disclaim any legal duty based on representation, warranty, or reliance; and

(iii) will not be liable for any damages or losses that may be suffered by a person arising out of or relating to

   a. the accuracy, completeness, or usefulness of the data in the attached draft report, or
   b. use of the draft report in a manner that does not comply with the terms of this Grant of Access and Use & Disclaimer.

HALIFAX REGIONAL MUNICIPALITY
FUTURE SERVICED COMMUNITIES

FINAL REPORT
VOLUME 4: MORRIS LAKE STUDY AREA
REPORT – LAND SUITABILITY ANALYSIS

August 1, 2024

Prepared for:
Halifax Regional Municipality

Prepared by:
Stantec Consulting Ltd

Project Number:
160410459

HALIFAX REGIONAL MUNICIPALITY – FUTURE SERVICED COMMUNITIES
FINAL REPORT – VOLUME 4: MORRIS LAKE STUDY AREA REPORT – LAND SUITABILITY ANALYSIS

The conclusions in the Report titled Halifax Regional Municipality Future Serviced Communities are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from Halifax Regional Municipality (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided by the Client to applicable authorities having jurisdiction and to other third parties in connection with the project, Stantec disclaims any legal duty based upon warranty, reliance or any other theory to any third party, and will not be liable to such third party for any damages or losses of any kind that may result.

Prepared by: _____
Signature

_____
Printed Name

Reviewed by: _____
Signature

_____
Printed Name

Approved by: _____
Signature

_____
Printed Name

Table of Contents

3 LAND SUITABILITY ANALYSIS 1

3.1 Overall Study Approach 1
3.2 Wetland Habitat 4
3.2.1 Desktop and Field summary 4
3.2.2 Land Suitability Analysis – Wetlands 7
3.3 Watercourses and Water Quality 18
3.3.1 Desktop and Field summary 18
3.3.2 Land Suitability Analysis – Watercourses and Water Quality 25
3.4 Forest Habitat and Species at Risk 28
3.4.1 Forest Habitat 28
3.4.2 Forest Ecosystem Classification 31
3.4.3 Species at Risk 42
3.4.4 Land Suitability Analysis – Forest Habitat and Species at Risk 68
3.5 Landscape Connectivity 72
3.6 Surficial and Bedrock Geology 75
3.6.1 Bedrock Geology 75
3.6.2 Surficial Geology 77
3.6.3 Depth to Water Table 79
3.6.4 Land Suitability Analysis – Geology 79
3.7 Topography 82
3.7.1 Land Suitability Analysis – Topography 82
3.8 Contaminated Sites 84
3.8.1 Methodology 84
3.8.2 Desktop Review 84
3.8.3 Field Results 85
3.8.4 Influence on Land Suitability 86
3.9 Areas of Cultural Significance 88
3.10 Summary of Land Suitability Analysis 88
3.10.1 Biological Components 89
3.10.2 Geology and Topography Components 91
3.11 References 93

LIST OF TABLES

Table 3.1 Summary of Wetland Evaluation Results 5
Table 3.2 Wetlands – Land Suitability Ranking Framework 7
Table 3.3 Ecological Condition Scores 8
Table 3.4 Wetland Risk Scores 9
Table 3.5 Wetland Functions 10
Table 3.6 Thresholds for Function Scores 12
Table 3.7 Wetland Function Scores 13
Table 3.8 Wetlands – Land Suitability Rankings 14
Table 3.9 Physical Watercourse Characteristics – MLSA 22
Table 3.11 Watercourses and Water Quality– Land Suitability Ranking Framework 26
Table 3.12 Summary of Vegetation Types in the MLSA 30
Table 3.13 SAR and SOCC Within 5 km of the MLSA (AC CDC 2023) 42
Table 3.14 Incidental Observations of SAR and SOCC 47
Table 3.15 Forest Habitat and Species at Risk – Land Suitability Ranking Framework 68
Table 3.16 Static Water Level Summary in Existing Groundwater Wells 79
Table 3.17 Surficial and Bedrock Geology – Land Suitability Ranking Framework 80

Table 3.18 Topography – Land Suitability Ranking Framework 82
Table B.1 Observed Vegetation in the MLSA ..... Appendix B
Table B.2 Stand Data for the MLSA ..... Appendix B
Table B.3 Vegetation Percent Cover Matrix for the MLSA ..... Appendix B
Table C.1 Incidental Wildlife Observations Recorded During Field Programs ..... Appendix C

LIST OF FIGURES

Figure 3.1 Morris Lake Study Area (MLSA) 3
Figure 3.2 Wetlands in the MLSA 6
Figure 3.3 Wetlands in the MLSA – Land Suitability Analysis 17
Figure 3.4 Watershed and Wet Area Mapping in the MLSA 19
Figure 3.5 Surface Water Quality Sampling Locations in the MLSA 21
Figure 3.6 Watercourses in the MLSA – Land Suitability Analysis 27
Figure 3.7a FEC Forest Group Classification Inventory for the MLSA 40
Figure 3.7b FEC Forest Group Classification Inventory for the MLSA 42
Figure 3.8 SAR, SOCC, and Sensitive Habitats Identified in the MLSA 48
Figure 3.9 Potential Distribution of Species at Risk – MLSA 66
Figure 3.10 Forest Habitat and SAR in the MLSA – Land Suitability Analysis 71
Figure 3.11 Proposed Landscape Connectivity Options for MLSA 74
Figure 3.12 Bedrock Geology in the MLSA 76
Figure 3.13 Surficial Geology in the MLSA 78
Figure 3.14 Geology in the MLSA – Land Suitability Analysis 81
Figure 3.15 Slopes in the MLSA – Land Suitability Analysis 83
Figure 3.16 Contaminated Sites In the MLSA 87
Figure 3.17 Land Suitability Analysis of Biological Components – MLSA 90
Figure 3.18 Land Suitability Analysis of Geological and Topographic Components – MLSA 92

LIST OF APPENDICES

Appendix A AC CDC Report
Appendix B Vegetation Data
Appendix C Wildlife Observations
Appendix D ARIA Report

3 Land Suitability Analysis

Stantec Consulting Ltd. (Stantec) completed a land suitability analysis of four potential Future Serviced Communities (FSC) within HRM: Sandy Lake, Highway 102 West Corridor, Morris Lake Expansion, and Westphal. The land suitability analysis included an evaluation of select biophysical characteristics, a contaminated sites review, and an archaeological and cultural study for each Study Area. The objective of the land suitability analysis was to determine what portions of each Study Area are potentially suitable for new housing development based on these limited characteristics. This analysis, along with other factors, will contribute to informed decision-making regarding future community planning work.

This section discusses the work completed in the Morris Lake Study Area (MLSA; Figure 3.1). The terms "MLSA" and "Study Area" are used interchangeably in this section; both refer to the Study Area indicated on Figure 3.1. Note that not all areas within the Study Area (Figure 3.1) are being considered for future development (e.g., if they are privately owned and/or are already developed).

There are many possible ways to evaluate biophysical characteristics and the roles they play in the landscape. The land suitability analysis described in this report is one approach to evaluate biophysical components and the impact they could have on development, and vice versa, and needs to be considered in the context of climate change. Results of the landscape suitability analysis are intended to be considered alongside other study components (e.g., watershed nutrient load modelling, stormwater modelling, transportation studies and engagement activities) to inform the decision-making process for future community planning work. Additional work may be undertaken to further understand the biophysical components of the Study Area.

Land suitability analysis is an evaluation of the current landscape and environmental features within that landscape to be able to suggest areas that may be relatively more or less conducive to development considering a wide range of factors. It is acknowledged that climate change may affect some of these factors regarding land suitability in the future. For example, changes in precipitation rates and distribution related to future climate change could, over time, result in changes to surface water hydrology and wetlands and the habitats they support. It could also result in changes to the distribution of rare or uncommon species due to changes to natural habitats and migration patterns. Predicting these changes and related timeframes in highly localized candidate development areas would be a highly challenging and somewhat speculative exercise and is beyond the scope of this current analysis.

3.1 Overall Study Approach

The land suitability analysis for the MLSA included both desktop and field components. Information was also gathered through stakeholder engagement efforts. The desktop component involved a review of existing data for the MLSA, including information gathered through previous studies provided by HRM. Desktop sources included:

- Atlantic Canada Conservation Data Centre (AC CDC) data for a 5 km radius around the MLSA
- Nova Scotia Department of Natural Resources and Renewables (NSDNRR) Forest Inventory data

- NSDNRR Wetland Inventory data (and the Nova Scotia Environment and Climate Change [NSECC] Wetlands of Special Significance [WSS] layer)
- Wet Areas Mapping (WAM) data (Forest Watershed Research Centre 2012)
- Boreal felt lichen habitat model (Cameron and Neily 2008)
- Aerial imagery and LiDAR data
- The Halifax Green Network Plan (HGNP)

In addition to the desktop review, Stantec completed a variety of field surveys (spring-fall 2023) to collect further information on environmental components and evaluate the potential for areas of cultural significance.

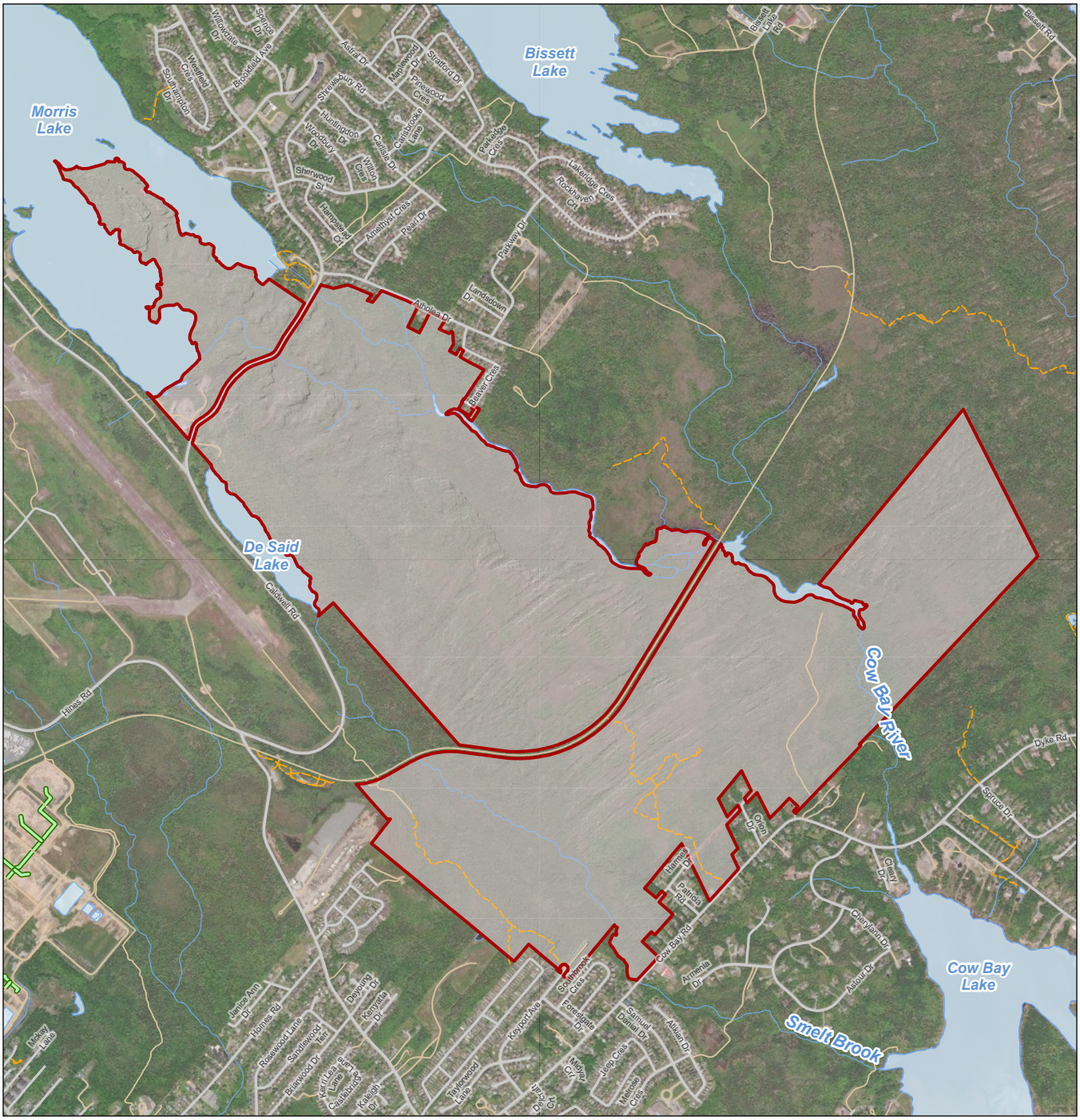
The land suitability analysis addresses the following components:

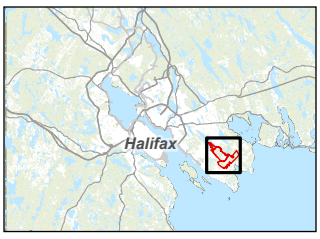
- Wetland Habitat
- Watercourses and Water Quality
- Forest Habitat and Species at Risk
- Landscape Connectivity
- Surficial and Bedrock Geology
- Topography
- Contaminated Sites
- Areas of Cultural Significance

Sections 3.2 through 3.8 describe desktop and field results followed by details about how each environmental component was evaluated from a land suitability perspective. Suitability for development was generally ranked as follows:

- a score of 1 indicates low suitability for development
- a score of 2 indicates moderate suitability for development
- a score of 3 indicates high suitability for development

Lower scores generally correspond to areas with higher ecological function, making them generally more suitable for conservation purposes and potentially less suitable for development. Conversely, higher scores indicate lands that are potentially less desirable for conservation efforts and potentially more suitable for development. It is important to note that many factors, in addition to those addressed in this section, contribute to suitability for development and/or conservation, including views expressed by members of the public, other stakeholders and Indigenous groups. Therefore, the information presented here should not be viewed in isolation.





Study Area

Utilities
- Pipeline

Transportation
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Stantec

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Reviewed by MB on 2024-03-18
Revised by SC on 2024-05-14

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_006

Figure No.
3.1

Title
Morris Lake Expansion Study Area (MLSA)

\\Ca0213-ppfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM FCM 2022.aprx: HRM_FCM_006 HRM Base Map AerialRevised : 2024-05-14 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.2 Wetland Habitat

The objective of the wetland evaluation was to determine where wetland habitat exists within the MLSA and determine if any Wetlands of Special Significance (WSS) are present. Having a general understanding of where the wetland boundaries are within the MLSA will support development planning and guide future wetland evaluations required to support permitting.

Wetland conservation in Nova Scotia is guided by the Nova Scotia Wetland Conservation Policy and supported by regulation under the provincial *Environment Act* and Activities Designation Regulations. The goals of the policy are to have no loss of WSS and to prevent net loss in area and function for other wetlands (Government of Nova Scotia 2011).

Current NSECC guidance indicates that wetland evaluation (i.e., delineation and functional assessment) should be completed in the same year (within 12 months) of permitting application submissions. Considering this guidance and the current stage of planning, wetland evaluation to support permitting applications was not proposed as part of the current scope of work. To inform planning, Stantec instead completed a desktop review and identified potential wetland areas. Subsequent field surveys helped to refine these boundaries.

3.2.1 DESKTOP AND FIELD SUMMARY

The wetland areas presented on Figure 3.2 were developed based on a combination of desktop and field information. Prior to field surveys, preliminary wetland areas were interpreted using LiDAR and aerial imagery. During field surveys, boundaries of these preliminary wetland areas were verified as they were encountered or adjusted as necessary. Any additional wetlands encountered during field surveys (i.e., that had not been identified through desktop review) were noted. Wetlands in the MLSA were categorized by class and type following the Canadian Wetland Classification System (CWCS). Wetland function was evaluated using the Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC) method, which consists of both field and office forms (NBDELG 2018). Twenty-six wetlands were identified within the MLSA, and thirteen were evaluated using WESP-AC (Table 3.1).

Multiple extreme weather events throughout the 2023 field season (i.e., wildfires and floods) resulted in some unsafe and/or inaccessible areas within the MLSA, and access to all properties within the MLSA had not been attained prior to field surveys. Therefore, due to these operational constraints, not all wetlands were evaluated using WESP-AC in 2023, although attempts were made to evaluate as many as possible. Wetlands not evaluated using WESP-AC are among the smallest wetlands on site (except for WL16). As per NSECC guidance, further wetland evaluation (i.e., delineation and functional assessment) will be required (prior to construction) to support permitting applications.

Table 3.1 Summary of Wetland Evaluation Results

Wetland ID	Wetland Class and Type	Approximate Wetland Area (ha)	Evaluated using WESP-AC	WSS[1]
WL1	Fen, Mixedwood Treed Swamp	0.20	Yes	No
WL2	Fen	0.96	Yes	No
WL3	Coniferous Treed Swamp, Mixedwood Treed Swamp	2.10	Yes	No
WL4	Coniferous Treed Swamp	0.04	Yes	No
WL5	Coniferous Treed Swamp	0.18	Yes	No
WL6	Fen	0.29	Yes	No
WL7	Slope Fen	0.21	Yes	No
WL8	Mixedwood Treed Swamp, Tall Shrub Swamp	0.33	Yes	No
WL9	Low Shrub Swamp	0.04	Yes	No
WL10	Low Shrub Swamp	0.03	Yes	No
WL11	Coniferous Treed Swamp, Low Shrub Swamp	0.74	Yes	No
WL12	Coniferous Treed Swamp, Tall Shrub Swamp, Plateau Bog	27.56	Yes	No
WL13	Coniferous Treed Swamp, Tall Shrub Swamp, Bog, Mixedwood Treed Swamp	101.57	Yes	No
WL14	Coniferous Treed Swamp, Low Shrub Swamp	0.06	No	NA
WL15	Mixedwood Treed Swamp	0.14	No	NA
WL16	Coniferous Treed Swamp, Low Shrub Swamp	10.59	No	NA
WL19	Mixedwood Treed Swamp	0.10	No	NA
WL20	Mixedwood Treed Swamp	0.06	No	NA
WL21	Mixedwood Treed Swamp, Coniferous Treed Swamp, Fen	1.49	No	NA
WL22	Mixedwood Treed Swamp, Fen	1.96	No	NA
WL23	Low Shrub Swamp, Mixedwood Treed Swamp	0.62	No	NA
WL24	Low Shrub Swamp, Mixedwood Treed Swamp, Fen	3.43	No	NA
WL25	Coniferous Treed Swamp	0.38	No	NA
WL26	Coniferous Treed Swamp	0.29	No	NA
WL27	Coniferous Treed Swamp	0.30	No	NA
WL28	Swamp[2]	0.54	No	Yes

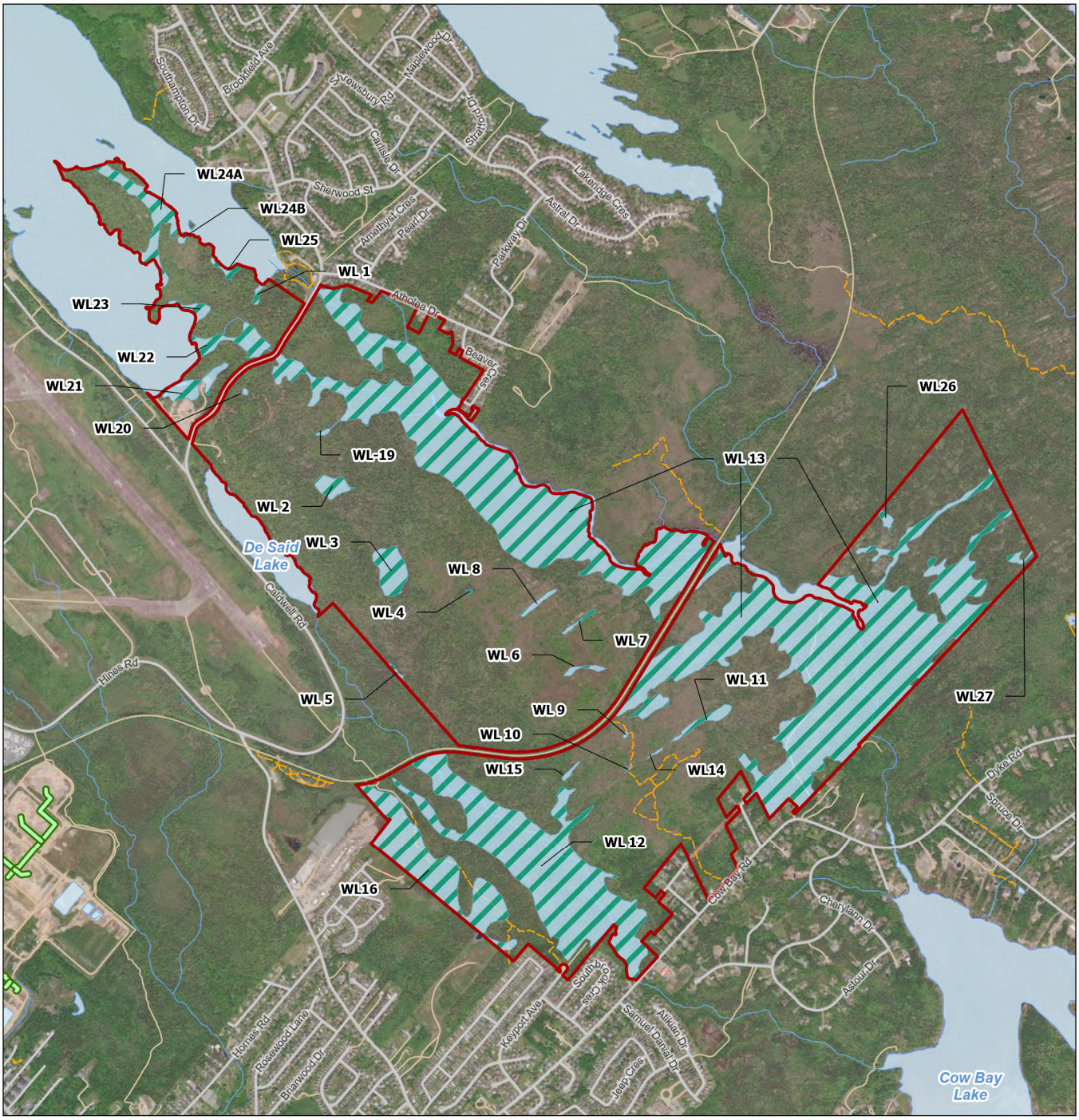
Notes

1 – As indicated in the Nova Scotia Wetland Conservation Policy, a wetland can be considered a WSS based on a variety of factors. The information in this column for wetlands 1-28 is based on the results of the WESP-AC functional WSS interpretation tool. Further surveys, observations, and/or evaluation could result in any of these wetlands being considered a WSS. Note that WL28 is considered a WSS based on the provincial WSS layer.

2 – According to the NS Provincial Landscape viewer

WL – Wetland

NA – Not Assessed





Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Service Nova Scotia, Stantec
3. Background: ESRI 2023

Study Area
Wetlands (Stantec, 2023)

Transportation
Road
Resource / Seasonal Road
Trail
Utilities
Pipeline
Other Features
Waterway
Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location	Prepared by lpodrug on 2024-02-29
Halifax Regional Municipality, Nova Scotia	Revised by SChubbs on 2024-04-03 Revised by NWhite on 2024-05-24
Client/Project	Fig ID: 160410459_011a
Halifax Regional Municipality Future Serviced Communities Background Studies	
Figure No.	
3.2	
Title	
Wetlands in the MLSA	

\\ca0213-pp\fs01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\Water.aprx: HRM_011a_3.2_Wetland_BoundariesRevised: 2024-05-24 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.2.2 LAND SUITABILITY ANALYSIS – WETLANDS

The WESP-AC functional assessment method is currently the accepted standardized approach for assessing wetland function in Atlantic Canada. WESP-AC generates scores and ratings for a variety of wetland functions (e.g., water storage, carbon sequestration, habitat characteristics – refer to Table 3.5). The scores and ratings that result from the functional assessment can be used to inform decisions about development near wetlands (NBDELG 2018). In Nova Scotia, WESP-AC includes a functional WSS interpretation tool, to help determine if the wetland should be considered a WSS.

The land suitability analysis for wetlands considered the level of ecosystem function each wetland provides based on the WESP-AC functional assessment results. Wetlands were scored using the WESP-AC results for ecological condition, wetland risk, the composite function score, and the WSS interpretation tool (Table 3.2). Taken together, this evaluation system provides a relative ranking of wetland values in terms of conservation and development potential. Higher conservation values generally resulted in a lower ranking for development suitability with lower conservation values generally resulting in higher suitability for development based on this ranking matrix.

As discussed in Section 3.1.2, not all wetlands in the Study Area could be evaluated using WESP-AC. Wetlands that were not evaluated using WESP-AC were not included in the land suitability analysis.

Table 3.2 Wetlands – Land Suitability Ranking Framework

Inputs	Land Suitability Ranking		
	1 - Low suitability for development	**2 - Moderate suitability for development**	**3 - Higher suitability for development**
WESP-AC Ecological Condition	Higher	Moderate	Lower
WESP-AC Risk	Higher	Moderate	Lower
Land Suitability Function Score[1]	51-40	39-29	28-17*
WESP-AC Functional WSS Interpretation Tool	None of the 13 wetlands evaluated using WESP-AC were determined to be a WSS using the WESP-AC Functional WSS Interpretation Tool		

Note:
1 – Derived from the WESP-AC function (composite score)
*17 is the lowest possible score if all functions are assigned a 1

3.2.2.1 Ecological Condition

Wetland ecological condition is determined by the WESP-AC Non-Tidal form for Nova Scotia. It is defined in the WESP-AC Manual as the integrity or health of the wetland determined primarily by its vegetation composition (because that is the only meaningful indicator that can be estimated rapidly). The tool states that non-tidal wetlands in excellent ecological condition often have no invasive plants and at least one species of conservation concern. Equally, they have little bare ground, no strongly dominant herbaceous or shrub species, and may have varied microtopography and no extensive algal blooms. However, many wetlands perceived to be in excellent condition do not have any of these characteristics (NBDELG 2018). Thus, wetlands with higher ecological conditions are prioritized for avoidance for development as they are more likely to support higher biodiversity compared to lower scoring wetlands.

For each of the 13 wetlands assessed using WESP-AC, a value is calculated for ecological condition which is ranked as Lower, Moderate or Higher through a comparison with calibrated wetlands for the region (Table 3.3). This output value is ranked based on the output status and assigned values of 3, 2 or 1. Wetlands with higher ecological function are assigned a lower value for development suitability, compared to wetlands with lower ecological function, which are assigned a higher suitability for development. Wetlands that could not be evaluated using WESP-AC were not provided a score for ecological condition for this land suitability analysis. The majority of the wetlands scored Higher for Ecological Condition, with few scoring Moderate and Lower.

Table 3.3 Ecological Condition Scores

Wetland ID	Ecological Condition Score	Ecological Condition Ranking	Land Suitability Ranking[1]
WL1	7.10	Higher	1
WL2	4.78	Moderate	2
WL3	4.78	Moderate	2
WL4	3.04	Lower	3
WL5	3.04	Lower	3
WL6	4.78	Moderate	2
WL7	8.26	Higher	1
WL8	7.39	Higher	1
WL9	7.39	Higher	1
WL10	7.39	Higher	1
WL11	8.26	Higher	1
WL12	7.10	Higher	1
WL13	8.26	Higher	1

Notes:

1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development

3.2.2.2 Wetland Risk

Wetland risk is determined by the WESP-AC Non-Tidal form for Nova Scotia. Wetland risk is defined in the WESP-AC Manual as the average of the wetland sensitivity score and the wetland stressors score. The WESP-AC Manual defines wetland sensitivity as the lack of intrinsic resistance and resilience of the wetland to human and natural stressors (Niemi et al. 1990), including but not limited to changes in water chemistry, shade, frequency and duration of inundation or soil saturation, water depth, biological invasion, habitat fragmentation, and others as described in the USEPA report by Adamus et al. (2001) (NBDELG 2018). Wetland stress is defined as the degree to which the wetland is or has recently been altered by, or exposed to risk from, human-related factors that degrade its ecological condition and/or reduce its capacity to perform one or more of the functions listed in the form (NBDELG 2018).Thus, wetlands with higher risk are relatively more vulnerable to disturbance associated with development and as such should be avoided as areas for development compared to wetlands with more risk tolerance.

For each of the 13 wetlands assessed using WESP-AC, a value was calculated for wetland sensitivity and wetland stressors which were ranked Lower, Moderate or Higher compared to the calibrated wetlands for the region. This output value was ranked based on the output status and assigned values of 3, 2 or 1 (Table 3.4). Wetlands with higher risk (i.e., greater sensitivity) were assigned a lower value (1) for potential development, compared to wetlands with lower risk function. Wetlands that could not be evaluated using WESP-AC were not provided a score for wetland risk for this land suitability analysis. Six of the assessed wetlands scored Higher for wetland risk and were assigned a land suitability ranking of 1 for wetland risk (Table 3.4).

Table 3.4 Wetland Risk Scores

Wetland ID	Wetland Risk Score[1]	Wetland Risk Ranking	Land Suitability Ranking
WL1	5.46	Moderate	2
WL2	8.24	Higher	1
WL3	8.82	Higher	1
WL4	7.87	Higher	1
WL5	5.89	Moderate	2
WL6	6.25	Moderate	2
WL7	7.21	Higher	1
WL8	6.52	Moderate	2
WL9	5.33	Moderate	2
WL10	6.12	Moderate	2
WL11	7.37	Higher	1
WL12	7.55	Higher	1
WL13	6.40	Moderate	2

Notes: 1 - This number is an average of the WESP-AC scores for wetland sensitivity and stressors

1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development

3.2.2.3 Function (Composite Score) Descriptions

The wetland function (composite score) was calculated using the WESP-AC wetland function scores determined by the WESP-AC Non-Tidal protocol developed for Nova Scotia (Adamus 2018). Functions that are considered in the WESP-AC evaluation are presented in Table 3.5.

While the land suitability analysis for wetlands considers the composite function score, scores for individual functions for each wetland could be separately considered if those individual functions are particularly important when considering future development scenarios. For example, the function scores for water storage may be particularly important for certain development scenarios. The scores for each of the assessed wetlands can be viewed in Table 3.7 and the thresholds for function scores are presented in Table 3.6. Using wetland WL12 as an example, Table 3.7 indicates that this wetland scored a 0.96 for water storage, which (according to Table 3.6) is considered low. WL3, on the other hand, scored a 9.54 for water storage, which is considered high.

Table 3.5 Wetland Functions

Function		Description
WS	Water Storage	The effectiveness of a wetland for storing or delaying the downslope movement of surface water for long or short periods. This potentially influences the height, timing, duration, and frequency of inundation in downstream and downslope areas. Many of the region's wetlands can perform this function.
SFS	Stream Flow Support	The effectiveness of a wetland for prolonging surface water in headwater streams during seasonally dry periods. This is important for fish passage and overall ecological support
WC	Water Cooling	The effectiveness of a wetland for maintaining or reducing the water temperature, primarily in headwater streams. Many of the region's wetlands are capable of performing this function.
SR	Sediment Retention	The effectiveness of a wetland for intercepting and filtering suspended inorganic sediments, allowing their deposition, reducing current velocity, resisting erosion, and stabilizing underlying sediments or soil. Many of the region's wetlands are capable of performing this function.
PR	Phosphorus Retention	The effectiveness for retaining phosphorus for long periods as a result of chemical adsorption complexation, or from translocation by plants to belowground zones or decay-resistant peat such that there is less potential for physically or chemically remobilizing phosphorus into the water.
NR	Nitrate Removal	The effectiveness for retaining particulate nitrate and converting soluble nitrate and ammonia to nitrogen gas, primarily through the microbial process of denitrification, while generating little or no nitrous oxide (a potent “greenhouse gas”).
CS	Carbon Sequestration	The effectiveness of a wetland both for retaining incoming particulate and dissolved carbon, and through the photosynthetic process, converting carbon dioxide gas to organic matter (particulate or dissolved). And to then retain that organic matter on a net annual basis for long periods while emitting little or no methane (a potent “greenhouse gas”).
OE	Organic Nutrient Export	The effectiveness of a wetland for producing, rapidly cycling, and subsequently exporting organic matter, either particulate (detritus) or dissolved, and including net export of nutrients (C, N, P, Si, Fe) comprising that matter. It does not include exports of carbon in gaseous form (methane and carbon dioxide) or as animal matter (e.g., emerging aquatic insects, fish).

Table 3.5 Wetland Functions

Function		Description
FA	Anadromous Fish Habitat	The capacity to support an abundance of native anadromous fish for functions other than spawning.
FR	Resident Fish Habitat	The capacity to support an abundance and diversity of native non-anadromous fish. The model described below will not predict habitat suitability accurately for every species, nor is it intended to assess the ability to restore fish access to a currently inaccessible wetland.
INV	Aquatic Invertebrate Habitat	The capacity to support an abundance and diversity of invertebrate animals which spend all or part of their life cycle underwater, on the water surface, or in moist soil. Includes dragonflies, aquatic flies, clams, snails, crustaceans, aquatic beetles, aquatic worms, aquatic bugs, and others, including semi-aquatic species.
AM	Amphibian & Reptile Habitat	The capacity of a wetland to support an abundance and diversity of native amphibians (frogs, toads, salamanders) as well as turtles.
WBF	Waterbird Feeding Habitat	The capacity to support an abundance and diversity of feeding waterbirds, primarily the migratory species present outside of the usual nesting season.
WBN	Waterbird Nesting Habitat	The capacity to support an abundance and diversity of nesting waterbirds.
SBM	Songbird, Raptor & Mammal Habitat	The capacity to support, at multiple spatial scales, an abundance and diversity of songbirds, raptors, and mammals, especially species that are most dependent on wetlands or water.
POL	Pollinator Habitat	The capacity to support pollinating insects, such as bees, wasps, butterflies, moths, flies, and beetles, and also pollinating birds (hummingbirds and perhaps others).
PH	Native Plant Habitat	The capacity to support, at multiple spatial scales, a diversity of native vascular and non-vascular (e.g., bryophytes, lichens) species and functional groups, especially those that are most dependent on wetlands or water.
Reference: NBDELG 2018		

The score of each of the functions presented in Table 3.5 was evaluated using the WESP-AC thresholds, which are described in Table 3.6. The scores were then converted to values of 1, 2 or 3. These values correspond to the output of the WESP-AC model of lower, moderate, and higher, respectively. The sum of these values was calculated for each wetland evaluated by WESP-AC and assigned an overall land suitability function score (Table 3.7). The land suitability function scores were then converted to a land suitability ranking, with higher functioning wetlands scoring lower in preference for development due to the higher contribution of ecosystem functions provided by these wetlands (Table 3.7). All the assessed wetlands scored moderate for development (39-29), except for WL13 which scored a total of 42 which falls in the lower suitability for development category (51-10) (Table 3.7).

Table 3.6 Thresholds for Function Scores

Function	Lower if ≤	Higher if ≥
Water Storage (WS)	3.80	7.63
Stream Flow Support (SFS)	1.51	4.62
Water Cooling (WC)	2.04	5.29
Sediment Retention & Stabilization (SR)	3.54	6.44
Phosphorus Retention (PR)	3.00	6.67
Nitrate Removal (NR)	2.76	4.62
Carbon Sequestration (CS)	3.22	6.36
Organic Nutrient Export (OE)	0	7.46
Anadromous Fish Habitat (FA)	0.96	2.87
Resident Fish Habitat (FR)	1.30	5.14
Aquatic Invertebrate Habitat (INV)	3.42	5.43
Amphibian & Reptile Habitat (AM)	3.56	6.67
Waterbird Feeding Habitat (WBF)	0	6.43
Waterbird Nesting Habitat (WBN)	2.36	6.55
Songbird, Raptor, & Mammal Habitat (SBM)	0	7.52
Native Plant Habitat (PH)	0	7.95
Pollinator Habitat (POL)	3.57	6.23

Notes:
Moderate ranking assigned if value falls between the lower and higher threshold value
Threshold values of 0 occur when calibrated wetlands frequently score 0 for a given function
From WESP-AC Non-Tidal Form 2021: Nova Scotia Normalization Reference Values

Table 3.7 Wetland Function Scores

Wetland ID	WESP-AC Normalised Function Scores[1]																	Land Suitability Function Score[2]	Land Suitability Ranking[3]
	WS	SFS	WC	SR	PR	NR	CS	OE	FA	FR	INV	AM	WBF	WBN	SBM	POL	PH		
WL1	6.56	0.00	8.15	10.0	10.0	10.0	4.88	6.91	0.00	0.00	5.73	2.04	7.35	6.74	8.35	8.12	3.67	39	2
WL2	6.89	0.00	6.65	10.0	10.0	10.0	5.04	8.23	0.00	0.00	6.18	4.60	5.05	6.46	8.68	8.18	3.17	38	2
WL3	9.54	0.00	0.00	7.86	2.40	10.0	8.57	8.32	0.00	0.00	5.61	2.73	0.00	0.00	5.79	7.54	3.25	31	2
WL4	6.05	0.00	6.75	10.0	10.0	10.0	5.39	8.29	0.00	0.00	5.96	3.60	4.61	6.58	6.89	6.92	0.97	37	2
WL5	1.89	5.59	8.15	4.35	3.88	3.02	5.49	10.0	0.00	0.00	5.88	4.86	4.76	6.31	8.45	6.38	3.34	35	2
WL6	6.12	0.00	5.90	10.0	10.0	10.0	4.27	7.91	0.00	0.00	3.91	4.07	4.66	5.68	8.08	7.25	1.88	36	2
WL7	1.39	2.79	7.38	1.68	4.37	1.68	3.59	10.0	0.00	0.00	5.31	3.58	4.58	5.44	6.77	7.72	2.46	30	2
WL8	8.98	0.00	0.00	6.44	4.33	10.0	6.80	8.32	0.00	0.00	7.45	2.52	0.00	0.00	5.67	7.39	3.11	31	2
WL9	6.55	0.00	6.75	10.0	10.0	10.0	0.00	8.12	0.00	0.00	4.47	3.55	3.89	4.13	7.06	8.92	3.28	34	2
WL10	5.78	0.00	6.75	10.0	10.0	10.0	0.47	8.02	0.00	0.00	4.55	2.96	3.99	3.75	6.95	8.11	2.96	34	2
WL11	8.39	0.00	0.00	5.73	1.95	10.0	6.45	9.59	0.00	0.00	7.27	2.17	0.00	0.00	5.28	8.77	3.17	31	2
WL12	0.96	6.69	7.40	3.07	1.05	2.51	2.34	9.65	4.68	5.02	5.72	4.10	4.77	5.72	8.75	9.38	5.24	36	2
WL13	1.79	6.00	5.60	4.53	0.00	3.90	4.00	9.54	6.94	7.82	8.78	6.21	6.96	7.78	7.78	8.23	6.08	42	1

Notes:

1 – The normalised function scores (found in the scores tab of each WESP-AC form) are summarized here for the 19 wetlands evaluated using WESP-AC. The values were categorized as higher, moderate, lower according to the thresholds presented in Table 3.6.

2 – The land suitability function score is the sum of the function scores after they have been converted to higher (1), moderate (2), or lower (3).

3 – The land suitability ranking is based on the land suitability function score.

1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development

3.2.2.4 Summary and Recommendations

Twenty-six wetlands were identified in the MLSA using the approach described in Section 3.2.1. Due to the operational constraints (discussed in Section 3.2.1), thirteen of the twenty-six wetlands in the Study Area were evaluated using WESP-AC and are included in the land suitability analysis. The land suitability analysis for wetlands considered the level of ecosystem function each wetland provides based on the WESP-AC functional assessment results. Wetlands were scored using the WESP-AC results for ecological condition (Table 3.3), wetland risk (Table 3.4), the composite function score (Table 3.7), and the WSS interpretation tool. These results are summarized in Table 3.8 and presented on Figure 3.3.

Table 3.8 Wetlands – Land Suitability Rankings

Wetland ID	Land Suitability Ranking			Average LSA Score[1]
	Ecological Condition	Wetland Risk	Function	
WL1	1	2	2	1.6
WL2	2	1	2	1.6
WL3	2	1	2	1.6
WL4	3	1	2	2
WL5	3	2	2	2.3
WL6	2	2	2	2
WL7	1	1	2	1.3
WL8	1	2	2	1.6
WL9	1	2	2	1.6
WL10	1	2	2	1.6
WL11	1	1	2	1.3
WL12	1	1	2	1.3
WL13	1	2	1	1.3

Notes:
1 – Average Land Suitability Analysis (LSA) Score is rounded to the nearest decimal

1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development

Wetlands that were not evaluated using WESP-AC are shown in grey on Figure 3.3. Note that while the WESP-AC functional WSS interpretation tool was included as a component of the analysis, none of the thirteen wetlands evaluated using WESP-AC were determined to be WSS using that method. Wetlands not evaluated using WESP-AC (WL14 to WL27) will require further wetland evaluation if these wetlands are to be considered in the land suitability analysis.

Wetlands represent an important constraint for any development in Nova Scotia. Conservation of wetlands in the province is guided by the Nova Scotia Wetland Conservation Policy and supported by regulation under the provincial *Environment Act* and Activities Designation Regulations. The goals of the policy are to have no loss of WSS and to prevent net loss in area and function for other wetlands (Government of Nova Scotia 2011). The policy states that the following are considered WSS:

- all salt marshes
- wetlands that are within or partially within a designated Ramsar site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Area or lands owned or legally protected by non-government charitable conservation land trusts.
- intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the Nova Scotia Eastern Habitat Joint Venture
- wetlands known to support at-risk species as designated under the federal SARA or the NS ESA
- wetlands in designated protected water areas as described within Section 106 of the *Environment Act*

Support/approval for alteration of a WSS will only be considered when the alteration is required to maintain, restore, or enhance a WSS, or if the alteration is deemed to provide necessary public function (Government of Nova Scotia 2011). While none of the wetlands in the MLSA evaluated using WESP-AC (i.e., 13 out of 26) were determined to be WSS, there are multiple factors that can result in a wetland being considered a WSS and further work and/or consultation with regulators may result in any of the wetlands within the MLSA being considered a WSS.

The provincial WSS layer is a screening tool to identify potential WSS in the province. According to the predictive later, the wetland along the edge of De Said Lake (WL28) has potential to be a WSS, due to a historical record of eastern whip-poor-will in 2008 (AC CDC 2023). Further work may be required to evaluate whether this wetland should be considered a WSS. In addition to the historical eastern whip-poor-will record, it is likely that snapping and//or eastern painted turtles could be found in De Said Lake.

As indicated in the Policy, wetland conservation is achieved by considering the mitigative sequence (avoidance, minimization, compensation). This sequence should be considered during the planning and design stage of any development.

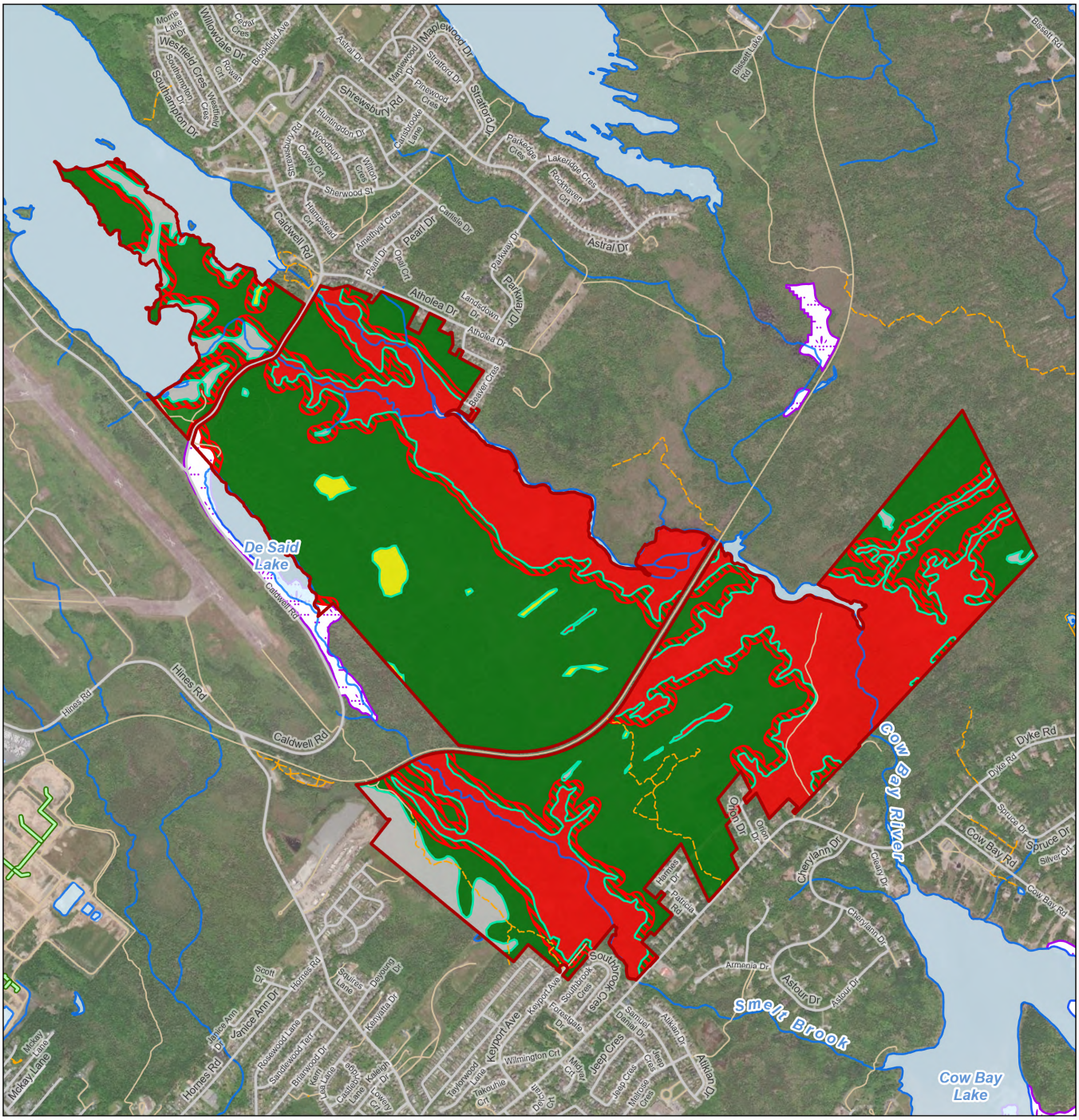
The first step in the sequence (and the priority) is avoidance. This option involves avoiding alteration to wetlands, forcing the consideration of alterative options for the project that may result in fewer impacts to wetlands. If no other alternative option exists, minimization is recommended, meaning that any unavoidable impacts to the wetland be managed in such a way that adverse impacts are reduced. This can be accomplished through specific techniques, materials, and/or site choice. Compensation is required for any permanent loss of wetland area or function. Compensation can be in the form of restoration, enhancement, creation and/or expansion of a wetland ecosystem. The amount of compensation necessary is determined by NSECC and ranges from 1 to 4 ha for every 1 ha of wetland altered, depending on the compensation approach and the relative ecological/social value of the disturbed wetland.

Stantec recommends engaging with NSECC as early as possible to discuss potential wetland impacts (direct or indirect), the permitting process, and compensation requirements (e.g., potential opportunities for wetland restoration, enhancement, or creation).

Once a construction timeline has been established, complete wetland evaluations (i.e., delineation and functional assessment) will likely be required to support permitting applications for wetlands that could be impacted by development. NSECC guidance indicates that wetland evaluation should be conducted during the growing season (June 1 to September 30) and within the same year that the application for alteration approval is submitted.

The land suitability analysis for wetlands is based on the WESP-AC results for ecological condition, wetland risk, the composite function score, and the WSS interpretation tool (Table 3.2). As discussed in Section 3.2.2.3, specific wetland functions may need to be considered in more detail depending on proposed development scenarios and results from other studies. When applying the mitigative sequence for decision making (i.e., avoidance, minimization, compensation, discussed above), avoidance should be a priority where larger areas of contiguous wetland habitat have been identified (e.g., WL13). Areas such as this are also considered in landscape connectivity planning (refer to Section 3.5).

The land suitability analysis represents one evaluation technique that can help prioritize areas for development and/or conservation. Within Nova Scotia there are regulatory processes and policies in place relating to wetlands and their conservation including the *Activities Designation Regulations* made under Section 66 of the *Environment Act*, Nova Scotia Wetland Conservation Policy and the Federal Policy on Wetland Conservation. These include aspects such as the prevention of a net loss of wetland area and function and the designation of wetlands of special significance based on wetlands that play particularly important roles in providing ecosystem services or functions (e.g., supporting rare or migratory species, protecting drinking water supplies, maintaining watershed health).





Study Area
Wetlands (Stantec, 2023)
Wetland of Special Significance (NSECC)
Setback on Wetlands Contiguous with Watercourses (30 m)

Land Suitability Score
- 3 (High)
- 2
- 1 (Low)
- No Score

Utilities
- Pipeline

Transportation
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
1:25,000

N

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia (Service Nova Scotia and Internal Services, Environment and Climate Change)
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-20
Revised by NWhite on 2024-07-08

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_006

Figure No.
3.3

Title
Wetlands in the MLSA with Required Setbacks – Land Suitability Analysis

\\ca0213-pdfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM_FCM_2024_Synthesis.aprx: HRM_FCM_030_Wetland_LSARevised: 2024-07-09 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.3 Watercourses and Water Quality

Watercourses are defined in the Nova Scotia *Environment Act* to include "the bed and shore of every river, stream, lake, creek, pond, spring, lagoon, or other natural body of water – whether it contains water or not." Desktop mapping of watercourses within the MLSA took place in spring 2023, with field verification of select watercourses completed concurrent with the water quality sampling between May and November. Stantec considered an aquatic feature a watercourse if:

- a watercourse was shown on a National Topographic Series (NTS) map;
- recent satellite imagery showed evidence of a watercourse channel; or
- field characteristics such as flowing water and clearly defined physical features such as substrate, bed, banks, aquatic vegetation, or aquatic animals were observed.

The objectives of the watercourses and water quality section of the land suitability analysis was to:

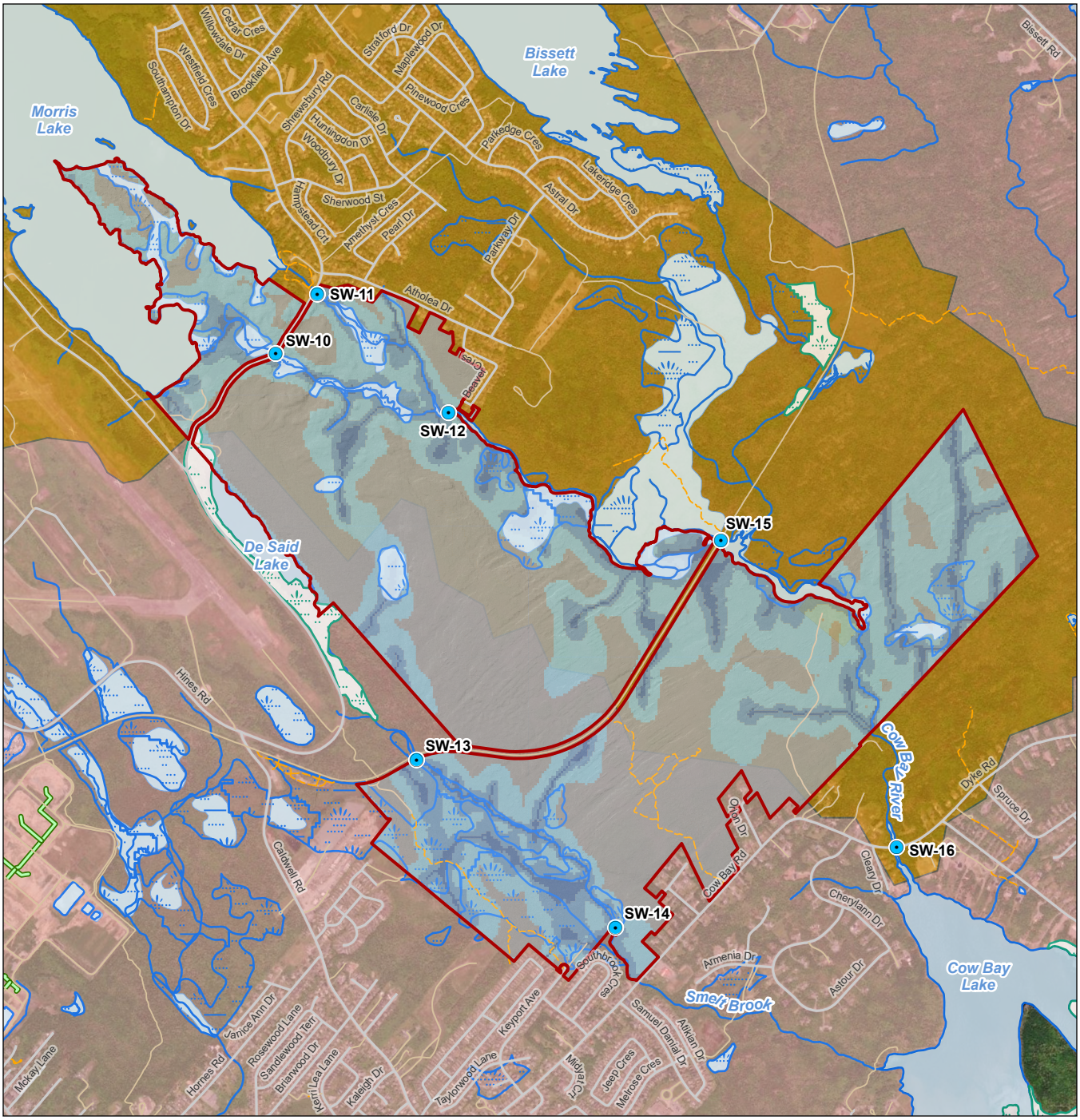
- identify watercourses present within the MLSA using field and desktop methods
- describe the aquatic habitat in the watercourses within the MLSA
- establish baseline water quality using historical and recently collected field data, and
- establish criteria to determine land suitability in relation to watercourses and water quality

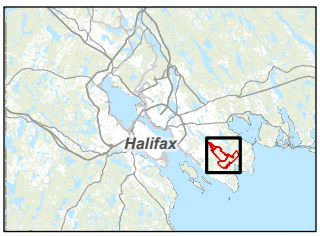
3.3.1 DESKTOP AND FIELD SUMMARY

Stantec completed a desktop inventory of watercourses using LiDAR, aerial imagery, and flow accumulation mapping (also known as wet areas mapping; Figure 3.4). The wet areas mapping indicates depth to water table and can be used to predict what areas may accumulate surface water in watercourses and wetlands. Figure 3.4 also indicates regional watersheds.

The watercourses in this desktop inventory were verified during field surveys conducted concurrently with the 2024 water quality sampling program. At each location where a watercourse was sampled for the water quality sampling program the following information was collected:

- Channel and wetted width
- Water depth
- Substrate composition
- Bank description
- Functional in-water and riparian vegetation cover





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Water Sampling Locations

Water Table Depth (metres)

- 0 - 0.10 m
- 0.11 - 0.50 m
- 0.51 - 2 m
- > 2m

Watershed Context Lands

- Cow Bay River
- Shore Direct

Other Features

- Waterway
- Waterbody
- Designated Wetland of Special Significance
- Wetland (NSECC)

Utilities

- Pipeline

Transportation

- Road
- Resource / Seasonal Road
- Trail
- Study Area

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IProdrug on 2024-03-06
Revised by SChubbs on 2024-05-14
Reviewed by MB on 2024-03-18

Client/Project
Fig ID: 160410459_009

Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure No.
3.4

Title
Watershed and Wet Area Mapping in the MLSA

\\Ca0213-ppfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM FCM 2022.aprx: HRM_FCM_009 Fig 3.4 Water Quality LocationsRevised: 2024-05-14 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

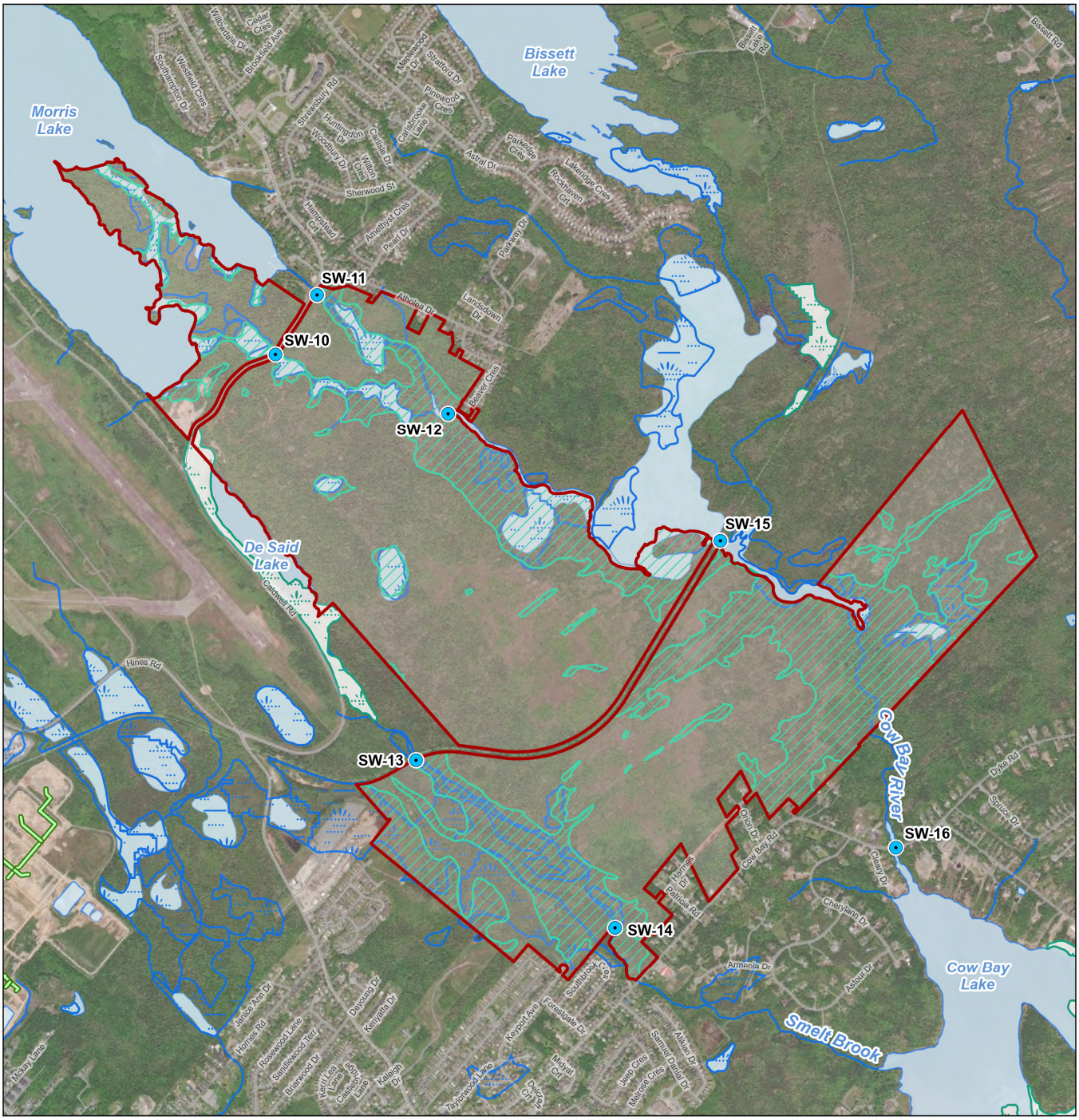
3.3.1.1 Watercourses

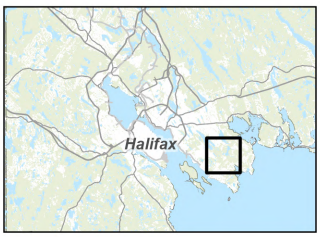
The MLSA is located within the Shore direct and Cow Bay River watersheds. Preliminary mapping identified two mapped watercourses and one mapped waterbody. Both of the mapped watercourses were confirmed during the water quality monitoring program and each contained at least one surface water monitoring station.

Morris Lake is located along the north border of the MLSA. Morris Lake has a surface area of 140 ha and drains into Cow Bay River which flows along the eastern border of the MLSA before flowing into Cow Bay. De Said Lake is located along the northwestern border of the MSA and has a surface area of 6 ha. De Said Lake drains into Smelt Brook which flows along the western side of the MLSA before flowing into Cow Bay.

Water quality station SW-10, SW-11, SW-12, SW-15, and SW-16 are located on Cow Bay River. SW-10 and SW-11 are located at the two separate outlets of Morris Lake which meet at SW-12. SW-15 is located at the confluence of Cow Bay River and the outflow of Bissett Lake which is located outside of the MLSA. SW-16 is located outside of the MLSA at the point where the river flows into Cow Bay.

Water quality station SW-13 and SW-14 are located on Smelt Brook. SW-13 samples the brook as it enters the MLSA and SW-14 samples the brook as it flows out of the MLSA towards Cow Bay.





Water Sampling Location

Study Area

Utilities

Pipeline

Transportation

Road

Other Features

Waterway

Waterbody

Wetland (NSECC)

Wetland of Special Significance (NSECC)

Wetlands (Stantec, 2023)

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Revised by NWhite on 2024-07-08

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_008

Figure No.
3.5

Title
Watercourse Mapping and Surface Water Sampling Locations in the MLSA

\\ca0213-pdfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM FCM 2022.aprx: HRM_FCM_008 Fig 3.5 Lake Watercourse InventoryRevised: 2024-07-08 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.3.1.2 Fish and Fish Habitat

Morris Lake is a popular fishing spot for recreational fishers. The lake has previously been host to fishing tournaments. Fish species that are known to be in Morris Lake include white sucker (*Catostomus commersoni*), white perch (*Morone americana*), banded killifish (*Fundulus diaphanous*), American eel (*Anquilla rostrata*), brook trout (*Salvelinus fontinalis*), smallmouth bass (*Micropterus dolomieu*) and chain pickerel (*Esox niger*; DFO1986; DFA 2023). Note that American eel is considered Threatened by COSEWIC and while not currently listed on Schedule 1 of the SARA, is under consideration for addition. This species is not included in the NS ESA.

While fish community surveys were not conducted as part of this analysis, potential fish presence was based on watercourse characteristics, including water levels, channel geometry, water quality and connectivity to watercourses downstream with known fish populations.

All the watercourses encountered from desktop and field surveys drained into Cow Bay. Connectivity is sufficient to provide fish passage into the drainage areas above Cow Bay; therefore, these watercourses are expected to contain a fish community which contains American eel, white perch, banded killifish, brook trout, American eel and smallmouth bass.

Physical watercourse characteristics were collected during the water quality sampling program. Table 3.9 outlines the results of the watercourse assessments for the seven watercourses confirmed in the field.

Table 3.9 Physical Watercourse Characteristics – MLSA

Station ID (Watercourse)	Channel Width (m)	Wetted Width (m)	Substrate Composition	Riparian Habitat Description
SW-10 (Cow Bay River)	0.8 to 1.5	0.6 to 1.3	Rubble sized rock with smaller amounts of cobble and organics.	Grassy low-lying banks with alders. At points contiguous with wetlands.
SW-11 (Cow Bay River)	5.5 to 7.5	5.0 to 7.0	Rubble sized rock with smaller amounts of cobble.	Grassy low-lying banks with woody shrubs. At points contiguous with wetlands.
SW-12 (Cow Bay River)	9.0 to 14.3	8.0 to 14.0	Fines and organic material	Grassy low-lying banks with woody shrubs. At points contiguous with wetlands.
SW-13	4.2 to 9.6	4.0 to 9.0	Fines and organic material with occasional rubble	Grassy low-lying banks with woody vegetation. Contiguous with wetlands.
SW-14	1.8 to 3.0	1.6 to 2.3	Fines and organic material with occasional rubble	Grassy low-lying banks with woody shrubs. At points contiguous with wetlands.
SW-15 (Cow Bay River)	9.0 to 14.0	8.0 to 12.0	Rubble sized rock with smaller amounts of boulder and cobble.	Grassy low-lying banks with woody shrubs and predominantly deciduous mixed wood forest. At points contiguous with wetlands.
SW-16 (Cow Bay River)	6.3 to 8.7	6.0 to 8.5	Bedrock with boulders present	Grassy/ baren banks with predominantly deciduous mixed wood forest
Notes: Boulder = >259 mm; Rubble = 100 mm to 250 mm; Cobble = 15 mm to 100 mm; Gravel = 5 mm to 15 mm; Sand = 0.02 to 2 mm; Fines = <0.02 mm				

3.3.1.3 Water Quality

Information on surface water quality for the MLSA was obtained using historical watershed studies, LakeWatchers data from 2022 and 2023 (HRM 2023), as well as field-based data collected monthly since April 2023 by Stantec. The historical water quality for the MLSA is focused on Morris Lake itself; the Stantec water samples from 2023 are the only water quality samples collected within the MLSA.

Water quality sampling began in April 2023 and the final round of sampling was completed in November 2023 at seven locations across the MLSA (Figure 3.5). Water quality samples were submitted under chain of custody protocols to Bureau Veritas Labs in Bedford, NS for laboratory analysis of coliform bacteria, total suspended solids (TSS), Total Phosphorus (TP), turbidity, colour, and chloride. Initial mean water quality results are presented in Table 3-10.

Water quality across the MLSA is quite variable with pH values ranging from a minimum of 4.79 observed at SW-13 to a maximum of 8.18 at SW-11. The average pH value across the MLSA was determined to be 6.84 which is within the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CWQG-FAL) (6.5 to 9.0). Mean Total phosphorus values range from 7 ug/L (SW-15) to 12 ug/L (SW-10, SW-11, SW-13). The median concentration of total phosphorus is 12 ug/L which is indicative of mesotrophic conditions. Historical sources of chloride within the Morris Lake watershed include septic systems, animal waste, and drainage from contact with road-salt chemicals. Chloride concentrations in MLSA are low, with median concentration of 62.7 mg/L and maximum concentration of 68.3 mg/L. The CCME CWQG-FAL limit for chloride is 120 mg/L for long term exposure. Total Suspended Solids (TSS) concentrations are generally low for MLSA with a median value of 1.60 mg/L. The maximum TSS value was observed at SW-14 of 660 mg/L is considered to be an anomaly due to limited flow in the stream at the time of sampling (September 2023). The low chloride and TSS concentrations suggest that the MLSA is not significantly affected by urban runoff or erosion within the watershed. The bacteria concentrations in the MLSA were observed to be consistently present in the streams with mean concentrations of 190 CFU/100mL for E.coli., and 825 CFU/100mL for total coliforms. Concentrations for MLSA are below the Health Canada Guideline for Canadian Recreational Water Quality for *E.coli* of 235 CFU/100 mL (Health Canada 2024).

Table 3.10 Water Quality Results from the MSLA collected during Spring/Summer 2023

	Units	Value	SW-10	SW-11	SW-12	SW-13	SW-14	SW-15	SW-16
Microbiological									
Escherichia coli	CFU/100mL	Mean	80	200	190	397	400	187	83
		Median	90	160	130	240	210	165	70
		Max	110	300	680	1100	1500	430	160
		Min	30	140	10	10	20	10	10
Total Coliforms	CFU/100mL	Mean	706	1062	813	1181	1504	690	825
		Median	600	1150	750	980	920	700	625
		Max	1500	2100	1600	2500	5100	1000	1500
		Min	190	210	520	530	500	300	460
Inorganics									
Dissolved Chloride (Cl-)	mg/L	Mean	65	68	58	29	40	63	66
		Median	63	67	56	22	33	54	64
		Max	90	91	89	56	61	86	94
		Min	40	48	7.5	13	24	47	42
Colour	TCU	Mean	46.6	18.5	71	151	120	49	41
		Median	45.5	15.5	17	120	100	28	35
		Max	100.0	34.0	410	250	250	150	82
		Min	14.0	11.0	13	84	57	17	22
Total Phosphorus	mg/L	Mean	0.012	0.012	0.009	0.012	0.015	0.007	0.010
		Median	0.010	0.008	0.010	0.011	0.015	0.008	0.010
		Max	0.021	0.023	0.012	0.015	0.023	0.010	0.018
		Min	0.006	0.006	0.006	0.009	0.006	0.004	0.005
Total Suspended Solids	mg/L	Mean	4.8	1.8	1.56	2.2	166	1.4	1.33
		Median	3.0	2.0	1.20	2.0	1.5	1.4	1.40
		Max	12	2.4	2.60	3.6	660	1.4	1.6
		Min	1.2	1.0	1.00	1.2	1.0	1.4	1.0
Turbidity	NTU	Mean	2.26	1.68	1.2	2.55	5.31	0.93	0.88
		Median	1.65	1.10	1.05	2.40	1.3	0.88	0.83
		Max	5.9	3.7	2.1	4.0	33	1.5	1.6
		Min	0.67	0.56	0.46	1.60	0.36	0.4	0.2

3.3.2 LAND SUITABILITY ANALYSIS – WATERCOURSES AND WATER QUALITY

The land suitability analysis for watercourses and water quality considered that development within watercourses is generally regulated provincially and federally. Provincially, the Nova Scotia *Environment Act* provides the overall authority to protect watercourses. Any activity that changes a watercourse, a water resource, or the flow of water therein requires an approval or a notification in accordance with the Activities Designation Regulations. Before any work can be done, an activity requires either an approval from NSECC or a notification to the Department for minor works.

Fish habitat is a significant and important component of aquatic habitat found in watercourses. In addition to provincial watercourse alteration requirements, Fisheries and Oceans Canada (DFO) is responsible, under the *Fisheries Act* and the SARA, for ensuring protection of fish and fish habitat. The federal *Fisheries Act* defines fish habitat as “water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas.”

Physical works within the watercourses are regulated by provincial and federal acts. Water quality is regulated under the provincial *Environment Act*, as well as the federal *Fisheries Act* where there are prohibitions against pollution, specifically termed deleterious substances. Within the *Fisheries Act* a deleterious substance “can be any substance that, if added to any water, would degrade or alter the water quality such that it could directly or indirectly harm fish, fish habitat, or the use of fish by humans.” Stormwater discharges are also managed in accordance with the Halifax Stormwater Management Standards for Development Activities (Halifax Regional Municipality 2020). Setbacks from watercourses are provided in the Eastern Passage / Cow Bay Land Use By-Laws (Halifax Regional Municipality 2023).

To protect aquatic ecosystems, the land suitability analysis considered riparian zones in addition to the bed and banks of the watercourse. Riparian zones are areas adjacent to watercourses, which are ecologically and geomorphologically diverse landscapes. Riparian zones provide a buffer that protects the watercourse from the impacts of adjacent development. In urban environments riparian zones also reduce the severity of flooding on adjacent lands.

Considering the ecological value associated with watercourses and their riparian habitats, values were assigned to the lands within the Study Area based on distance to the watercourse and termed ‘ecological zones’ (Table 3.11). Areas located within 30 m of a watercourse were considered to have low suitability for development. Areas between 30 m and 100 m from a watercourse were considered to have moderate suitability for development while areas greater than 100 m from a watercourse were considered to have higher suitability for development.

The objective of establishing these ecological zones was to provide suitable areas for development while retaining watercourse function and potential habitat quality for fish. The ecological zones were established based on watercourse setbacks and a buffer of 30 m established in the Eastern Passage / Cow Bay Land Use By-Laws (Halifax Regional Municipality 2023). Wider buffers are more effective at filtering contaminants, encouraging infiltration and providing diversity of habitat. The buffer width beyond the minimum standard should be evaluated on a case-by-case basis taking into account the growing need for residential units and the limited land available within Halifax.

Considering the effective width of the setback varies with soil type, slope, watercourse size, ecological habitat function and vegetative cover, the Eastern Passage / Cow Bay Land Use By-Laws setbacks are considered the minimum criteria levels and additional buffer width may be implemented during the Planning or Subdivision Approval process.

For the purpose of the land suitability analysis watercourse ecological functions were divided into two aspects:

- aquatic habitat which considers the value watercourses play in providing habitat for fish and other aquatic species
- water quality which has two aspects: the provision of suitable habitat for aquatic species and the intrinsic value for local residents

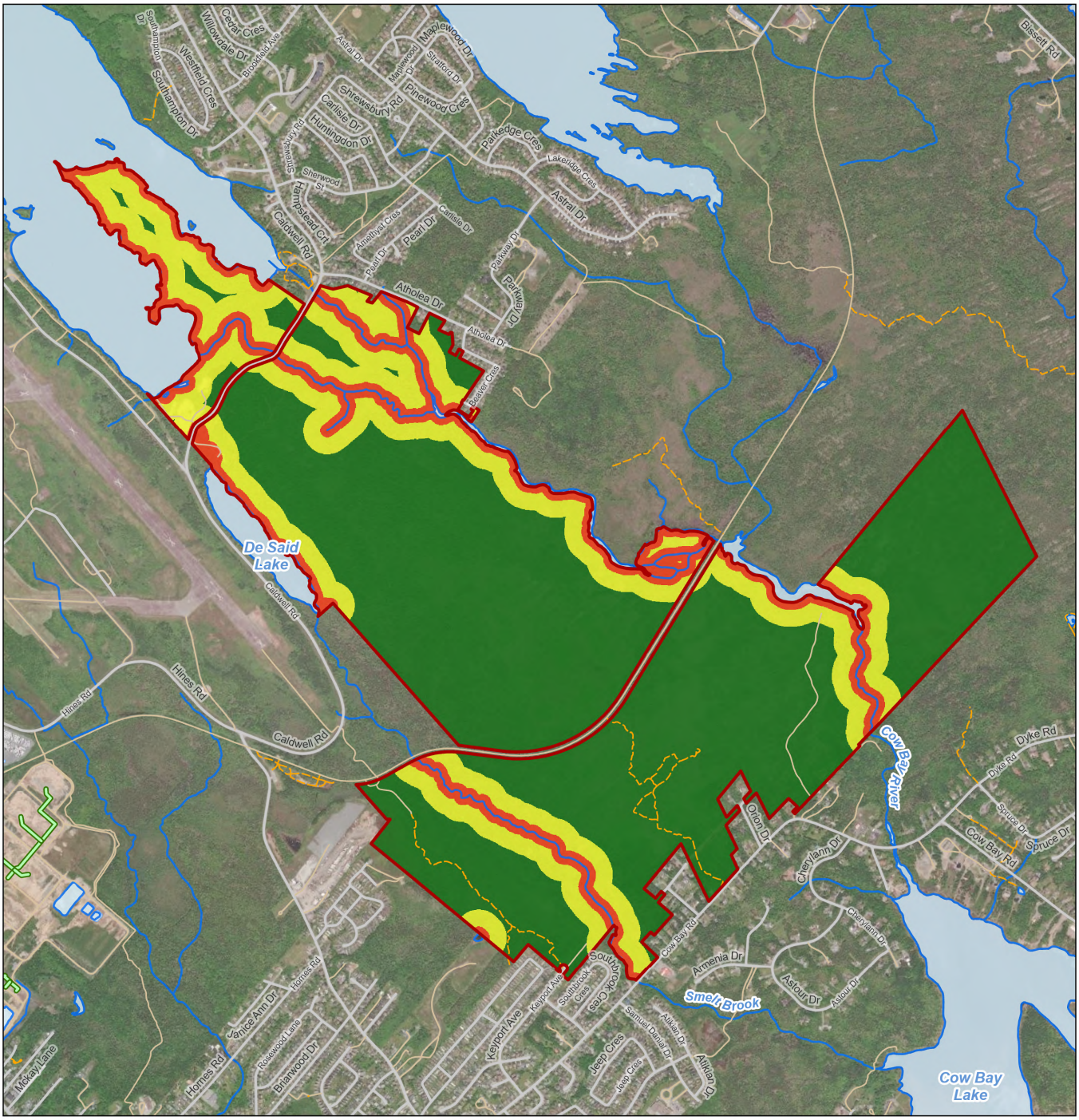
Land considered to have low suitability for development was determined to be areas within 30 m of mapped and field identified watercourses. Land considered to have moderate suitability for development was determined to be areas that extend from 30 m to 100 m from a watercourse. Land with higher suitability for development is determined to be areas that are greater than 100m from watercourses, as areas within a 100m buffer of watercourses would protect the greatest amount of riparian and aquatic habitat (Table 3.11).

This process culminated in the creation of a map (Figure 3.6) that illustrates development suitability of land as it relates to watercourses. The results allow for the identification of suitable and unsuitable areas, as well as the recognition of potential constraints. A lower score for land suitability for development generally corresponds with higher ecological and social value.

Note that recommendations for landscape connectivity have also considered the location of watercourses in the Study Area (refer to Section 3.5)

Table 3.11 Watercourses and Water Quality– Land Suitability Ranking Framework

Layer	Land Suitability Ranking		
	1 - Low suitability for development	**2 - Moderate suitability for development**	**3 - Higher suitability for development**
Water-courses	Areas within 30 m of mapped and field identified watercourses	Areas that extend from 30 m to 100 m from a watercourse	Areas that are greater than 100 m from watercourses





Study Area

Land Suitability Score

- 3 (High)
- 2
- 1 (Low)

Utilities

- Pipeline

Transportation

- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-08
Revised by NWhite on 2024-07-09

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_031

Figure No.
3.6

Title
Watercourses in the MLSA – Land Suitability Analysis

\\ca0213-pdfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM_FCM_2024_Synthesis.aprx: HRM_FCM_031_Watercourse_LSARevised: 2024-07-09 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.4 Forest Habitat and Species at Risk

Forest habitat within the MLSA was evaluated using the NSDNRR Forest and Wetland Inventory databases, the Nova Scotia Forest Ecosystem Classification (FEC) system (Neily et al. 2023), and data collected during field surveys (Appendix B).

A desktop review of species at risk (SAR) and species of conservation concern (SOCC) was conducted using data requested from the AC CDC (AC CDC 2023; Appendix A) and the NSDNRR Boreal Felt Lichen predictive habitat layer (Cameron and Neily 2008). The desktop review was supplemented by incidental field observations recorded during field programs (Appendix C).

Forest habitat and SAR were combined for land suitability analysis. The FEC data (combined with wetland data and field observations) were used to understand what habitat types are present in the Study Area. Once habitat types within the MLSA were identified, they were compared to known habitat preferences of SAR recorded within 5 km of the Study Area to understand the distribution of potential SAR habitat.

3.4.1 FOREST HABITAT

The NSDNRR Forest Inventory database is based on air photo interpretation and are not ground-truthed. NSDNRR forest polygons were visited during field surveys in spring and summer 2023 (indicated as ‘field survey sites’ on Figure 3.7a and Fig 3.7b). Vegetation within the polygons was evaluated and then compared with the FEC system, which places forest stands into Forest Groups (FG) that are composed of different Vegetation Types (VTs) with similar site conditions, successional pathways, and species composition (Neily et al. 2023). A patchwork of different forest and plant communities reflect a changing landscape based on disturbance (blowdown, insects, fire, disease, anthropogenic), site conditions and natural successional stages.

The MLSA is located within the Eastern Interior Ecodistrict with the southernmost portion bordering the Eastern Shore Ecodistrict (NSDNR 2017), allowing for a coastal influence on some of the VTs seen with the presence of the Coastal Boreal FG within the MLSA. The Eastern Interior Ecodistrict is mainly underlain by meta-sedimentary rock. This is the largest ecodistrict in the province, stretching from Pockwock Lake (Halifax County) in the west to Chedabucto Bay (Guysborough County) in the east. This expansive tract of upland topography is a rolling till-plain comprised of generally gravelly and stony soils (NSDNR 2017).

This Ecodistrict has three distinct concentrations of drumlins which can be identified roughly by the watersheds of the three rivers that flow through them: Sackville River, Tangier River, and Moser River. Dominant soils are derived from gravelly sandy loam till (Halifax/Danesville soils); gravelly sandy clay loam till containing shale, sandstone, and mudstone (Wolfville/Hantsport soils); shallow and/or very stony sandy loam till high in quartzite (Rockland soils); and gravelly loam to silt loam till high in slate (Bridgewater/Riverport soils) (NSDNR 2017).

The Eastern Interior Ecodistrict has several significant forest ecosystems: a zonal climax black spruce (*Picea mariana*) forest (Spruce Pine Forest Group) that is widely dispersed on dry to moist, nutrient poor soils (28%); a zonal softwood/mixedwood forest of red spruce (*Picea rubens*), eastern hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*) and red maple (*Acer rubrum*) (Spruce Hemlock Forest Group) on fresh to fresh-moist, nutrient medium soils (50%); and a zonal Tolerant Hardwood forest of sugar maple (*Acer saccharum*), yellow birch and red maple on fresh, nutrient medium to rich soils (10%) (NSDNR 2017). The Study Area contains the following FEC FGs:

- Coastal Boreal (CB)
- Intolerant Hardwood (IH)
- Mixedwood (MW)
- Open Woodland (OW)
- Spruce Hemlock (SH)
- Spruce Pine (SP)
- Wet Boreal (WB)
- Wet Coniferous (WC)
- Wet Deciduous (WD)
- Wet-Mixedwood (WM)

Dominant vegetation was described for 46 forest inventory polygons visited during field surveys (Table 3.13). Unique identifiers were assigned at the point surveyed (PC1-PC54). All plant species were recorded at that point in the tree, shrub and ground vegetation layers as well as site specific details such as drainage class, stand description and estimated stand age (Appendix B). VTs were identified and inventoried based on the overall percent cover of dominant tree and shrub species (Appendix B). Transitions to other VTs were marked and compared to existing data as they were encountered. The FEC classification for each stand is presented in Appendix B. VTs and their typical description can be found below. A list of plants is included in Appendix B.

Table 3.12 Summary of Vegetation Types in the MLSA

Vegetation Type (VT)	FEC VT Code	VT Frequency[1]	Forest Group (FG)
Balsam fir / Foxberry – Twinflower	CB3	1	CB
White birch – Balsam fir/Foxberry – Wood aster	CB4	2	
Red maple / Hay-scented fern – Wood-sorrel	IH8	9	IH
Red spruce – Red maple – White birch / Goldthread	MW2	5	MW
Balsam fir – Red maple / Wood-sorrel – Goldthread	MW7	1	
Black spruce – Red maple / Bracken – Sarsaparilla	MW9	13	
Black spruce / Lambkill / Reindeer lichen	OW2	3	OW
Black Huckleberry Heath	S1	3	S
Mixed Tall Shrubland	S3	1	
Sheep Laurel Highland Health	S5	4	
Red spruce – White pine / Lambkill / Bracken	SH4	1	SH
Black spruce / Feathermoss	SP5	1	SP
Black spruce – Balsam fir / Blueberry	SP6	2	
Black spruce / Lambkill – Wild raisin – Mountain holly	SP7	2	
Black spruce / Mountain ash / Foxberry / Sphagnum	WB1	2	WB
Black spruce / Cinnamon fern / Sphagnum	WC1	1	WC
Black spruce / Lambkill – Labrador tea / Sphagnum	WC2	6	
Balsam fir / Cinnamon fern – Three seeded sedge / Sphagnum	WC6	1	
Tamarack – Black spruce / Lambkill / Sphagnum	WC7	6	
Black spruce Woodland Bogs	WC11	6	
Red maple / Cinnamon fern / Sphagnum	WD2	2	WD
Red maple – Balsam fir / Wood aster / Sphagnum	WM1	1	WM
Red maple – Black spruce / Lambkill / Cinnamon fern / Sphagnum	WM3	4	

Note:
1 – Frequency is the number of stands of each VT out of 46 total stands with VTs

3.4.2 FOREST ECOSYSTEM CLASSIFICATION

A total of 10 FGs and 1 barrens type represented the 20 individual VTs and three different shrubland associations noted in Table 3.8. FGs are presented on Figure 3.7a and 3.7b. The following sections describe each VT including successional stage, disturbance, and specific ecological features.

3.4.2.1 Coastal Boreal

Coastal boreal is one of two coastal forest groups and is seen along the saltwater coastlines of Nova Scotia. This VT ranges from partial to closed canopy. The canopy is comprised of black spruce, white spruce and balsam fir. Red spruce, sugar maple, beech, eastern hemlock and white pine are not present within this forest group. Coastal forests provide habitat for many migratory birds.

CB3 – Balsam fir / Foxberry – Twinflower

- Succession: Mid to Late
- Typical Disturbance Type: Windthrow, breakage, insect infestation, and harvesting
- Ecological Features: Older stands of this VT provide good habitat for rare epiphytic lichens.

This VT occurs on fresh to fresh-moist, nutrient poor to medium soils. The overstory of this VT is dominated by balsam fir, with components of spruce. The shrub layer is often comprised of regenerating trees, while the herbaceous layer has moderate diversity. The bryophyte layer is extensive with a variety of species present such as bazzania and Scherber's moss.

CB4 – White birch – Balsam fir / Foxberry – Wood aster

- Succession: Mid
- Typical Disturbance Type: Windthrow, breakage, insect infestation, and harvesting
- Ecological Features: Older stands of this VT may support boreal felt lichen and other rare cyanolichens.

CB4 occurs on fresh, nutrient medium rich soils. The shrub layer is dominated by regenerating conifers such as balsam fir. The overstory is dominated by white birch (*Betula papyrifera*) and/or heartleaf birch (*Betula cordifolia*)with a large component of balsam fir and white spruce. There is low diversity in the herbaceous layer, but a well-developed bryophyte layer in this VT.

3.4.2.2 Intolerant Hardwood

Intolerant hardwoods (IH) are early to mid-successional closed canopy forest stands that are dominated by red maple, white birch, grey birch (*Betula populifolia*) and aspen (*Populus* spp.) trees. The canopy is closed hardwood, with scattered residuals from previous succession stages. The shrub layer is typically extensive and has woody shrub species (e.g., wild raisin [*Viburnum nudum*] and honey-suckle [*Lonicera canadensis]*). Intolerant hardwood stands are typically short-lived, even-aged forests that result from stand-level disturbance events such as fire, windthrow, or harvesting. These stands provide habitat for deer, moose, and snowshoe hare.

IH8 White birch – Red maple / Lambkill – Huckleberry

- Succession: Early
- Typical Disturbance Type: Insects, disease and windthrow.
- Ecological Features: damp crevices between surface rocks provide great habitat for snakes, amphibians and small rodents. There is also high tree and lichen species richness in this VT.

White birch (*Betula papyrifera*) and red maple are the dominant species in the IH8 vegetation type, with an extensive understory of ericaceous shrubs. Tree growth in this VT is limited by the nutrient poor soils and often has stunted growth in the tree layer. In addition to the abundance of ericaceous shrubs, witch hazel if often present in the shrub layer. The bryophyte later is typically poorly developed due to restriction by leaf litter.

3.4.2.3 Mixedwood

The characteristics of the mixedwood (MW) group can be quite variable, including both coniferous and deciduous trees, ranging from early to late successional stages. Mixedwood vegetation types can be composed of either shade-tolerant or intolerant canopy species and can be large patch to matrix scale forests with complex canopy structures including softwood or hardwood inclusions or, more commonly, a relatively even blend of both growth forms. Earlier successional MW forests include red maple, white birch, grey birch, aspen(s), and/or balsam fir. In turn, later successional forests are characterized by yellow birch, sugar maple, red spruce, white spruce and/or eastern hemlock.

MW2 Red spruce-Red maple-White birch / Goldthread

- Succession: Mid
- Typical Disturbance Type: Windthrow, harvesting.
- Ecological Features: Increased Forest structural complexity can provide nesting habitat for woodpeckers, owls, and northern goshawks (*Accipiter gentilis*).

This VT is associated with fresh to fresh-moist sites, and is typically dominated by red spruce, red maple, and large-tooth (*Populus grandidentata*) or trembling aspen (*Populus tremuloides*). It is a closed canopy and mid-successional forest, which follows partial disturbances such as harvesting. The shrub layer is mainly composed of regenerating tree species, and the herb layer contains species similar to other mixedwood VTs such as starflower, sarsaparilla and several fern species.

MW7 Balsam fir-Red maple / Wood-sorrel – Goldthread

- Succession: Early to Mid
- Typical Disturbance Type: Stand-level disturbances (e.g., windthrow, fire, harvesting).
- Ecological Features: Forms a matrix and has variably-sized patch ecosystems.

MW7 is comprised of shale-intolerant hardwoods, including white birch and aspen. The shrub layer is moderately developed and includes regenerative trees as this VT follows stand-replacing disturbances. MW7 occurs on fresh to moist, nutrient medium soils and is most common in eastern Nova Scotia. It supports rapid site revegetation, nutrient cycling, and establishing nursing crops for later successional stages like red spruce, eastern hemlock, and yellow birch.

MW9 Black spruce – Red maple / Bracken – Sarsaparilla

- Succession: Even-aged, edaphic
- Typical Disturbance Type: Stand-replacing disturbances (e.g., windthrow, fire, harvesting).
- Ecological Features: Occurs in small to large patches on surfaces with high stoniness. Mature forests will develop old man's beard and lichen.

MW9 is an even-aged VT which develops in fresh to moist, nutrient poor soils. There is a mixedwood overstory which has moderate canopy closure supported by herbaceous plants. The shrub layer is co-dominated by lambkill (*Kalmia angustifolia*), velvet-leaf and lowbush blueberry (*Vaccinium myrtilloides, V. angustifolium*), and huckleberry (*Gaylussacia* sp.). This VT patches are typically large and found on sites with high amounts of stoniness.

3.4.2.4 Open Woodland

Open woodland (OW) forests are limited by site conditions and natural disturbances (e.g., acidic bedrock soil, windthrow) resulting in limited tree growth and well-developed shrub layers. Common species include pine, black spruce, red maple and red oak, whereas huckleberry, lambkill, and rhodora dominate the shrub layers.

OW2 Black spruce / Lambkill / Reindeer lichen

- Succession type: Early, edaphic
- Typical Disturbance Type: Stand level disturbances (e.g., fire, windthrow)
- Ecological Features: Limited distribution and only exists in Atlantic Canada, creating conservation challenges.

OW2 is a VT found on acidic bedrock and thin glacial soils, with dry to moist, nutrient very poor or stoney soils. Black spruce or pine dominate, and other species are typically uncommon. The understory is woody and has acid-tolerant shrubs (e.g., lambkill), and the herbaceous layer is low in species richness and abundance. This VT only is successful during early successional stages and only exists in the Atlantic provinces in small patches; however, it supports animal, plant, and epiphytic lichen species.

3.4.2.5 Shrubland Associations

The shrubland association is one of three barrens associations in Nova Scotia. These VTs are found in a separate guide to the FEC classifications (Porter et al. 2020). The shrubland associations are distinguished by characteristic shrub presence.

S1 Black Huckleberry Heath

- Succession: N/A
- Typical Disturbance Type: Fire
- Ecological Features: N/A

S1 is the only barrens VT dominated by black huckleberry (*Gaylussacia baccata*). It typically occurs on sites with shallow and stony soils, frequently with a cemented or partially cemented horizon. The soils of this association are typically nutrient poor and acidic humus over coarse-grained mineral soils. This association is among the most widespread shrubland associations of Nova Scotia's barrens.

S3 Mixed Tall Shrubland

- Succession: N/A
- Typical Disturbance Type: Fire
- Ecological Features: N/A

S3 barrens association is characterized by a mixture of false holly (*Ilex mucronata*), black chokeberry (*Aronia melanocarpa*), sheep laurel (*Kalmia angustifolia*), wild raisin (*Viburnum nudum*), rhodora (*Rhododendron canadense*), and/or black huckleberry (*Gaylusaccia baccata*). This VT can sometimes support trees and of all the barren types has on average taller vegetation. The soils of this VT are typically thick litter accumulations and thin, poorly developed humus over stony till.

S5 Sheep Laurel Highland Health

- Succession: N/A
- Typical Disturbance Type: Stand level disturbance (e.g., fire)
- Ecological Features: N/A

S5 is a barren VT, which is dominated by sheep laurel (aka lambkill, *Kalmia angustifolia*) on inland barrens on surficial deposits. This VT typically occurs on sheltered sites with moderate to negligible wind exposure. Trees are present in this association in only one quarter to one third of all sites. The most common tree species present are black spruce and white pine. There is a distinct lichen and bryophyte layer. Physical evidence of fire disturbance is seen in charcoal near the surface in one third of sites. The association also has the presence of exposed woody substrates, surface rock, mineral soil, and humus.

3.4.2.6 Spruce-Hemlock

Spruce-hemlock (SH) VT is a mid- to late-successional group with closed canopy and softwood species, predominantly red spruce, eastern hemlock, and eastern white pine. Mid to late successional stages are typically even-aged, closed canopy, but can develop a multi-age structure as they progress into a later successional stage. Within the well-developed canopies, the mid successional stages usually have a significant balsam fir component along with eastern hemlock, red spruce, and eastern white pine in the overstory. The SH type occurs on soils with a wide range of moisture levels; however, the fertility levels are typically moderate.



SH4 Red spruce-White pine / Lambkill / Bracken

- Succession: Late
- Typical Disturbance Type: Windthrow or harvesting.
- Ecological Features: Occupies large areas of land and supports old growth development and habitat cover for moose, deer, and fisher.

This VT occurs on dry to fresh, nutrient poor to medium soils. They are closed canopy forests that are dominated by red spruce, and lesser amounts of eastern white pine. The shrub layer is composed of regenerative balsam fir and red spruce. Bracken fern (*Pteridium aquilinum*) is typically the dominant species of the herbaceous layer. SH4 is a large matrix forest and dominates large areas of land. It supports wildlife habitat, including nesting and brood-rearing for avifauna, and overwintering habitat for deer and moose.

3.4.2.7 Spruce-Pine

Spruce-pine (SP) forests are nutrient poor and are often dominated by black spruce and pines with plants in the understory that are tolerant of nutrient poor soils. They are typically associated with sloped environments with bedrock ridges and outcrops. The shrub layer of these stands are often dominated by lambkill, blueberry and black huckleberry (*Gaylussacia baccata*). The herb layer is variable in species composition depending on the amount of light available.

SP5 Black spruce / Feathermoss

- Succession: Edaphic
- Typical Disturbance: Stand replacing events (e.g., fire, harvesting, windthrow)
- Ecological Features: Commonly large-patch matrices which are mature forests that provide wildlife habitat.

SP5 is a closed canopy VT with black spruce which develops on fresh to moist, nutrient poor soils. The understory shrubs and herbs are sparse but there is a well-developed bed of moss. The shrub layer has low species abundance and diversity, and the herb and bryophyte diversity are also generally low. These VTs are large patches and are the end-successional stage for many VTs in the spruce pine forest group. Wildlife species that are associated with SP5 include spruce grouse, olive-sided flycatcher, mourning warbler, star-nosed mole, and amphibians.

SP6 – Black spruce – Balsam fir / Blueberry

- Succession: Early to Mid
- Typical Disturbance: Stand replacing disturbance (e.g. Insects, harvesting and windthrow)
- Ecological Features: SP6 stands provide suitable habitat conditions for many species such as red and flying squirrel, deer, moose, salamanders and other amphibians, songbirds and small mammals.

SP6 is a closed canopy forest with a dominant presence of balsam fir in the overstory. Common associates in the overstory include black spruce, hybrid (red/black) spruce, red maple and white pine. The shrub layer is mostly comprised of regenerating tree species along with velvet-leaf blueberry and lambkill. The herbaceous and bryophyte layers are well developed but with few species. This VT has dry to fresh, nutrient poor soils.

SP7 Black spruce / Lambkill – Wild raisin – Mountain holly

- Succession: Even-aged, edaphic
- Typical Disturbance: Stand replacing disturbances (e.g., fire, harvesting, windthrow)
- Ecological Features: Provides habitat for spruce grouse, olive-sided flycatcher, mourning warbler, star-nosed mole, and amphibians.

SP7 is a closed canopy VT that is comprised of shade-tolerant black spruce, a well-developed shrubby layer, and moist- nutrient poor soils. The shrub layer has species such as lambkill, blueberry, and other ericaceous species. The herb species present will be limited, but include bunchberry, bracken, and goldthread (*Coptis trifolia*). This VT does not shift to other vegetation types after disturbance, will occur as small to large patches in ecosystems comprised of other SP VTs.

3.4.2.8 Wet Boreal

Wet boreal (WB) VTs are small to large patch forests that usually occur within larger wetland complexes and are edaphic climax forests. The canopy can be closed to partially closed and is dominated by black spruce, balsam fir and /or tamarack. The understory is comprised of plants tolerant of wet conditions with a well-developed shrub, herb and bryophyte layers. Sphagnum cover is usually extensive in this FG. The conditions of this FG promote growth of many rare lichens species in the province in older undisturbed stands.

WB1 – Black spruce / Mountain ash / Foxberry / Sphagnum

- Succession: Edaphic
- Typical Disturbance Type: Stand replacing (e.g. windthrow and insects)
- Ecological Features: Conditions support high bryophyte abundance and occurrence of rare lichens species in the province.

WB1 is the most common wet forest type in the Atlantic Coastal ecoregion. It is a moderately closed canopy forest dominated by black spruce in the overstory. The shrub layer is primarily composed of regenerating black spruce and balsam fir and a smaller component of woody shrubs. The herbaceous layer is relatively diverse, and the bryophyte layer is dominated by Sphagnum species. This VT is found on wet, nutrient poor soils.

3.4.2.9 Wet-Coniferous

Wet-coniferous (WC) VTs are wet forest ecosystems that have water at or near the soil surface. The canopy is partially closed and is dominated by softwood species. There is a well-developed understory of plants that are tolerant of wet conditions. The shrub layer of WC VTs is typically characterized by ericaceous species and tall shrubs such as mountain holly (*Ilex mucronata*). These forests create unique landscapes which are important for carbon storage, nitrogen cycling, and often form the headwaters of watercourses so they can be important in flow regulation.

WC1 – Black spruce / Cinnamon fern / Sphagnum

- Succession: Edaphic
- Typical Disturbance Type: Windthrow and uprooting
- Ecological Features: Provides thermal cover for moose and deer.

WC1 is characterized by dominant black spruce in the canopy. The shrub layer is scattered with low cover of ericaceous shrubs and black spruce layering. The herbaceous layer has moderate to high cover. While the bryophyte layer is well-developed and dominated by sphagnum species. It is found on wet, nutrient poor soils and persists as an edaphic climax.

WC2- Black spruce / Lambkill – Labrador tea / Sphagnum

- Succession: Edaphic
- Typical Disturbance Type: Windthrow and uprooting
- Ecological Features: Supports low species richness and limited habitat diversity due to harsh site conditions

This VT occurs on nutrient poor to very poor soils that are poorly drained. The canopy is dominated by black spruce and crown closure is considered low to moderate. The canopy may also be formed by stunted trees. The shrub layer, in instances where the stand is young, is more exposed, or extremely wet. The understory is woody and dominated by lambkill or other species such as Labrador tea (*Rhododendron groenlandicum*), rhodora and mountain holly. These stands are maintained by limiting conditions including soil saturation limiting the rooting potential; however, they can sustain old growth conditions and some plant species of conservation concern.

WC6 – Balsam fir / Cinnamon fern – Three seeded sedge / Sphagnum

- Succession: Early to Mid, Edaphic
- Typical Disturbance Type: Harvest, windthrow and spruce budworm
- Ecological Features: WC6 support some of the highest provincial concentrations of epiphytic cyanolichens.

This VT occurs on poorly to very poorly drained flats or shallow depressions. The canopy is dominated by balsam fir with other associates spruce (red, white and/or black) and/or red maple. The shrubs layer is somewhat developed with low to moderate cover. The herbaceous layer has moderate cover of wet site species. Sphagnum species dominate the bryophyte layer.

WC7 Tamarack – Black spruce / Lambkill / Sphagnum

- Succession: Early to Mid, Edaphic
- Typical Disturbance Type: Harvest, windthrow
- Ecological Features: The only tamarack dominant ecosystem in Nova Scotia found on organic soils. Often contain rare plant species for example black ash (*Fraxinus nigra*).

This VT occurs on poorly to very poorly drained flats or shallow depressions. This semi open canopy forest is characterized by a tamarack overstory, high sphagnum cover and high graminoid diversity. The overstory often contains red maple and black spruce.

WC11 Black spruce Woodland Bogs

- Succession: Edaphic
- Typical Disturbance Type: maintained by site limiting conditions
- Ecological Features: This VT creates a transition zone and creates habitat for species with affinities for wet open coniferous habitat.

WC11 is an open woodland ecosystem that sits on wet (minerotrophic) soils and is characterized by stunted black spruce. This VT has nutrient poor soils that are primarily organics. The tree layer in this VT is limited while the shrub layer can be extensive with stunted black spruce and woody shrubs. The herbaceous and bryophyte layers have low species diversity.

3.4.2.10 Wet-Deciduous

The wet-deciduous (WD) forest group is characterized by water at or near the ground surface for much of the growing season. Canopies are often partly open or closed and are generally dominated by red maple, and occasionally white ash. Vegetation types occur primarily on level to depressional topography or within riparian zones.

WD2 Red maple / Cinnamon fern / Sphagnum

- Succession: Early to mid, edaphic
- Typical Disturbance Type: Windthrow, harvesting.
- Ecological Features: Moderately productive system which can support black ash

WD2 is a widespread maple swamp VT that is found throughout Nova Scotia. The soils are usually organic deposits or poorly drained mineral soils. It has a relatively high percentage of deciduous trees, primarily red maple. Shrub cover is moderate, however it is characterized by low species diversity. It can include regenerative overstory species, as well as other shrub species (e.g., speckled alder [*Alnus incana*]). The herbaceous layer is also characterized by low diversity but can have high vegetation cover. Wildlife species that are associated with WD2 include olive-sided flycatcher and Canada Warbler .

3.4.2.11 Wet-Mixedwood

Wet-mixedwood (WM) vegetation types occur on poorly drained sites where the water table is at or near the soil surface for most of the growing season. Canopies are partly open to closed, and are generally dominated by red maple, spruce, balsam fir, white ash, and yellow birch. WM vegetation types are mid-successional and have fluctuating water levels, wind throw, and insect/disease disturbance. They support both coniferous and deciduous tree species. They exist in small patches that act as a transition ecosystem for forest wetland species.

WM1 Red maple-Balsam fir / Wood aster / Sphagnum

- Succession: Mid, Edaphic
- Typical Disturbance Type: Individual tree mortality and windthrow.
- Ecological Features: Small pools or narrow channels typically are present with slowly moving water, supporting biodiversity features similar to wet deciduous VTs.

This vegetation type is found on wet, poor to medium mineral soils with some level of groundwater and/or surface flow. The canopy is closed and comprised mainly of balsam fir and red maple, with high herbaceous cover and a well-developed bryophyte layer. The crown closure is moderate to high, and the understory supports woody species.

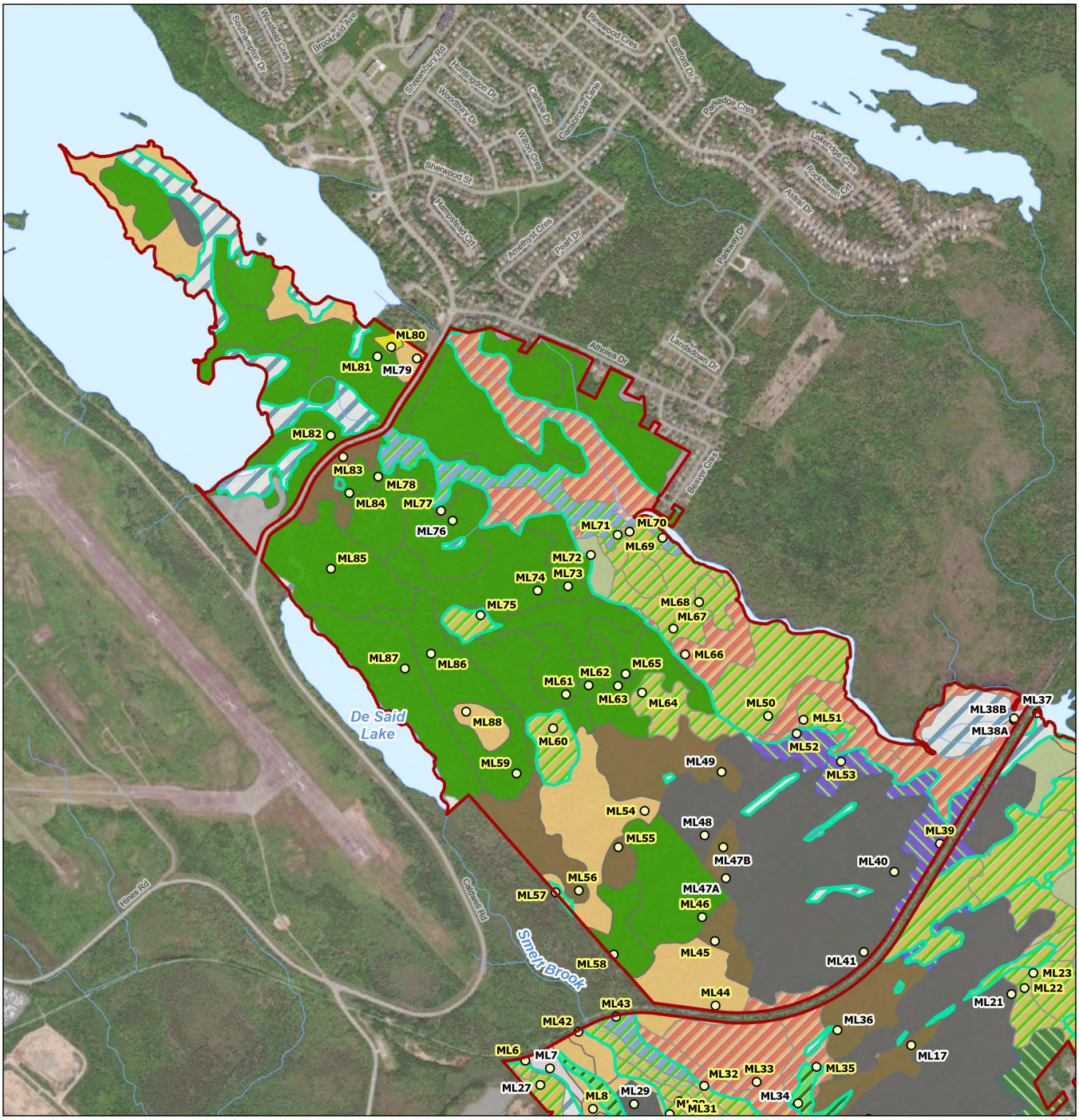
WM3 Red maple-Black spruce / Lambkill / Cinnamon fern / Sphagnum

- Succession: Mid, Edaphic
- Typical Disturbance Type: Windthrow and timber harvesting
- Ecological Features: Occupies small areas and acts as a stepping-stone in large forest matrices for wetland dependent species.

This VT occurs on poorly drained sites that are underlain by wet mineral or organic deposits. It is a closed canopy forest with high shrub and herbaceous cover, and a well-developed sphagnum moss layer. The canopy is dominated by black spruce, red maple, and balsam fir. WM3 is characterized by the lowest nutrient availability of the WM VTs. This type typically consists of small patches found within large matrices. There are often pools of open water and peaty hummocks which provide habitat for amphibians, invertebrates, and avifauna.

3.4.2.12 Forested Wetlands

There are several wetlands within the MLSA, varying in size, type, and complexity. Many of these wetlands are complexes, containing more than one wetland community (e.g., a fen with a tree and shrub swamp halo around the perimeter). Although the Nova Scotia FEC system provides habitat types that are described as ‘wet coniferous’ or ‘wet deciduous’ conditions, there isn’t a sufficient classification within this system for all wetland types (Section 3.2). Some of the wet forest groups are also not always indicative of wetland conditions and can also include forest mosaics or moist sites. The variation between wet forest groups and wetlands is also difficult to distinguish from digital data sources, therefore they were simply identified as ‘wetland’ in Figure 3.7a and Figure 3.7b.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia; Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Field Survey Location

Forest Group

- Alder Thicket (AT)
- Intolerant Hardwood (IH)
- Mixedwood (MW)
- Open Woodland (OW)
- Spruce - Hemlock Forest (SH)
- Spruce - Pine Forest (SP)
- Coastal Boreal Forest (CB)
- Wet Boreal Forest (WB)

Non-Forest Group

- Barrens
- Urban Other

Wetland

- Wet Mixedwood Forest (WM)
- Wet Coniferous Forest (WC)
- Wet Deciduous Forest (WD)
- Wetland Other (Not Evaluated Using WESP-AC)
- Tall Shrub Swamp (TSS)

Other Features

- Waterway
- Waterbody
- Wetlands (Stantec, 2023)
- Study Area

Forest Stand Estimated Age

- PC18 > 80 Years
- PC18 30 to 80 Years
- PC18 < 30 Years

0 250 500 Metres

(At original document size of 8.5x11)
1:17,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Revised by NWhite on 2024-07-09

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

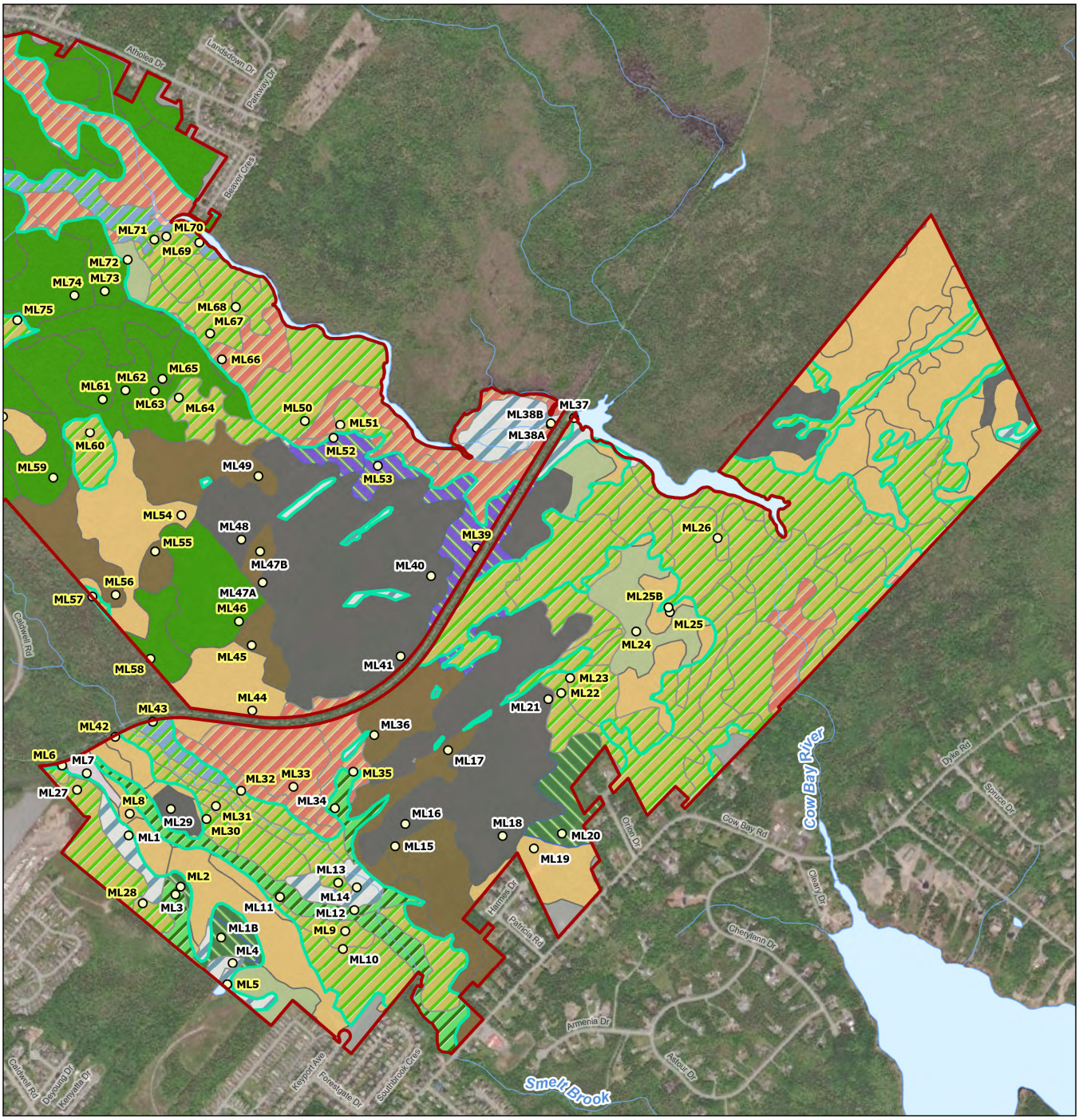
Fig ID: 160410459_021

Figure No.
3.7a

Title
Forest Groups - MLSA

HRM FCM 2022.aprx Revised: 2024-07-09 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Stantec; Government of Nova Scotia; Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Field Survey Location

Forest Group

- Alder Thicket (AT)
- Intolerant Hardwood (IH)
- Mixedwood (MW)
- Open Woodland (OW)
- Spruce - Pine Forest (SP)
- Coastal Boreal Forest (CB)
- Wet Boreal Forest (WB)

Non-Forest Group

- Barrens
- Urban Other

Wetland

- Wet Mixedwood Forest (WM)
- Wet Coniferous Forest (WC)
- Wet Deciduous Forest (WD)
- Wetland Other (Not Evaluated Using WESP-AC)
- Tall Shrub Swamp (TSS)

Other Features

- Waterway
- Waterbody
- Wetlands (Stantec, 2023)
- Study Area

Forest Stand Estimated Age

- PC18 > 80 Years
- PC18 30 to 80 Years
- PC18 < 30 Years

0 250 500 Metres

(At original document size of 8.5x11)
1:17,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Revised by NWhite on 2024-07-09

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_021

Figure No.
3.7b

Title
Forest Groups - MLSA

HRM FCM 2022.aprx Revised: 2024-07-09 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.4.3 SPECIES AT RISK

AC CDC records (AC CDC 2023) indicate that the MLSA and surrounding environment may support a variety of wildlife, including SAR and SOCC. For the purposes of this report, SAR are defined as any species with a status of Special Concern, Vulnerable, Threatened, Vulnerable, or Endangered by the Nova Scotia *Endangered Species Act* (NS ESA), the Federal *Species at Risk Act* (SARA), or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). SOCC are defined as any species with an AC CDC S-rank of S1 (Critically Imperiled), S2 (Imperiled), or S3 (Vulnerable), and not otherwise defined as SAR. Table 3.13 presents species identified in the AC CDC data report (full report provided in Appendix A). The distribution of SAR and SOCC that have been recorded in or near the MLSA either during the field surveys or from existing records are presented on Figure 3.8.

Incidental observations of wildlife and plant species were recorded during wetland, vegetation, water, and archeology field programs. Stantec observed 271 species (31 birds, 8 mammals, 7 reptiles and 225 vascular plants) This includes 4 SOCC vascular plant Species in table 3.14. No SAR were observed during the field surveys, but this is not definitive proof of their absence in the MLSA. A full list of wildlife species observed during field studies is available in Appendix C.

A different method was used to assess the potential presence of boreal felt lichen (*Erioderma pedicellatum*). A predictive habitat model for boreal felt lichen has been developed for Nova Scotia (Cameron and Neily 2008) and is now integral in supporting habitat identification according to Special Management Practices (NSDNR 2018). Less than 20% of known occurrences of the rare boreal felt lichen are located within the modelled habitat (NSDNR 2018), but the model identifies the coarse-scale habitat features of importance to boreal felt lichen across all of Nova Scotia. The model output showing the predicted distribution of boreal felt lichen was compared to the most recent imagery of the MLSA to confirm that suitable habitat was still present. If suitable habitat was still present, boreal felt lichen was considered to be potentially present.

Table 3.13 SAR and SOCC Within 5 km of the MLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Birds					
Morus bassanus	Northern Gannet				SHB
Branta bernicla	Brant				S3M
Anas acuta	Northern Pintail				S1B, SUM
Spatula discors	Blue-winged Teal				S3B
Spatula clypeata	Northern Shoveler				S2B, SUM
Mareca strepera	Gadwall				S2B, SUM
Aythya americana	Redhead				SHB
Somateria mollissima	Common Eider				S3B, S3M, S3N
Histrionicus histrionicus pop. 1	**Harlequin Duck – Eastern Population**	SC	SC	EN	S2S3N, SUM

Table 3.13 SAR and SOCC Within 5 km of the MLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Bucephala clangula	Common Goldeneye				S2S3B, S5N, S5M
Bucephala islandica	**Barrow's Goldeneye**	SC	SC		S1N, SUM
Oxyura jamaicensis	Ruddy Duck				S1B
Cathartes aura	Turkey Vulture				S2S3B, S4S5M
Accipiter cooperii	Cooper's Hawk		NAR		S1?B, SUN, SUM
Buteo lagopus	Rough-legged Hawk				S3N
Falco sparverius	American Kestrel				S3B,S4S5M
Gallinula galeata	Common Gallinule				S1B
Fulica americana	American Coot				S1B
Pluvialis squatarola	Black-bellied Plover				S3M
Pluvialis dominica	American Golden-plover				S2S3M
Charadrius semipalmatus	Semipalmated Plover				S1B, S4M
Charadrius melodus melodus	**Piping Plover melodus subspecies**	EN	EN	EN	S1B
Charadrius vociferus	Killdeer				S3B
Tringa melanoleuca	Greater Yellowlegs				S3B, S4M
Tringa flavipes	**Lesser Yellowlegs**		TH		S3M
Tringa semipalmata	Willet				S3B
Numenius phaeopus	Whimbrel				S2S3M
Numenius phaeopus hudsonicus	Whimbrel				S2S3M
Limosa haemastica	**Hudsonian Godwit**		TH		S2S3M
Arenaria interpres	Ruddy Turnstone				S3M
Calidris canutus	**Red Knot**	EN	EN	EN	S2M
Calidris alba	Sanderling				S2N, S3M
Calidris pusilla	Semipalmated Sandpiper				S3M
Calidris minutilla	Least Sandpiper				S1B, S4M
Calidris melanotos	Pectoral Sandpiper				S3M
Calidris subruficollis	**Buff-breasted Sandpiper**	SC	SC		SNA
Limnodromus griseus	Short-billed Dowitcher				S3M
Gallinago delicata	Wilson's Snipe				S3B, S5M
Phalaropus lobatus	**Red-necked Phalarope**	SC	SC		S2S3M
Phalaropus fulicarius	Red Phalarope				S2S3M
Leucophaeus atricilla	Laughing Gull				SHB
Chroicocephalus ridibundus	Black-headed Gull				S3N

Table 3.13 SAR and SOCC Within 5 km of the MLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Sterna hirundo	Common Tern				S3B
Uria aalge	Common Murre				S1?B
Coccyzus erythropthalmus	Black-billed Cuckoo				S3B
Asio otus	Long-eared Owl				S2S3
Asio flammeus	**Short-eared Owl**	SC	TH		S1B
Chordeiles minor	**Common Nighthawk**	SC	SC	TH	S3B
Antrostomus vociferus	**Eastern Whip-poor-will**	TH	SC	TH	S1?B
Chaetura pelagica	**Chimney Swift**	TH	TH	EN	S2S3B,S1M
Contopus cooperi	**Olive-sided Flycatcher**	SC	SC	TH	S3B
Contopus virens	**Eastern Wood-Pewee**	SC	SC	VU	S3S4B
Tyrannus tyrannus	Eastern Kingbird				S3B
Riparia riparia	**Bank Swallow**	TH	TH	EN	S2B
Petrochelidon pyrrhonota	Cliff Swallow				S2S3B
Hirundo rustica	**Barn Swallow**	TH	SC	EN	S3B
Perisoreus canadensis	Canada Jay				S3
Poecile hudsonicus	Boreal Chickadee				S3
Mimus polyglottos	Northern Mockingbird				S1B
Vireo philadelphicus	Philadelphia Vireo				S2?B, SUM
Setophaga tigrina	Cape May Warbler				S3B, SUM
Setophaga pinus	Pine Warbler				S2S3B, S4S5M
Setophaga striata	Blackpoll Warbler				S3B, S5M
Cardellina canadensis	**Canada Warbler**	TH	SC	EN	S3B
Icteria virens	**Yellow-breasted Chat**	EN	EN		SNA
Piranga olivacea	Scarlet Tanager				S2B, SUM
Pheucticus ludovicianis	Rose-breasted Grosbeak				S3B
Passerina cyanea	Indigo Bunting				S1?B, SUM
Passerculus sandwichensis princeps	**Ipswich Sparrow**	SC	SC		S1B
Zonotrichia querula	**Harris's Sparrow**		SC		SNA
Calcarius lapponicus	Lapland Longspur				S3?N, SUM
Dolichonyx oryzivorus	**Bobolink**	TH	SC	VU	S3B
Euphagus carolinus	**Rusty Blackbird**	SC	SC	EN	S2B
Molothrus ater	Brown-headed Cowbird				S2B
Icterus galbula	Baltimore Oriole				S2S3B, SUM
Pinicola enucleator	Pine Grosbeak				S3B, S5N, S5M
Spinus pinus	Pine Siskin				S3

Table 3.13 SAR and SOCC Within 5 km of the MLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Coccothraustes vespertinus	**Evening Grosbeak**	SC	SC	VU	S3B, S3N, S3M
Mammals					
Myotis and Perimyotis	**Bats or Bat hibernaculum†**	EN	EN	EN	S1
Lasionycteris noctivagans	**Silver-haired Bat**		EN		SUB, S1M
Globicephala melas	Long-finned Pilot Whale				S2S3
Megaptera novaeangliae	Humpback Whale				S3
Reptiles					
Chelydra serpentina	**Snapping Turtle**	SC	SC	VU	S3
Chrysemys picta picta	**Eastern Painted Turtle**	SC	SC		S4
Glyptemys insculpta	**Wood Turtle**	TH	TH	TH	S2
Fish					
Anarhichas lupus	**Atlantic Wolffish**	SC	SC		SNR
Anguilla rostrata	**American Eel**		TH		S3N
Morone saxatilis	**Striped Bass**		E, SC		S2S3B, S2S3N
Gadus morhua	**Atlantic Cod**		E,SC,DD		SNR
Insects					
Danaus plexippus	**Monarch**	SC	EN	EN	S2?B, S3M
Polygonia comma	Eastern Comma				S1?
Nymphalis l-album	Compton Tortoiseshell				S2S3
Aglais milberti	Milbert's Tortoisehell				S2S3
Polygonia interrogationis	Question Mark butterfly				S3B
Bombus terricola	**Yellow-banded Bumble Bee**	SC	SC	VU	S3
Bombus bohemicus	**Gypsy Cuckoo Bumble Bee**	EN	EN	EN	S1
Pachydiplax longipennis	Blue Dasher				S1
Somatochlora kennedyi	Kennedy's Emerald				S2S3
Somatochlora forcipata	Forcipate Emerald				S3
Pantala hymenaea	Spot-winged Glider				S2?B
Hippodamia perenthesis	Parenthesis Lady Beetle				S3
Naemia seriata	Seaside Lady Beetle				S3
Myzia pullata	Streaked Lady Beetle				S3
Lichens and Mosses					
Erioderma pedicellatum	**Boreal Felt Lichen**	EN	EN	EN	S1
Elodium blandowii	Blandow's Bog Moss				S3?
Vascular Plants					
Ranunculus sceleratus	Cursed Buttercup				S2

Table 3.13 SAR and SOCC Within 5 km of the MLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Caltha palustris	Yellow Marsh Marigold				S2S3
Hudsonia ericoides	Pinebarren Golden Heather				S2
Clethra alnifolia	**Coast Pepper-bush**	TH	EN	VU	S2
Polygala sanguinea	Blood Milkwort				S3
Senecio pseudoarnica	Seabeach Ragwort				S3
Carex swanii	Swan's Sedge				S3
Cypripedium parviflorum	Yellow Lady's-slipper				S3
Neottia bifolia	Southern Twayblade				S3

Notes:
Bold common name indicates SAR status.
†ACCDC includes three species of bats as one unit. These species are the *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat). Each has the same status (EN) and the same S-Rank (S1).
[1] Species at risk in Canada listed under Schedule 1 the federal *Species at Risk Act* as Endangered (EN), Threatened (TH), or Special Concern (SC) (Government of Canada 2023).
[2] Species in Canada assessed by COSEWIC as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC); not at risk species = NAR, Data Deficient = DD (Government of Canada 2023).
[3] Species at risk in Nova Scotia listed under the provincial *Endangered Species Act* (NS) as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC; Government of Nova Scotia 2023).
[4] Species ranked by the Atlantic Canada Conservation Data Centre (AC CDC 2023) and recorded within 5 km of the Project by desktop data source, where:
S1: Critically Imperiled – Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences). May be especially vulnerable to extirpation.
S2: Imperiled – Imperiled in the province because of rarity due to very restricted range, very few populations (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3: Vulnerable – Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer).
S4: Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors (80+ occurrences).
S5: Secure – Common, widespread, and abundant in the province.
S#S#: A numeric range rank (*e.g.*, S2S3) is used to indicate any range of uncertainty about the status of the species or community.
SH: Possibly Extirpated (Historical) – Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
SU: Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

Incidental observations of wildlife were recorded during wetland, vegetation, water, and archeology field programs. Stantec observed 47 species (32 birds, 8 mammals, 4 amphibians, 3 reptile) including one SOCC. A total of 207 vascular plant species were recorded during the vegetation surveys including four SOCC. The SOCC species observed in the field are identified in Table 3.14 and shown on Figure 3.8. SAR and SOCC that have been reported by AC CDC near the MLSA are also presented in Figure 3.8. A full list of species observed during field studies is available in Appendix C.

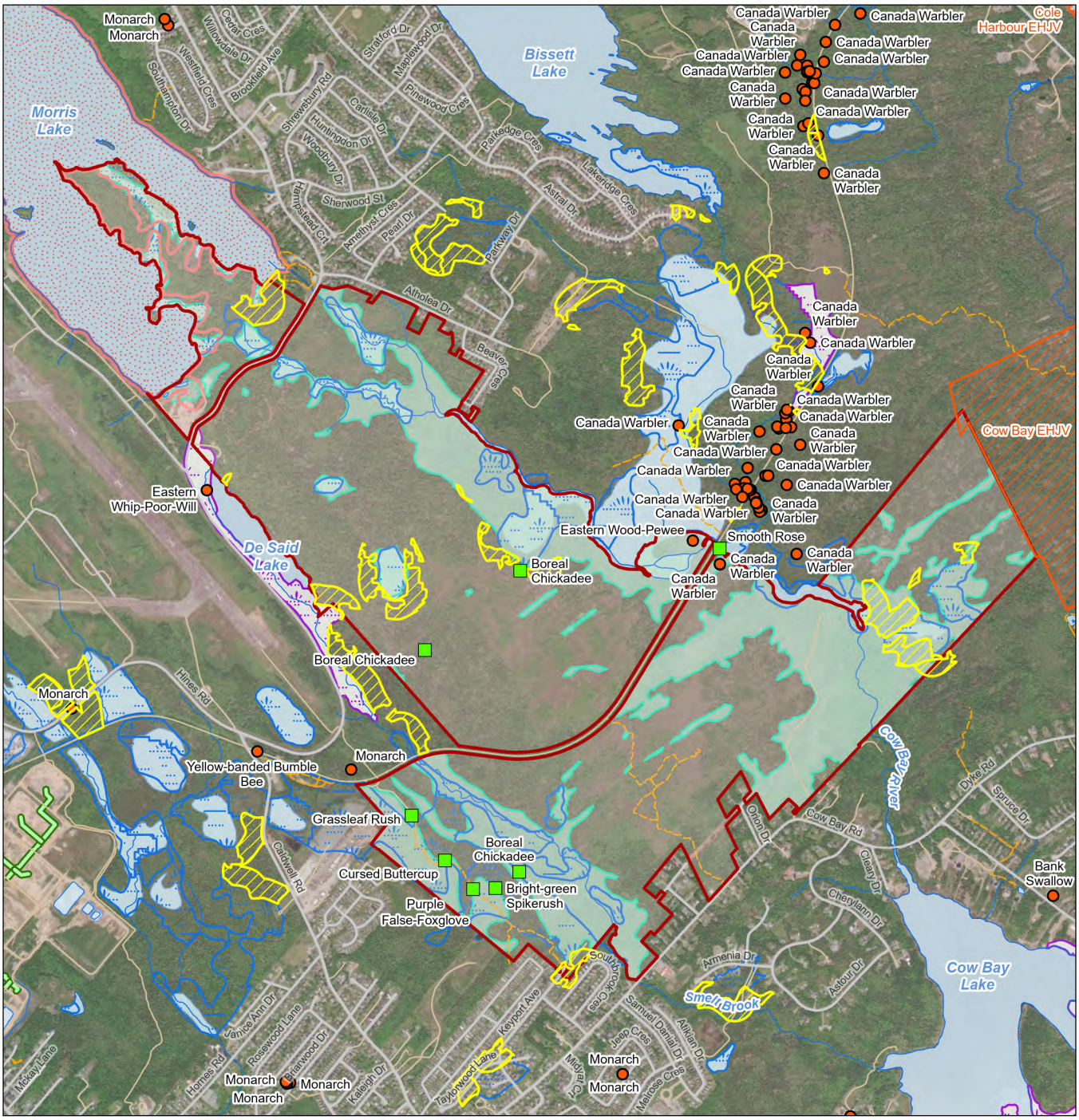
The presence of individual SAR was not used exclusively to evaluate the role of SAR on land suitability within the MLSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present at the MLSA. Instead, SAR that are or could potentially be present in the MLSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the MLSA. The habitat preferences of these species were compared to the results of the upland, wetland, and aquatic surveys conducted on the MLSA along with available habitat mapping. Where matches were found between SAR habitat preferences and the habitats that had been mapped in the MLSA, those species were considered potentially present.

A different method was used to assess the potential presence of boreal felt lichen (*Erioderma pedicellatum*).

Table 3.14 Incidental Observations of SAR and SOCC

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Birds					
Poecile hudsonicus	Boreal Chickadee	-	-	-	S3
Vascular Plants					
Ranunculus sceleratus	Cursed Buttercup	-	-	-	S1S2
Rosa blanda	Smooth Rose	-	-	-	S1
Agalinus purpurea	Purple False-foxglove	-	-	-	S2S3
Eleocharis flavescens var. olivacea	Bright-green Spikerush	-	-	-	S3

Notes:
Bold indicates SAR status.
[1] Species at risk in Canada listed under Schedule 1 the federal *Species at Risk Act* as Endangered (EN), Threatened (TH), or Special Concern (SC) (Government of Canada 2023).
[2] Species in Canada assessed by COSEWIC as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC); not at risk species = NAR, Data Deficient = DD (Government of Canada 2023).
[3] Species at risk in Nova Scotia listed under the provincial *Endangered Species Act* (NS) as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC; Government of Nova Scotia 2023).
[4] Species ranked by the AC CDC (AC CDC 2023) and recorded within 5 km of the Project by desktop data source, where:
S1: Critically Imperiled – Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences). May be especially vulnerable to extirpation.
S2: Imperiled – Imperiled in the province because of rarity due to very restricted range, very few populations (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3: Vulnerable – Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer).
S4: Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors (80+ occurrences).
S5: Secure – Common, widespread, and abundant in the province.
S#S#: A numeric range rank (*e.g.*, S2S3) is used to indicate any range of uncertainty about the status of the species or community.
SH: Possibly Extirpated (Historical) – Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
SU: Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.





Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Natural Resources and Renewables; NS Environment and Climate Change; East Coast Aquatics - Ecological aspects of a local Wood Turtle (*Glyptemys insculpta*) population along the Sackville River, Nova Scotia (Page 17) 2016.; Atlantic Canada Conservation Data Centre, 2023
3. Background: Government of Nova Scotia Department of Service Nova Scotia and Internal Services; Nova Scotia Department of Natural Resources and Renewables

- Species of Conservation Concern (Incidental Observation)
- Species at Risk and Species of Conservation Concern (ACCDC)
- Pipeline
- Road
- Resource / Seasonal Road
- Trail
- Waterway
- Waterbody
- Wetland (Stantec, 2023)
- Wetland (NSECC)
- Designated Wetland of Special Significance
- Significant Habitat - Migratory Bird
- Boreal Felt Lichen Predicted Habitat (NSECC, 2010)
- Managed Area (ACCDC)
- Study Area

0 250 500 Metres
(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IPodrug on 2024-03-07
Revised by NWhite on 2024-03-14
Revised by SChubbs on 2024-05-10

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure ID: 007

Figure No.
3.8

Title
SAR, SOCC, and Sensitive Habitats Identified - MLSA

\\Ca0213-ppfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM FCM 2022.aprx Revised: 2024-05-23 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.4.3.1 Species at Risk Descriptions

SAR identified in either the AC CDC (2023) report or identified during the field programs are described below. Species are presented in the order they appear in the tables above and information is provided on the species biology, as well as its regulatory status. Species identified during field programs are marked with an asterisk (*).

Harlequin Duck

The eastern population of the harlequin duck is listed as Special Concern under the federal SARA and Endangered under the Nova Scotia ESA. The harlequin duck is a sea duck that nests along fast flowing streams (COSEWIC 2013a). It does not nest in Nova Scotia and the nearest breeding populations are in northern New Brunswick and in the Gaspe Peninsula of Quebec. Harlequin ducks spend the winter months in coastal waters. Wintering birds are typically found on exposed, rocky coastline. This species has high site fidelity for wintering sites. The AC CDC data report indicates that harlequin duck has been recorded once within a 5 km radius of the Study Area. The record is from South East Passage, 4.7 km east of the MLSA. No suitable harlequin duck wintering habitat is present in the MLSA.

Barrow's Goldeneye

Barrow's goldeneye is listed as Special Concern under the federal SARA but is not listed under the NS ESA. The federal ranking was first assigned in 2003, and was reevaluated, with no changes made, in 2011 (COSEWIC 2000; 2011a). Barrow's goldeneye is a medium sized diving duck residing in Canada and the United States. Most Barrow's goldeneyes are found west of the Rocky Mountains; however, a small population is present in Quebec and the Atlantic provinces (COSEWIC 2011a). In eastern Canada Barrow's goldeneyes nest in Quebec in the boreal forest along the north shore of the St. Lawrence River. This species does not nest in Nova Scotia; however, small numbers of Barrow's goldeneyes winter in nearshore coastal waters of Nova Scotia where they feed on mussels and other aquatic invertebrates. There is one record of Barrow's goldeneye within 5 km of the MLSA. This record was from South East Passage, 4.8 km west of the MLSA. The Study Area provides neither suitable breeding nor wintering habitat for this species.

Piping Plover

Piping plover is listed as Endangered under both the federal SARA and the NS ESA. In Nova Scotia this species nests on coastal beaches, usually on barrier islands and sand bars (COSEWIC 2013b). The beaches where piping plovers nest are typically wide, sparsely vegetated and have a mix of substrates including sand, pebbles, gravel, and shells.

There are 71 records of piping plover within 5 km of the MLSA. Most of the records are from Rainbow Haven Beach, Cole Harbour, Cow Bay, and McNabs Island. Given the fact that the MLSA contains no coastal beaches, piping plovers would not use the MLSA as habitat.

Lesser Yellowlegs

The lesser yellowlegs is a medium-sized shorebird that nests in wetlands in the boreal forest of Canada and Alaska. This species is listed as Threatened by COSEWIC (2020a) but is not listed under either the federal SARA or the NS ESA. Lesser yellowlegs do not nest in Nova Scotia but pass through the province during fall migration. In the Maritime Provinces, lesser yellowlegs typically use both freshwater and marine shorelines during migration (COSEWIC 2020a).

There are 75 records of lesser yellowlegs observed within 5 km of the MLSA. Most of these birds were observed at either Cole Harbour or Rainbow Haven Beach, presumably in coastal wetlands and shores. There are also a few records from South East Passage and Devils Island. This species may also use freshwater shorelines. Areas within the MLSA that could provide suitable migration foraging habitat for lesser yellowlegs include the shorelines of Morris Lake and De Said Lake at the western end of the MLSA and Cow Bay River along the northern boundary.

Hudsonian Godwit

The Hudsonian godwit is a large shorebird that nests in the Canadian Arctic and Alaska. This species is listed as Threatened by COSEWIC (2019) but is not listed under either the federal SARA or the NS ESA. Hudsonian godwits do not nest in Nova Scotia but pass through the province during fall migration. This species is noted for its long-distance flights that may take days to complete. Because of these long-distance flights, many Hudsonian godwits fly over Nova Scotia but relatively few interact with habitats in the province. During migration, Hudsonian godwits will forage in coastal marshes and mudflats in Nova Scotia (COSEWIC 2019).

The MLSA does not contain suitable Hudsonian godwit foraging habitat so it is unlikely that this species would make use of habitats in the MLSA. There are 16 records of Hudsonian godwits within 5 km of the MLSA. Most of these records were from coastal habitats at Cole Harbour and Upper Lawrencetown with single records from, Eastern Passage and Devils Island.

Red Knot

The red knot is a medium sized shorebird that nests in barrens habitat in the Arctic. Red knots pass through Nova Scotia during migration with more birds present in the fall than in the spring. In Nova Scotia, red knots are typically found on sandy beaches with adjacent mud flats (COSEWIC 2020b). They may also feed on low-lying meadows after the hay has been cut.

Red knots were recorded on 18 occasions within 5 km of the MLSA with all but two records from Cole Harbour. The remaining two records are from Eastern Passage. Suitable foraging habitat for red knots is not present in the MLSA so this species would not be present.

Buff-breasted Sandpiper

The buff-breasted sandpiper is listed as Special Concern under the SARA but is not listed under the NS ESA. Most buff-breasted sandpipers nest in the Canadian Arctic. During migration, adults move south through the center of the continent while juveniles work their way towards the Pacific or Atlantic Coast and follow the coastline south to their wintering grounds in South America (COSEWIC 2012a). During migration, buff-breasted sandpipers favour open areas with low vegetation cover such as short-grass prairie, grazed pastures, and salt marsh. The MLSA does not provide suitable migration habitat for buff-breasted sandpiper; consequently, this species is not expected to be present.

Red-necked Phalarope

The red-necked phalarope is a pelagic shorebird that is listed as Special Concern under the federal SARA but is not listed under the NS ESA. This species is a circumpolar breeder. Parts of the Canadian and European populations of red-necked phalaropes migrate along the Atlantic coast to their wintering area in the Humbolt Current off the coast of Ecuador, Peru, and Chile (ECCC 2022a). Most birds migrate offshore and are not commonly observed in nearshore waters.

There are three records of Red-necked Phalarope from within 5 km of the MLSA.

These records are from Cole Harbour, Hartlen Point and an undisclosed location. The nearest record is 4.4 km from the center of the MLSA. Suitable habitat for Red-necked Phalarope is not present at the MLSA so this species would not be present.

Short-eared Owl

The short-eared owl is listed as Special Concern under the federal SARA but is not listed under the NS ESA. This species is a year-round resident of Nova Scotia. Its preferred nesting habitat is in large open habitats at least 50 ha in size such as grasslands, dyked wet meadows, tundra, and marshes (COSEWIC 2021a). Most breeding occurs near the coast.

There are three records of short-eared owl from within 5 km of the MLSA. Two of the records are from Maritime Breeding Bird Atlas (MBBA) squares in 2010. The MBBA records are derived from a 100 km^2 area. The center of the MBBA square is used as the location coordinates for all birds recorded in this area. No precise location data are available for bird records from this program. The third record is from South East Passage, Eastern Passage which is located 4.8 km from the MLSA. Short-eared owls have also been observed at 12 Wing Shearwater which is located approximately 200 m south of the southern boundary of the MLSA. There is little open habitat on the MLSA that would provide suitable habitat for short-eared owls. There are several graminoid dominated wetlands, however, these are not large enough to provide suitable habitat. There is a relatively large (approximately 75 ha) area of barrens in the center of the MLSA. This open habitat is of sufficient size; however, the heavy and relatively tall cover of ericaceous shrubs would provide poor foraging and nesting cover. It is unlikely that short-eared owls would be present on the MLSA Site although they may be present near it at 12 Wing Shearwater.

Common Nighthawk

Common nighthawk is listed as Special Concern under the federal SARA and as Threatened under the NS ESA. Common nighthawk was first federally listed as Threatened in 2007 (COSEWIC 2007a); however, due to a stabilization in the rate of decline, and the abundance of common nighthawk in suitable environments, COSEWIC (2018a) revised the status to Special Concern in 2018. The federal SARA status was downgraded from Threatened to Special Concern in 2023. Common nighthawk is a medium-sized aerial insectivore that nests in a variety of open habitats with minimal ground vegetation including open forest (especially areas with cuts, burns or rock outcrops), short grass prairie, dry bogs, rocky areas (such as quarries, gravel pits, and bedrock outcrops), sandy coastal habitats and settled areas that resemble open natural areas such as railways, gravel roads, airports, cultivated fields, orchards, parks, buildings with gravel roofs, oil-well pads, and pipelines. Common nighthawks are opportunistic generalist foragers and aggregate in areas where flying insects are abundant including waterways, lighted areas, and wetlands.

No common nighthawks were observed during the field surveys. There are four records of common nighthawk within a 5 km radius of the center of the MLSA. All the records are from either the Cole Harbour or Halifax MBBA square. Each of these MBBA squares is 100 km^2 so it is not possible to determine with any accuracy where these common nighthawks were observed. Suitable nesting habitat is present at the MLSA at several locations where grubbing and roads have exposed bare ground and where rocky bedrock outcrops are present. Grubbed areas are present near the northern end of De Said Lake and near the Shearwater Flyers trail head. Small bedrock exposures are scattered throughout the MLSA but are most frequently encountered in the barrens habitat in the center of the MLSA.

Eastern Whip-poor-will

The eastern whip-poor-will is a nocturnal insectivorous bird which is listed as Threatened by both the federal SARA and the NS ESA. This species nests in sparse forests or at the edge of forests adjacent to open habitats required for foraging (ECCC 2018b). Foraging habitats are varied but typically have relatively sparse tree cover. Foraging habitat can include wetlands with shrubs, shrub thickets, regenerating clear-cuts, and agricultural lands. Suitable foraging habitat must have scattered trees or other elevated structures that can be used as perches. A variety of forest types are used as nesting habitat as well as rock or sand barrens with scattered trees, savannahs, old burns, and sparse conifer plantations. Structurally, suitable nesting sites have well drained soils (eastern whip-poor-wills nest on the ground), moderate tree cover, and moderate to sparse shrub and herbaceous cover. Eastern whip-poor-will may also nest in dense forest adjacent to suitable foraging habitat, with nests typically established within 30 m of the edge of the dense forest.

There are two records of eastern whip-poor-wills from within 5 km of the MLSA. Both were recorded in the Cole Harbour MBBA square in 2008. No precise location data are available for the first record other than that it was recorded somewhere within the 100 km^2 square whose center is located 3.3 km from the Study Area. However, a relatively accurate location is available for the second record which is located at the northern end of De Said Lake. Suitable habitat for eastern whip-poor-will may be present at the western end of the MLSA. This area contains forested habitat located adjacent to large areas of open grassland

and patches of shrub cover associated with the runways at 12 Wing Shearwater. Eastern whip-poor-wills could potentially nest in a 30 m wide strip of forest extending along the eastern shore of De Said Lake. There is a large area (approximately 75 ha) of barrens habitat in the center of the MLSA that may also provide suitable nesting and foraging habitat. Shrub cover in most of this barrens area is thick and relatively tall which may reduce its value as nesting and foraging habitat for eastern whip-poor-wills.

Chimney Swift

Chimney swift is listed as Threatened under the federal SARA and Endangered under the NS ESA. This species has been assessed by COSEWIC twice, first in 2007, followed by a confirmatory report in 2018 (COSEWIC 2007b; 2018b). Chimney swift is a small aerial insectivore which is found in Eastern North America during the breeding season. Before European settlement, chimney swifts nested and roosted in large hollow trees. These nesting and roosting sites became less common because of forest harvesting. Chimney swifts adapted to the loss of natural nesting and roosting sites by using large masonry chimneys for nesting and roosting. Eventually, large masonry chimneys fell out of favor and the supply of suitable nesting and roosting sites dwindled.

There are three records of chimney swift recorded within 5 km of the MLSA. One record is from Colby Village and the second is from Rainbow Haven. The third record is from the Cole Harbour MBBA which amalgamates bird records from a 100 km^2 MBBA square. It is, therefore, impossible to determine with precision where this bird was observed. No chimney swifts were observed during the field surveys. No large masonry chimneys are present in the Study Area and there are few large trees at the Study Area that could provide nesting sites. It is unlikely that chimney swifts would breed at the MLSA.

Olive-sided Flycatcher

Olive-sided flycatcher is listed as Special Concern under the federal SARA and as Threatened under the provincial NS ESA. It was first federally listed as Threatened in 2007; however, due to a stabilization in the rate of decline, COSEWIC (2018c) revised the status to Special Concern in 2018. The federal SARA status was downgraded in Schedule 1 from Threatened to Special Concern in 2023. In Nova Scotia, olive-sided flycatchers are found in forested areas where scattered trees or snags remain after clear-cutting or fire, as well as mature stands of black spruce (*Picea mariana*) adjacent to bogs, fens, beaver ponds, or clearcuts. Nests are established in black spruce trees.

No olive-sided flycatchers were recorded during the field surveys. The AC CDC data report (2023) indicates that one olive-sided flycatcher has been recorded within approximately 5 km of the MLSA. This bird was observed in the Cole Harbour MBBA square in 2006. Habitat mapping for the Study Area indicates that suitable nesting habitat for olive-sided flycatcher may be present at two locations in the MLSA. There is an area of wooded swamp near the point where the Shearwater Flyer Trail crosses the Cow Bay River that has recently suffered heavy tree mortality because of hydrological fluctuations. The presence of open wetland habitat with scattered snags would provide good olive-sided flycatcher habitat provided patches of thick conifer cover are also present. The large area of barrens habitat in the center of the MLSA may also provide suitable breeding habitat for olive-sided flycatchers. The barrens consists of a matrix of open low shrub dominated areas, small patches of forest including patches of coniferous forest and scattered snags or living trees.

Eastern Wood-Pewee

Eastern wood-pewee is listed as Special Concern under the federal SARA and Vulnerable under the NS ESA. Eastern wood-pewee is a medium sized flycatcher that typically nests in mature deciduous and mixedwood forest stands. They typically occupy the mid to upper layers of the canopy and favor areas where canopy openings are present where they can catch flying insects (NSDNRR 2022a). Threats to eastern wood-pewee are poorly understood, but like most aerial insectivores, a decline in insect populations is thought to be a key contributor (COSEWIC 2012b).

The AC CDC data request (2023) indicates that there are three records of eastern wood-pewee within approximately 5 km of the MLSA. One record is from 1986 from within the 100 km^2 Cole Harbour MBBA square so it is not possible to determine with any precision where these birds were observed. The second record is from near the Shearwater Flyer Trail near the bridge over the Cow Bay River at the western boundary of the MLSA. The third record is from South East Passage, 4.6 km southeast of the MLSA. No eastern wood-pewees were recorded during the field surveys; however, the field surveys were executed late in the summer at this site after the end of the breeding season when eastern wood-pewees sing and are most easily detected. FEC forest stand mapping for the Study Area suggests that suitable nesting habitat may be present in the MLSA. This would include mature deciduous and mixedwood forest stands in the northern portions of the MLSA that border open habitats such as man-made forest clearings and those that flank open wetland habitats along the Cow Bay River and recently flooded forest stands.

Bank Swallow

Bank swallow is listed as Threatened under the federal SARA and as Endangered under the provincial NS ESA. Bank swallows nest in burrows that they excavate in a variety of habitat types. These include lake and ocean bluffs; stream and riverbanks; sand and gravel pits; roadcuts; piles of sand, topsoil, sawdust, coal ash, and other materials (COSEWIC 2013c). The nest burrows are excavated in vertical or near vertical slopes (76 - 105º slope). Critical habitat has been defined and mapped for bank swallow in Nova Scotia (NSDNRR 2021). Critical habitat is the habitat that is necessary for the survival or recovery of a species. Critical habitat for this species consists of suitable nesting habitat as well as suitable foraging habitat that is found within 500 m of the nesting habitat. Foraging habitat consists of open habitats that produce insects such as wetlands, salt marshes, grasslands, and hay fields. Seasonal wetlands or ponds that are flooded are important sources of insect prey for bank swallows.

The Study Area does not fall within Bank Swallow critical habitat that is currently mapped. The AC CDC data search (2023) indicated that there are 50 records of Bank Swallow within approximately 5 km of the MLSA with most of the records from Hartlen Point. The nearest record is from the northern shore of Cow Bay which is 2.7 km from the center of the MLSA. No Bank Swallows were observed during the field surveys. No natural potential nesting sites (lake bluffs and stream banks) or anthropogenic nesting sites (steep embankments or soil stockpiles) were observed within the Study Area. It is unlikely that Bank Swallows nest at the MLSA.

Barn Swallow

Barn swallow is listed as Threatened under the federal SARA and Endangered under the provincial NS ESA; however, the species was re-assessed as Special Concern in 2021 (COSEWIC 2021b) making it eligible for a status change under the federal SARA. Barn swallow is a mid-sized aerial insectivore that forages in open habitats (e.g., agricultural fields, shorelines) and nests on anthropogenic structures, particularly in rural areas, and other structures (e.g., culverts; COSEWIC 2011b). Before European settlement, barn swallow nesting habitat was mainly characterized by natural features such as caves, holes, crevices, and ledges associated with rocky cliff faces. Although barn swallows continue to nest in traditional natural situations, they are now most closely associated with human-made structures in rural areas. Such nesting sites include a variety of artificial structures that provide either a horizontal nesting surface (e.g., a ledge) or a vertical face, usually with some sort of overhang that provides shelter. Nests are most commonly located in and around open barns, garages, sheds, boat houses, bridges, road culverts, verandahs, and wharfs, and are situated on such things as beams and posts, light fixtures, and ledges over windows and doors (COSEWIC, 2011b). This species was listed on Schedule 1 of SARA in 2017, but critical habitat has not been identified to date.

No barn swallows were observed during the field surveys in August when this species would be present in Nova Scotia. There were 19 records of barn swallows reported by the AC CDC (2023) within a 5 km radius from the MLSA. The nearest record is from Colby Village, 3.3 km north of the MLSA. There is no suitable nesting habitat inside the MLSA; however, the MLSA is bordered in some areas by residences, some of which may provide suitable nesting habitat. Potential foraging habitat for barn swallows that might nest adjacent to the MLSA would include Morris Lake and De Said Lake at the northern end of the Study Area and Cow Bay River along the western boundary of the MLSA.

Canada Warbler

Canada warbler is listed as Threatened under the federal SARA and Endangered under the provincial NS ESA; however, the species was re-assessed as Special Concern in 2020 (COSEWIC 2020c) making it eligible for a status change under the federal SARA. Close to 80% of the Canada warbler population breeds in Canada (COSEWIC 2020c). Many key threats identified by COSEWIC (2020c) are present on the wintering grounds outside of Canada, though habitat loss in Canada is recognized as a contributing factor.

Canada warblers are found in a variety of forest types, but are most common in wet, mixed deciduous-coniferous forest with a well-developed shrub layer. It is also found in shrub swamps, red maple (*Acer rubrum*) stands, eastern white cedar (*Thuja occidentalis*) stands, conifer swamps dominated by black spruce (*Picea mariana*) and larch (*Larix laricin*a), and riparian woodlands along rivers and lakes.

No Canada warblers were encountered during the field surveys. This species is typically found in dense vegetation and the field surveys were not conducted during peak Canada warbler breeding activity in June when this species can be detected by its song so it is likely that Canada warbler may have gone undetected during the field surveys. There are 74 AC CDC records of Canada warbler within approximately 5 km of the MLSA. There are two records that appear to be inside the MLSA. Both records

are from near the point where the Shearwater Flyer Trail crosses Cow Bay River. There are six records from just outside of the MLSA approximately 100 m northwest of the same bridge crossing. The remaining records are from outside of the MLSA on the Shearwater Flyer Trail, the Salt Marsh Trail as well as from the Cole Harbour MBBA.

There is suitable habitat for Canada warblers at various locations within the MLSA. Twenty forested or tall shrub dominated wetlands having relatively open tree overstories and dense shrub understories were encountered during the field surveys which could provide suitable breeding habitat for this species.

Yellow-breasted Chat

The yellow-breasted chat is listed as Endangered under the SARA but is not listed under the NS ESA because this species occurs in Nova Scotia as a vagrant. It does not nest in Nova Scotia and does not normally migrate through the province. There are four records of yellow-breasted chat from within 5 km of the MLSA. Three of the records are from Colby Village and the fourth is from Sunset Acres. All records are from early winter and most are likely birds blown north by storms or are reverse migrants. Yellow-breasted chats typically nest in dense shrub cover often near habitat edges and forage in the same habitat type outside of the breeding season (COSEWIC 2011c). Suitable nesting and foraging habitat is present in the MLSA; however, since this bird occurs as a vagrant, this habitat is not ecologically important to this species.

Ipswich Sparrow

The Ipswich Sparrow is listed as Special Concern under the federal SARA but is not listed under the NS ESA. The Ipswich Sparrow is a large sub-species of Savannah Sparrow. Almost the entire population of Ipswich Sparrows breeds on Sable Island (COSEWIC 2008a). A few Ipswich Sparrows do not return to Sable Island in the spring and breed with Savannah Sparrows on mainland Nova Scotia. Ipswich Sparrows nest on Sable Island in areas dominated by heath and areas dominated by Marram grass (*Ammophilla breviligulata*) which comprise most of the vegetation on Sable Island.

There are 21 records of Ipswich Sparrow from within 5 km of the MLSA. Most of the records are from South East Passage, with a few records from Eastern Passage and one from Devils Island. All the records are of spring migrants which pass through Nova Scotia during the period from late March to early May. The MLSA does not provide suitable habitat for either breeding or migrating Ipswich Sparrows.

Harris's Sparrow

Harris's Sparrow is listed as Special Concern under COSEWIC but is not listed under either the SARA or the NS ESA. Harris's Sparrows nest in northwestern Canada and winter in south central United States of America (COSEWIC 2017a). This species breeds in the transitional zone between boreal forest and tundra. During migration and in the wintering grounds, Harris's Sparrows use a variety of habitats including riparian thickets, woodland edges, hedgerows, willow thickets, and agricultural fields. This species does not breed in Nova Scotia and does not normally migrate through Nova Scotia. It occurs as an occasional vagrant. There is one record of Harris's Sparrow from 7.1 km from the MLSA. This record is

from early winter and is likely a migrant blown off course or a reverse migrant. Suitable winter foraging habitat is present on the MLSA; however, since this bird occurs as a rare vagrant, this habitat is not ecologically important to this species.

Bobolink

The Bobolink is a medium sized grassland passerine that is listed as Threatened under the federal SARA and Vulnerable under the NSESA; however, the species was re-assessed as Special Concern in 2022 (COSEWIC 2022a) making it eligible for a status change under the federal SARA. Bobolinks nest in natural grasslands and in agricultural lands used as hay fields and pasture. They prefer to nest in areas composed mainly of dense grass of moderate height (ECCC 2022b). Grass swards with moderate thatch are preferred. Forb cover in suitable nesting habitat is low to moderate and the cover of trees and shrubs is low. Scattered trees, tall shrubs, power poles, or fence posts are required as singing posts for males. Minimum habitat size varies geographically and by habitat quality, but 10 ha is believed to be the minimum habitat size required for successful nesting.

No bobolinks were encountered in the MLSA. The AC CDC data report indicates that there are two records of bobolink within a 5 km radius of the Study Area. One was from the Cole Harbour MBBA square from 1986 and the second was from Rainbow Haven. The MLSA contains no suitable habitat for bobolinks and this species is not expected to be present in the MLSA.

Rusty Blackbird

Rusty blackbird is listed as Special Concern under the federal SARA and Endangered under the provincial NS ESA. Rusty blackbird is a medium-sized blackbird found in coniferous-dominated forests adjacent to wetlands (COSEWIC 2017b). Approximately 85% of the rusty blackbird breeding range is in Canada. Rusty blackbird breeding habitat includes sedge meadows, beaver ponds, muskegs, swamps, scrub riparian habitats of islands, lakes, rivers and streams, as well as alder and willow thickets. In Cape Breton rusty blackbirds will occasionally occur in pastures. This species typically selects breeding areas that contain shallow water areas for foraging and low open coniferous cover for nesting. Rusty blackbirds are typically found in remote areas.

No rusty blackbirds were recorded during the field surveys. There is one record of rusty blackbird located within approximately 5 km of the MLSA. This record is from the Cole Harbour MBBA square in 1986. No precise location data are available for this record other than that it was recorded somewhere within the 100 km^2 square whose center is located 3.3 km from the center of the MLSA. The habitat mapping for the Study Area reveals that potential rusty blackbird nesting habitat may be present in coniferous forest and conifer dominated forested wetlands located adjacent to streams that flow through the MLSA including Smelt Brook in the southeastern corner of the MLSA and Cow Bay River and several of its tributaries that are located along the western edge of the MLSA. These areas contain both shallow water areas and patches of low open coniferous cover. However, given the proximity of the MLSA to residential development, the likelihood of rusty blackbirds nesting in these areas may be low.

Evening Grosbeak

Evening grosbeak is listed as Special Concern under the federal SARA and Vulnerable under the provincial NS ESA. Evening grosbeaks nest in large mature conifer stands and old mixed forest stands with a high proportion of balsam fir (*Abies balsamea*), white spruce (*Picea glauca*) or trembling aspen (*Populus tremuloides*) (COSEWIC 2016a). Forest Stands having varied structure and open canopy are preferred as breeding habitat. Evening grosbeaks are resident birds that can remain in their breeding range year-round. During the winter months evening grosbeaks are often attracted to areas where seeds and berries are abundant. This species is attracted to plant species that produce large-winged seeds, particularly Manitoba maple (*Acer negundo*) and will also visit bird feeders where common sunflower (*Helianthus anuus*) seeds are available.

No evening grosbeaks were observed during the field surveys. The AC CDC data search (2023) indicated that there are three records of evening grosbeak within 5 km of the MLSA. An evening grossbeak was confirmed as nesting within the Cole Harbour MBBA square in 2010. It is not possible to determine the precise location where it was observed. The two remaining records are from late fall or early winter and were recorded from the Forest Hills area 4.6 and 5.7 km from the MLSA. The MLSA contains few old conifer or mixedwood stands and none of these stands had the tree species composition preferred by nesting evening grosbeaks. It is therefore unlikely that evening grosbeak would nest at the MLSA. There are some residences located around the periphery of the MLSA and it is likely that some of these residences feed birds which may attract evening grosbeaks to the MLSA outside of the breeding season.

Myotis and Perimyotis Bats

The AC CDC (2023) data request results indicate that bats may be present near the MLSA. Three species of hibernating bat have been listed as Endangered by both the federal government and the province of Nova Scotia. These include little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*) and tri-colored bat (*Perimyotis subflavus*) (COSEWIC 2013d). The populations of these three bat species have been severely reduced by white-nose syndrome, an introduced disease caused by the fungus (*Pseudogymnoascus destructans*) that affects hibernating bats. Little brown myotis, northern myotis and tri-colored bat are considered location sensitive species in Nova Scotia, and thus location data for sightings of these species are considered confidential and are not provided in AC CDC data reports.

Habitat for these three species consists of hibernacula for overwinter survival and summering areas with suitable foraging areas within commuting range of structures used for roosting or maternity colonies. Hibernacula have been identified as critical habitat for little brown myotis, northern myotis and tri-colored bat (ECCC 2018b). All three species hibernate in caves or abandoned mines. Hibernation habitat is used for approximately six months each year. No critical habitat has been identified near the MLSA. The nearest areas known to provide bat hibernacula are near Ship Harbour approximately 50 km to the east and Milford Station approximately 45 km to the north.

These bat species forage in a variety of habitat types which vary by species. Foraging habitat includes lakes, ponds and rivers, forest gaps, the edges of forests and along trails. These bat species tend to avoid large open areas such as agricultural land, large clear-cuts and burned forests. Maternity colony habitat varies by species. Little brown myotis females will establish maternity colonies in buildings, under

bridges, in rock crevices, or in cavities of canopy trees in forests. Northern myotis establish maternity colonies in large trees. Tri-colored bats often establish maternity roosts in clumps of arboreal lichens and may also establish maternity colonies in buildings. Maternity colonies often consist of hundreds of females and their young, so the locations of these roost sites are important. Males typically do not roost in large numbers and may use a variety of sites such as snags, crevices under bark and human made structures.

Hibernaculum sites and maternity colonies are the most important and sensitive habitats for non-migratory bats since large numbers of individuals gather at these sites. The geology of the MLSA is not conducive to the formation of solution caves and there was no evidence to indicate that underground mine workings are present in the Study Area. As such, it is unlikely that the Study Area provides potential hibernacula for bats. The Study Area is mostly forested. The mature mixed forest stands found in the Study Area could potentially be suitable for maternity colonies. Attics in residences situated around the periphery of the MLSA could provide maternity colony sites for little brown myotis and possibly tri-colored bat. Suitable foraging habitat would be present throughout most of the MLSA.

Silver-haired Bat

The silver-haired bat is listed as Endangered by COSEWIC but has not been listed under either the federal SARA or the NS ESA. The silver-haired bat is a migratory species that breeds in much of North America and winters in the United States of America and Mexico (COSEWIC 2023). Silver-haired bats are uncommon in Nova Scotia during late spring and summer and are absent during the rest of the year although an overwintering silver-haired bat has been recorded in the province. While in Canada silver-haired bats require roosting, drinking and foraging habitat. Foraging habitat is the most important of these habitats. Roosting sites provide shelter for resting bats during the day as well as sheltered sites for bat pups. Silver-haired bats prefer to roost in tree cavities (hollow trees or woodpecker holes) or under sheets of loose bark. These preferred roost sites are typically associated with large trees.

The AC CDC data report indicates that there is one record of silver-haired bat near the MLSA. The location of the record is listed as Bon Portage which is located in southwestern Nova Scotia; however, the coordinates place it 6.5 km west of the center of the MLSA. The MLSA contains a number of mature forest or forested wetland stands that would have trees large enough to be used as roosting sites by silver-haired bats; consequently, there is potential for this species to be present in the MLSA.

Snapping Turtle

Snapping turtle is listed as Special Concern under the federal SARA and Vulnerable under the provincial NS ESA. Snapping turtles are found in Canada through Nova Scotia, New Brunswick, Quebec, Ontario, and in parts of Saskatchewan (COSEWIC 2008b). They are typically found in slow moving or standing water with a soft mud bottom and dense aquatic vegetation. Snapping turtles are found in lakes, ponds, sloughs, shallow bays or river edges and slow streams. Snapping turtles will bask on offshore logs or rocks when water temperatures are low. This species spends most of its time in the water; however, between mid-May and mid-June female snapping turtles leave the water to find suitable sites to lay their eggs. These nesting sites include sand and gravel banks along waterways, muskrat houses, abandoned beaver lodges, railroad and road embankments, gardens, pastures, sawdust piles, manure piles, and forest clearings. Nesting sites are usually located near water. Snapping turtles may follow streams (including rocky streams) to reach suitable nesting sites. Mating may occur in these streams during the movements to nesting sites. The eggs hatch during the early fall and the hatchlings disperse to water where they bury themselves under leaf litter and debris and hibernate until spring.

There are nine records of snapping turtles within approximately 5 km of the MLSA. The nearest records are from Morris Lake which forms the northern boundary of the MLSA. All the remaining records are from north and northeast of the Study Area. Suitable aquatic habitat for snapping turtles is present in or adjacent to the MLSA at Morris Lake, De Said Lake and the Stillwater portion of Cow Bay River which forms the northeastern boundary of the MLSA. Signage regarding snapping turtles is present on the Shearwater Flyers Trail Bridge that crosses Cow Bay River. Presumably, this would indicate that snapping turtles have been observed in this watercourse. The railroad bed and shoreline beaches at this location would provide good nesting habitat for snapping turtles. The borrow pit located near the north end of De Said Lake and the gravel pad located in the forest to the northeast of De Said Lake would also provide good nesting sites for snapping turtles.

Eastern Painted Turtle

The eastern subspecies of the painted turtle is listed as Special Concern under the federal SARA but is not listed under the NS ESA. Eastern painted turtle was first assessed by COSEWIC in 2018 (COSEWIC 2018d) and was designated as Special Concern in 2021. This suggests that a status change under the NS ESA is possible, as the federal designation was recent. The painted turtle is a small turtle with one of the most northernly distributions of North American freshwater turtles. In Canada, the eastern painted turtle subspecies is found in mainland Nova Scotia and near the coast in New Brunswick.

Eastern painted turtles occupy slow moving, relatively shallow and well vegetated wetlands (swamps, marshes, ponds, and oxbows) and water bodies (lakes, rivers, creeks, and streams) with abundant basking sites and organic substrate. They are found in association with aquatic plants including water shield (*Brasenia schreberi*), American water lily (*Nymphaea odorata*), cow lily (*Nuphar variegata*), pickerel weed (*Pontederia cordata*), and pondweed (*Potamogeton* spp.), which are used for cover and feeding.

No eastern painted turtles were observed during the field surveys. There are 17 AC CDC records of this species from within approximately 5 km of the MLSA. Most of the records are from Colby Village and the nearest record is from 2.7 km north of the MLSA in Colby Village. Suitable habitat for eastern painted turtles is present in or adjacent to the MLSA at Morris Lake, De Said Lake and the Stillwater portion of Cow Bay River which forms the northeastern boundary of the MLSA.

Wood Turtle

Wood turtle is listed as Threatened under both the federal SARA and the provincial NS ESA. Wood turtle was first added to Schedule 1 of SARA in 2010 and had the status of Threatened reaffirmed in 2018 (COSEWIC 2018e). Wood turtle is a medium-sized turtle with a grey/brown or yellow carapace. They can be found throughout Eastern North America, and prefer semi-aquatic, riparian environments. Wood turtle is considered a location sensitive species in Nova Scotia, and thus location data for individual sightings of wood turtle are considered confidential.

Wood turtles are associated with meandering shallow rivers with sand, gravel and/or cobble bottoms. These rivers are typically clear, with moderate current and frequent oxbows. Secondary tributaries (brooks) that feed these rivers may also support wood turtles by providing travel routes to resource patches. Still water or slow water habitats such as vernal pools, oxbows, marshes, and beaver ponds are also used, though less frequently than riverine habitats. Wood turtles are highly terrestrial and will forage in riparian and wetland habitats adjacent to river systems.

The AC CDC records indicate that wood turtle has been recorded within 5 km of the MLSA; however, since this species is considered location sensitive there is no precise location data available. The Cow Bay River runs along the northeastern boundary of the Study Area; however, it provides little exposed sand and gravel substrates during early summer when nesting occurs. The wetland habitats that surround it are acidic and oligotrophic and are not expected to provide good foraging habitat. Wood turtles are not expected to be present at the MLSA.

Atlantic Wolffish

The Atlantic wolffish is listed as Special Concern under the federal SARA but is not listed under the NS ESA. The Atlantic wolffish is an ocean fish that typically occupies benthic habitats that are rocky or sandy (COSEWIC 2012c). This fish is found from nearshore to depths of 918 m. There is one record of Atlantic wolffish from Devils Island, 5.9 km east of the Study Area. The MLSA contains no marine habitat so there is no potential for this species to be found there.

American Eel

The American eel is listed as Threatened by COSEWIC but is not listed under either the federal SARA or the NS ESA. American eels reproduce in the Sargasso Sea. Some eels remain at sea while others migrate to the rivers and streams where they mature before heading back to sea to reproduce (COSEWIC 2012d). American eels use a wide range of aquatic habitats and are capable of overcoming barriers to movement by leaving the water and moving over wet surfaces on the land. As such, they can be found far up small streams. American eels are generally nocturnal and spend the day in burrows or under cover objects. They feed on fish and aquatic invertebrates.

No American eels were observed during the field surveys. There are four AC CDC records of American eel within approximately 5 km of the MLSA with the nearest observations in Eastern Passage, 3.7 km southwest of the center of the MLSA. There are several locations at the MLSA where American eels could be expected to be present. These include Morris Lake, De Said Lake, Smelt Brook which drains De Said Lake, as well as the Cow Bay River and its tributaries which are found along the northeastern boundary of the MLSA.

Striped Bass

The striped bass is listed as Threatened by COSEWIC but is not listed under either the federal SARA or the NS ESA. The striped bass is an anadromous fish which spawns in freshwater and grows in salt water. In Nova Scotia, spawning occurs only on the Shubenacadie River (COSEWIC 2012e). There is one record of striped bass from Devils Island, 5.9 km east of the MLSA. The MLSA contains no marine or estuarine habitat so non-breeding striped bass would not be present. None of the freshwater watercourses on the site are connected to the watershed of the Shubenacadie River so spawning striped bass would not be present.

Atlantic Cod

The Atlantic cod is listed as Threatened by COSEWIC but is not listed under either the federal SARA or the NS ESA. The Atlantic cod is a marine fish that occupies a wide range of habitats. The most essential habitat for this species is thought to be the benthic habitat used by juvenile cod. Benthic habitat having abundant vertical structure such as eel grass (*Zostera marina*) beds provide necessary cover and prey sources for juvenile cod (COSEWIC 2010). There is one record of Atlantic cod from Devils Island, 5.9 km east of the MLSA. The MLSA contains no marine habitat so there is no potential for this species to be found there.

Monarch

Monarch is listed as Special Concern under the federal SARA and as Endangered under the NS ESA. The monarch is a milkweed butterfly in the family *Nymphalidae*. The eastern North American population is migratory and monarchs that breed in Northeastern North America migrate to over wintering sites in Mexico, Florida, and the Gulf Coast of the United States (COSEWIC 2016b). Adult monarchs feed on a variety of plant species and can be found in a variety of habitats. In Nova Scotia, monarch larvae feed on

the introduced common milkweed (*Asclepias syriaca*) and the native swamp milkweed (*Asclepias incarnata*). This limited selection of suitable larval food plants restricts the distribution of larval monarchs to the distribution of the two milkweed species. Common milkweed is typically found along roadsides and in agricultural fields particularly in sandy soils. It is uncommon in most of Nova Scotia but may be locally common in the Annapolis Valley. Swamp milkweed is an uncommon native species in Nova Scotia that is typically found in wet thickets usually near a stream or lake shore.

Monarchs have been recorded 93 times within approximately 5 km of the MLSA. The nearest record is 390 m south of the MLSA on Jeep Crescent. Six of the records were larval monarchs indicating that suitable host plants were present. The nearest larval record is from approximately 2.3 km north of the northern tip of the MLSA. Neither common milkweed nor swamp milkweed was noted at the MLSA during the habitat surveys; however, small populations of these species could potentially be present. Gardeners may also cultivate milkweed to provide breeding habitat for monarchs. Areas of the MLSA with the greatest potential to provide breeding habitat for monarchs would be relatively rich swamps and shorelines where swamp milkweed may be present such as along the shores of Cow Bay River. Patches of common milkweed could potentially be present on roadsides. Residential areas, which are found on the periphery of the MLSA, could also provide breeding habitat. Adult monarchs feed on nectar of a wide variety of flowers. Residential areas and open habitats such as old fields and vacant lots would provide high concentrations of flowers.

Yellow-banded Bumble Bee

Yellow-banded bumble bee is designated as Special Concern under the federal SARA and as Vulnerable under the NS ESA. The species was first assessed in 2015 (COSEWIC 2015) and was designated for federal status in 2018. Yellow-banded bumble bee is found in much of Canada and parts of the United States and occurs in a diverse range of habitats, including mixed woodlands, farmlands, urban areas, montane meadows, prairie grasslands and boreal habitats. It has been recorded foraging on flowers for pollen and nectar from a variety of plant genera. Like many bumble bees, it usually nests underground in pre-existing cavities such as abandoned rodent burrows and rotten logs. Yellow-banded bumble bee queens overwinter underground and in decomposing organic material such as rotting logs" (COSEWIC 2015; ECCC 2022c).

There are five records of yellow-banded bumblebee within approximately 5 km of the MLSA. The nearest record is from Shearwater approximately 540 m west of the western boundary of the MLSA. Given the generalist nature of this species and the wide range of forested and open habitats that it uses, yellow-banded bumble bees could potentially be present throughout the MLSA.

Gypsy Cuckoo Bumble Bee

The gypsy cuckoo bumble bee is listed as Endangered under both the federal SARA and the NS ESA. This species is an obligate nest parasite of other bumble bee species. Gypsy cuckoo bumble bee queens usurp the nests of other bumble bee species and use the host worker bees to care for the offspring of the gypsy cuckoo bumble bee queen (ECCC 2022d). In Nova Scotia, the host species is the yellow-banded bumble bee which is also a SAR. Because the gypsy cuckoo bumble bee is entirely dependent on yellow-

banded bumble bees, required habitat for this species is the same as for the yellow-banded bumble bee. Gypsy cuckoo bumble bee has been recorded once within 5 km of the MLSA. This species was found on Mc Nabs Island in 1968. Given the generalist nature of the yellow-banded bumble bee and the wide range of forested and open habitats that it uses, the parasitic gypsy cuckoo bumble bee could potentially be present throughout the MLSA.

Boreal Felt Lichen

Boreal felt lichen is listed as Endangered under both the federal SARA and the NS ESA. The distribution of boreal felt lichen formerly included Nova Scotia, New Brunswick and Newfoundland; however, it is now extirpated in New Brunswick. As of 2020, there are 54 sites where boreal felt lichen still exists, down from 317 sites in 2014.

This species inhabits cool, humid forests containing balsam fir (*Abies balsamea*). Boreal felt lichens are found in or adjacent to forested wetlands having a ground vegetation layer dominated by *Sphagnum* moss, located within 25 km of the Atlantic coast and at elevations < 200 m above sea level (COSEWIC 2014a). In the past, this species was found growing on balsam fir, black spruce (*Picea mariana*), white spruce (*Picea glauca*), red maple (*Acer rubrum*), and white birch (*Betula papyrifera*); however, it is currently found only on mature balsam fir.

There are no historical records of boreal felt lichen or any indicator species within 5 km of the MLSA (AC CDC 2023). However, predicted boreal felt lichen habitat polygons are found at 14 locations scattered throughout the MLSA. These boreal felt lichens are found both within forested wetlands and in coniferous and mixedwood forests stands around the periphery of wetlands. These results indicate that boreal felt lichen are potentially present in this area (Figure 3.8). There is also a small (<1 ha area) section of predicted habitat in the southern corner of the MLSA near Southbrook Crescent that is unlikely to support boreal felt lichen as it is disturbed by the immediately adjacent residential area.

Targeted surveys of the predicted habitat polygons in the MLSA including a buffer of 100 m around them are required to determine if the predicted habitat is suitable for or supports boreal felt lichen (NSDNR 2018) prior to physical work at the site. If boreal felt lichen is present, a 500 m Special Management Zone applies (NSDNR 2018).

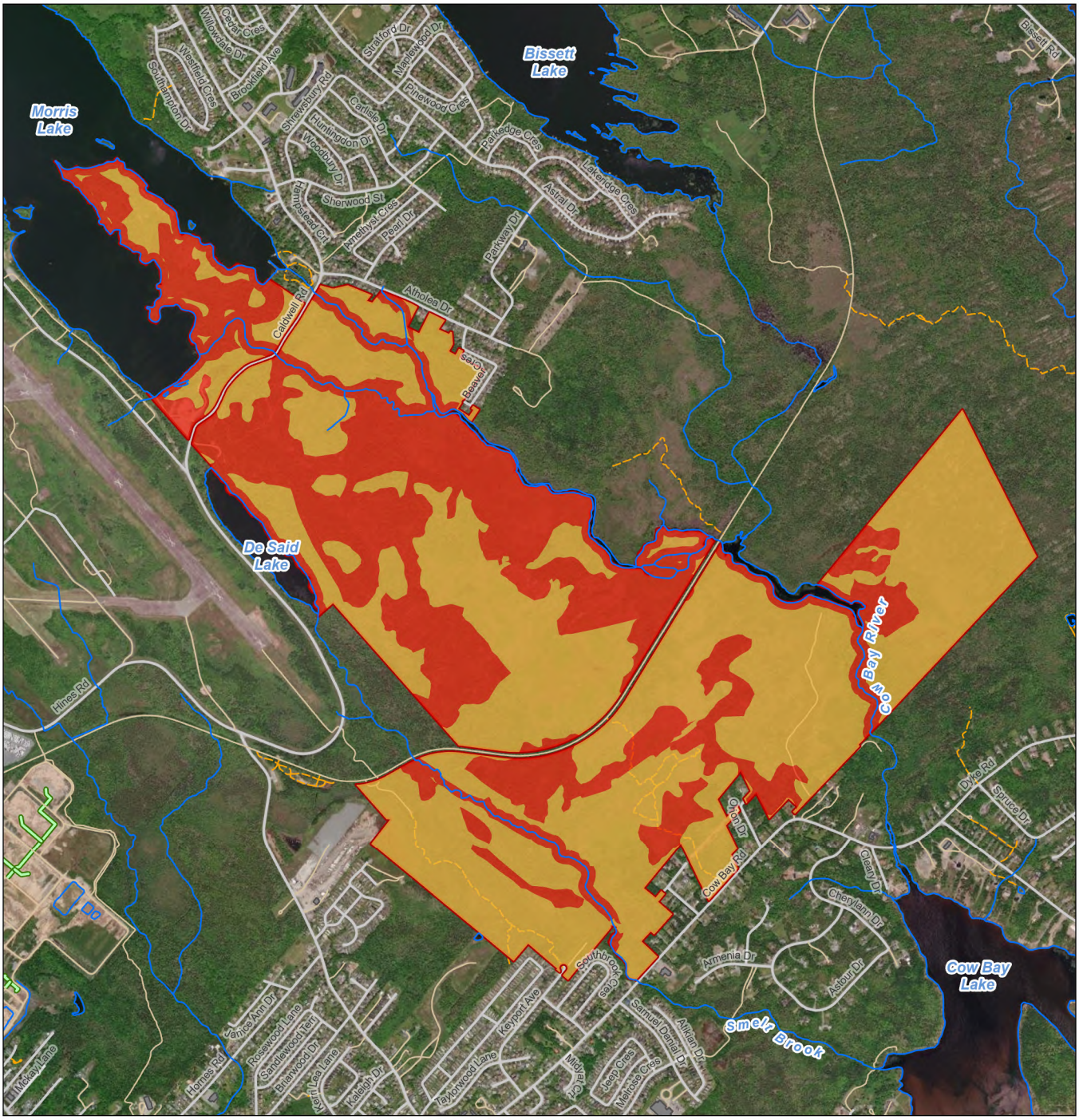
Coast Pepperbush

The coast pepperbush is listed as Threatened under the federal SARA and Vulnerable under the NS ESA. It is an Atlantic Coastal Plain species that reaches the northern end of its distribution in Nova Scotia (COSEWIC 2014b). Natural populations of coast pepperbush are restricted to six lakes in southwestern Nova Scotia. This species grows on upper lake shores and in deciduous treed swamps within 20 m of streams. Coast pepperbush is grown as an ornamental shrub, and several populations believed to be derived from plantings have been identified in Nova Scotia. One of these populations was reported on McNabs Island in 1968 (AC CDC 2023). No coast pepperbush was encountered at the MLSA. Although potentially suitable habitat is present at the MLSA, the limited distribution of this species in Nova Scotia makes it highly unlikely that it is present.

3.4.3.2 Species at Risk Distribution

The presence of individual SAR was not used exclusively to evaluate the presence and distribution of SAR within the MLSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present in the MLSA. Instead, SAR that are or could potentially be present in the MLSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the MLSA. The habitat preferences of these species were compared to the results of the upland, wetland and aquatic surveys conducted in the MLSA along with available habitat mapping and aerial imagery. Where matches were found between SAR habitat preferences and the habitats that had been mapped in the MLSA, those species were considered potentially present. The habitat mapping was then used to map the potential distribution of various SAR in the Study Area.

The distributions of each SAR that could potentially be present in the MLSA were plotted onto a single map to identify areas where SAR were potentially present, absent, or where multiple SAR could be present. The habitat areas were ranked based on the number of SAR species the area could potentially support. Habitat areas that could potentially support more than three SAR were given the lowest priority for development, while habitat areas that are unlikely to support any SAR were given the highest priority for development. In some instances, SAR habitat areas are subdivisions of habitat polygons. Subdivision of habitat polygons was done when the habitat polygon contained areas that were both suitable and unsuitable for a particular SAR and where these suitable and unsuitable areas could be viewed and mapped from the available imagery. In other instances, buffers were created around habitat features such as watercourses or shorelines to identify habitat areas such as riparian areas that may be regularly used by semi-aquatic SAR. The final map product incorporates the potential suitable habitat for all SAR that may be present in the MLSA (Figure 3.9).





Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Study Area

Species at Risk
- Habitat Potentially used by 4+ SAR
- Habitat Potentially used by 1-3 SAR
- Habitat Unlikely to be used by SAR

Utilities
- Pipeline

Transportation
- Road
- Resource / Seasonal Road
- Trail
- Waterway
- Building

0 250 500 Metres
(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-05-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_024

Figure No.
3.9

Title
Potential Distribution of Species at Risk - Morris Lake Expansion

HRM FCM 2022.aprx Revised: 2024-05-23 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Several patterns are visible in the SAR distribution mapping (Figure 3.9). There are no areas in the MLSA where no SAR could potentially be present. This was attributable to the potential presence of yellow-banded bumble bee which has a broad niche and the gypsy cuckoo bumble bee which is a nest parasite of the yellow-banded bumble bee. These species can potentially be found in all terrestrial habitat types in the MLSA.

Areas in the MLSA potentially capable of supporting more than three SAR are typically associated with five habitat features including watercourses, wetlands, mature forests, barrens, and anthropogenic habitats. Watercourses provide habitat and travel routes for a variety of SAR that have been recorded in the vicinity of the MLSA including American eel, snapping turtle, and eastern painted turtle. SAR associated with wetlands include lesser yellowlegs, eastern whip-poor-will, Canada warbler, olive-sided flycatcher, rusty blackbird, monarch, yellow-banded bumble bee, gypsy cuckcoo bumble bee, and boreal felt lichen. SAR that are associated with mature forests include eastern wood pewee, evening grosbeak, little brown myotis, northern myotis, tri-colored bat, silver-haired bat, gypsy cuckcoo bumble bee, yellow-banded bumble bee, and boreal felt lichen. Barrens in the MLSA could potentially support common nighthawk, eastern whip-poor-will, olive-sided flycatcher, gypsy cuckcoo bumble bee, and yellow-banded bumble bee.

The areas where SAR are potentially concentrated in the MLSA are often linked by watercourses. Cow Bay River on the northern side of the MLSA is particularly important in this regard. This is probably attributable to several factors. The watercourses provide habitat for their own suite of SAR. Wetlands often develop along these watercourses or are the headwaters for watercourses and support a different group of SAR. The riparian habitats along the watercourses are protected by buffer zones within which no forest harvesting may occur. Therefore, the remnants of mature forest can become concentrated along the shores of these watercourses. These mature forest remnants provide habitat for other SAR. These linear concentrations of SAR are of particular benefit since they can provide both habitat for SAR and corridors to connect plant and animal populations in urban areas.

Eight of the 19 SAR that have been identified as potentially present in the MLSA are known to make use of anthropogenic habitat for at least part of their life history. These include barn swallow, common nighthawk, evening grosbeak, little brown myotis, common snapping turtle, yellow-banded bumble bee, gypsy cuckcoo bumble bee, and monarch. It is important to note that although these species can exploit anthropogenic habitats, they often also require nearby undisturbed habitats to satisfy other aspects of their natural history. For instance, barn swallows and common nighthawks often nest on human structures or in areas heavily disturbed by humans; however, both species require nearby foraging habitats such as wetlands or water courses that produce abundant flying insects to provide food for themselves and their nestlings. In heavily developed areas these food sources may not be present or may be degraded to the point where they do not produce enough food.

3.4.4 LAND SUITABILITY ANALYSIS – FOREST HABITAT AND SPECIES AT RISK

Stantec conducted a land suitability assessment for forest habitat and species at risk by collating existing desktop data, referring to previously published reports, and conducting field surveys. The data underwent analysis using geographic information systems (GIS) and other tools to identify factors influencing land suitability. Following digitization, Stantec established a list of key terrestrial layers and devised a scoring system based on their significance to the assessment objectives. The evaluated layers include:

- Forest Maturity and Forest Succession
- Species at Risk Habitat

This process culminated in the creation of a map (Figure 3.10) that illustrates these criteria and weights used to evaluate the suitability of different areas for development. The results allow for the identification of potentially suitable and unsuitable areas, as well as the recognition of potential constraints. The sections below apply a suitability score for field confirmed forest habitat and its potential to facilitate SAR.

Figure 3.10 displays the land suitability output collated from the previous sections based on scoring criteria presented in Table 3.15. The reader is reminded that a lower score for land suitability for development generally corresponds with higher ecological value associated with the three categories, and a higher suitability score corresponds with a lower ecological value for the three categories.

Table 3.15 Forest Habitat and Species at Risk – Land Suitability Ranking Framework

Layers	Land Suitability Ranking		
	1 - Low suitability for development	**2 - Moderate suitability for development**	**3 - Higher suitability for development**
Forest Maturity / Forest Succession*	Potential old growth (>80 years old) / late and mid-to-late successional	Mature (30-80 years old) / mid-successional and edaphic	Immature (<30 years old) / early and early-to-mid successional
SAR Habitat	Habitat potentially used by more than 3 SAR	Habitat potentially used by 3 or fewer SAR	Habitat unlikely to be used by SAR
Notes: *When no forest maturity class could be determined based on field determined stand age, forest succession was used			

3.4.4.1 Forest Maturity and Forest Succession

Forest maturity classes were assigned based on the estimated stand ages from field data collection. Forested stands under 30 years of age are considered immature stands, while stands between 30-80 years of age are considered mature. Immature stands are composed of younger overstory vegetation compared to the mature stands which have progressed towards the climax community seen in old growth forests. Forested stands above 80 years of age are considered to have the potential to be old growth forest. The province of Nova Scotia defines old growth forest as an area where 20% or more of the basal area is in trees greater than or equal to the reference age for that forest type (NSDNRR 2022b; Appendix E). This age criteria ranges between 100-140 years of age depending on the FEC VT. At this time, the exact stand age and forest maturity status cannot be determined without specific old growth forest sampling and thus stands estimated to be over 80 years old are considered to have the potential to be old growth forest for this land suitability analysis.

Where age was not estimated in the field, forest succession types from the FEC manual are used based on the above ranking criteria. Forest succession is typically divided into three classes; early successional, mid successional, and late successional which correspond to stand age and successional dynamics. Using the FEC VTs for each stand, each VT (e.g., MW2, IH6, SH5) is assigned successional classifications of early, early-to-mid, mid, mid-late, late and edaphic. For sites classified as barrens types, they are assigned a score of 2 based on the lack of available knowledge on successional dynamics of barrens in Nova Scotia and the potential for diversity within the VT.

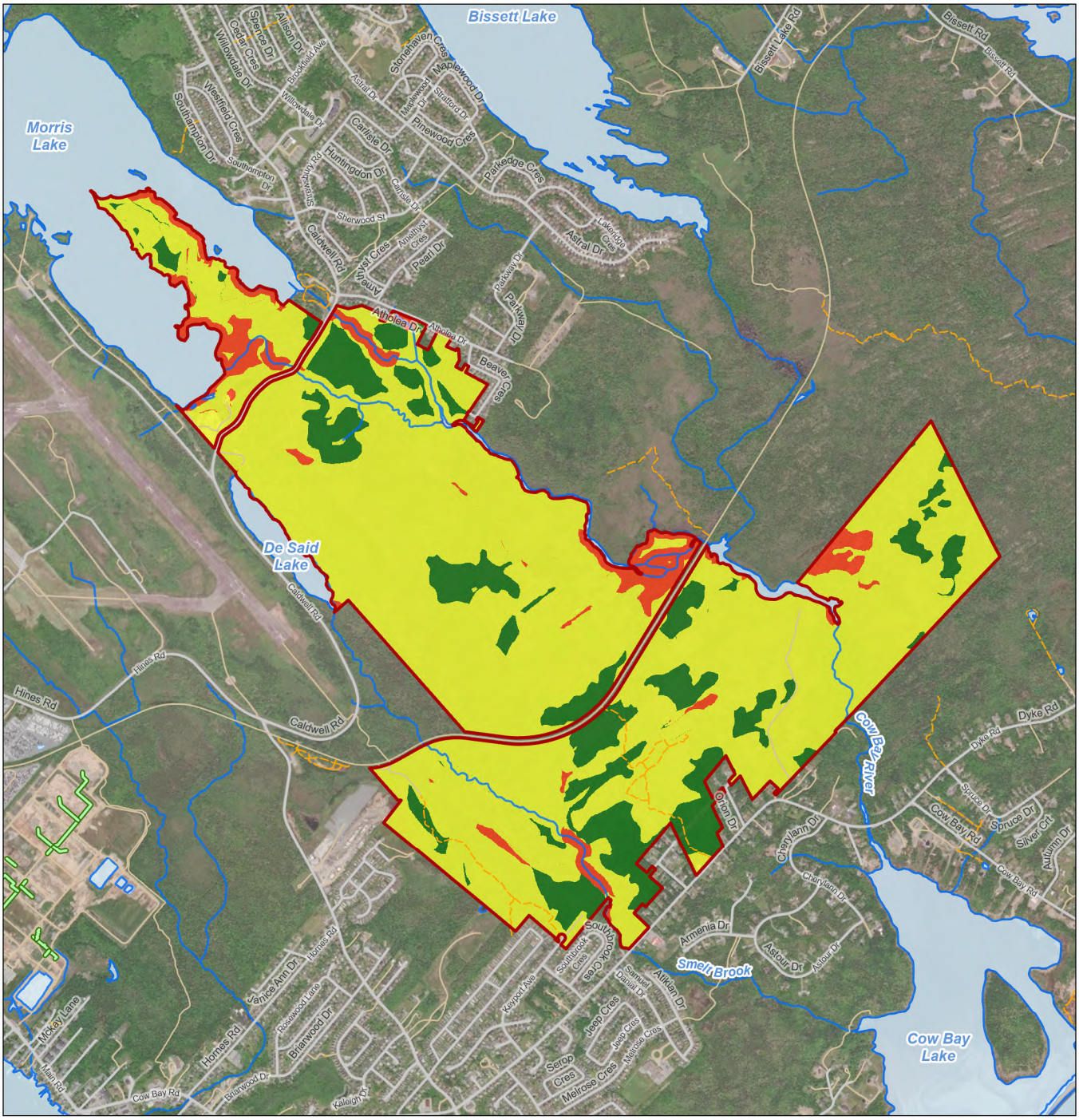
Stands with the potential for old growth forest provide the highest ecological significance and are ranked as lower for potential future development, while immature stands are ranked higher for development. VTs with early and early to mid-successional stages are assigned a higher potential for development as they generally do not support key habitat or are close to progression to later more structurally complex stands. A list of VT types that can reach old growth classification can be found in Appendix E. Stands with site limiting factors such as sites with low nutrients or wetlands are denoted as edaphic and are rated as moderate for development as due to the limiting factors; they will not reach a climax stage but can provide distinct habitat types. Late successional forests are assigned the lowest priority for development due to their limited occurrence on the landscape and the high potential to provide key habitat.

3.4.4.2 Species at Risk

The presence of individual SAR was not used exclusively to evaluate the role of SAR on land suitability within the WSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present at the MLSA. Instead, SAR that are or could potentially be present in the MLSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the MLSA. The habitat preferences of these species were compared to the results of the upland, wetland, and aquatic surveys conducted on the MLSA along with available habitat mapping. Where matches were found between SAR habitat preferences and the habitats that had been mapped in the MLSA, those species were considered potentially present. The habitat mapping was then used to map the potential distribution of various SAR on the site. This information was also considered and evaluated as part of the landscape connectivity exercise.

SAR identified in the AC CDC (2023) report that have suitable habitat within the MLSA and/or were identified during the field programs are compiled and the habitat areas are ranked based on the number of SAR species this habitat could potentially support. Habitat areas that potentially support multiple species (i.e., three or more) of SAR are given the lowest priority for development, while habitat areas that are unlikely to be used by SAR are given the highest priority for development. Some habitat areas are subdivisions of habitat polygons or buffers are created around habitat features such as watercourses as habitat preferences vary by species. Figure 3.10 incorporates the potential suitable habitat for all SAR that may be present in the MLSA.

The forgoing analysis of potential land suitability based on forest habitat and species at risk should only be viewed as a preliminary tool to assist in planning for future development in the MLSA. Responsible land development depends on many factors including those described above, and no one factor or group of factors should be considered determinative. Rankings are meant to be indicative, and to lay the groundwork for future, site specific investigations to be conducted as planning proceeds. In particular, further field confirmation will be required (e.g., for wetlands) in areas not covered in this study.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Study Area

Land Suitability Score

- 3 (High)
- 2
- 1 (Low)

Utilities

- Pipeline

Transportation

- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:27,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-15
Revised by NWhite on 2024-05-24

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_033

Figure No.
3.10

Title
Forest Habitat and SAR Land Suitability Analysis - MLSA

\\ca0213-ppfss01\work_group\1214active\160410459\gis_data\mapping\ArcGIS Pro\HRM_FCM_2024_Synthesis.aprx: HRM_FCM_033_Forest_SAR_LSARevised: 2024-05-24 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.5 Landscape Connectivity

The land suitability mapping derived from the integration of the forest maturity / succession, wetland, watercourse, and SAR mapping exercises were used in conjunction with existing studies of landscape connectivity in HRM to identify potential wildlife corridors within the MLSA. The goal of this exercise is to identify connectivity between patches of undisturbed habitat that may be potentially isolated by development. The provision of wildlife corridors allows wildlife that require larger home ranges to inhabit areas that would otherwise consist of isolated patches too small to support those species. Wildlife corridors allow wildlife to emigrate from areas that are overpopulated and immigrate to areas where suitable habitat is available. They also provide conduits for genetic material, reducing the potential for inbreeding.

The Halifax Green Network Plan (HGNP) identifies an Important Corridor that runs from Cole Harbour to Hartlen Point. This Corridor intercepts the Cow Bay River and passes through the eastern end of the MLSA (Figure 3.11). It consists of a large area of relatively undisturbed forested habitat that also supports large areas of wetland. The HGNP recommends that Essential Corridors be at least 1 km wide and Important Corridors should be at least 100 m wide to facilitate movement of wildlife (Halifax Regional Municipality and O2 Planning + Design 2018).

An analysis of the distribution of sensitive ecological features in the MLSA such as species at risk, potential old growth forests, wetlands and watercourses has been undertaken to identify which areas of the MLSA are of the greatest ecological importance and where a wildlife corridor would be most beneficial. Most of the field records of SOCC from the Study Area are from the southern end of the MLSA (Figure 3.8). The species at risk habitat modelling indicates that areas that could potentially support more than three SAR are scattered throughout the MLSA with large areas of such habitat associated with wetlands and aquatic habitat along the Cow Bay River and Smelt Brook as well as in areas of mature forest in the northcentral portion of the MLSA (Figure 3.9). The highest potential concentrations of SAR are found along the Cow Bay River with up to 11 SAR species potentially present there.

There is little potential old growth forest in the MLSA, with patches of potential old growth forest restricted to the remote eastern corner of the MLSA, the peninsula that extends out into Morris Lake and along the Cow Bay River. Some of the potential old growth forest along the Cow Bay River has been killed by recent hydrological alterations to the riparian zone of the river, likely caused by old beaver flooding near point ML37 on Figure 3.7a . Mature forest is present throughout much of the MLSA.

Wetlands are also scattered throughout the MLSA; however, the greatest concentrations of wetlands are found along the Cow Bay River and Smelt Brook. These areas support relatively large wetland complexes composed of a variety of wetland types. The Cow Bay River is the largest watercourse present in the MLSA and has the greatest potential to support fish and other aquatic or semi-aquatic organisms.

The wildlife corridor recommended in the HGNP (Figure 3.11) would help to preserve about half of the wetland habitat associated with the portion of the Cow Bay River found in the MLSA as well as approximately one kilometer of the river. This area also potentially supports a high concentration of SAR. Modifications to the HGNP Important Corridor could increase its efficacy as a wildlife corridor.

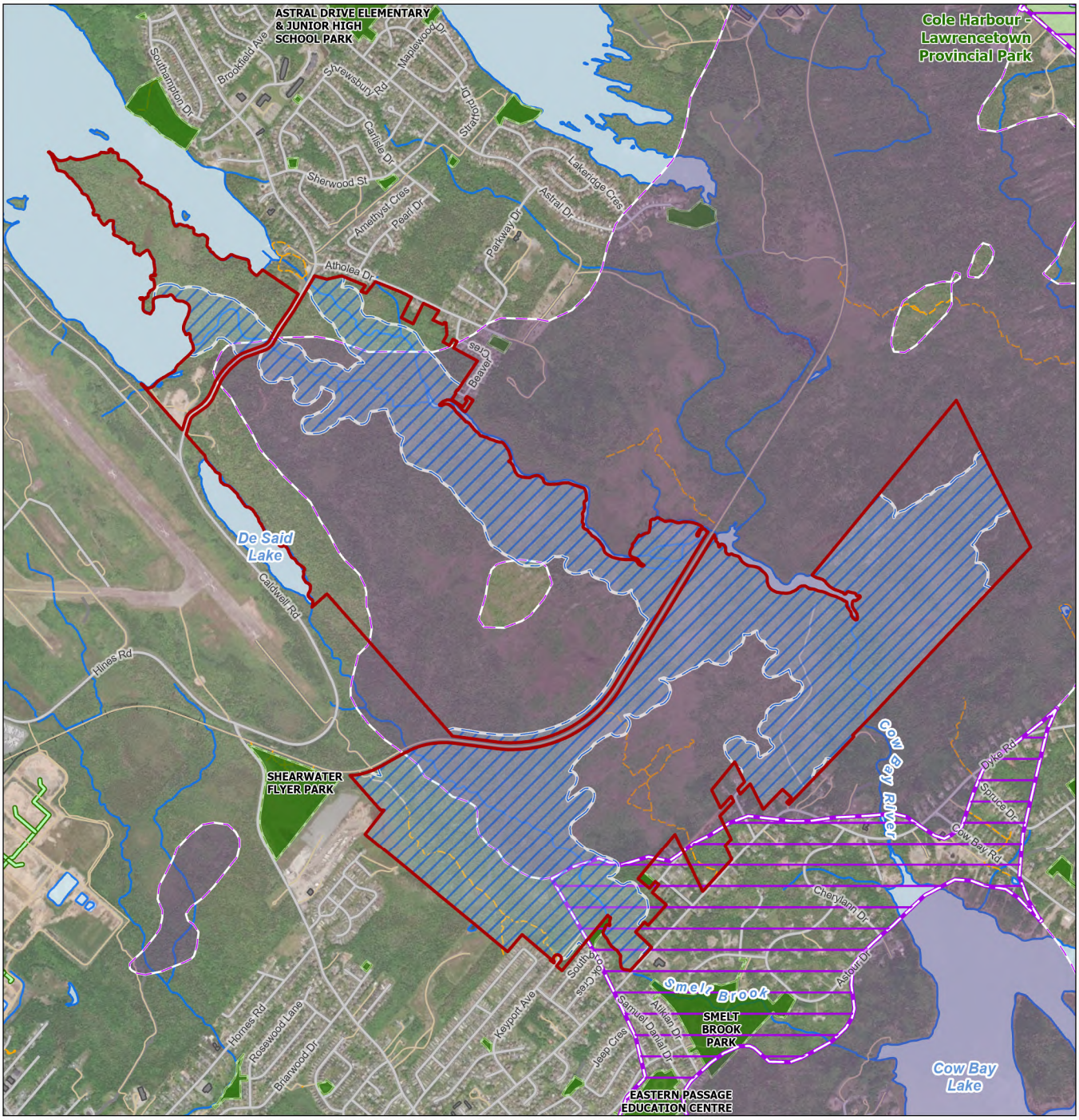
Modifications would consist of extending the corridor to the northwest to encompass the entire wetland complex that flanks the Cow Bay River, establishing another corridor along Smelt Brook and connecting the two corridors with a third corridor that would flank the Shearwater Flyers Trail.

Protection of the Cow Bay River and the riparian wetlands associated with it would provide an aquatic corridor between Cow Bay Lake and Morris Lake as well as a terrestrial corridor between the remnants of upland habitat associated with Morris Lake and 12 Wing Shearwater. It would also protect the area in the MLSA that has potentially the highest concentration SAR and the location where the rarest plant discovered during the field surveys (smooth rose) was found (Figure 3.8).

The establishment of a corridor along Smelt Brook would provide an aquatic corridor to De Said Lake and a second terrestrial corridor to the area around Morris Lake and 12 Wing Shearwater. This corridor would have the added benefit of preserving the habitat of three of the four vascular plant SOCC (cursed buttercup, purple false-foxglove and bright-green spikerush) that were discovered in the MLSA during the field surveys (Figure 3.8). This corridor also potentially supports high concentrations of SAR. The corridor along the Shearwater Flyers Trail would provide a terrestrial connection between the riparian habitats along the Cow Bay River and Smelt Brook and would help to preserve the aesthetic quality of the Shearwater Flyers Trail.

Both the Cow Bay River and Smelt Brook corridors are currently identified as Protected Areas under the Halifax Green Network Plan (Halifax Regional Municipality and O2 Planning + Design 2018) presumably due to the presence of watercourses and associated wetlands. Watercourses and wetlands are important ecological features that are regulated under provincial legislation. Watercourses and the wetlands that are often associated with them are often used as travel routes by wildlife, and for aquatic species they are typically the only means by which they can disperse through terrestrial habitats. Given the importance of watercourses and wetlands, these features have low land suitability rankings (i.e., less favorable for development).

The Cow Bay River is the largest watercourse in the MLSA and extends northwest/southeast almost the entire length of the MLSA. Smelt Brook is the second largest watercourse in the MLSA. Both watercourses provide natural travel routes for both aquatic and terrestrial species. The riparian habitat flanking the Cow Bay River and Smelt Brook would be buffered 30 m to protect the stream. Both streams also support an extensive wetland complex which would be difficult to develop and, according to the SAR modelling, could potentially support up to 11 SAR species. This would indicate that preservation of this area would be beneficial. HRM regulations require that in instances where watercourses are hydraulically connected to wetlands, the watercourse buffer must extend 30 m beyond the upland edge of the wetland. The Province of Nova Scotia recommends that, where feasible, wetlands should be buffered in the same manner as watercourses (Government of NS 2011). The margins of wetlands in the MLSA would therefore be buffered by 30 m in this corridor mapping exercise to reduce the potential for adverse effects to these wetlands from adjacent development such as hydrological or trophic level disturbances. In areas where the combined buffering of watercourses and/or wetlands along this corridor is insufficient to provide a 100 m wide corridor, additional buffering has been applied (Figure 3.11) to make the corridor at least 100 m wide as recommended in the HGNP.





Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services, NSCSLLT
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Study Area
- Proposed Corridor (Stantec 2024)
- Halifax Green Network Plan Important Corridor
- Halifax Green Network Plan Essential Corridor
- Halifax Regional Municipality Parks
- Protected Wilderness Area

Utilities
- Pipeline

Other Features
- Road
- Resource / Seasonal Road
- Trail
- Waterway
- Waterbody
- Buildings

0 250 500 750 Metres

(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-05-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_025

Figure No.
3.11

Title
Proposed Landscape Connectivity Options for MLSA

\\Ca0213-ppfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM_SAR_workingMapping\HRM_SAR_HabitatAndCorridor.aprxRevised: 2024-05-23 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.6 Surficial and Bedrock Geology

A desktop assessment was conducted using provincial bedrock and surficial geology mapping and GIS layers to delineate and inventory the acid generating potential of bedrock and the amount of overburden that may be covering the bedrock (i.e., surficial geology). An inventory of acid rock potential was developed for the MLSA using publicly available GIS data, including surficial and bedrock geologic mapping and acid-rock drainage (ARD) risk mapping developed for Nova Scotia. The reported depth to the water table in the vicinity of the Study Area was estimated through an assessment of existing groundwater wells using data gathered from the NSECC Well Logs Database (NSECC 2022).

The presence of sulphide-bearing rock has land-use planning implications as disturbance during development/construction can expose the bedrock to air and water, which has the potential to leach sulphuric acid. This leaching can result in decreased pH of associated waters, which can then result in mobilization of metals and adversely affect aquatic habitats. Increased costs for development can be incurred as excavated material in areas of known sulphide-bearing rock must be managed and disposed of according to Sulphide Bearing Material Disposal Regulations (NSECC 2021).

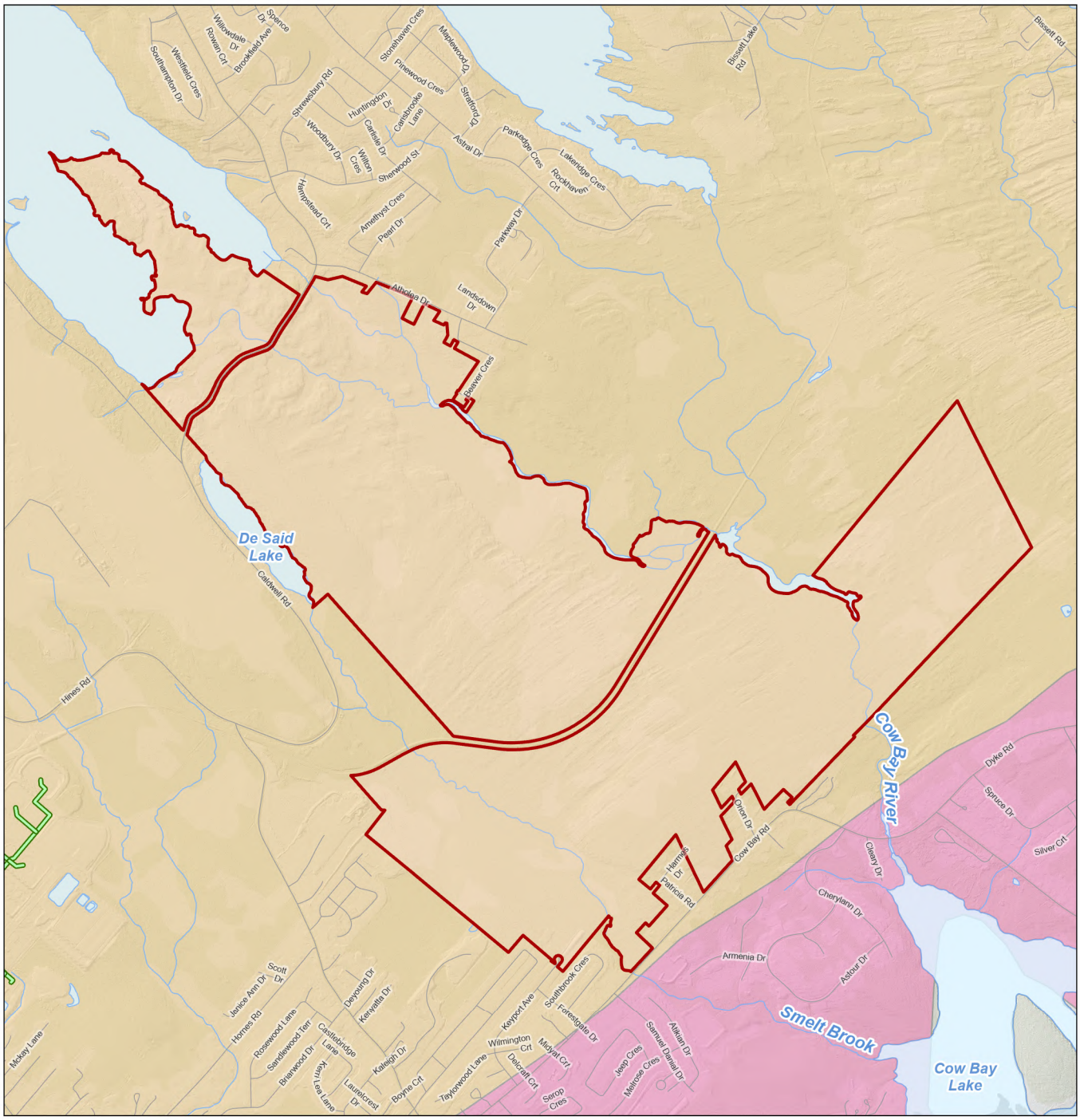
3.6.1 BEDROCK GEOLOGY

The MLSA is underlain by the Cambrian to Early Ordovician age metamorphosed sedimentary bedrock of the Goldenville Group and is marginal to the Halifax Group (White et. al. 2014) (Figure 3.12).

The Goldenville Group consists of the Taylors Head and Beaverbank Formations. The Taylors Head formation consists of grey, thickly bedded and weakly cleaved, metasandstone locally interlayered with green, cleaved metasiltstone and rare black to rusty slate and is considered non-acid producing. The Beaverbank Formation overlies the Taylors Head Formation and consists of grey to black, cleaved metasiltstone interbedded with minor thin, light grey metasandstone and black graphitic slate and is considered potentially acid producing (White and Goodwin 2011).

The Halifax Group consists of the Bluestone and Cunard Formations. The Cunard Formation consists of black and rusty slate with thin beds and lenses of black metasiltstone. This formation typically contains abundant sulphide-rich pyrrhotite and pyrite and is considered to have the highest acid-producing potential for bedrock in the HRM (White and Goodwin 2011). The Bluestone Formation is not located in the vicinity of the development areas.

Detailed bedrock geology mapping is not available in the area immediately surrounding the MLSA. Regional mapping indicates that the entirety of the MLSA is underlain by the Goldenville Group with the southeast edge of the development area marginal to the Halifax Group (Figure 3.12). However, the groups can be sub-divided based on detailed bedrock geology from adjacent map sheets (White et. al. 2014). Most of the MLSA is underlain by the Taylors Head Formation except the southeastern extent of the development area, which intersects the potentially acid producing Beaverbank Formation. The sulphide-rich Cunard Formation lies proximal to the southeastern extent of the development within approximately 100 m.





Study Area
Halifax Group
Goldenville Group

Utilities
Pipeline

Other Features
Road
Waterway
Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality,
Nova Scotia

Prepared by IPodrug on 2024-01-05
Revised by NWhite on 2024-04-03
Revised by SChubbs on 2024-05-09

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure ID: 003

Figure No.
3.12

Title
Bedrock Geology - MLSA

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Natural Resources and Renewables
3. Background: Government of Nova Scotia Department of Service Nova Scotia and Internal Services; Nova Scotia Department of Natural Resources and Renewables

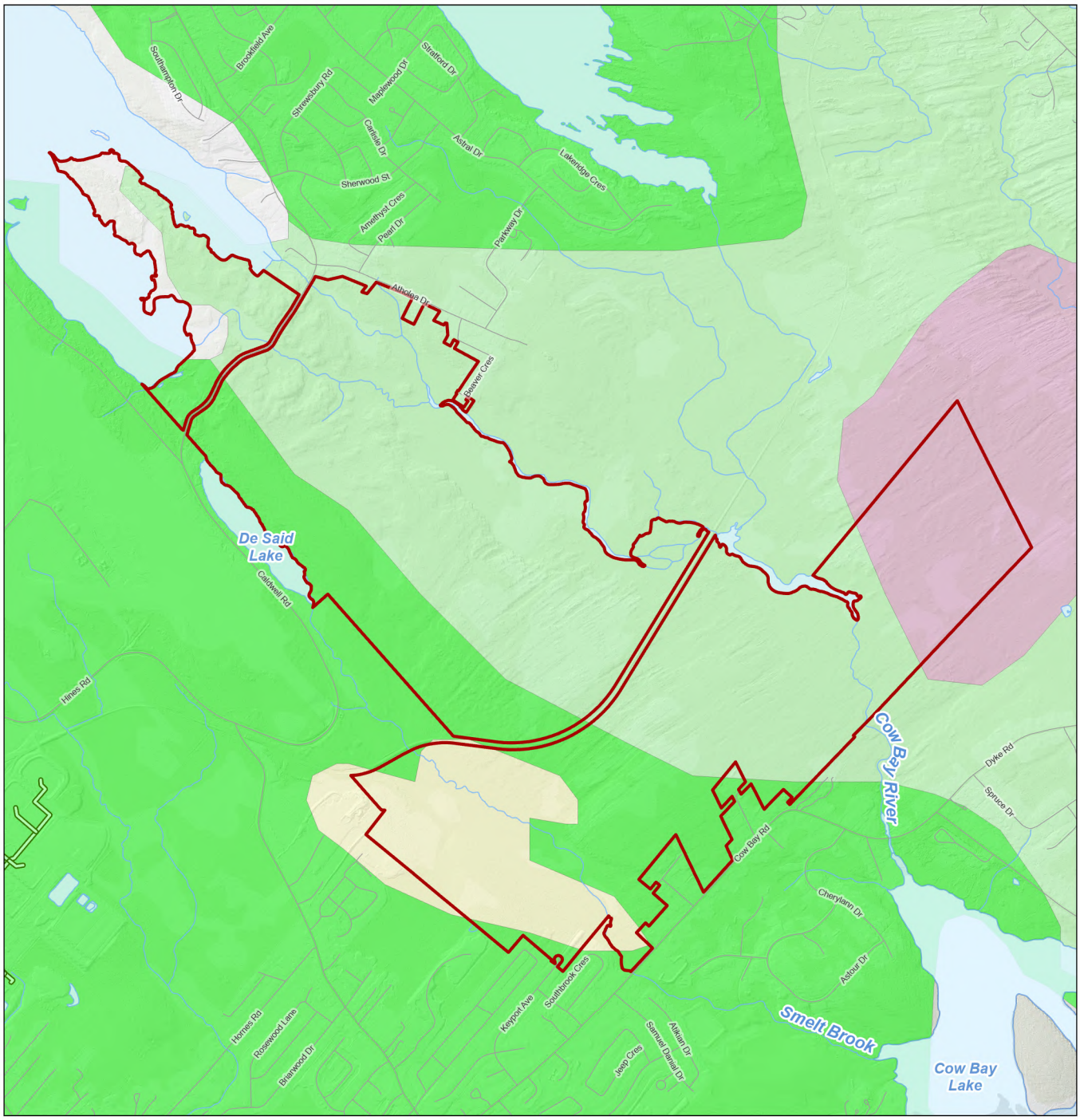
\\ca0213-pp\ss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM FCM 2022.aprx Revised: 2024-05-22 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.6.2 SURFICIAL GEOLOGY

A review of surficial geology mapping for the area (Stea et al. 1992) was carried out to identify areas of exposed bedrock, which may present a greater risk for ARD during development (Figure 3.13).

Overburden at the MLSA consists primarily of stony and silty till plains with overburden depths ranging from 2-30 m thick. Overburden thins in the northeastern limb of the development area, where exposed bedrock, or bedrock concealed by veneers of soil and vegetation, is expected. Areas of exposed bedrock correspond to the non-acid producing Taylors Head Formation.





Study Area

Surficial Geologic Units

- Organic Deposits
- Stony Till Plain (Ground Moraine)
- Silty Till Plain (Ground Moraine)
- Exposed Bedrock
- Lakes

Utilities

- Pipeline

Other Features

- Road
- Waterway
- Waterway

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Natural Resources and Renewables

3. Background: Government of Nova Scotia Department of Service Nova Scotia and Internal Services; Nova Scotia Department of Natural Resources and Renewables

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IPodrug on 2024-01-05
Revised by NWhite on 2024-04-03
Revised by SChubbs on 2024-05-10

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure ID: 002

Figure No.
3.13

Title
Surficial Geology - MLSA

\\ca0213-pp\fs01\work_group\12214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM FCM 2022.aprx Revised: 2024-05-22 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.6.3 DEPTH TO WATER TABLE

Depth to water table in the MLSA was estimated using static water levels in existing drilled wells provided in the NSECC Well Logs Database (NSECC 2022). While static water levels in drilled wells can be used to infer the depth to water table, they are not considered a precise representation of the water table, particularly with partially confined or confined aquifer conditions, or if the water level was measured prior to full recovery in the wells and if water levels are measured during different seasons. Statistical summaries of static water levels in existing groundwater wells within 100 m of the MLSA are shown in Table 3.16.

Table 3.16 Static Water Level Summary in Existing Groundwater Wells

Development Area	Number of Wells[1]	Minimum Static Water Level (mbtoc[2])	Maximum Static Water Level (mbtoc)	Average Static Water Level (mbtoc)	Median Static Water Level (mbtoc)
Morris Lake	15	1.52	9.74	4.18	3.04

Notes:
1 – Includes wells with static water level data within the MLSA boundary and any well within a 100 m radius of the MLSA boundary
2 – mbtoc=metres below top of casing

The NSECC Well Logs Database generally indicates that static water levels in drilled wells are shallow (generally within 4 m of ground surface). Shallow groundwater table is also inferred from nearby surface water bodies and wetlands in the vicinity of the development area.

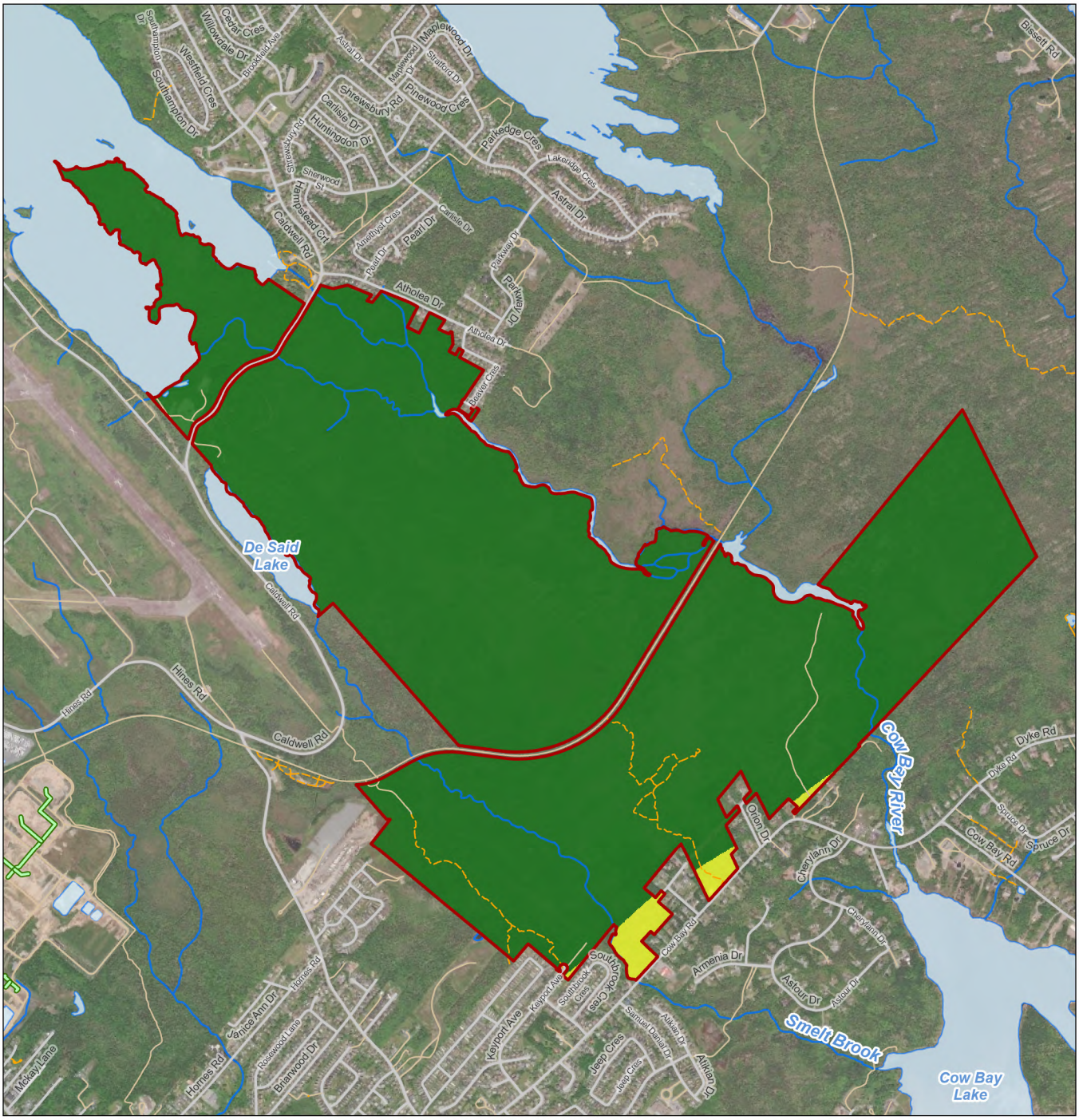
3.6.4 LAND SUITABILITY ANALYSIS – GEOLOGY

For the geology component of the land suitability analysis, bedrock was classified based on its acid producing potential (Table 3.17; Figure 3.14). In the context of ARD, surficial geology is primarily relevant in situations where overburden thickness is insufficient to prevent exposure of potentially acid producing bedrock to air and/or water during development. Information available from provincial mapping provide a wide range of thicknesses for each surficial geology unit, so surficial geology was classified primarily on the acid producing potential of the bedrock underlying the overburden.

Surficial and bedrock geology, as it relates to potential acid generation, is only one of many factors that must be considered when evaluating land suitability for development. The current assessment of surficial and bedrock geology is based on a desktop review of available provincial mapping, and does not purport to be definitive regarding development risks and opportunities. If sulphide-bearing rock is encountered during development, it must be managed and disposed of according to Sulphide Bearing Material Disposal Regulations (NSECC 2021).

Table 3.17 Surficial and Bedrock Geology – Land Suitability Ranking Framework

Layer	Land Suitability Ranking		
	1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development
Bedrock Geology	Cunard Formation	Beaverbank Formation	Taylors Head Formation
Surficial Geology	Exposed bedrock in a potentially acid-producing formation	Soil greater than 2 m overlying potentially acid-producing bedrock	Non acid-producing bedrock





Study Area

Land Suitability Score

- 3
- 2
- 1

Transportation

- Road
- Resource / Seasonal Road
- Trail

Utilities

- Pipeline

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-08
Revised by NWhite on 2024-05-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_032

Figure No.
3.14

Title
Geology Land Suitability Analysis - MLSA

HRM FCM 2022.aprx Revised: 2024-05-17 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.7 Topography

Stantec processed LiDAR data provided by HRM to classify slopes within the MLSA. This was primarily a desktop exercise using ESRI ArcMAP, with considerations from the field (field crews noted any significant slopes along watercourses and wetlands).

3.7.1 LAND SUITABILITY ANALYSIS – TOPOGRAPHY

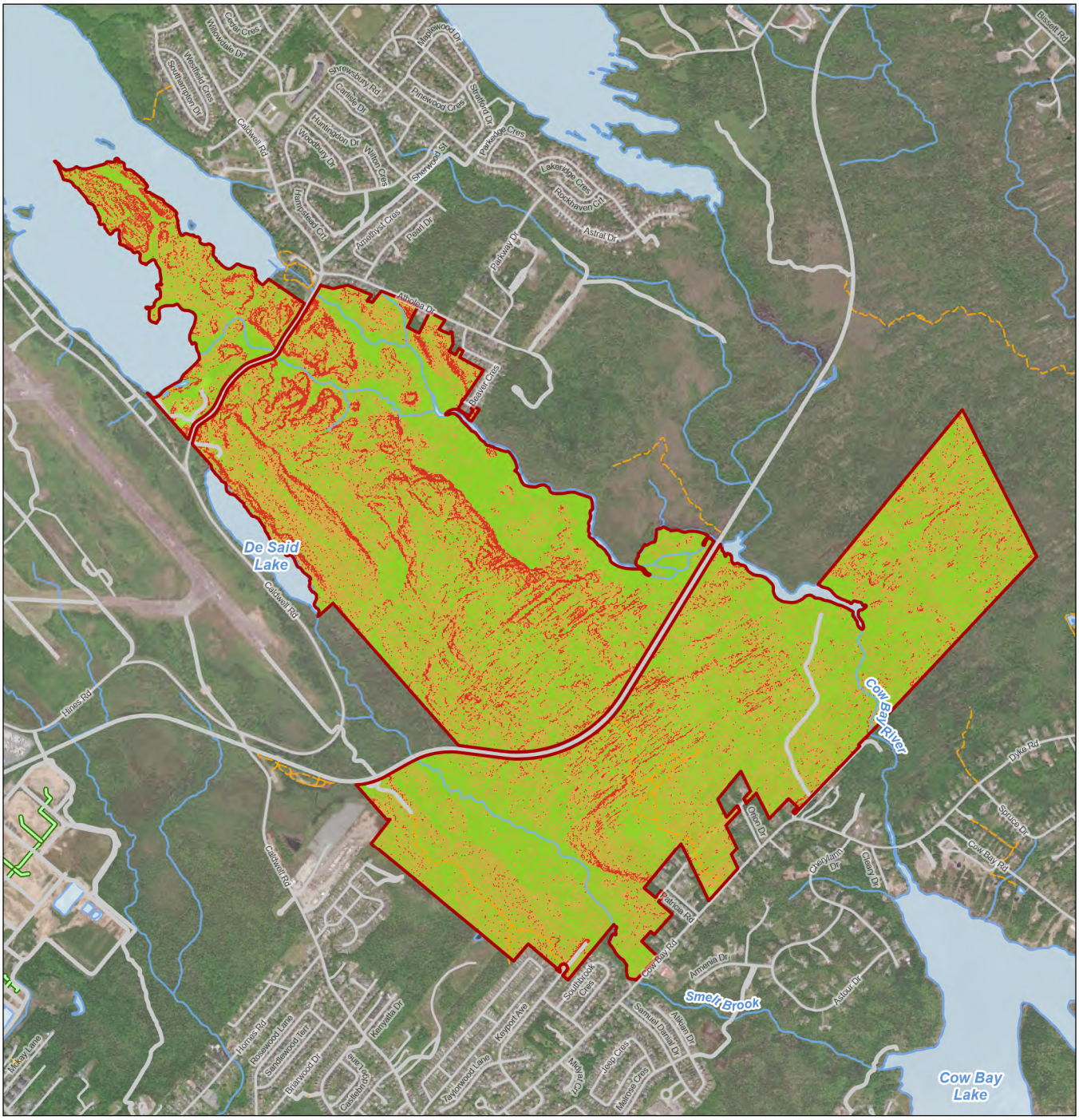
Steep slopes can be associated with environmental features such as rock outcrops, shallow soils, and groundwater springs. These features can have various impacts on development planning including surface water flow, water quality, erosion, and sediment patterns. These factors also influence microclimate which contributes to vegetation growth and succession. These unique features can also provide niche habitat for SAR, specifically bank swallows and bats.

For this land suitability analysis, steeper slopes were ranked as the lowest priority for potential development while the relatively flatter topography is ranked higher for potential development (Table 3.18). Slopes have been classified into three categories based on their percent rise: 0%-5%, 5.01%-15% and >15%. Slope mapping can be found below in Figure 3.15.

Slope is only one of many factors that must be considered when evaluating land suitability for development. The current assessment of topography is based primarily on a desktop review of available provincial mapping, and does not purport to be definitive regarding development risks and opportunities. Stantec recommends a slope review be conducted prior to finalizing consultation planning.

Table 3.18 Topography – Land Suitability Ranking Framework

Layer	Land Suitability Ranking		
	1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development
Slope	>15%	5.01%-15%	0%-5%





Study Area

Slope Analysis (Percent Rise)

- 0 - 5%
- 5.01 - 15%
- >15%

Transportation

- Trail
- Highway
- Other Road

Utilities

- Pipeline

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IPodrug on 2023-11-09
Revised by NWhite on 2024-05-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_014

Figure No.
3.15

Title
Slope Land Suitability Analysis - Morris Lake Expansion

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

HRM FCM 2022.aprx Revised: 2024-05-17 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.8 Contaminated Sites

Stantec conducted a contaminated sites review of the MLSA. The purpose of the review was to assess if evidence of potential or actual environmental contamination exists in connection with the Study Area, because of current or past activities on the Study Area or neighboring properties.

3.8.1 METHODOLOGY

The contaminated sites review consisted of the following:

- records review including, but not limited to, aerial photographs, LiDAR imagery
- provincial government regulatory search for the Study Area
- a site visit (relevant features were recorded during the wetland delineation; a site visit specifically to document potential environmental contamination concerns was not completed)
- evaluation of information

The review does not include sampling or testing of air, soil, groundwater, surface water or building materials. Nor does it include a review or audit of operational environmental compliance issues, or of any environmental management systems, which may exist for the Study Area.

Desktop mapping and field verification for the Study Area took place in spring/summer 2023. Stantec field staff documented the location of sites that exhibited characteristics of contamination as well as incidental evidence of anthropogenic activities (e.g., illegal dumping, camp sites). Existing structures were not accessed, and private properties occupied and unoccupied were not evaluated in the field. The Study Area and readily visible and publicly accessible portions of adjoining and neighboring properties were examined for the presence of potential sources of environmental contamination. No interviews were conducted with persons associated with the Study Area.

3.8.2 DESKTOP REVIEW

Aerial Photography / LiDAR Review

The MLSA is located within HRM boundaries in Halifax County, Nova Scotia. The Study Area includes a variety of users including residential properties adjacent to the Study Area along Cow Bay Road and Atholea Drive, Morris Lake East Holdings owned undeveloped lands, utility corridors, and the Shearwater Flyer Trail.

From at least 1931 Caldwell Road and the Cananda National Railway (The Musquodoboit Railway, officially known as the Dartmouth Subdivision) were present cutting through the Study Area. In the 1931, 1945, and 2002 aerial photographs showed that the Study Area was treed and undeveloped. In 1945/47 a small, cleared area was noted in the area of Property Identifier (PID) 40852592. The Railway was abandoned in 1983 and converted to a recreational path (Shearwater Flyer Trail) in the early 1990s. LiDAR imagery review did not reveal features (pits or piles) of note.

The following concerns regarding potential environmental contamination issues were noted:

- Evidence of human activity on PID 40852592 in 1940s.
- The presence of a railway crosscutting the southern portion of the Study Area.

Regulatory Request

NSECC was queried for information about the MLSA and received NSECC's Environmental Registry response. The information is summarized below and will be appended to the final report.

Regulatory Infractions Search: NSECC has provided no records of infractions for the Study Area.

Environmental Investigations: Information pertaining to site assessments, risk assessments, remedial work or other environmental investigations registered with NSECC for the Study Area are available only through "Freedom of Information" requests which require a ninety-day turn-around time. Ms. Tina Skeir of NSECC indicated the following files requiring a "Freedom of Information and Protection of Privacy" (FOIPOP) request were on file for the following properties, which fall within the boundary of the Study Area:

- A subdivision file (file #96000-32-AMH-2021-2813907) pertaining to 0 Orion Drive, Eastern Passage.

These FOIPOP records may provide additional information relevant to the proposed development of the MLSA.

Tank Registrations: No tanks were registered to the Study Area based on information provided from the NSECC Petroleum Storage Tank Registry.

Other:

- Orion Drive, Eastern Passage (PID 40127649):

Application for Approval for the Rayken Subdivision located on the southeastern portion of the site.

Construction and installation of an on-site sewage disposal system to service a single unit residential structure with a design flow of 1000 liters per day at PID 40127649, lot Block RW-3, Rayken Subdivision, Eastern Passage, dated May 4, 2010 was reviewed.

These records do not represent a potential environmental concern to the MLSA.

3.8.3 FIELD RESULTS

The following environmental concerns were noted during the site visit and are noted on Figure No. 3.16-Contaminated Sites in the MLSA:

- Potential Contaminated Site S1: PID 40852592-Craig Charles Hartlen, on the western portion of the Study Area-fishing gear storage on a cleared property.

- Potential Contaminated Site S2: PID 40117269-Morris Lake East Holdings Limited- a hunting blind was noted on the southern portion of the Study Area.
- Potential Contaminated Site S3: PID 00372995-Morris Lake East Holdings Limited-a hunting blind was noted on the southern portion of the Study Area.
- Potential Contaminated Site S4: PID 40291775-Morris Lake East Holdings Limited- a hunting blind was noted on the southern portion of the Study Area.
- Potential Contaminated Site S5 and S6: PID 41412834-Morris Lake East Holdings Limited-two hunting blinds were noted on the southern portion of the Study Area.
- Potential Contaminated Site S7: PID 41412834-Morris Lake East Holdings Limited-a area of dumping (approximately 20 bags of recyclables and discarded camping chairs) were noted.
- Potential Contaminated Sites S8, S9, and S10: PID 41129974-Morris Lake East Holdings Limited- a hunting blind was noted on the southern portion of the Study Area.

These may represent a potential environmental concern to the MLSA.

3.8.4 INFLUENCE ON LAND SUITABILITY

The study has revealed evidence of potential and/or actual environmental contamination associated with the Study Area. The following environmental concerns were identified:

- Evidence of human activity (equipment storage) on PID 40852592.
- Evidence of human activity (hunting blinds) on PID 40117269, PID 00372995, PID 41129974, PID 41412834, and PID 40291775.
- Dumping (recyclables) on PID 41412834.
- The presence of a railway crosscutting the southern portion of the Study Area from at least 1931 until the early 1980s.

Due to the potential presence of environmental contamination within the Study Area, if material is exposed or is planned to be excavated and removed from the Site during redevelopment, it should be tested to confirm the handling and disposal requirements. Additional environmental assessment and reporting to NSECC under the Contaminated Sites Regulations may be required as part of the development process. There are no constraints to development with respect to potential contaminated sites provided the NSECC Regulations are followed.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Potential Contaminated Site
- NSECC File (FOIPOP, Tank Registration, other)
- Study Area

Utilities
- Pipeline

Transportation
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody
- Property Boundary

0 250 500 Metres
(At original document size of 8.5x11)
1:27,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-05-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_036

Figure No.
3.16

Title
Potential Contaminated Sites in the MLSA

\\ca0213-ppfss01\work_group\1214active\160410459\gis_data\mapping\ArcGIS Pro\HRM_2024_Contaminated_Sites\HRM_2024_Contaminated_Sites.aprx: Fig_3.16_HRM_FCM_036_Contaminated_SitesRevised: 2024-05-23 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.9 Areas of Cultural Significance

Stantec completed an archaeological and cultural study that included an Archaeological Resource Impact Assessment (ARIA) conducted under Heritage Research Permit (HRP) A2023NS168 to document areas of archaeological potential within the MLSA. The scope of the assessment included a site walkover carried out on November 22, 23, 29, and 30, 2023, and a background study (including environmental setting, Pre-Contact and Historic Period land use, property history, and past archaeological assessments). This archaeological assessment was conducted to provide a baseline for future study, informed by Mi'kmaq knowledge. The results of the ARIA are detailed in a final report under a separate cover to be submitted to the Nova Scotia Department of Communities, Culture, Tourism, and Heritage to fulfill the requirements of the HRP. Refer to Appendix D for the full ARIA report and recommendations.

3.10 Summary of Land Suitability Analysis

Stantec has prepared a summary of the land suitability analysis which integrates results from the environmental components that were studied for the MLSA. The objective of the land suitability analysis was to determine what portions of the Study Area are potentially most suitable for new community development based on a desktop and field analysis of these components. Note that not all areas within the Study Area (Figure 3.1) are being considered for future development (e.g., if they are privately owned and/or are already developed).

It is important to note that this is not an exhaustive analysis of all parameters that could influence whether or not a given location is amenable for development. It is also not possible to definitively declare which parameters are most important in determining whether an area is suitable for development. Therefore, each parameter used in the summary analysis is equally weighted and caution should be used when applying the combined analysis for planning purposes. In Stantec's opinion, it is recommended that planners consider the results, including regulatory requirements and management implications, for each component separately for a more useful representation of development opportunities and constraints.

Sections 3.2 through 3.8 describe desktop and field results followed by details about how each environmental component was evaluated from a land suitability perspective. Suitability for development was generally ranked as follows:

- a score of 1 indicates low suitability for development
- a score of 2 indicates moderate suitability for development
- a score of 3 indicates high suitability for development

Lower scores generally correspond to areas with higher ecological function, making them generally more suitable for conservation purposes and potentially less suitable for development. Conversely, higher scores indicate lands that are potentially less desirable for conservation efforts and potentially more suitable for development. It is important to note that many factors, in addition to those addressed throughout this report, contribute to suitability for development and/or conservation, including views expressed by members of the public, other stakeholders and Indigenous groups. Therefore, the information presented in this summary should not be viewed in isolation.

This section consists of a combined summary of all data layers used in the previous LSA sections divided into two separate sections which offer the best opportunity for a meaningful combination: 1) biological components and 2) geology/topography components. Another key component that should inform development is landscape connectivity, which is discussed in Section 3.5. While it is noted that landscape connectivity coincides with other biological components explicitly considered in the sections above and this summary (i.e., watercourses, wetlands, forest habitat/SAR), Section 3.5 considers these factors in a holistic way regarding wildlife movement and sustainability.

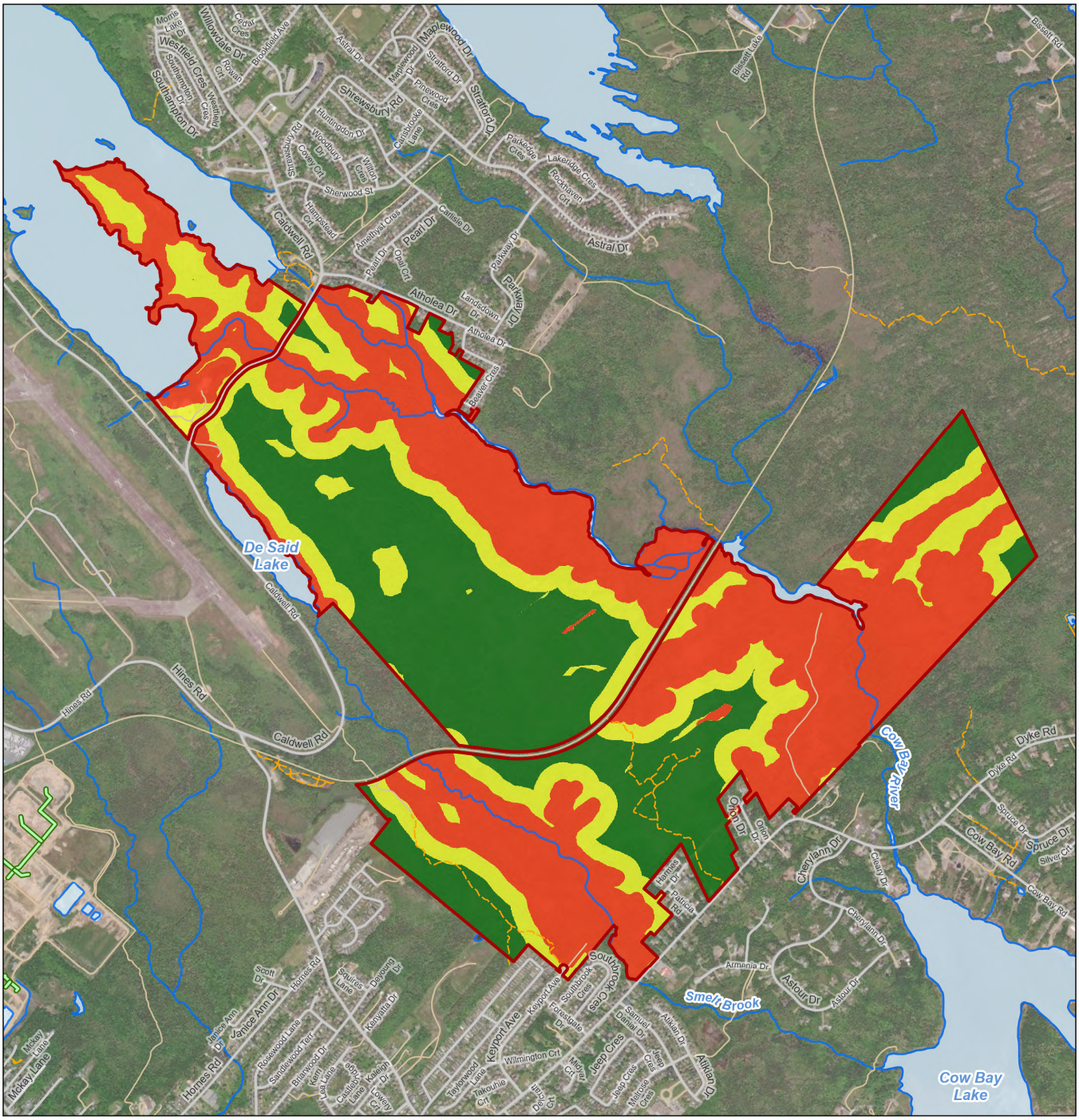
3.10.1 BIOLOGICAL COMPONENTS

This section combines the LSA figures for wetlands (Section 3.2.1; Figure 3.3), watercourses (Section 3.3.2; Figure 3.6) and forest habitat and species at risk (Section 3.4.4; Figure 3.10).

Twenty-five wetlands were identified within the MLSA and thirteen were evaluated using WESP (Table 3.1). Further evaluation and permitting are highlighted in Section 3.2.2.

The forest habitat and species at risk analysis combines two layers: the Forest Maturity and Forest Succession and Species at Risk. For the forest maturity layer, 46 forest inventory polygons visited during field surveys were classified according to the Nova Scotia FEC system (Table 3.13). Where age is not determined in the field due to various constraints, the maturity class from the FEC or age from the NSDNRR Forest Inventory was used. The presence of individual SAR was not used exclusively to evaluate the presence and distribution of SAR within the MLSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present at the MLSA. Instead, SAR that are or could potentially be present in the MLSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the MLSA. Where matches were found between SAR habitat preferences and habitats mapped in the MLSA, those species were considered potentially present and reflected in the LSA mapping.

Each of the three LSA figures for the biological components have been weighted and combined to show the overall summary LSA of biological components (Figure 3.17). Habitat LSA and Wetland LSA scores have been averaged and Stantec manually adjusted the weighting of policy-protected constraints including established environmental buffers such as watercourse setbacks and wetlands intersected by watercourses. These features were deemed to have low development suitability and were manually emphasized as indicated by the red shading in Figure 3.17.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Study Area

Land Suitability Score

- 3 (High)
- 2
- 1 (Low)

Utilities

- Pipeline

Transportation

- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-20
Revised by NWhite on 2024-07-09

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_035

Figure No.
3.17

Title
Land Suitability Analysis of Biological Components - MLSA

HRM FCM 2022.aprx Revised: 2024-07-10 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

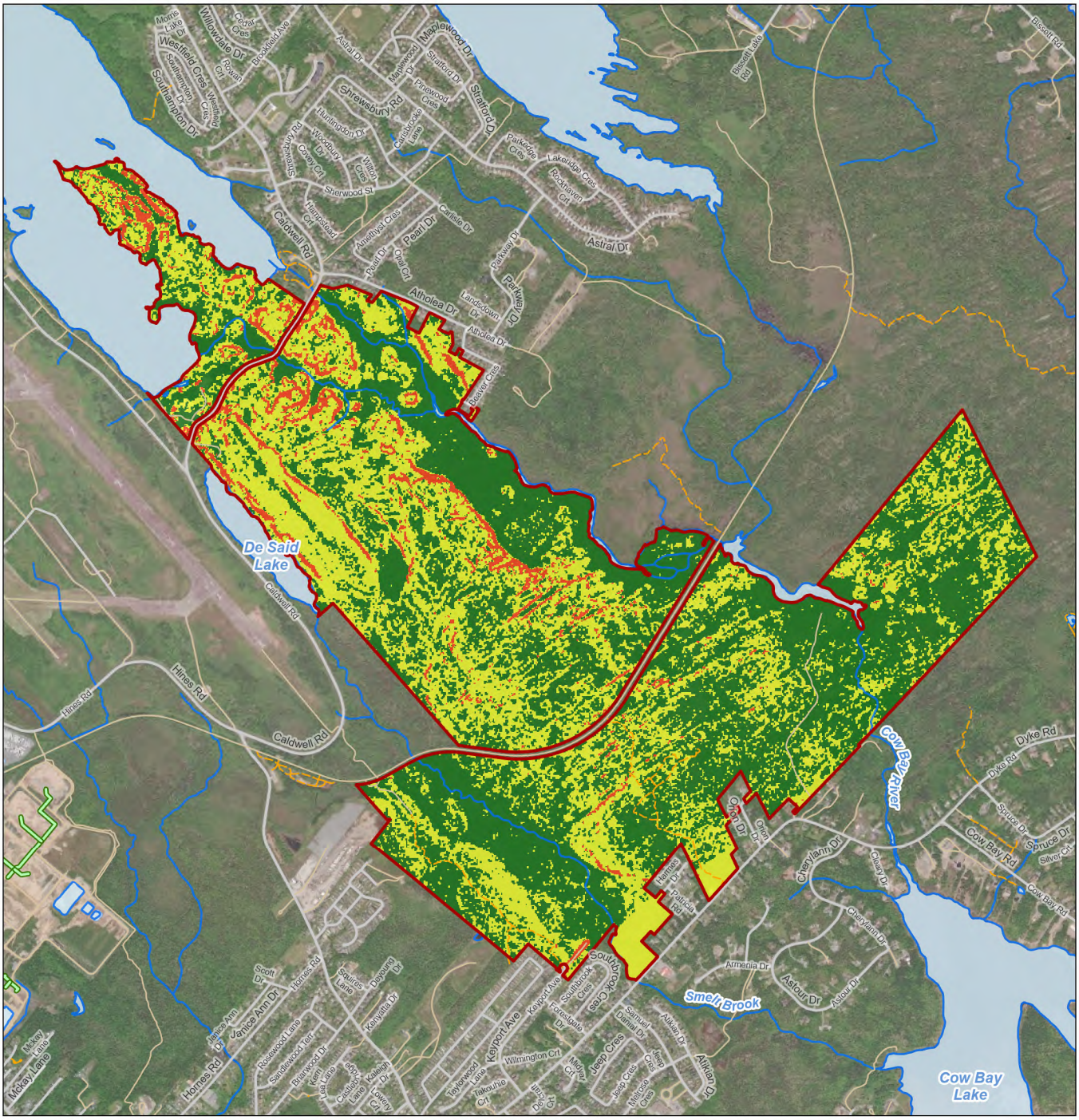
3.10.2 GEOLOGY AND TOPOGRAPHY COMPONENTS

This section combines the LSA figures for geology (Section 3.6.4: Figure 3.14) and topography (Section 3.7.1: Figure 3.15).

The primary parameter used to evaluate geology in the MLSA for potential land suitability for development is the acid producing potential associated with sulphide-bearing bedrock (Table 3.18; Figure 3.14). Acid producing potential is considered an important and regulated constraint for development. The current assessment of surficial and bedrock geology is based on a desktop review of available provincial mapping and indicates a general absence of acid producing bedrock in the MLSA. These findings should be confirmed through further investigations. If sulphide-bearing rock is encountered during development, it must be managed and disposed of according to Sulphide Bearing Material Disposal Regulations (NSECC 2021).

For the topography component of the land suitability analysis, LiDAR data provided by HRM to was used to classify slopes within the MLSA. This was primarily a desktop exercise using ESRI ArcMAP, with incidental field observations. These findings should be confirmed through further investigations.

Each of the two LSA figures for geology and topography have been weighted equally and combined to show the overall summary LSA for these components (Figure 3.18).



Study Area

Land Suitability Score

- 3
- 2
- 1

Utilities

- Pipeline

Transportation

- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbodies

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-20
Revised by NWhite on 2024-04-22

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_034

Figure No.
3.18

Title
Land Suitability Analysis of Geological and Topographic Components - MLSA

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

HRM FCM 2022.aprx Revised: 2024-05-17 By: niwhite

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.11 References

Beaupre-McPhee, Carter. 2022. *Research Report Former Nova Scotia Home for Colored Children, 18 Wilfred Jakson Way, Dartmouth*, prepared by HRM Panning and Development, HRM, Halifax.

Cameron, R. P., and Neily, T. 2008. Heuristic model for identifying the habitats of *Erioderma pedicellatum* and other rare cyanolichens in Nova Scotia, Canada. The Bryologist 111: 650-658.

CBWES (CB Wetlands & Environmental Specialists). 2013. Post-Restoration Monitoring (Year 5) of the Lawrencetown Lake Salt Marsh Restoration Project, Produced for Nova Scotia Department of Transportation and Infrastructure Renewal

COSEWIC. 2000. COSEWIC assessment and status report on the Barrow's Goldeneye *Bucephala islandica*, Eastern population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 65 pp. (https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html).

COSEWIC. 2007a. COSEWIC assessment and status report on the Common Nighthawk *Chordeiles minor* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

COSEWIC. 2007b. COSEWIC assessment and status report on the Chimney Swift *Chaetura pelagica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 49 pp.

COSEWIC 2008a. COSEWIC assessment and status report on the Ipswich Sparrow princeps subspecies *Passerculus sandwichensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 13 pp.

COSEWIC. 2008b. COSEWIC assessment and status report on the Snapping Turtle Chelydra serpentina in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 47 pp.

COSEWIC. 2010. COSEWIC assessment and update status report on the Atlantic Cod *Gadus morhua* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 76 pp .

COSEWIC. 2011a. COSEWIC status appraisal summary on the Barrow's Goldeneye *Bucephala islandica*, Eastern population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii pp.

COSEWIC. 2011b. COSEWIC assessment and status report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

COSEWIC. 2011c. COSEWIC assessment and status report on the Yellow-breasted Chat auricollis subspecies *Icteria virens auricollis* and the Yellow-breasted Chat virens subspecies *Icteria virens virens* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 51 pp.

COSEWIC. 2012a. COSEWIC assessment and status report on Buff-breasted Sandpiper *Tryngites subruficollis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 44 pp.

COSEWIC. 2012b. COSEWIC assessment and status report on the Eastern Wood-pewee *Contopus virens* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 39 pp.

COSEWIC. 2012c. COSEWIC assessment and status report on the Atlantic Wolffish *Anarhichas lupus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 56 pp.

COSEWIC, 2012d. COSEWIC assessment and status report on the American Eel *Anguilla rostrata* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 109 pp.

COSEWIC. 2012e. COSEWIC assessment and status report on the Striped Bass *Morone saxatilis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. iv + 82 pp.

COSEWIC 2013a. COSEWIC assessment and status report on the Harlequin Duck *Histrionicus histrionicus* Eastern population in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 38 pp.

COSEWIC. 2013b. COSEWIC assessment and status report on the Piping Plover *circumcinctus* subspecies (*Charadrius melodus circumcinctus*) and the *melodus* subspecies (*Charadrius melodus melodus*), in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 39 pp.

COSEWIC, 2013c. COSEWIC assessment and status report on the Bank Swallow *Riparia riparia* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 48 pp.

COSEWIC. 2013d. COSEWIC assessment and status report on the little brown myotis *Myotis lucifugus*, northern myotis *Myotis septentrionalis* and tri-colored bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Ottawa. xxiv + 93 pp.

COSEWIC. 2014a. COSEWIC assessment and status report on the Boreal Felt Lichen *Erioderma pedicellatum,* Boreal population and Atlantic population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 66 pp.

COSEWIC. 2014b. COSEWIC assessment and status report on the Sweet Pepperbush *Clethra alnifolia* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 41 pp.

COSEWIC. 2015. COSEWIC assessment and status report on the Yellow-banded Bumble Bee *Bombus terricola* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 60

COSEWIC. 2016a. COSEWIC assessment and status report on the Evening Grosbeak *Coccothraustes vespertinus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 64 pp.

COSEWIC. 2016b. COSEWIC assessment and status report on the Monarch *Danaus plexippus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 59 pp.

COSEWIC. 2017a. COSEWIC assessment and status report on the Harris's Sparrow *Zonotrichia querula* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 36 pp.

COSEWIC. 2017b. COSEWIC assessment and status report on the Rusty Blackbird *Euphagus carolinus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 64 pp.

COSEWIC. 2018a. COSEWIC assessment and status report on the Common Nighthawk *Chordeiles minor* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 50 pp.

COSEWIC. 2018b. COSEWIC assessment and status report on the Chimney Swift *Chaetura pelagica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 63 pp.

COSEWIC. 2018c. COSEWIC assessment and status report on the Olive-sided Flycatcher *Contopus cooperi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 52 pp.

COSEWIC. 2018d. 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 Endangered Wildlife in Canada. Ottawa. xvi + 107 pp.

COSEWIC. 2018e. COSEWIC assessment and status report on the Wood Turtle *Glyptemys insculpta* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 51 pp.

COSEWIC. 2019. COSEWIC assessment and status report on the Hudsonian Godwit *Limosa haemastica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 50 pp.

COSEWIC. 2020a. COSEWIC assessment and status report on the Lesser Yellowlegs *Tringa flavipes* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 64 pp.

COSEWIC. 2020b. COSEWIC assessment and status report on the Red Knot *Calidris canutus*, *islandica* subspecies *Calidris canutus islandica*), *roselaari* subspecies (*Calidris canutus roselaari*) and *rufa* subspecies (*Calidris canutus rufa*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxxv + 173 pp.

COSEWIC. 2020c. COSEWIC assessment and status report on the Canada Warbler *Cardellina canadensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 54 pp.

COSEWIC. 2021a. COSEWIC assessment and status report on the Short-eared Owl *Asio flammeus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 69 pp.

COSEWIC. 2021b. COSEWIC assessment and status report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 60 pp. (https://wildlife-species.az.ec.gc.ca/species-risk-registry/virtual_sara/files//cosewic/sr%20Barn%20Swallow%202021_e.pdf).

COSEWIC. 2022a. COSEWIC assessment and status report on the Bobolink *Dolichonyx oryzivorus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 60 pp.

COSEWIC. 2023. COSEWIC assessment and status report on the Hoary Bat *Lasiurus cinereus*, Eastern Red Bat *Lasiurus borealis* and Silver-haired Bat *Lasionycteris noctivagans*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxi + 100 pp.

East Coast Aquatics. 2016. Ecological aspects of a local Wood Turtle (*Glyptemys insculpta*) population along the Sackville River, Nova Scotia. Part 5. Produced for Nova Scotia Department of Transportation and Infrastructure Renewal. March 2016. 60 pp.

Environment and Climate Change Canada. 2018. Recovery strategy for the Eastern Whip-poor-will (*Antrostomus vociferus*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vi + 107pp.

Environment and Climate Change Canada. 2018. Recovery strategy for the Little Brown Myotis (*Myotis lucifugus*), the Northern Myotis (*Myotis septentrionalis*), and the Tri-colored bat (*Perimyotis subflavus*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 172pp.

Environment and Climate Change Canada. 2020. Action Plan for the Boreal Felt Lichen (Erioderma pedicellatum) (Atlantic population) and Vole Ears Lichen (Erioderma mollissimum) in Canada. Species at Risk Act Action Plan Series. Environment and Climate Change Canada, Ottawa. v + 44 pp.

Environment and Climate Change Canada. 2022a. Management Plan for the Red-necked Phalarope (*Phalaropus lobatus*) in Canada (Proposed). *Species at Risk Act* Management Plan Series. Environment and Climate Change Canada, Ottawa. iv + 40pp.

Environment and Climate Change Canada. 2022b. Recovery strategy for the Bobolink (*Dolichonyx oryzivorus*) in Canada (Proposed). *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. viii + 141pp.

Environment and Climate Change Canada. 2022c. Management Plan for the Yellow banded Bumble Bee (Bombus terricola) in Canada [Proposed]. Species at Risk Act Management Plan Series. Environment and Climate Change Canada, Ottawa. iv + 46 pp

Environment and Climate Change Canada (ECCC). 2022d. Recovery Strategy for the Gypsy Cuckoo Bumble Bee (*Bombus bohemicus*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. viii + 80 pp.

Environment Canada. 2007. Recovery Strategy for the Boreal Felt Lichen (Erioderma pedicellatum), Atlantic Population, in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. viii + 31 pp.

Environment Canada. 2014. Recovery strategy for the Dense Blazing Star (*Liatris spicata*) in Canada (Proposed). *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vi + 27pp.

Government of NS. 2011. Nova Scotia Wetland Conservation Policy. Dated September 2011, revised October 2019. Available from: https://novascotia.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf

Halifax Regional Municipality. 2022. *Item No. 9.1.3 Heritage Advisory Committee*, Case H00534: Request to include 18 Wilfred Jakson Way, Westphal, in the Registry of Heritage Property for the Halifax Regional Municipality, Halifax.

Halifax Regional Municipality. 2024. Land Use Bylaw Eastern Passage / Cow Bay. Accessed at: https://cdn.halifax.ca/sites/default/files/documents/about-the-city/regional-community-planning/easternpassagecowbay-lub-eff-23oct13-case2023-002-toclinked-2.pdf April 8, 2024

Halifax Regional Municipality and Halifax Water. 2020. Halifax Stormwater Management Standards For development activities July 2020

Halifax Regional Municipality and O2 Planning + Design. 2018. Halifax Green Network Plan. Available from: https://cdn.halifax.ca/sites/default/files/documents/about-the-city/regional-community-planning/HGNP-Final%20Report_20180726_updated.pdf. June 2018

Hastings, K., King, M., and Allard, K. 2014. Ecologically and Biologically Significant Areas in the Atlantic Coastal Region of Nova Scotia. Canadian Technical Report of Fisheries and Aquatic Sciences 3107

NBDELG (New Brunswick Department of Environment and Local Government). 2018. Manual for Wetland Ecosystem Protocol for Atlantic Canada (WESP-AC): Non-tidal Wetlands. Fredericton, NB.

Neily, P., S. Basquill, E. Quigley K. Keys, S. Maston and B. Stewart. 2023. Forest Ecosystem Classification for Nova Scotia (2022): Field Guide. Nova Scotia Dept. of Natural Resources and Renewables forestry and Wildlife Branch.

Nova Scotia Lands and Forestry (NSLF). 2018. At-Risk-Lichens: Special Management Practises. Available Online: January 2024 https://novascotia.ca/natr/wildlife/habitats/terrestrial/pdf/SMP_BFL_At-Risk-Lichens.pdf.

NSDNR (Nova Scotia Department of Natural Resources). 2017. Ecological Land Classification for Nova Scotia. Retrieved from Ecological-Land-Classification-guide.pdf (novascotia.ca)

NSDNRR (Nova Scotia Department of Natural Resources and Renewables). 2021. Recovery Plan for the Bank Swallow (Riparia riparia) in Nova Scotia (Final). Nova Scotia Endangered Species Act Recovery Plan Series.

NSDNRR. 2022a. Management Plan for the Eastern Wood-pewee (*Contopus virens*) in Nova Scotia. *Nova Scotia Endangered Species Act Recovery Plan Series*. 39 pp.

NSDNRR. 2022b. An Old-Growth Forest Policy for Nova Scotia old-growth-forest-policy.pdf (novascotia.ca). Accessed September 2023.

NSECC (Nova Scotia Department of Environment and Climate Change). 2021. Sulphide Bearing Material Disposal Regulations. Updated 2021.

NSECC (Nova Scotia Department of Environment and Climate Change). 2022. NS Well Logs Database. https://novascotia.ca/nse/groundwater/welldatabase.asp. Updated 2022.

Porter, C.J.M., Basquill, S.P. and Lundholm, J.T. 2020. Barrens Ecosystems in Nova Scotia: Classification of Heathlands and Related Plant Communities.

Sadeghpour, M.H. and T.F. Ginnett. 2011. Habitat selection by female American black bears in northern Wisconsin. Ursus 22(2): 159-166.

Scheidegger, C. (Lichen Specialist Group). 2003. *Erioderma pedicellatum*. The IUCN Red List of Threatened Species 2003: e.T43995A10839336. http://dx.doi.org/10.2305/IUCN.UK.2003.RLTS.T43995A10839336.en

Stea, R.R., Conley, H., and Brown, Y. (compilers) 1992: Surficial Geology of the Province of Nova Scotia; Nova Scotia Department of Natural Resources, Map 92-3, Scale 1:500 000.

White, C.E. and Goodwin, T.A.. 2011. Lithogeochemistry, petrology, and the acid-generating potential of the Goldenville and Halifax groups and associated granitoid rocks in metropolitan Halifax Regional Municipality, Nova Scotia, Canada.

White, C.E., MacDonald, M.A., and Home, R. J. 2014: Bedrock geology map of the Halifax area, NTS 11D/12, Halifax County, Nova Scotia; Nova Scotia Department of Natural Resources, Open File Map ME 2014-010, scale 1:50,000.

APPENDIX A

AC CDC Report

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

DATA REPORT 7795: Morris Lake, NS

Prepared 4 August 2023
by J. Churchill, Data Manager

CONTENTS OF REPORT

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

2.0 Rare and Endangered Species
- 2.1 Flora
- 2.2 Fauna
- Map 2: Flora and Fauna

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

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

5.0 Rare Species within 100 km
- 5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (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
MorrisLkNS_7795ob.xls	Rare or legally-protected Flora and Fauna in your study area
MorrisLkNS_7795ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
MorrisLkNS_7795msa.xls	Managed and Biologically Significant Areas in your study area
MorrisLkNS_7795bp.xls	Rare and common Pelagic Birds in your study area (CWS 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
(902) 541-0081
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-0816
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
(902) 890-1046
Kimberly.George@novascotia.ca

Eastern: Harrison Moore
(902) 497-4119
Harrison.Moore@novascotia.ca

Eastern: Maureen Cameron-MacMillan
(902) 295-2554
Maureen.Cameron-MacMillan@novascotia.ca

Eastern: Elizabeth Walsh
(902) 563-3370
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

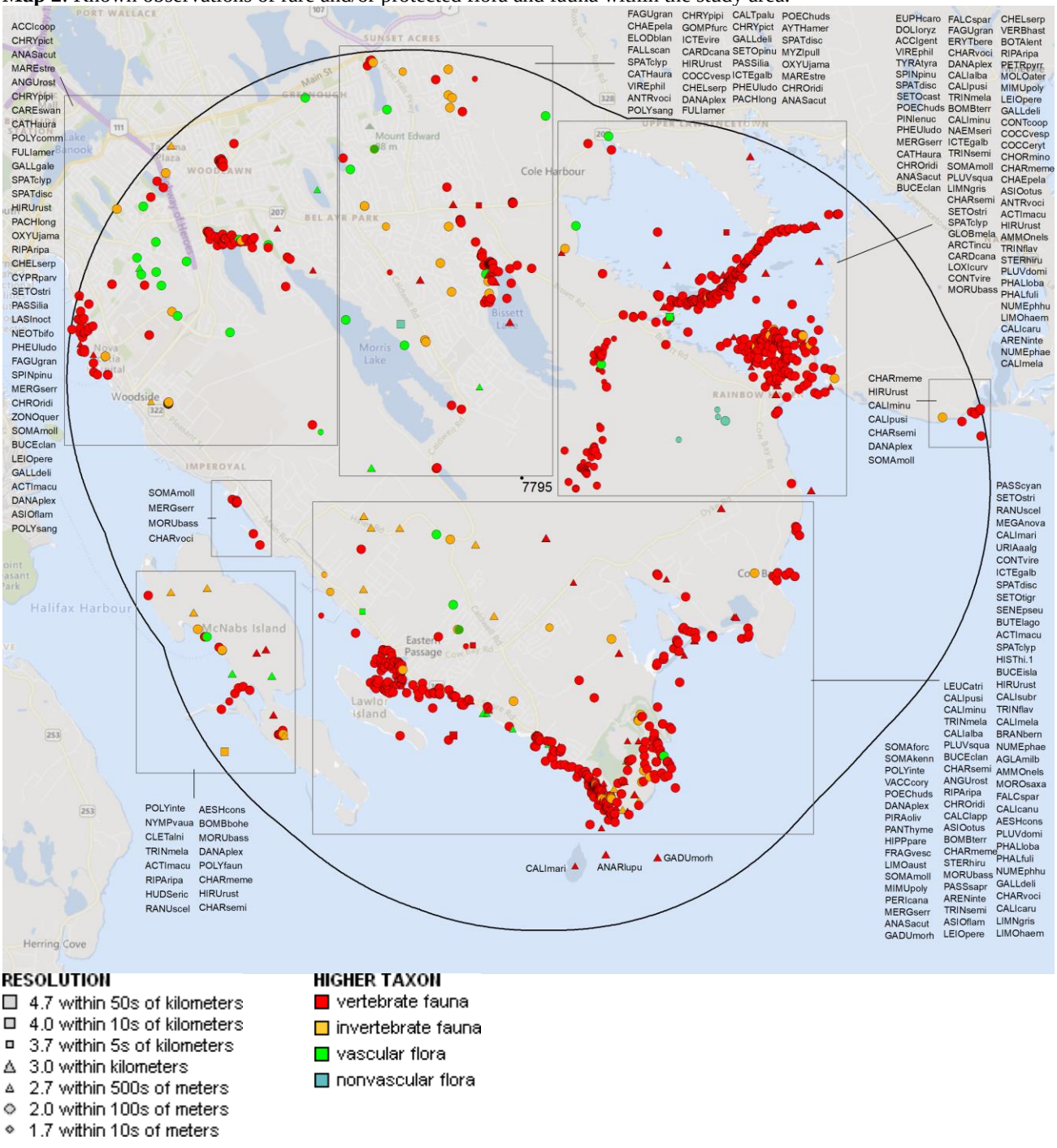
2.1 FLORA

The study area contains 44 records of 15 vascular and 5 records of 2 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 FAUNA

The study area contains 1937 records of 99 vertebrate and 131 records of 18 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.



3.0 SPECIAL AREAS

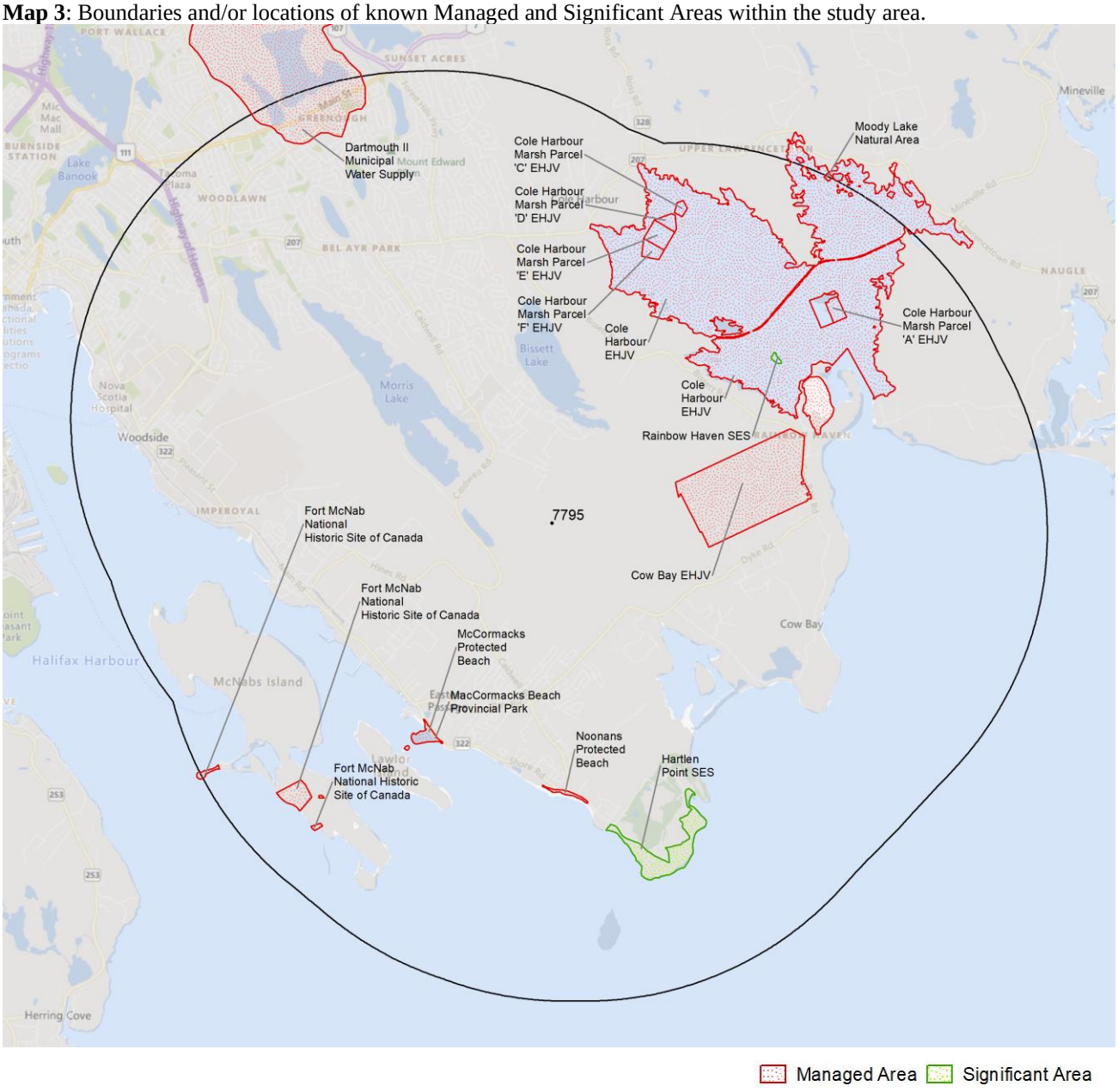
3.1 MANAGED AREAS

The GIS scan identified 13 managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified 2 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *msa.xls).

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	*Elodium blandowii*	Blandow's Bog Moss				S3?	1	3.0 ± 7.0
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	4	2.5 ± 0.0
P	*Clethra alnifolia*	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S2	1	5.4 ± 0.0
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	1	4.9 ± 2.0
P	*Ranunculus sceleratus*	Cursed Buttercup				S2	4	3.8 ± 1.0
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	1	4.8 ± 0.0
P	*Senecio pseudoarnica*	Seabeach Ragwort				S3	2	3.6 ± 1.0
P	*Polygala sanguinea*	Blood Milkwort				S3	2	2.3 ± 1.0
P	*Carex swanii*	Swan's Sedge				S3	1	5.4 ± 0.0
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S3	1	6.8 ± 0.0
P	*Neottia bifolia*	Southern Twayblade				S3	1	6.2 ± 0.0
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	1	1.6 ± 0.0
P	*Fagus grandifolia*	American Beech				S3S4	21	2.1 ± 0.0
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	1	1.5 ± 0.0
P	*Fragaria vesca*	Woodland Strawberry				S3S4	1	2.2 ± 0.0
P	*Limosella australis*	Southern Mudwort				S3S4	5	3.2 ± 3.0
P	*Verbena hastata*	Blue Vervain				S3S4	1	3.3 ± 7.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	71	3.3 ± 7.0
A	*Icteria virens*	Yellow-Breasted Chat	Endangered	Endangered		SNA	4	3.4 ± 0.0
A	*Lasionycteris noctivagans*	Silver-haired Bat	Endangered			SUB,S1M	1	6.5 ± 0.0
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern		S1B	3	3.3 ± 0.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	50	2.7 ± 0.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	3	2.4 ± 1.0
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S2S3M	16	4.4 ± 0.0
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	75	3.1 ± 0.0
A	*Anguilla rostrata*	American Eel	Threatened			S3N	4	3.6 ± 0.0
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1?B	2	1.3 ± 0.0
A	*Passerculus sandwichensis princeps*	Ipswich Sparrow	Special Concern	Special Concern		S1B	21	3.6 ± 0.0
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	1	4.8 ± 0.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	1	3.3 ± 7.0
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	3	4.4 ± 0.0
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S2S3N,SUM	1	4.7 ± 0.0
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	9	3.3 ± 10.0
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	19	3.3 ± 0.0
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	74	0.8 ± 0.0
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	4	3.3 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	1	3.3 ± 7.0
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Vulnerable	S3B	2	3.3 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	3	3.3 ± 7.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3	0.7 ± 0.0
A	*Chrysemys picta*	Painted Turtle	Special Concern	Special Concern		S4	17	2.7 ± 0.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	45	3.0 ± 0.0
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	3	4.8 ± 0.0
A	*Zonotrichia querula*	Harris's Sparrow	Special Concern			SNA	1	7.1 ± 0.0
A	*Anarhichas lupus*	Atlantic Wolffish	Special Concern	Special Concern		SNR	1	5.9 ± 0.0
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	1	6.7 ± 0.0
A	*Fulica americana*	American Coot	Not At Risk			S1B	5	2.7 ± 0.0
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	2	4.2 ± 0.0
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	1	4.3 ± 0.0
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	30	3.4 ± 0.0
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	1	4.6 ± 0.0
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	4	3.3 ± 7.0
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	14	3.3 ± 7.0
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	18	4.4 ± 0.0
A	*Calidris canutus*	Red Knot	E,SC	E,T		S2M	2	4.6 ± 1.0
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3B,S2S3N	1	5.1 ± 0.0
A	*Gadus morhua*	Atlantic Cod	E,SC,DD			SNR	2	3.6 ± 0.0
A	*Uria aalge*	Common Murre				S1?B	1	4.3 ± 0.0
A	*Passerina cyanea*	Indigo Bunting				S1?B,SUM	2	4.1 ± 0.0
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	7	2.7 ± 0.0
A	*Gallinula galeata*	Common Gallinule				S1B	1	6.1 ± 0.0
A	*Mimus polyglottos*	Northern Mockingbird				S1B	4	2.7 ± 0.0
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S4M	103	3.0 ± 0.0
A	*Calidris minutilla*	Least Sandpiper				S1B,S4M	77	2.7 ± 7.0
A	*Anas acuta*	Northern Pintail				S1B,SUM	21	2.8 ± 0.0
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B,SUM	2	1.3 ± 0.0
A	*Molothrus ater*	Brown-headed Cowbird				S2B	1	3.3 ± 7.0
A	*Spatula clypeata*	Northern Shoveler				S2B,SUM	13	1.5 ± 0.0
A	*Mareca strepera*	Gadwall				S2B,SUM	4	2.8 ± 0.0
A	*Piranga olivacea*	Scarlet Tanager				S2B,SUM	4	1.8 ± 0.0
A	*Calidris alba*	Sanderling				S2N,S3M	46	3.4 ± 0.0
A	*Asio otus*	Long-eared Owl				S2S3	2	3.2 ± 0.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	1	3.3 ± 7.0
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	11	1.4 ± 0.0
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	2	4.0 ± 0.0
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	36	3.3 ± 0.0
A	*Icterus galbula*	Baltimore Oriole				S2S3B,SUM	4	3.1 ± 0.0
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	14	4.4 ± 0.0
A	*Numenius phaeopus*	Whimbrel				S2S3M	12	3.7 ± 0.0
A	*Numenius phaeopus hudsonicus*	Whimbrel				S2S3M	14	4.4 ± 0.0
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	3	4.4 ± 0.0
A	*Perisoreus canadensis*	Canada Jay				S3	1	2.7 ± 0.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	6	1.0 ± 1.0
A	*Spinus pinus*	Pine Siskin				S3	2	3.3 ± 7.0
A	*Calcarius lapponicus*	Lapland Longspur				S3?N,SUM	1	3.6 ± 0.0
A	*Spatula discors*	Blue-winged Teal				S3B	14	3.1 ± 0.0
A	*Charadrius vociferus*	Killdeer				S3B	10	4.1 ± 0.0
A	*Tringa semipalmata*	Willet				S3B	148	2.9 ± 0.0
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	1	3.3 ± 7.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	1	3.3 ± 7.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	3	3.0 ± 0.0
A	*Somateria mollissima*	Common Eider				S3B,S3M,S3N	187	2.7 ± 0.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S4M	160	1.0 ± 1.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	3	5.1 ± 0.0
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	7	3.3 ± 7.0
A	*Setophaga striata*	Blackpoll Warbler				S3B,S5M	7	2.2 ± 0.0
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	2	3.3 ± 7.0
A	*Setophaga tigrina*	Cape May Warbler				S3B,SUM	2	4.3 ± 0.0
A	*Branta bernicla*	Brant				S3M	1	4.8 ± 0.0
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	132	3.0 ± 0.0
A	*Arenaria interpres*	Ruddy Turnstone				S3M	47	3.4 ± 0.0
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	89	3.0 ± 0.0
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	20	4.0 ± 0.0
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	72	3.0 ± 0.0
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	16	2.8 ± 0.0
A	*Loxia curvirostra*	Red Crossbill				S3S4	1	1.0 ± 0.0
A	*Botaurus lentiginosus*	American Bittern				S3S4B,S4S5M	1	3.3 ± 7.0
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	1	3.3 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	29	3.3 ± 7.0
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	3	3.3 ± 7.0
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	4	3.4 ± 0.0
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	45	3.3 ± 7.0
A	*Calidris maritima*	Purple Sandpiper				S3S4N	3	4.1 ± 10.0
A	*Morus bassanus*	Northern Gannet				SHB	10	3.0 ± 3.0
A	*Aythya americana*	Redhead				SHB	1	3.0 ± 0.0
A	*Leucophaeus atricilla*	Laughing Gull				SHB	3	3.4 ± 0.0
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	1	5.6 ± 1.0
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	93	1.2 ± 2.0
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	5	1.4 ± 0.0
I	*Pachydiplax longipennis*	Blue Dasher				S1	5	2.9 ± 0.0
I	*Polygonia comma*	Eastern Comma				S1?	1	7.4 ± 0.0
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	4	2.5 ± 1.0
I	*Nymphalis l-album*	Compton Tortoiseshell				S2S3	2	5.4 ± 2.0
I	*Aglais milberti*	Milbert's Tortoiseshell				S2S3	1	4.9 ± 1.0
I	*Somatochlora kennedyi*	Kennedy's Emerald				S2S3	2	2.5 ± 1.0
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	1	3.4 ± 0.0
I	*Naemia seriata*	Seaside Lady Beetle				S3	1	3.7 ± 0.0
I	*Myzia pullata*	Streaked Lady Beetle				S3	1	3.0 ± 0.0
I	*Somatochlora forcipata*	Forcipate Emerald				S3	1	2.5 ± 1.0
I	*Polygonia interrogationis*	Question Mark				S3B	7	2.1 ± 2.0
I	*Polygonia faunus*	Green Comma				S3S4	2	5.4 ± 2.0
I	*Aeshna constricta*	Lance-Tipped Darner				S3S4	2	5.1 ± 1.0
I	*Gomphaeschna furcillata*	Harlequin Darner				S3S4	1	6.7 ± 0.0
I	*Erythrodiplax berenice*	Seaside Dragonlet				S3S4	1	5.0 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting 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	Endangered	No
Glyptemys insculpta	**Wood Turtle**	**Threatened**	**Threatened**	**YES**
Falco peregrinus pop. 1	**Peregrine Falcon - anatum/tundrius pop.**		**Vulnerable**	**YES**
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
957	iNaturalist.ca. 2023. iNaturalist Data Export December 2022. iNaturalist.org; iNaturalist.ca.
495	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
190	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
123	Paquet, Julie. 2018. Atlantic Canada Shorebird Survey (ACSS) database 2012-2018. Environment Canada, Canadian Wildlife Service.
71	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
49	eBird. 2020. eBird Basic Dataset. Version: EBD_relNov-2019. Ithaca, New York. Nov 2019, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology.
39	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
33	Staicer, C. 2021. Additional compiled Nova Scotia Species at Risk bird records, 2005-2020. Dalhousie University.
21	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
12	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
10	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.
10	Staicer, Cindy. 2022. 2021 Landbird Species at Risk observations. Dalhousie University.
9	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
9	Feltham, Carter. 2022. Monarch (Danaus plexippus) and Milkweed MTRI records from the 2022 Field Season. Mersey Tobeatic Research Institute.
9	Nova Scotia Dept Natural Resources, Forestry Branch. 2007. Restricted & Limited Use Land Database (RLUL). , http://www.gov.ns.ca/natr/FORESTRY/rlul/downloadrlul.htm.
8	Canadian Wildlife Service. 2011. Eastern Canada Seabirds at Sea (ECSAS), 3.27 Ed. Environment Canada, 305,783 recs.
7	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
6	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
6	Staicer, Cindy. 2023. 2022 SAR Bird field occurrences from the Landbirds at Risk Project, NS. Dalhousie University, 446 records.
5	iNaturalist. 2020. iNaturalist butterfly records selected for the Maritimes Butterfly Atlas. iNaturalist.
5	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
4	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
4	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
4	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.
4	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
3	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
3	Chapman, C.J. 2019. Atlantic Canada Conservation Data Centre 2019 botanical fieldwork. Atlantic Canada Conservation Data Centre, 11729 recs.
3	e-Butterfly. 2016. Export of Maritimes records and photos. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
3	Mersey Tobetic Research Institute. 2021. 2020 Monarch records from the MTRI monitoring program. Mersey Tobetic Research Institute, 72 records.
3	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
3	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
3	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
3	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
2	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
2	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.

# recs	CITATION
2	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
2	Paquet, Julie. 2019. Atlantic Canada Shorebird Survey ACSS database for 2019. Environment Canada, Canadian Wildlife Service.
1	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
1	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
1	e-Butterfly. 2019. Export of Maritimes records and photos. McFarland, K. (ed.) e-butterfly.org.
1	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
1	Hubley, Nicole. 2022. Monarch (Danaus plexippus) records submitted to MTRI from the 2021 field season. Mersey Tobeatic Research Institute.
1	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
1	MacKinnon, D.; Wright, P.; Smith, D. 2014. 2014 Common Tern email report, Eastern Passage, NS. NS Department of Environment.
1	NatureServe Canada. 2018. iNaturalist Butterfly Data Export . iNaturalist.org and iNaturalist.ca.
1	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
1	Nova Scotia Department of Lands and Forestry. 2020. NS Lands Proposed or Pending Protection. NSDLF, 231 features. Received via email.
1	Nova Scotia Dept Natural Resources, Mineral Resources Branch. 2007. Restricted & Limited Use Land Database (RLUL). , http://www.gov.ns.ca/natr/forestry/rlul/download.asp. 767 recs.
1	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
1	Richardson, Leif. 2018. Maritimes Bombus records from various sources. Richardson, Leif.
1	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
1	Sabine, D.L. Bombus terricola specimens in Dwayne Sabine's personal collection. pers. comm. 2022.
1	Staicer, Cindy. 2023. 2022 SAR Bird ARU occurrences. Dalhousie University, 379 records.
1	Sutherland, B. 2000. NSNT Properties Data. Nova Scotia Nature Trust, 5 locations.
1	Treasury Board of Canada Secretariat. 2020. National Historic Sites. Directory of Federal Real Property.https://www.tbs-sct.gc.ca/dfrp-rbif/home-accueil-eng.aspx.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 38530 records of 164 vertebrate and 1880 records of 69 invertebrate fauna; 7454 records of 269 vascular and 2990 records of 181 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	146	90.9 ± 1.0	NS
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	228	6.3 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Myotis	Endangered	Endangered	Endangered	S1	20	40.4 ± 0.0	NS
A	*Perimyotis subflavus*	Tricolored Bat	Endangered	Endangered	Endangered	S1	22	40.4 ± 0.0	NS
A	*Emydoidea blandingii*	Blanding's Turtle	Endangered	Endangered	Endangered	S1	2	10.8 ± 0.0	NS
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered		S1	34	27.8 ± 0.0	NS
A	*Salmo salar pop. 6*	Atlantic Salmon - Nova Scotia Southern Upland population	Endangered			S1	35	15.0 ± 0.0	NS
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	990	3.3 ± 7.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	68	19.9 ± 0.0	NS
A	*Dermochelys coriacea pop. 2*	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered		S1S2N	3	44.7 ± 5.0	NS
A	*Morone saxatilis pop. 2*	Striped Bass - Bay of Fundy population	Endangered			S2S3B,S2S3N	4	35.8 ± 0.0	NS
A	*Melanerpes erythrocephalus*	Red-headed Woodpecker	Endangered	Threatened		SNA	1	89.4 ± 0.0	NS
A	*Protonotaria citrea*	Prothonotary Warbler	Endangered	Endangered		SNA	1	19.7 ± 0.0	NS
A	*Icteria virens*	Yellow-Breasted Chat	Endangered	Endangered		SNA	24	3.4 ± 0.0	NS
A	*Lasiurus cinereus*	Hoary Bat	Endangered			SUB, S1M	23	16.0 ± 0.0	NS
A	*Lasionycteris noctivagans*	Silver-haired Bat	Endangered			SUB,S1M	9	6.5 ± 0.0	NS
A	*Lasiurus borealis*	Eastern Red Bat	Endangered			SUB,S1M	1	83.7 ± 0.0	NS
A	*Colinus virginianus*	Northern Bobwhite	Endangered	Endangered			7	26.7 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern		S1B	31	3.3 ± 0.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	826	6.7 ± 1.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	1343	2.7 ± 0.0	NS
A	*Thamnophis saurita*	Eastern Ribbonsnake	Threatened	Threatened	Threatened	S2S3	15	86.5 ± 1.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	885	2.4 ± 1.0	NS
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S2S3M	102	4.4 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2S3N	9	40.8 ± 0.0	NS
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S3B	58	8.3 ± 7.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	934	3.1 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S3N	110	3.6 ± 0.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	3	9.4 ± 0.0	NS
A	*Melanerpes lewis*	Lewis's Woodpecker	Threatened	Threatened		SNA	2	15.7 ± 0.0	NS
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened		SUB	2	7.6 ± 0.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	31	30.9 ± 0.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1?B	12	1.3 ± 0.0	NS
A	*Passerculus sandwichensis princeps*	Ipswich Sparrow	Special Concern	Special Concern		S1B	30	3.6 ± 0.0	NS
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	20	4.8 ± 0.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	205	3.3 ± 7.0	NS
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	3	23.5 ± 0.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	11	4.4 ± 0.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S2S3N,SUM	74	4.7 ± 0.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	358	3.3 ± 10.0	NS
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	1031	3.3 ± 0.0	NS
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	898	0.8 ± 0.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	434	3.3 ± 7.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	697	3.3 ± 7.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Vulnerable	S3B	556	3.3 ± 7.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	527	3.3 ± 7.0	NS
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern		S3N,SUM	21	37.9 ± 0.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	766	0.7 ± 0.0	NS
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern			S4	15	7.9 ± 7.0	NS
A	*Phocoena phocoena pop. 1*	Harbour Porpoise - Northwest Atlantic Population	Special Concern			S4	2	76.2 ± 0.0	NS
A	*Chrysemys picta*	Painted Turtle	Special Concern	Special Concern		S4	66	2.7 ± 0.0	NS
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	422	3.0 ± 0.0	NS
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	52	4.8 ± 0.0	NS
A	*Zonotrichia querula*	Harris's Sparrow	Special Concern			SNA	1	7.1 ± 0.0	NS
A	*Anarhichas lupus*	Atlantic Wolffish	Special Concern	Special Concern		SNR	5	5.9 ± 0.0	NS
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern			1	91.9 ± 0.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	12	6.7 ± 0.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	41	2.7 ± 0.0	NS
A	*Chlidonias niger*	Black Tern	Not At Risk			S1B	1	17.0 ± 0.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk		Vulnerable	S1B,SUM	48	4.4 ± 0.0	NS
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	2	95.7 ± 0.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B,SUM	4	39.3 ± 7.0	NS
A	*Lynx canadensis*	Canada Lynx	Not At Risk		Endangered	S2S3	2	82.3 ± 1.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	3	4.2 ± 0.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	32	10.6 ± 0.0	NS
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	2	4.3 ± 0.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	319	3.4 ± 0.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	50	10.1 ± 0.0	NS
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	1	4.6 ± 0.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	113	3.3 ± 7.0	NS
A	*Glaucomys volans*	Southern Flying Squirrel	Not At Risk			S3S4	8	40.3 ± 2.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	5	12.6 ± 2.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	136	3.3 ± 7.0	NS
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	644	4.4 ± 0.0	NS
A	*Calidris canutus*	Red Knot	E,SC	E,T		S2M	4	4.6 ± 1.0	NS
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3B,S2S3N	29	5.1 ± 0.0	NS
A	*Gadus morhua*	Atlantic Cod	E,SC,DD			SNR	11	3.6 ± 0.0	NS
A	*Salmo salar*	Atlantic Salmon	E,T,SC			S1B,S1N	13	42.8 ± 0.0	NS
A	*Alces alces americana*	Moose			Endangered	S1	57	16.1 ± 0.0	NS
A	*Alces alces*	Moose				S1	6	26.9 ± 0.0	NS
A	*Uria aalge*	Common Murre				S1?B	7	4.3 ± 0.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B,SUM	19	4.1 ± 0.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	13	2.7 ± 0.0	NS
A	*Gallinula galeata*	Common Gallinule				S1B	8	6.1 ± 0.0	NS
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	27	8.1 ± 7.0	NS
A	*Cistothorus palustris*	Marsh Wren				S1B	2	74.7 ± 0.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	75	2.7 ± 0.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	13	8.1 ± 0.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S4M	1883	3.0 ± 0.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S4M	1348	2.7 ± 7.0	NS
A	*Anas acuta*	Northern Pintail				S1B,SUM	68	2.8 ± 0.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B,SUM	19	13.7 ± 0.0	NS
A	*Vespertilionidae sp.*	bat species				S1S2	177	3.6 ± 0.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S1S2B,SUM	17	22.6 ± 7.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B,SUM	31	1.3 ± 0.0	NS
A	*Alca torda*	Razorbill				S2B	26	11.8 ± 0.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S2B	33	39.2 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	25	7.9 ± 7.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	133	3.3 ± 7.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B,SUM	28	1.5 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B,SUM	35	2.8 ± 0.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B,SUM	36	1.8 ± 0.0	NS
A	*Calidris alba*	Sanderling				S2N,S3M	1465	3.4 ± 0.0	NS
A	*Martes americana*	American Marten			Endangered	S2S3	2	16.6 ± 0.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	22	3.2 ± 0.0	NS
A	*Rallus limicola*	Virginia Rail				S2S3B	18	12.5 ± 7.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S2S3B	16	39.2 ± 0.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	211	3.3 ± 7.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3B,S2S3N	93	7.1 ± 12.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	92	1.4 ± 0.0	NS
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	42	4.0 ± 0.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	282	3.3 ± 0.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B,SUM	70	3.1 ± 0.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	258	4.4 ± 0.0	NS
A	*Numenius phaeopus*	Whimbrel				S2S3M	20	3.7 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Whimbrel				S2S3M	255	4.4 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	4	4.4 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	499	2.7 ± 0.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	536	1.0 ± 1.0	NS
A	*Spinus pinus*	Pine Siskin				S3	421	3.3 ± 7.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	100	9.8 ± 0.0	NS
A	*Salvelinus namaycush*	Lake Trout				S3	2	33.4 ± 0.0	NS
A	*Sorex maritimensis*	Maritime Shrew				S3	1	86.4 ± 1.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	1	98.0 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	9	32.2 ± 0.0	NS
A	*Calcarius lapponicus*	Lapland Longspur				S3?N,SUM	6	3.6 ± 0.0	NS
A	*Spatula discors*	Blue-winged Teal				S3B	67	3.1 ± 0.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	532	4.1 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Tringa semipalmata*	Willet				S3B	1852	2.9 ± 0.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	69	7.5 ± 0.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	39	3.3 ± 7.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	175	3.3 ± 7.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	313	3.0 ± 0.0	NS
A	*Alosa pseudoharengus*	Alewife				S3B	33	15.7 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3B,S3M,S3N	1013	2.7 ± 0.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S4M	2084	1.0 ± 1.0	NS
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	230	5.1 ± 0.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	528	3.3 ± 7.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3B,S5M	135	2.2 ± 0.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	71	8.1 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	131	3.3 ± 7.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S3B,SUM	148	4.3 ± 0.0	NS
A	*Branta bernicla*	Brant				S3M	3	4.8 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	2038	3.0 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	794	3.4 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	1678	3.0 ± 0.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	348	4.0 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	1293	3.0 ± 0.0	NS
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	30	2.8 ± 0.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	155	7.9 ± 7.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	220	1.0 ± 0.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B,S4S5M	168	3.3 ± 7.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	363	3.3 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	751	3.3 ± 7.0	NS
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	381	3.3 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	89	3.4 ± 0.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	327	3.3 ± 7.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3S4N	198	4.1 ± 10.0	NS
A	*Lanius borealis*	Northern Shrike				S3S4N	2	27.0 ± 0.0	NS
A	*Morus bassanus*	Northern Gannet				SHB	62	3.0 ± 3.0	NS
A	*Aythya americana*	Redhead				SHB	5	3.0 ± 0.0	NS
A	*Leucophaeus atricilla*	Laughing Gull				SHB	12	3.4 ± 0.0	NS
A	*Progne subis*	Purple Martin				SHB	1	7.6 ± 0.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N,S5M	25	7.7 ± 0.0	NS
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	24	5.6 ± 1.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	896	1.2 ± 2.0	NS
I	*Danaus plexippus plexippus*	Monarch	Endangered	Special Concern		S2?B,S3M	2	57.1 ± 0.0	NS
I	*Barnea truncata*	Atlantic Mud-piddock	Threatened	Threatened		S1	10	79.7 ± 0.0	NS
I	*Bombus suckleyi*	Suckley's Cuckoo Bumble Bee	Threatened			SH	4	54.3 ± 5.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Threatened	S3	5	44.5 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	144	1.4 ± 0.0	NS
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern		Endangered	SH	4	51.4 ± 2.0	NS
I	*Gomphurus ventricosus*	Skillet Clubtail	Special Concern	Endangered		SH	2	33.3 ± 0.0	NS
I	*Cicindela formosa*	Big Sand Tiger Beetle				S1	1	92.8 ± 1.0	NS
I	*Erora laeta*	Early Hairstreak				S1	1	13.5 ± 1.0	NS
I	*Pachydiplax longipennis*	Blue Dasher				S1	28	2.9 ± 0.0	NS
I	*Polygonia comma*	Eastern Comma				S1?	21	7.4 ± 0.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	7	13.0 ± 1.0	NS
I	*Somatochlora brevicincta*	Quebec Emerald				S1S2	1	15.9 ± 0.0	NS
I	*Tharsalea dospassosi*	Maritime Copper				S2	3	11.0 ± 5.0	NS
I	*Satyrium acadica*	Acadian Hairstreak				S2	4	88.7 ± 2.0	NS
I	*Coenagrion resolutum*	Taiga Bluet				S2	2	21.2 ± 1.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	65	30.5 ± 0.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	6	2.5 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	*Nymphalis l-album*	Compton Tortoiseshell				S2S3	19	5.4 ± 2.0	NS
I	*Aglais milberti*	Milbert's Tortoiseshell				S2S3	19	4.9 ± 1.0	NS
I	*Somatochlora kennedyi*	Kennedy's Emerald				S2S3	3	2.5 ± 1.0	NS
I	*Enallagma geminatum*	Skimming Bluet				S2S3	2	93.6 ± 0.0	NS
I	*Stylurus scudderi*	Zebra Clubtail				S2S3	4	33.3 ± 0.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	22	8.4 ± 0.0	NS
I	*Strophiona nitens*	Chestnut Bark Long-horned Beetle				S3	2	16.8 ± 0.0	NS
I	*Psephenus herricki*	Herrick's Water Penny Beetle				S3	1	75.1 ± 0.0	NS
I	*Carabus serratus*	Serrated Ground Beetle				S3	1	86.7 ± 0.0	NS
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	3	3.4 ± 0.0	NS
I	*Disonycha pensylvanica*	Pennsylvania Flea Beetle				S3	1	92.8 ± 0.0	NS
I	*Chrysochus auratus*	Dogbane Leaf Beetle				S3	1	37.4 ± 0.0	NS
I	*Naemia seriata*	Seaside Lady Beetle				S3	29	3.7 ± 0.0	NS
I	*Elateroides lugubris*	Sapwood Ship-timber Beetle				S3	1	15.0 ± 0.0	NS
I	*Chilocorus stigma*	Twice-stabbed Lady Beetle				S3	10	11.8 ± 0.0	NS
I	*Myzia pullata*	Streaked Lady Beetle				S3	5	3.0 ± 0.0	NS
I	*Monochamus marmorator*	Balsam Fir Sawyer				S3	1	29.4 ± 0.0	NS
I	*Trachysida aspera*	Rough Flower Longhorn Beetle				S3	1	10.5 ± 0.0	NS
I	*Dicerca tuberculata*	Swollen Jewel Beetle				S3	1	27.9 ± 9.0	NS
I	*Astylopsis sexguttata*	Six-speckled Long-horned Beetle				S3	2	22.4 ± 0.0	NS
I	*Satyrium calanus*	Banded Hairstreak				S3	71	7.8 ± 1.0	NS
I	*Callophrys lanoraieensis*	Bog Elfin				S3	23	19.4 ± 2.0	NS
I	*Strymon melinus*	Gray Hairstreak				S3	12	13.0 ± 1.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S3	2	39.6 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S3	11	87.9 ± 0.0	NS
I	*Ophiogomphus rupinsulensis*	Rusty Snaketail				S3	21	33.3 ± 0.0	NS
I	*Epitheca princeps*	Prince Baskettail				S3	14	16.7 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4	2.5 ± 1.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	5	19.4 ± 0.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	164	2.1 ± 2.0	NS
I	*Lepturopsis biforis*	Two-spotted Long-horned Beetle				S3S4	1	68.1 ± 0.0	NS
I	*Cecropterus pylades*	Northern Cloudywing				S3S4	5	87.4 ± 2.0	NS
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S3S4	26	8.0 ± 0.0	NS
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	28	21.6 ± 0.0	NS
I	*Argynnis aphrodite*	Aphrodite Fritillary				S3S4	27	15.8 ± 0.0	NS
I	*Polygonia faunus*	Green Comma				S3S4	14	5.4 ± 2.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3S4	6	40.6 ± 1.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3S4	11	14.5 ± 1.0	NS
I	*Aeshna constricta*	Lance-Tipped Darner				S3S4	21	5.1 ± 1.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3S4	3	56.4 ± 1.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3S4	14	6.7 ± 0.0	NS
I	*Somatochlora franklini*	Delicate Emerald				S3S4	2	43.0 ± 1.0	NS
I	*Erythrodiplax berenice*	Seaside Dragonlet				S3S4	7	5.0 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3S4	21	14.6 ± 0.0	NS
I	*Enallagma vesperum*	Vesper Bluet				S3S4	4	43.0 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3S4	2	82.7 ± 1.0	NS
I	*Sphaerophoria pyrrhina*	Violaceous Globetail				SH	1	81.0 ± 5.0	NS
I	*Icaricia saepiolus*	Greenish Blue				SH	1	13.0 ± 2.0	NS
I	*Polygonia gracilis*	Hoary Comma				SH	1	82.8 ± 2.0	NS
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1	25	38.2 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	426	18.4 ± 0.0	NS
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened	Threatened	S1	16	58.7 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S2S3	155	15.1 ± 1.0	NS
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened	Threatened	S3	38	15.5 ± 0.0	NS
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S3	18	19.3 ± 0.0	NS
N	*Heterodermia squamulosa*	Scaly Fringe Lichen	Threatened			S3	9	46.2 ± 0.0	NS
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	250	7.6 ± 0.0	NS
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S3S4	30	18.5 ± 7.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	19	11.8 ± 1.0	NS
N	*Fissidens exilis*	Pygmy Pocket Moss	Not At Risk			S3	15	57.2 ± 0.0	NS
N	*Chaenotheca servitii*	Flexuous Golden Stubble	Data Deficient			S1	1	89.2 ± 1.0	NS
N	*Aloina brevirostris*	Short-Beaked Rigid Screw Moss				S1	2	57.6 ± 2.0	NS
N	*Sematophyllum demissum*	a Moss				S1	1	23.2 ± 2.0	NS
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				S1	1	89.2 ± 0.0	NS
N	*Blennothallia crispa*	Crinkled Jelly Lichen				S1	1	77.7 ± 0.0	NS
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1	1	32.0 ± 5.0	NS
N	*Usnea perplexans*	Powdered Beard Lichen				S1	1	79.9 ± 0.0	NS
N	*Lathagrium cristatum*	Fingered Jelly Lichen				S1	3	64.9 ± 0.0	NS
N	*Fuscopannaria praetermissa*	Moss Shingles Lichen				S1	1	62.7 ± 0.0	NS
N	*Scytinium schraderi*	Wrinkled Jellyskin Lichen				S1	1	67.7 ± 0.0	NS
N	*Lichina confinis*	Marine Seaweed Lichen				S1	4	19.7 ± 0.0	NS
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S1	1	74.0 ± 0.0	NS
N	*Pseudevernia consocians*	Common Antler Lichen				S1	1	82.5 ± 0.0	NS
N	*Sticta limbata*	Powdered Moon Lichen				S1	4	47.6 ± 3.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	5	61.3 ± 0.0	NS
N	*Bryoria nitidula*	Tundra Horsehair Lichen				S1	2	15.0 ± 0.0	NS
N	*Hypogymnia hultenii*	Powdered Honeycomb Lichen				S1	14	15.1 ± 1.0	NS
N	*Calypogeia neogaea*	Common Pouchwort				S1?	1	75.4 ± 0.0	NS
N	*Jubula pennsylvanica*	a liverwort				S1?	1	51.6 ± 0.0	NS
N	*Aloina rigida*	Aloe-Like Rigid Screw Moss				S1?	3	57.6 ± 2.0	NS
N	*Imbribryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1?	2	73.7 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	1	38.5 ± 2.0	NS
N	*Tortula obtusifolia*	a Moss				S1?	3	69.3 ± 0.0	NS
N	*Didymodon tophaceus*	Olive Beard Moss				S1?	2	77.4 ± 4.0	NS
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	1	93.3 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	3	57.5 ± 0.0	NS
N	*Physcomitrium immersum*	a Moss				S1?	1	93.8 ± 0.0	NS
N	*Schistostega pennata*	Luminous Moss				S1?	2	53.1 ± 0.0	NS
N	*Enchylium limosum*	Lime-loving Tarpaper Lichen				S1?	2	77.4 ± 4.0	NS
N	*Scytinium intermedium*	Forty-five Jellyskin Lichen				S1?	1	77.4 ± 4.0	NS
N	*Melanelia culbersonii*	Appalachain Camouflage Lichen				S1?	1	50.3 ± 0.0	NS
N	*Arrhenopterum heterostichum*	One-sided Groove Moss				S1S2	2	57.6 ± 2.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	1	63.3 ± 2.0	NS
N	*Tortula acaulon*	Cuspidate Earth Moss				S1S2	1	99.2 ± 0.0	NS
N	*Plagiothecium latebricola*	Alder Silk Moss				S1S2	1	60.3 ± 5.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	1	61.4 ± 0.0	NS
N	*Sematophyllum marylandicum*	a Moss				S1S2	2	23.5 ± 3.0	NS
N	*Timmia megapolitana*	Metropolitan Timmia Moss				S1S2	2	94.7 ± 1.0	NS
N	*Tortula mucronifolia*	Mucronate Screw Moss				S1S2	1	98.4 ± 3.0	NS
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	1	54.7 ± 0.0	NS
N	*Haplocladium microphyllum*	Tiny-leaved Haplocladium				S1S2	1	75.9 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Rhynchostegium serrulatum*	Dark Beaked Moss				S1S2	1	46.3 ± 2.0	NS
N	*Enchylium bachmanianum*	Bachman's Jelly Lichen				S1S2	2	65.1 ± 0.0	NS
N	*Placidium squamulosum*	Limy Soil Stipplescale Lichen				S1S2	1	68.4 ± 6.0	NS
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	1	94.7 ± 3.0	NS
N	*Rhizoplaca subdiscrepans*	Scattered Rock-posy Lichen				S1S2	1	51.5 ± 1.0	NS
N	*Parmotrema reticulatum*	Netted Ruffle Lichen				S1S2	1	81.0 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1S2	11	30.1 ± 0.0	NS
N	*Umbilicaria polyrhiza*	Ballpoint Rocktripe Lichen				S1S3	1	88.6 ± 0.0	NS
N	*Lecanora polytropa*	a lichen				S1S3	2	19.6 ± 1.0	NS
N	*Acarospora sinopica*	a cracked lichen				S1S3	2	12.3 ± 0.0	NS
N	*Heterodermia galactophylla*	Branching Fringe Lichen				S1S3	1	51.4 ± 0.0	NS
N	*Xylopsora friesii*	a Lichen				S1S3	2	8.0 ± 0.0	NS
N	*Stereocaulon grande*	Grand Foam Lichen				S1S3	1	97.8 ± 0.0	NS
N	*Stereocaulon intermedium*	Pacific Brain Foam Lichen				S1S3	3	17.5 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2	1	11.2 ± 30.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S2	2	24.7 ± 3.0	NS
N	*Sphagnum subnitens*	Lustrous Peat Moss				S2	1	47.0 ± 2.0	NS
N	*Usnea flavocardia*	Blood-splattered Beard Lichen				S2	1	24.9 ± 4.0	NS
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S2	3	19.4 ± 0.0	NS
N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S2	3	51.5 ± 0.0	NS
N	*Scytinium imbricatum*	Scaly Jellyskin Lichen				S2	2	71.9 ± 4.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2	1	11.8 ± 1.0	NS
N	*Nephroma resupinatum*	a lichen				S2	11	17.0 ± 5.0	NS
N	*Placynthium flabellosum*	Scaly Ink Lichen				S2	1	37.3 ± 17.0	NS
N	*Moerckia flotoviana*	Flotow's Ruffwort				S2?	1	78.0 ± 0.0	NS
N	*Riccardia multifida*	Delicate Germanderwort				S2?	2	50.2 ± 0.0	NS
N	*Weissia muhlenbergiana*	a Moss				S2?	4	63.3 ± 1.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	2	89.2 ± 2.0	NS
N	*Ptychostomum pendulum*	Drooping Bryum				S2?	1	57.6 ± 2.0	NS
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2?	4	23.2 ± 2.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	2	37.1 ± 0.0	NS
N	*Ditrichum rhynchostegium*	a Moss				S2?	1	19.1 ± 1.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	1	70.6 ± 1.0	NS
N	*Kiaeria starkei*	Starke's Fork Moss				S2?	1	35.3 ± 10.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	1	65.0 ± 2.0	NS
N	*Philonotis marchica*	a Moss				S2?	2	88.1 ± 0.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	1	45.9 ± 0.0	NS
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	1	9.5 ± 5.0	NS
N	*Platylomella lescurii*	a Moss				S2?	4	48.7 ± 0.0	NS
N	*Phylliscum demangeonii*	Black Rock-wafer Lichen				S2?	4	64.9 ± 0.0	NS
N	*Oxyrrhynchium hians*	Light Beaked Moss				S2S3	4	19.3 ± 5.0	NS
N	*Scorpidium revolvens*	Limprichtia Moss				S2S3	3	38.8 ± 2.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S2S3	58	16.7 ± 0.0	NS
N	*Moelleropsis nebulosa ssp. frullaniae*	Blue-gray Moss Shingle Lichen				S2S3	3	47.7 ± 0.0	NS
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S2S3	11	7.0 ± 5.0	NS
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2S3	67	23.0 ± 1.0	NS
N	*Usnea ceratina*	Warty Beard Lichen				S2S3	2	82.3 ± 0.0	NS
N	*Usnea rubicunda*	Red Beard Lichen				S2S3	6	57.3 ± 0.0	NS
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S2S3	20	27.0 ± 0.0	NS
N	*Usnocetraria oakesiana*	Yellow Band Lichen				S2S3	9	21.0 ± 0.0	NS
N	*Cladonia mateocyatha*	Mixed-up Pixie-cup				S2S3	4	17.2 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Cladonia parasitica*	Fence-rail Lichen				S2S3	2	29.9 ± 0.0	NS
N	*Chaenotheca gracilenta*	a lichen				S2S3	1	8.6 ± 0.0	NS
N	*Scytinium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	7	19.4 ± 0.0	NS
N	*Melanohalea septentrionalis*	Northern Camouflage Lichen				S2S3	1	79.8 ± 0.0	NS
N	*Myelochroa aurulenta*	Powdery Axil-bristle Lichen				S2S3	1	87.0 ± 2.0	NS
N	*Parmelia fertilis*	Fertile Shield Lichen				S2S3	8	72.8 ± 0.0	NS
N	*Hypotrachyna minarum*	Hairless-spined Shield Lichen				S2S3	2	40.4 ± 0.0	NS
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	2	10.4 ± 0.0	NS
N	*Racodium rupestre*	Rockhair Lichen				S2S3	3	25.5 ± 1.0	NS
N	*Umbilicaria polyphylla*	Petalled Rocktripe Lichen				S2S3	2	25.9 ± 0.0	NS
N	*Usnea cavernosa*	Pitted Beard Lichen				S2S3	4	79.9 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	1	79.9 ± 0.0	NS
N	*Fuscopannaria sorediata*	a Lichen				S2S3	5	25.5 ± 1.0	NS
N	*Physcia subtilis*	Slender Rosette Lichen				S2S3	2	25.8 ± 0.0	NS
N	*Dimelaena oreina*	Golden Moonglow Lichen				S2S3	2	9.2 ± 0.0	NS
N	*Cetraria arenaria*	Sand-loving Icelandmoss Lichen				S2S3	13	67.0 ± 0.0	NS
N	*Cladonia coccifera*	Eastern Boreal Pixie-cup Lichen				S2S3	3	15.3 ± 2.0	NS
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S2S3	2	67.3 ± 4.0	NS
N	*Cladonia phyllophora*	Felt Lichen				S2S3	2	99.2 ± 4.0	NS
N	*Usnea flammea*	Coastal Bushy Beard Lichen				S2S3	1	19.6 ± 1.0	NS
N	*Ephemerum serratum*	a Moss				S3	3	65.2 ± 5.0	NS
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S3	14	43.8 ± 0.0	NS
N	*Anomodon tristis*	a Moss				S3	3	44.1 ± 15.0	NS
N	*Sphagnum contortum*	Twisted Peat Moss				S3	4	75.2 ± 4.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3	2	47.0 ± 2.0	NS
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	37	26.0 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S3	11	44.8 ± 2.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	81	15.1 ± 0.0	NS
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	33	16.7 ± 0.0	NS
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S3	9	57.3 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	6	17.3 ± 5.0	NS
N	*Placynthium nigrum*	Common Ink Lichen				S3	1	69.3 ± 0.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	1	47.8 ± 0.0	NS
N	*Punctelia appalachensis*	Appalachian Speckleback Lichen				S3	5	98.1 ± 0.0	NS
N	*Viridothelium virens*	a lichen				S3	4	31.2 ± 2.0	NS
N	*Ephebe lanata*	Waterside Rockshag Lichen				S3	4	37.3 ± 17.0	NS
N	*Phaeophyscia adiastola*	Powder-tipped Shadow Lichen				S3	1	9.2 ± 0.0	NS
N	*Phaeophyscia pusilloides*	Pompom-tipped Shadow Lichen				S3	9	8.9 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S3	9	19.7 ± 0.0	NS
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3?	3	15.5 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	1	54.4 ± 3.0	NS
N	*Drummondia prorepens*	a Moss				S3?	1	63.6 ± 5.0	NS
N	*Elodium blandowii*	Blandow's Bog Moss				S3?	4	3.0 ± 7.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	3	58.2 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3?	1	60.8 ± 0.0	NS
N	*Sphagnum riparium*	Streamside Peat Moss				S3?	2	38.2 ± 0.0	NS
N	*Cladonia stygia*	Black-footed Reindeer Lichen				S3?	3	31.1 ± 0.0	NS
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	1	98.4 ± 0.0	NS
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S3S4	3	21.4 ± 3.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	1	37.0 ± 0.0	NS
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	1	98.4 ± 3.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	2	37.3 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	2	82.5 ± 0.0	NS
N	*Tomentypnum nitens*	Golden Fuzzy Fen Moss				S3S4	4	47.7 ± 2.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	2	47.8 ± 0.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	1	10.1 ± 0.0	NS
N	*Bryoria pseudofuscescens*	Mountain Horsehair Lichen				S3S4	4	17.2 ± 1.0	NS
N	*Enchylium tenax*	Soil Tarpaper Lichen				S3S4	10	44.4 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3S4	68	17.0 ± 5.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	85	2.5 ± 0.0	NS
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	9	22.3 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	28	10.9 ± 0.0	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3S4	26	25.4 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	4	15.3 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3S4	36	50.8 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3S4	90	25.7 ± 0.0	NS
N	*Melanohalea olivacea*	Spotted Camouflage Lichen				S3S4	1	79.9 ± 0.0	NS
N	*Parmeliopsis hyperopta*	Gray Starburst Lichen				S3S4	1	99.2 ± 0.0	NS
N	*Parmotrema perlatum*	Powdered Ruffle Lichen				S3S4	24	9.5 ± 0.0	NS
N	*Peltigera hymenina*	Cloudy Pelt Lichen				S3S4	2	15.3 ± 2.0	NS
N	*Sphaerophorus fragilis*	Fragile Coral Lichen				S3S4	11	15.3 ± 2.0	NS
N	*Sclerophora peronella*	Frosted Glass-whiskers Lichen				S3S4	2	93.9 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	676	14.1 ± 0.0	NS
N	*Physcia caesia*	Blue-gray Rosette Lichen				S3S4	2	19.6 ± 1.0	NS
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	7	8.3 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	81	21.5 ± 0.0	NS
N	*Evernia prunastri*	Valley Oakmoss Lichen				S3S4	35	56.4 ± 0.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	95	13.9 ± 0.0	NS
P	*Clethra alnifolia*	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S2	3	5.4 ± 0.0	NS
P	*Juglans cinerea*	Butternut	Endangered	Endangered		SNA	30	7.7 ± 0.0	NS
P	*Fraxinus nigra*	Black Ash	Threatened		Threatened	S1S2	754	12.6 ± 0.0	NS
P	*Liatris spicata*	Dense Blazing Star	Threatened	Threatened		SNA	4	7.9 ± 0.0	NS
P	*Lophiola aurea*	Goldencrest	Special Concern	Special Concern	Vulnerable	S2	19	91.7 ± 1.0	NS
P	*Lilaeopsis chinensis*	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	S3	140	82.9 ± 0.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S3	10	98.3 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2S3	2	85.4 ± 7.0	NS
P	*Acer saccharinum*	Silver Maple				S1	10	84.9 ± 0.0	NS
P	*Osmorhiza depauperata*	Blunt Sweet Cicely				S1	1	86.9 ± 5.0	NS
P	*Andersonglossum boreale*	Northern Wild Comfrey				S1	5	60.5 ± 1.0	NS
P	*Turritis glabra*	Tower Mustard				S1	1	90.1 ± 0.0	NS
P	*Lobelia spicata*	Pale-Spiked Lobelia				S1	5	82.8 ± 7.0	NS
P	*Ribes americanum*	Wild Black Currant				S1	4	59.4 ± 3.0	NS
P	*Fraxinus pennsylvanica*	Red Ash				S1	11	40.6 ± 5.0	NS
P	*Persicaria careyi*	Carey's Smartweed				S1	1	63.4 ± 3.0	NS
P	*Phytolacca americana*	Common Pokeweed				S1	4	13.0 ± 0.0	NS
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S1	1	96.5 ± 0.0	NS
P	*Montia fontana*	Water Blinks				S1	1	10.3 ± 1.0	NS
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	1	35.5 ± 0.0	NS
P	*Salix myrtillifolia*	Blueberry Willow				S1	1	46.7 ± 0.0	NS
P	*Salix serissima*	Autumn Willow				S1	2	46.4 ± 0.0	NS
P	*Carex garberi*	Garber's Sedge				S1	4	89.0 ± 0.0	NS
P	*Carex laxiflora*	Loose-Flowered Sedge				S1	1	97.9 ± 1.0	NS
P	*Carex plantaginea*	Plantain-Leaved Sedge				S1	4	85.6 ± 0.0	NS
P	*Carex viridula var. saxilittoralis*	Greenish Sedge				S1	4	60.7 ± 2.0	NS
P	*Scirpus atrovirens*	Dark-green Bulrush				S1	4	44.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Iris prismatica*	Slender Blue Flag				S1	1	98.0 ± 100.0	NS
P	*Sisyrinchium fuscatum*	Coastal Plain Blue-eyed-grass				S1	1	93.8 ± 0.0	NS
P	*Juncus vaseyi*	Vasey Rush				S1	1	89.2 ± 0.0	NS
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	3	92.1 ± 10.0	NS
P	*Spiranthes casei var. casei*	Case's Ladies'-Tresses				S1	1	80.7 ± 0.0	NS
P	*Dichanthelium xanthophysum*	Slender Panic Grass				S1	10	89.0 ± 1.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	11	54.6 ± 1.0	NS
P	*Adiantum pedatum*	Northern Maidenhair Fern				S1	26	53.3 ± 1.0	NS
P	*Dryopteris goldieana*	Goldie's Woodfern				S1	1	75.4 ± 1.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	1	95.1 ± 5.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	10	7.7 ± 0.0	NS
P	*Selaginella rupestris*	Rock Spikemoss				S1	1	59.6 ± 0.0	NS
P	*Solidago hispida*	Hairy Goldenrod				S1?	2	8.1 ± 7.0	NS
P	*Suaeda rolandii*	Roland's Sea-Blite				S1?	5	60.9 ± 2.0	NS
P	*Carex pensylvanica*	Pennsylvania Sedge				S1?	3	26.5 ± 0.0	NS
P	*Allium schoenoprasum*	Wild Chives				S1?	1	18.2 ± 0.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S1?	1	83.4 ± 7.0	NS
P	*Crocanthemum canadense*	Long-branched Frostweed			Endangered	S1S2	2	27.1 ± 1.0	NS
P	*Cypripedium arietinum*	Ram's-Head Lady's-Slipper			Endangered	S1S2	308	55.4 ± 2.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1S2	6	57.3 ± 0.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1S2	1	99.1 ± 0.0	NS
P	*Proserpinaca intermedia*	Intermediate Mermaidweed				S1S2	2	42.4 ± 0.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	5	83.4 ± 7.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1S2	2	83.9 ± 1.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	1	56.8 ± 10.0	NS
P	*Euphrasia farlowii*	Farlow's Eyebright				S1S3	2	85.1 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	2	50.8 ± 0.0	NS
P	*Zizia aurea*	Golden Alexanders				S2	41	69.3 ± 1.0	NS
P	*Antennaria parlinii ssp. fallax*	Parlin's Pussytoes				S2	33	55.4 ± 7.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S2	24	43.9 ± 7.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S2	1	96.3 ± 0.0	NS
P	*Cardamine maxima*	Large Toothwort				S2	1	86.9 ± 0.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	177	4.9 ± 2.0	NS
P	*Desmodium canadense*	Canada Tick-trefoil				S2	12	82.5 ± 5.0	NS
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S2	22	58.9 ± 0.0	NS
P	*Conopholis americana*	American Cancer-root				S2	18	86.3 ± 7.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	12	9.5 ± 0.0	NS
P	*Hepatica americana*	Round-lobed Hepatica				S2	74	45.5 ± 0.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S2	24	3.8 ± 1.0	NS
P	*Galium boreale*	Northern Bedstraw				S2	5	90.3 ± 1.0	NS
P	*Gratiola neglecta*	Clammy Hedge-Hyssop				S2	6	64.7 ± 0.0	NS
P	*Dirca palustris*	Eastern Leatherwood				S2	75	40.2 ± 1.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S2	2	46.7 ± 0.0	NS
P	*Carex pellita*	Woolly Sedge				S2	2	67.4 ± 10.0	NS
P	*Carex livida*	Livid Sedge				S2	13	21.9 ± 0.0	NS
P	*Juncus greenei*	Greene's Rush				S2	5	9.9 ± 10.0	NS
P	*Allium tricoccum*	Wild Leek				S2	41	87.0 ± 0.0	NS
P	*Lilium canadense*	Canada Lily				S2	70	37.3 ± 1.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	26	28.6 ± 7.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	10	57.6 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	57	46.1 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Platanthera flava var. flava*	Southern Rein Orchid				S2	3	85.7 ± 7.0	NS
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S2	11	84.7 ± 1.0	NS
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	3	68.1 ± 1.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S2	28	70.5 ± 0.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S2	60	70.7 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S2	6	8.1 ± 7.0	NS
P	*Festuca subverticillata*	Nodding Fescue				S2	8	66.2 ± 5.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	2	75.0 ± 10.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S2	3	65.7 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	1	44.4 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	1	59.6 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	5	43.2 ± 7.0	NS
P	*Carex peckii*	White-Tinged Sedge				S2?	4	45.8 ± 0.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S2S3	7	41.9 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2S3	15	60.1 ± 0.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2S3	2	68.9 ± 1.0	NS
P	*Lactuca hirsuta*	Hairy Lettuce				S2S3	3	17.5 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2S3	2	69.7 ± 0.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2S3	68	44.9 ± 0.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2S3	7	97.9 ± 1.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2S3	7	87.7 ± 0.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2S3	4	50.5 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2S3	2	60.7 ± 2.0	NS
P	*Hypericum majus*	Large St John's-wort				S2S3	4	8.1 ± 7.0	NS
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	4	15.3 ± 10.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	5	8.1 ± 7.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	12	69.9 ± 3.0	NS
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2S3	8	41.9 ± 1.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	13	31.3 ± 5.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2S3	8	19.3 ± 7.0	NS
P	*Polygala polygama*	Racemed Milkwort				S2S3	1	9.9 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	8	58.2 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	3	55.8 ± 1.0	NS
P	*Polygonum oxyspermum*	Sharp-fruit Knotweed				S2S3	1	23.9 ± 0.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2S3	9	25.5 ± 0.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2S3	17	75.1 ± 1.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2S3	15	9.9 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	25	4.8 ± 0.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	1	89.5 ± 7.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	9	8.5 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	3	59.0 ± 2.0	NS
P	*Tiarella cordifolia*	Heart-leaved Foamflower				S2S3	6	42.8 ± 0.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S2S3	1	97.8 ± 0.0	NS
P	*Boehmeria cylindrica*	Small-spike False-nettle				S2S3	56	39.6 ± 0.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	8	10.2 ± 0.0	NS
P	*Carex comosa*	Bearded Sedge				S2S3	4	63.9 ± 7.0	NS
P	*Carex houghtoniana*	Houghton's Sedge				S2S3	1	63.0 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2S3	4	95.0 ± 0.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2S3	4	40.4 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2S3	7	40.7 ± 0.0	NS
P	*Vallisneria americana*	Wild Celery				S2S3	11	30.4 ± 1.0	NS
P	*Najas gracillima*	Thread-Like Naiad				S2S3	2	49.1 ± 0.0	NS
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S2S3	16	42.3 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Spiranthes casei var. novaescotiae*	Case's Ladies'-Tresses				S2S3	3	56.7 ± 0.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2S3	13	45.3 ± 1.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2S3	10	83.6 ± 5.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2S3	1	96.1 ± 1.0	NS
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	4	58.9 ± 5.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	4	28.0 ± 0.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	5	12.5 ± 7.0	NS
P	*Potamogeton pulcher*	Spotted Pondweed			Vulnerable	S3	8	68.1 ± 2.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	1	72.2 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S3	1	62.4 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S3	2	81.2 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S3	59	59.6 ± 0.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S3	30	3.6 ± 1.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S3	5	32.2 ± 5.0	NS
P	*Symphyotrichum undulatum*	Wavy-leaved Aster				S3	125	21.7 ± 7.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S3	18	46.1 ± 0.0	NS
P	*Alnus serrulata*	Smooth Alder				S3	19	91.1 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S3	31	23.6 ± 0.0	NS
P	*Betula pumila*	Bog Birch				S3	3	44.0 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S3	14	37.3 ± 1.0	NS
P	*Palustricodon aparinoides*	Marsh Bellflower				S3	14	62.1 ± 1.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	169	8.1 ± 7.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S3	56	8.6 ± 2.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S3	10	23.9 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S3	11	31.1 ± 5.0	NS
P	*Ceratophyllum echinatum*	Prickly Hornwort				S3	6	72.6 ± 0.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S3	47	55.6 ± 0.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S3	1	39.0 ± 0.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	94	8.1 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	4	14.2 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S3	3	32.3 ± 0.0	NS
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	9	61.5 ± 0.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	3	59.3 ± 7.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	6	63.2 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	29	2.3 ± 1.0	NS
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S3	10	43.9 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	7	8.2 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	1	93.8 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	43	9.6 ± 5.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	1	18.6 ± 0.0	NS
P	*Anemone virginiana*	Virginia Anemone				S3	19	56.5 ± 5.0	NS
P	*Cephalanthus occidentalis*	Common Buttonbush				S3	8	8.1 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S3	79	43.7 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S3	54	30.9 ± 0.0	NS
P	*Salix sericea*	Silky Willow				S3	122	33.4 ± 1.0	NS
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S3	1	92.1 ± 7.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	8	58.2 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	46	39.9 ± 0.0	NS
P	*Pilea pumila*	Dwarf Clearweed				S3	9	7.4 ± 0.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S3	6	62.1 ± 1.0	NS
P	*Carex bebbii*	Bebb's Sedge				S3	24	57.6 ± 0.0	NS
P	*Carex castanea*	Chestnut Sedge				S3	39	43.7 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	11	32.9 ± 6.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Carex eburnea*	Bristle-leaved Sedge				S3	11	67.6 ± 1.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S3	32	50.1 ± 7.0	NS
P	*Carex lupulina*	Hop Sedge				S3	62	20.0 ± 1.0	NS
P	*Carex rosea*	Rosy Sedge				S3	34	56.7 ± 1.0	NS
P	*Carex swanii*	Swan's Sedge				S3	4	5.4 ± 0.0	NS
P	*Carex tenera*	Tender Sedge				S3	4	58.2 ± 0.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	13	46.4 ± 0.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	32	57.5 ± 2.0	NS
P	*Eleocharis nitida*	Quill Spikerush				S3	5	53.5 ± 5.0	NS
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S3	7	13.8 ± 0.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S3	6	12.4 ± 1.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S3	3	82.1 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S3	577	6.8 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	119	6.2 ± 0.0	NS
P	*Platanthera flava*	Southern Rein-Orchid				S3	31	88.8 ± 0.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	82	9.7 ± 0.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	14	59.4 ± 0.0	NS
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S3	6	63.9 ± 7.0	NS
P	*Piptatheropsis canadensis*	Canada Ricegrass				S3	8	17.6 ± 7.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S3	1	58.9 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	2	73.0 ± 5.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	4	62.4 ± 0.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	15	31.4 ± 5.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	3	95.3 ± 7.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3	4	95.1 ± 7.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	2	85.8 ± 0.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	18	10.5 ± 0.0	NS
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S3?	19	40.7 ± 0.0	NS
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3?	26	19.1 ± 0.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	2	84.8 ± 0.0	NS
P	*Bidens vulgata*	Tall Beggarticks				S3S4	6	12.6 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3S4	25	57.7 ± 7.0	NS
P	*Hieracium paniculatum*	Panicled Hawkweed				S3S4	24	55.9 ± 11.0	NS
P	*Bidens beckii*	Water Beggarticks				S3S4	8	30.2 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3S4	104	55.3 ± 0.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	13	66.5 ± 0.0	NS
P	*Shepherdia canadensis*	Soapberry				S3S4	113	49.8 ± 7.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3S4	3	40.7 ± 0.0	NS
P	*Vaccinium cespitosum*	Dwarf Bilberry				S3S4	62	19.1 ± 0.0	NS
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	12	1.6 ± 0.0	NS
P	*Fagus grandifolia*	American Beech				S3S4	657	2.1 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3S4	26	19.2 ± 7.0	NS
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3S4	13	18.9 ± 1.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3S4	2	61.1 ± 0.0	NS
P	*Nuphar microphylla*	Small Yellow Pond-lily				S3S4	1	51.1 ± 0.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3S4	26	43.2 ± 7.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	17	1.5 ± 0.0	NS
P	*Rumex pallidus*	Seabeach Dock				S3S4	1	29.3 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3S4	9	32.4 ± 50.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3S4	270	42.9 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3S4	41	25.8 ± 0.0	NS
P	*Crataegus succulenta*	Fleshy Hawthorn				S3S4	1	17.8 ± 0.0	NS
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	65	40.1 ± 0.0	NS
P	*Fragaria vesca*	Woodland Strawberry				S3S4	16	2.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Galium aparine*	Common Bedstraw				S3S4	44	8.0 ± 0.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3S4	4	67.1 ± 0.0	NS
P	*Limosella australis*	Southern Mudwort				S3S4	7	3.2 ± 3.0	NS
P	*Ulmus americana*	White Elm				S3S4	68	8.0 ± 0.0	NS
P	*Verbena hastata*	Blue Vervain				S3S4	145	3.3 ± 7.0	NS
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S3S4	28	8.0 ± 0.0	NS
P	*Viola selkirkii*	Great-Spurred Violet				S3S4	3	53.1 ± 4.0	NS
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3S4	10	9.9 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	6	61.9 ± 1.0	NS
P	*Sisyrinchium atlanticum*	Eastern Blue-Eyed-Grass				S3S4	4	73.4 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	29	32.3 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	5	18.0 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3S4	23	27.2 ± 0.0	NS
P	*Luzula parviflora ssp. melanocarpa*	Black-fruited Woodrush				S3S4	2	91.7 ± 0.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3S4	5	69.5 ± 0.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	8	18.1 ± 0.0	NS
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	7	8.1 ± 10.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3S4	4	53.1 ± 4.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3S4	7	43.7 ± 0.0	NS
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3S4	297	19.5 ± 0.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	3	58.2 ± 0.0	NS
P	*Koeleria spicata*	Narrow False Oats				S3S4	11	57.1 ± 1.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3S4	12	82.0 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3S4	14	57.3 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	12	14.1 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3S4	2	86.9 ± 1.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3S4	6	72.9 ± 7.0	NS
P	*Sceptridium multifidum*	Leathery Moonwort				S3S4	8	62.5 ± 10.0	NS
P	*Botrychium matricariifolium*	Daisy-leaved Moonwort				S3S4	4	7.9 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	2	63.9 ± 0.0	NS
P	*Greeneochloa coarctata*	Small Reedgrass				SH	1	13.5 ± 6.0	NS

5.1 SOURCE BIBLIOGRAPHY (100 km)

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
13205	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
6281	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
5487	iNaturalist.ca. 2023. iNaturalist Data Export December 2022. iNaturalist.org; iNaturalist.ca.
2473	Paquet, Julie. 2018. Atlantic Canada Shorebird Survey (ACSS) database 2012-2018. Environment Canada, Canadian Wildlife Service.
2412	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
2225	Pardieck, K.L., Ziolkowski Jr., D.J., Lutmerding, M., Aponte, V.I., and Hudson, M-A.R. 2020. North American Breeding Bird Survey Dataset 1966 - 2019: U.S. Geological Survey data release, https://doi.org/10.5066/P9J6QUF6
1600	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
1062	eBird. 2020. eBird Basic Dataset. Version: EBD_relNov-2019. Ithaca, New York. Nov 2019, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology.
931	Paquet, Julie. 2019. Atlantic Canada Shorebird Survey ACSS database for 2019. Environment Canada, Canadian Wildlife Service.
776	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
622	Cameron, E. 2008. Canadian Gypsum Co. survey 2007-08. Conestoga-Rovers & Assoc., 623 recs.
604	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
596	Eaton, S. 2014. Nova Scotia Wood Turtle Database. Environment and Climate Change Canada, 4843 recs.
562	SwiftWatch. 2022. Total Chimney Swift counts from roost watches for the duration of the SwiftWatch program (2011-2021). Birds Canada.
465	Clayden, S. Digitization of Wolfgang Maass Nova Scotia forest lichen collections, 1964-2004. New Brunswick Museum. 2018.
405	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.

# recs	CITATION
338	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
336	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
326	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
312	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
305	Belliveau, A.G. 2020. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2019, 2020. E.C. Smith Herbarium.
293	Wildlife Division. 2021. Fraxinus nigra records assembled to define and model habitat. Nova Scotia Department of Natural Resources and Renewables.
288	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
288	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.
288	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
284	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
263	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
262	Phinney, Lori. 2020. Pre- and post White-nose Syndrome bat acoustic monitoring, NS. Mersey Tobeatic Research Institute, 1279 recs.
255	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
210	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
206	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
198	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
174	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
165	Toms, B. 2018. Bat Species data from www.batconservation.ca for Nova Scotia. Mersey Tobeatic Research Institute, 547 Records.
156	Gallop, John. 2023. Species at Risk and Species of Conservation Interest records. McCallum Environmental.
154	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
149	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
145	Pepper, C. 2013. 2013 rare bird and plant observations in Nova Scotia. , 181 records.
143	Bryson, I.C. 2020. Nova Scotia flora and lichen observations 2020. Nova Scotia Environment, 139 recs.
143	Hagerman, Christianne. 2022. Wisqoq and Eastern White Cedar field work. E.C. Smith Herbarium, Acadia University.
138	Munro, Marian K. Tracked lichen specimens, Nova Scotia Provincial Museum of Natural History Herbarium. Atlantic Canada Conservation Data Centre. 2019.
130	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
115	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
114	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2018. Atlantic Canada Conservation Data Centre, 907 recs.
112	e-Butterfly. 2016. Export of Maritimes records and photos. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
111	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
111	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
109	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
108	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
102	e-Butterfly. 2019. Export of Maritimes records and photos. McFarland, K. (ed.) e-butterfly.org.
96	Belliveau, A.G. & Churchill, J.L.; Anderson, F.; Brooks, F. 2023. Lichen Inventory of Blue Rocks, NS. E.C. Smith Herbarium.
96	Brazner, J. 2016. Nova Scotia Forested Wetland Bird Surveys. Nova Scotia Department of Lands and Forestry.
95	Breen, A. 2019. 2019 Atlantic Whitefish observations. Coastal Action, 95 recs.
88	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
87	McNeil, J.A. 2018. Wood Turtle records, 2018. Mersey Tobeatic Research Institute, 68 recs.
87	Richardson, Leif. 2018. Maritimes Bombus records from various sources. Richardson, Leif.
86	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
83	Hubley, Nicole. 2022. Monarch (Danaus plexippus) records submitted to MTRI from the 2021 field season. Mersey Tobeatic Research Institute.
81	Staicer, C. 2021. Additional compiled Nova Scotia Species at Risk bird records, 2005-2020. Dalhousie University.
79	Belliveau, A.G. 2021. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2021. E.C. Smith Herbarium.
73	Bryson, I. 2020. Nova Scotia and Newfoundland rare species observations, 2018-2020. Nova Scotia Environment.
73	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
72	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
65	Belliveau, A.G. 2014. Plant Records from Southern and Central Nova Scotia. Atlantic Canada Conservation Data Centre, 919 recs.
64	Staicer, Cindy. 2022. 2021 Landbird Species at Risk observations. Dalhousie University.
62	Churchill, J.L. 2022. Atlantic Canada Conservation Data Centre Fieldwork 2022. Atlantic Canada Conservation Data Centre.
62	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
62	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
59	Blaney, C.S. 2020. Sean Blaney 2020 field data. Atlantic Canada Conservation Data Centre, 4407 records.
58	iNaturalist. 2020. iNaturalist butterfly records selected for the Maritimes Butterfly Atlas. iNaturalist.
56	Birds Canada. 2022. Maritimes Swiftwatch project data for 2022. Pers. comm., 155 records.
56	Toms, Brad & Pepper, Chris; Neily, Tom. 2022. Nova Scotia lichen database [as of 2022-04]. Mersey Tobeatic Research Institute.
55	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
55	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.
54	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.

# recs	CITATION
52	Staicer, Cindy. 2023. 2022 SAR Bird field occurrences from the Landbirds at Risk Project, NS. Dalhousie University, 446 records.
50	Churchill, J.L. 2020. Atlantic Canada Conservation Data Centre Fieldwork 2020. Atlantic Canada Conservation Data Centre, 1083 recs.
49	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
48	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
47	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
46	Feltham, Carter. 2022. Monarch (Danaus plexippus) and Milkweed MTRI records from the 2022 Field Season. Mersey Tobeatic Research Institute.
42	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
41	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
40	Cameron, E. 2007. Canadian Gypsum Co. survey 2005-07. Dillon Consulting Ltd, 40 recs.
40	Chapman-Lam, C.J. 2021. Atlantic Canada Conservation Data Centre 2020 botanical fieldwork. Atlantic Canada Conservation Data Centre, 17309 recs.
40	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
39	Mersey Tobetic Research Institute. 2021. 2020 Monarch records from the MTRI monitoring program. Mersey Tobetic Research Institute, 72 records.
38	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
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.
37	Pepper, C. 2021. Rare bird, plant and mammal observations in Nova Scotia, 2017-2021.
37	Tsehtik, M.; Leblanc, M.; Creaser, T. 2020. Coastal Action: 2020 Species at Risk Data. Coastal Action, 40 records.
36	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre, 2318 recs.
33	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
32	Atlantic Canada Conservation Data Centre. 2020. Cape LaHave Island observations from August 2020. Atlantic Canada Conservation Data Centre, 605 records.
32	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
32	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
32	Haughian, Sean. 2021. Update to lichen data from 2017-2021. Nova Scotia Museum.
32	Patrick, A.; Horne, D.; Noseworthy, J. et. al. 2017. Field data for Nova Scotia and New Brunswick, 2015 and 2017. Nature Conservancy of Canada.
31	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
30	Cameron, R.P. 2018. Degelia plumbea records. Nova Scotia Environment.
29	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
29	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
28	Pepper, Chris. 2012. Observations of breeding Canada Warbler's along the Eastern Shore, NS. Pers. comm. to S. Blaney, Jan. 20, 28 recs.
28	Staicer, Cindy. 2023. 2022 SAR Bird ARU occurrences. Dalhousie University, 379 records.
27	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
26	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
25	MacDonald, E.C. 2018. CWS Piping Plover Census, 2010-2017. Canadian Wildlife Service, 672 recs.
25	MacDonald, E.C. 2018. Piping Plover nest records from 2010-2017. Canadian Wildlife Service.
25	Westwood, A., Staicer, C. 2016. Nova Scotia landbird Species at Risk observations. Dalhousie University.
24	Belliveau, A.G. 2018. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2018. E.C. Smith Herbarium, 6226 recs.
24	Belliveau, A.G. 2021. New Black ash site records near Kentville, NS. Acadia University, 47 records.
24	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
23	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
23	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
22	Belliveau, A. 2013. Rare species records from Nova Scotia. Mersey Tobeatic Research Institute, 296 records. 296 recs.
22	Breen, A. 2018. 2018 Atlantic Whitefish observations. Coastal Action.
22	LaPaix, Rich. 2022. Rare species observations, 2018-2022. Nova Scotia Nature Trust.
22	Nelly, T.H. 2006. Cypripedium arietinum in Hants Co. Pers. comm. to C.S. Blaney. 22 recs, 22 recs.
21	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.
19	Chapman, C.J. 2019. Atlantic Canada Conservation Data Centre 2019 botanical fieldwork. Atlantic Canada Conservation Data Centre, 11729 recs.
19	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
19	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
17	Anderson, Frances; Neily, Tom. 2010. A Reconnaissance Level Survey of Calciphilous Lichens in Selected Karst Topography in Nova Scotia with Notes on Incidental Bryophytes. Mersey Tobeatic Research Institute.
17	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
17	Hall, R.A. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 189 recs.
17	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
17	Richardson, D., Anderson, F., Cameron, R, McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen (Anzia colpodes). COSEWIC.
16	McNeil, Jeffie. 2023. 2022 Turtle Records. Mersey Tobeatic Research Institute.
16	Nature Conservancy of Canada. 2022. NCC Field data for Nova Scotia. Nature Conservancy of Canada.
16	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
15	Brazner, John; MacKinnon, Frances. 2020. Relative conservation value of Nova Scotia's forests: forested wetlands as avian biodiversity hotspots. Canadian Journal of Forest Research, 50(12): 1307-1322. dx.doi.org/10.1139/cjfr-2020-0101.
15	Neily, T.H. & Pepper, C. 2020. Nova Scotia SMP lichen surveys 2020. Mersey Tobeatic Research Institute.

# recs	CITATION
14	Cameron, R.P. 2014. 2013-14 rare species field data. Nova Scotia Department of Environment, 35 recs.
14	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
14	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
14	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
14	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
13	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
13	Holder, M. 2003. Assessment and update status report on the Eastern Lilaeopsis (Lilaeopsis chinensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 16 recs.
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	Powell, B.C. 1967. Female sexual cycles of Chrysemy spicta & Clemmys insculpta in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
13	Richardson, D., Anderson, F., Cameron, R, Pepper, C., Clayden, S. 2015. Field Work Report on the Wrinkled Shingle lichen (Pannaria lurida). COSEWIC.
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	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
12	Cameron, R.P. 2017. 2017 rare species field data. Nova Scotia Environment, 64 recs.
11	Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
11	Basquill, S.P. 2011 vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
11	Blaney, C.S.; Mazerolle, D.M.; Hill, N.M. 2011. Nova Scotia Crown Share Land Legacy Trust Fieldwork. Atlantic Canada Conservation Data Centre, 5022 recs.
11	Stewart, J.I. 2010. Peregrine Falcon Surveys in New Brunswick, 2002-09. Canadian Wildlife Service, Sackville, 58 recs.
10	Bredin, K.A. 2002. NS Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centere, 30 recs.
10	Neily, T. H. 2018. Lichen and Bryophyte records, AEI 2017-2018. Tom Neily; Atlantic Canada Conservation Data Centre.
10	Patrick, Allison. 2021. Animal and plant records from NCC properties from 2019 and 2020. Nature Conservancy Canada.
9	Bryson, I. 2013. Nova Scotia rare plant records. CBCL Ltd., 180 records.
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	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
9	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
9	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
8	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
8	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
8	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.
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	McNeil, J.A. 2014. Blandings Turtle (Emydoidea blandingii) and Snapping Turtle (Chelydra serpentina) sightings, 2014. Mersey Tobeatic Research Institute.
8	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.
8	Neily, T.H. & Anderson, F. 2011. Lichen observations from NRC site at Sandy Cove. , 97.
8	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.
8	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
8	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
8	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.
7	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
7	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
7	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.
7	Cameron, B. 2006. Hepatica americana Survey at Scotia Mine Site in Gays River, and Discovery of Three Yellow-listed Species. Conestoga-Rovers and Associates, (a consulting firm), october 25. 7 recs.
7	Chapman, C.J. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 11171 recs.
7	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.
7	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
7	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-05-25]. Mersey Tobeatic Research Institute, 668 recs.
6	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
6	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
6	Benjamin, L.K. 2006. Cypripedium arietinum. Pers. comm. to D. Mazerolle. 9 recs, 9 recs.
6	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
6	Blaney, C.S; Korol, J.B.; Crowell, I. 2023. 2022 AC CDC Botany program field data. Atlantic Canada Conservation Data Centre, 5293 records.
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	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 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	Klymko, J.J.D. 2012. Odonata specimens & observations, 2010. Atlantic Canada Conservation Data Centre, 425 recs.

# recs	CITATION
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	McNeil, Jeffie. 2023. Ribbonsnake records from 2022. Mersey Tobeatic Research Institute.
6	Neily, T.H. Tom Neily NS Sphagnum records (2009-2014). T.H. Neily, Atlantic Canada Conservation Data Centre. 2019.
6	Nova Scotia Nature Trust. 2022. Ram's Head Lady Slipper observations from 2015 and 2019. , 6 records.
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	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
5	Holder, M.L.; Kingsley, A.L. 2000. Kinglsey and Holder observations from 2000 field work.
5	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
5	McNeil, J.A. 2020. Snapping Turtle and Eastern Painted Turtle records, 2020. Mersey Tobeatic Research Institute.
5	Pohl, G.P. Specimen data from Northern Forest Research Centre. Northern Forest Research Centre. 2022.
5	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
5	Rock, J. 2020. Atlantic Canada Piping Plover field surveys: Nesting pairs by beach, 2018-2020. Environment and Climate Change Canada - Canadian Wildlife Service, 216 records.
5	Towell, C. 2014. 2014 Northern Goshawk and Common Nighthawk email reports, NS. NS Department of Natural Resources.
5	White, S. 2019. Notable species sightings, 2018. East Coast Aquatics.
4	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
4	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
4	Cameron, R.P. 2012. Additional rare plant records, 2009. , 7 recs.
4	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
4	Forsythe, B. 2006. Cypripedium arietinum at Meadow Pond, Hants Co. Pers. comm. to C.S. Blaney. 4 recs, 4 recs.
4	Haughian, S.R. 2018. Description of Fuscopannaria leucosticta field work in 2017. New Brunswick Museum, 314 recs.
4	Hughes, Cory. 2020. Atlantic Forestry Centre Coccinella transversoguttata collections. Canadian Forest Service, Atlantic Forestry Centre.
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	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
4	McMullin, R.T. 2022. Maritimes lichen records. Canadian Museum of Nature.
4	McNeil, Jeffie. 2022. Ribbonsnake records, 2021. Mersey Tobeatic Research Institute.
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	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
4	Sabine, D.L. Bombus terricola specimens in Dwayne Sabine's personal collection. pers. comm. 2022.
3	Basquill, S.P. 2009. 2009 field observations. Nova Scotia Dept of Natural Resources.
3	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
3	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
3	Bradford, R. 2004. Coregonus huntsmani locations. Dept of Fisheries & Oceans, Atlantic Region, Pers. comm. to K. Bredin. 4 recs.
3	Brunelle, P.-M. (compiler). 2010. ADIP/MDDS Odonata Database: NB, NS Update 1900-09. Atlantic Dragonfly Inventory Program (ADIP), 935 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	Cody, W.J. 2003. Nova Scotia specimens of Equisetum pratense at the DAO herbarium in Ottawa. , Pers. comm. to C.S. Blaney. 4 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	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	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
3	Sabine, M. 2016. NB DNR staff incidental Black Ash observations. New Brunswick Department of Natural Resources.
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	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
2	Basquill, S.P. 2011. Field observations & specimen collections, 2010. Nova Scotia Department of Natural Resources, Pers. comm. , 8 Recs.
2	Cameron, B. 2005. C. palmicola, E. pedicellatum records from Sixth Lake. Pers. comm. to C.S. Blaney. 3 recs, 3 recs.
2	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
2	Canadian National Collection of Insects Arachnids, and Nematodes Bombus specimen database export. Government of Canada. 2022.
2	Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
2	Heron, J. 2022. Bombus records communicated to J. Klymko over email in autumn 2022. Pers. comm.
2	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.
2	Klymko, J. 2019. Atlantic Canada Conservation Data Centre zoological fieldwork 2018. Atlantic Canada Conservation Data Centre.
2	Klymko, J.J.D. 2011. Insect fieldwork & submissions, 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 742 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	Mazerolle, David. 2021. Botanical fieldwork 2019-20200. Parks Canada.
2	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.
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.

# recs	CITATION
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	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.
2	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
2	Porter, Caitlin. 2021. Field data for 2020 in various locations across the Maritimes. Atlantic Canada Conservation Data Centre, 3977 records.
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	Standley, L.A. 2002. Carex haydenii in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
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	Amiro, Peter G. 1998. Atlantic Salmon: Southern Nova Scotia SFA 21. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-11. 1 rec.
1	Anderson, Frances. 2022. Heterodermia squamulosa record near Lunenburg, NS. pers. comm.
1	Austin-Smith, P. 2014. 2014 Common Nighthawk personal communication report, NS. NS Department of Natural Resources.
1	Basquill, S. P. 2008. Nova Scotia Dept of Natural Resources.
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. 2012. 2012 Atlantic Coastal Plain Flora observations. Mersey Tobeatic Research Institute, 1543.
1	Belliveau, A.G. E.C. Smith Herbarium Specimen Database 2019. E.C. Smith Herbarium, Acadia University. 2019.
1	Benjamin, L.K. 2003. Cypripedium arietinum in Cogmagun River NS. Pers. comm. to S. Blaney, 1 rec.
1	Blaney, C.S. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
1	Blaney, C.S. 2019. Sean Blaney 2019 field data. Atlantic Canada Conservation Data Centre, 4407 records.
1	Brach, A.R. 2019. Correspondence to Sean Blaney regarding Calamagrostis cinnoides specimen from Halifax NS. pers. comm., Harvard University Herbaria, 1 record.
1	Breen, A. 2017. 2017 Atlantic Whitefish observation. Coastal Action.
1	Brooks, Fiona. Erioderma mollissimum records in Lunenburg County, NS. Pers. comm., 2 records.
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	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.
1	Creaser, Alissa & Belliveau, Alain Bombus specimens collected in Wolfville, Nova Scotia, in July 2022. E.C. Smith Herbarium. 2022.
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	Docherty, Joanne. 2022. Phone call to John Klymko about Danaus plexippus observation in Nova Scotia. Personal communication.
1	Eastman, A. 2019. Snapping Turtle observation at Brookfield, Colchester Co. NS. Halifax Field Naturalists Nova Scotia Nature Archive Facebook Page, 1 record.
1	Gilhen, J., Jones, A., McNeil, J., Tanner, A.W. 2012. A Significant Range Extension for the Eastern Ribbonsnake, Thamnophis sauritus, in Nova Scotia, Canada. The Canadian Field-Naturalist, 126(3): 231-233.
1	Golder Associates Ltd. 2021. Black Ash location from Goff's Quarry Expansion Environment Assessment, 2017. Golder Associates Ltd., 1 record.
1	iNaturalist.ca. 2022. iNaturalist records 2022. iNaturalist.ca (ed.) iNaturalist.org; iNaturalist.ca, Web site: 3 recs.
1	Jacques Whitford Ltd. 2003. Cananda Lily location. Pers. Comm. to S. Blaney. 2pp, 1 rec, 1 rec.
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	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	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.
1	Newell, R.E. 2004. Hepatica nobilis var. obtusa record. Pers. comm. to S. Blaney, 1 rec.
1	Niel, K. & Majka, C. 2008. New Records of Tiger Beetles (Coleoptera: Carabidae: Cicindelinae) in Nova Scotia. Journal of the Acadian Entomological Society, 4: 3-6.
1	Payzant, P. 2018. Satyr Comma record from Bible Hill, NS. https://novascotiabutterflies.ca.
1	Phinney, L. 2019. Little Brown Myotis maternal colony counts and birdSAR, 2019. Mersey Tobeatic Research Institute.
1	Scott, F.W. 1988. Status Report on the Southern Flying Squirrel (Glaucomys volans) in Canada. Committee on the Status of Endangered Wildlife in Canada, 2 recs.
1	Skevington, Jeffrey H. 2020. Syrphid records used for the Field Guide to the Flower Flies of Northeastern North America. Canadian National Collection of Insects.
1	Sollows, M.C,. 2009. NBM Science Collections databases: Coccinellid & Cerambycid Beetles. New Brunswick Museum, Saint John NB, download Feb. 2009, 569 recs.
1	Sollows, M.C. 2008. NBM Science Collections databases: herpetiles. New Brunswick Museum, Saint John NB, download Jan. 2008, 8636 recs.
1	Sollows, M.C. 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
1	Stewart, P. 2013. email to Sean Blaney regarding the discovery of a Listera australis population at Blockhouse. Envirosphere Consultants Limited, 1.

# recs	CITATION
1	Toms, Brad. 2022. Non-Lichen Observations from Lichen SMP and NCC Property Searches. Mersey Tobeatic Research Institute.
1	WIlliams, M. Cape Breton University Digital Herbarium. Cape Breton University Digital Herbarium. 2013.

APPENDIX B

Vegetation Data

Table B.1 - Observed Vegetation in the MLSA

Species Name	Common Name
Abies balsamea	Balsam Fir
Acer pensylvanicum	Striped Maple
Acer rubrum	Red Maple
Agalinis neoscotica	Nova Scotia Agalinis
AGALINIS PURPUREA	Purple False-Foxglove
Agrostis capillaris	Colonial Bent Grass
Agrostis scabra	Rough Bent Grass
Alisma triviale	Northern Water Plantain
Alnus alnobetula	Green Alder
Alnus incana	Speckled Alder
Amelanchier sp.	Serviceberry
AMELANCHIER SPICATA	Running Serviceberry
Anaphalis margaritacea	Pearly Everlasting
Aralia nudicaulis	Wild Sarsaparilla
Aronia melanocarpa	Photinia melanocarpa
Bartonia paniculata	Branched Bartonia
Bazzania trilobata	Bazzania
Betula alleghaniensis	Yellow Birch
Betula papyrifera	White Birch
Betula populifolia	Gray Birch
Bidens cernua	Nodding Beggarticks
Bidens frondosa	Devil's Beggarticks
Brachyelytrum aristosum	Northern Shorthusk
Bromus ciliatus	Bromus ciliatus
Calamagrostis canadensis	Bluejoint Reed Grass
Callitriche palustris	Marsh Water-starwort
Carex brunnescens	Brownish Sedge
Carex debilis	White-edged Sedge
Carex folliculata	Northern Long Sedge
Carex gracillima	Graceful Sedge
Carex gynandra	Nodding Sedge
Carex leptalea	Bristly-stalked Sedge
Carex lurida	Sallow Sedge
Carex nigra	Smooth Black Sedge
Carex novae-angliae	New England Sedge
Carex scoparia	Broom Sedge
Carex sp.	a Sedge
Carex stricta	Tussock Sedge
Carex trisperma	Three-seeded Sedge
Centaurea nigra	Black Knapweed
Centaurium pulchellum	Branched Centaury
Chamaedaphne calyculata	Leatherleaf
Chelone glabra	White Turtlehead
Cladonia sp.	Reindeer Lichen
Claytosmunda claytoniana	Interupted Fern
Clintonia borealis	Yellow Bluebead Lily
Coptis trifolia	Goldthread
Corema conradii	Broom Crowberry
Cornus canadensis	Bunchberry
Cypripedium acaule	Pink Lady's-Slipper
Danthonia compressa	Flattened Oat Grass
Danthonia spicata	Poverty Oat Grass
Daucus carota	Queen Anne's Lace
Dennstaedtia puntilobula	Hay-scented Fern
Deschampsia flexuosa	Tufted Hair Grass
Dianthus armeria	Deptford Pink
Dichanthelium acuminatum	Woolly Panic Grass
Dicranium sp.	Dicraniums
Diervilla lonicera	Northern Bush Honeysuckle
Digitaria ischaemum	Smooth Crab Grass
Doellingeria umbellata	Hairy Flat-top White Aster
Drosera intermedia	Spoon-Leaved Sundew
Drosera rotundifolia	Round-leaved Sundew
Dryopteris carthusiana	Spinulose Wood Fern
Dryopteris cristata	Crested Wood Fern
ELEOCHARIS FLAVESCENS VAR. OLIVACEA	Bright-green Spikerush
Epigaea repens	Trailing Arbutus
Epilobium ciliatum	Northern Willowherb
Erigeron annuus	Annual Fleabane
Erigeron canadensis	Conyza canadensis
Eriophorum angustifolium	Narrow-leaved Cottongrass
Eriophorum virginicum	Tawny Cottongrass
Euphrasia nemorosa	Common Eyebright
Eurybia radula	Low Rough Aster
Euthamia graminifolia	Grass-leaved Goldenrod
Festuca filiformis	Hair Fescue
Festuca rubra	Red Fescue
Fragaria virginiana	Wild Strawberry
Frangula alnus	Glossy Buckthorn
Galium palustre	Common Marsh Bedstraw
Gaultheria hispidula	Creeping Snowberry
Gaultheria procumbens	Eastern Teaberry
Gaylussacia baccata	Black Huckleberry
Glyceria canadensis	Canada Manna Grass
Glyceria grandis	Common Tall Manna Grass
Glyceria obtusa	Atlantic Manna Grass
Glyceria striata	Fowl Manna Grass
Hamamelis virginiana	Witch Hazel
Hieracium umbellatum	Umbellate Hawkweed
Hylocomium splendens	Stairstep Moss
Hypericum canadense	Canada St John's-wort
Hypericum fraseri	Triadenum fraseri
Hypericum perforatum	Common St. John's-wort
Hypnum imponens	Plume Moss
Hypopitys monotropa	Monotropa hypopithys
Ilex mucronata	Nemopanthus mucronatus
Ilex verticillata	Winterberry
Impatiens capensis	Spotted Touch-me-not
Iris versicolor	Harlequin Blue Flag
JUNCUS ACUMINATUS	Sharp-fruit Rush
Juncus brevicaudatus	Narrow-Panicled Rush

Table B.1 - Observed Vegetation in the MLSA

Species Name	Common Name
Juncus canadensis	Canada Rush
Juncus effusus	Soft Rush
Juncus marginatus	Grassleaf Rush
Juncus pelocarpus	Brown-Fruited Rush
Juncus tenuis	Slender Rush
Juniperus communis	Common Juniper
Kalmia angustifolia	Sheep Laurel
Kalmia polifolia	Pale Bog Laurel
Larix laricina	Tamarack
Leersia oryzoides	Rice Cut Grass
Lemna minor	Lesser Duckweed
Leucobryum glaucum	White Pincushion Moss
Leucobryum sp.	a Moss
Linnaea borealis	Twinflower
Lonicera villosa	Mountain Fly Honeysuckle
Lotus corniculatus	Garden Bird's-foot Trefoil
Ludwigia palustris	Marsh Seedbox
Lycopus americanus	American Water Horehound
Lycopus uniflorus	Northern Water Horehound
Lysimachia borealis	Trientalis borealis ssp. borealis
Maianthemum canadense	Wild Lily-of-The-Valley
Maianthemum trifolium	Three-leaved False Soloman's Seal
Matricaria discoidea	Pineapple Weed
Mitchella repens	Partridgeberry
Monotropa uniflora	Convulsion-Root
Morella pensylvanica	Northern Bayberry
Muhlenbergia uniflora	Bog Muhly
Myrica gale	Sweet Gale
Nabalus trifoliolatus	Three-leaved Rattlesnakeroot
Nasturtium officinale	Rorippa nasturtium-aquaticum
Nuphar variegata	Variegated Pond-lily
Oclemena acuminata	Whorled Wood Aster
Oclemena nemoralis	Bog Aster
Oclemena x blakei	a hybrid White Panicled American-Aster
Oenothera biennis	Common Evening Primrose
Oenothera perennis	Perennial Evening Primrose
Onoclea sensibilis	Sensitive Fern
Osmunda claytoniana	Interrupted Fern
Osmunda regalis	Royal Fern
Osmundastrum cinnamomeum	Cinnamon Fern
Oxalis montana	Wood Sorrel
Oxalis stricta	European Wood Sorrel
Persicaria hydropiper	Polygonum hydropiper
Persicaria maculosa	Polygonum persicaria
Persicaria sagittata	Polygonum sagittatum
Picea glauca	White Spruce
Picea mariana	Black Spruce
Picea mariana x rubens	Hybrid Spruce
Picea rubens	Red Spruce
Pinus strobus	Eastern White Pine
Plantago major	Common Plantain
Pleurozium schreberi	Scherber's Moss
Poa compressa	Canada Blue Grass
Poa palustris	Fowl Blue Grass
Poa pratensis	Kentucky Blue Grass
Pogonia ophioglossoides	Rose Pogonia
Polypodium virginianum	Rock Polypody
Polytrichum sp.	Polytrichum
Pontederia cordata	Pickerelweed
Populus grandidentata	Large-toothed Aspen
Populus tremuloides	Trembling Aspen
Potentilla simplex	Old Field Cinquefoil
Prunus pensylvanica	Pin Cherry
Pteridium aquilinum	Bracken Fern
Ptilium crista-castrensis	Knight's Plume Moss
Quercus rubra	Red Oak
Ranunculus acris	Common Buttercup
Ranunculus repens	Creeping Buttercup
RANUNCULUS SCELERATUS	Cursed Buttercup
Rhinanthus minor	Little Yellow Rattle
Rhododendron canadense	Rhodora
Rhododendron groenlandicum	Ledum groenlandicum
Rhynchospora alba	White Beakrush
Rhytidiadelphus triquetrus	Electrified Cat's-tail Moss
ROSA BLANDA	Smooth Rose
Rosa multiflora	Multiflora Rose
Rosa nitida	Shining Rose
Rosa palustris	Swamp Rose
Rosa virginiana	Virginia Rose
Rubus canadensis	Smooth Blackberry
Rubus chamaemorus	Cloudberry
Rubus hispidus	Bristly Dewberry
Rubus idaeus	Red Raspberry
Rubus pubescens	Dwarf Red Raspberry
Rubus sp.	Rubus
Salix bebbiana	Bebb's Willow
Salix discolor	Pussy Willow
Salix humilis var. humilis	Upland Willow
Sarracenia purpurea	Northern Pitcher Plant
Schoenoplectus subterminalis	Water Bulrush
Scirpus atrocinctus	Black-girdled Bulrush
Scirpus cyperinus	Common Woolly Bulrush
Scirpus hattorianus	Mosquito Bulrush
Scorzoneroides autumnalis	Leontodon autumnalis
Sium suave	Common Water Parsnip
Solidago canadensis	Canada Goldenrod
Solidago puberula	Downy Goldenrod
Solidago rugosa	Rough-stemmed Goldenrod
Solidago uliginosa	Northern Bog Goldenrod
Sorbus americana	American Mountain Ash
Sparganium americanum	American Burreed

Table B.1 - Observed Vegetation in the MLSA

Species Name	Common Name
Sparganium angustifolium	Narrow-leaved Burreed
Sphagnum sp.	Sphagnum Moss
Spiraea alba	White Meadowsweet
Spiraea tomentosa	Steeplebush
Spiranthes cernua	Nodding Ladies'-Tresses
Symphotrichum puniceum	Purple-stemmed Aster
Symphyotrichum novi-belgii	New York Aster
Symphyotrichum puniceum	Purple-stemmed Aster
Thalictrum pubescens	Tall Meadow-Rue
Thelypteris noveboracensis	New York Fern
Trientalis borealis	Starflower
Trillium undulatum	Painted Trillium
Tussilago farfara	Coltsfoot
Typha latifolia	Broad-leaved Cattail
Vaccinium angustifolium	Late Lowbush Blueberry
Vaccinium macrocarpon	Large Cranberry
Vaccinium myrtilloides	Velvet-leaved Blueberry
Vaccinium oxycoccos	Small Cranberry
Vaccinium vitis-idaea	Mountain Cranberry
Viburnum lantanoides	Hobblebush
Viburnum nudum	Northern Wild Raisin
Viola cucullata	Marsh Blue Violet
Viola lanceolata	Lance-leaved Violet
* Captialized species are SOCC	

Table B.2 - Stand Data for the MLSA

Site ID	Field Description	Drainage Class	Estimated Stand Age	Forest Group (FG)	VT(2022)	Forest Maturity	Maturity Score	Forest Succession	Succession Score
ML1	semi-barrens	mesic	unknown	OW	OW2			Early	3
ML2	mature coniferous forest	subhygric	40	WB	WB1	Mature	2	Edaphic	2
ML3	tall shrub swamp	hygric	unknown	wetland	TSS	N/A	N/A	N/A	N/A
ML4	treed bog	hygric	unknown	wetland	swamp	N/A	N/A	N/A	N/A
ML5	mature coniferous woodland	subhygric	40	OW	OW2	Mature	2	Early	3
ML6	mature mixedwood forest	mesic	30	MW	MW9	Mature	2	Early	3
ML7	tall shrub thicket	mesic	unknown	wetland	TSS	N/A	N/A	N/A	N/A
ML8	mature coniferous forest	mesic	60	SP	SP5	Mature	2	Edaphic	2
ML9	coniferous treed basin swamp	hygric	60	WC	WC2	Mature	2	Edaphic	2
ML10	coniferous treed basin swamp	hygric	20	WC	WC2	Immature	3	Edaphic	2
ML11	tall shrub dominated stream swamp	hygric	unknown	wetland	TSS	N/A	N/A	N/A	N/A
ML12	tall shrub dominated swamp	hygric	unknown	wetland	TSS	N/A	N/A	N/A	N/A
ML13	mixedwood treed slope swamp	hygric	20	WM	WM3	Immature	3	Edaphic, Mid	2
ML14	tall shrub dominated slope swamp	hygric	unknown	wetland	swamp		2*		
ML15	immature hardwood forest	submesic	20	IH	IH8	Immature	3	Early	3
ML16	barrens	submesic	unknown	Barrens	S3		2*	S3	
ML17	immature hardwood woodland/barrens	submesic	10	IH	IH8	Immature	3	Early	3
ML18	fire barrens	mesic	10	Barrens	S1	Immature	3	S1	
ML19	immature coniferous forest	mesic	20	SP	SP6	Immature	3	Early to Mid	3
ML20	immature mixedwood forest	subhygric	20	WB	WB1	Immature	3	Edaphic	2
ML21	fire barrens	mesic	15	Barrens	S5	Immature	3	S5	
ML22	mature mixedwood forest	subhygric	70	WC	WC7	Mature	2	Edaphic, Early to	2
ML23	coniferous treed basin swamp	hygric	30	WC	WC2	Mature	2	Edaphic	2
ML24	coniferous treed woodland	submesic	40	OW	OW2	Mature	2	Early	3
ML25	mature coniferous forest	mesic	40	SP	SP6	Mature	2	Early to Mid	3
ML25b	coniferous treed basin swamp	hygric	40	WC	WC6	Mature	2	Edaphic	2
ML26	coniferous treed basin swamp	hygric	40	WC	WC2	Mature	2	Edaphic	2
ML27	barrens/treed bog	subhygric	unknown	WC	WC11			Edaphic	2
ML28	mature coniferous forest	subhygric	40	WC	WC2	Mature	2	Edaphic	2
ML29	barrens	mesic	unknown	Barrens	S5		2*	S5	
ML30	mixedwood treed basin swamp	hygric	50	WC	WC7	Mature	2	Edaphic, Early to	2
ML31	mixedwood treed swamp	hygric	40	WC	WC7	Mature	2	Edaphic, Early to	2
ML32	mixedwood treed swamp	hygric	40	WM	WM3	Mature	2	Edaphic, Mid	2
ML33	mixedwood treed swamp	hygric	50	WM	WM3	Mature	2	Edaphic, Mid	2
ML34	tall shrub swamp	hygric	unknown	wetland	TSS	N/A	N/A	N/A	N/A
ML35	mixedwood treed basin swamp	hygric	50	WM	WM1	Mature	2	Edaphic, Mid	2
ML36	hardwood woodland	mesic	15	IH	IH8	Immature	3	Early	3
ML37	low shrub dominated stream swamp	hygric	unknown	wetland	LSS	N/A	N/A	N/A	N/A
ML38a	Former mixedwood forest	imperfectly	unknown	MW	N/A	N/A	N/A	N/A	N/A
ML38b	former mixedwood swamp now marsh	hydric	unknown	wetland	swamp	N/A	N/A	N/A	N/A
ML39	mature mixedwood forest	mesic	50	CB	CB3	Mature	2	Mid to Late	1
ML40	barrens	well drained	unknown	Barrens	S5		2*	S5	
ML41	hardwood woodland	well drained	15	Barrens	S1	Immature	3	S1	
ML42	coniferous forest	imperfectly	60	SP	SP7	Mature	2	Edaphic	2
ML43	mixedwood treed stream swamp	hygric	30	WD	WD2	Mature	2	Edaphic, Early to	2
ML44	mature coniferous forest	mesic	30	SP	SP7	Mature	2	Edaphic	2
ML45	mature hardwood forest	well drained	40	IH	IH8	Mature	2	Early	3
ML46	mature mixedwood forest	mesic	50	MW	MW9	Mature	2	Early	3
ML47a	barrens	well drained	unknown	Barrens	S5			S5	
ML47b	immature hardwood forest	well drained	15	IH	IH8	Immature	3	Early	3
ML48	barrens	well drained	unknown	Barrens	S1		2*	S1	
ML49	immature hardwood forest	mesic	15	IH	IH8	Immature	3	Early	3
ML50	Treed Bog	hygric	60	WC	WC7	Mature	2	Edaphic, Early to	2
ML51	coniferous treed basin swamp	hygric	40	WC	WC7	Mature	2	Edaphic, Early to	2
ML52	mature mixedwood forest	mesic	50	CB	CB4	Mature	2	Mid	2
ML53	mature mixedwood woodland	mesic	50	CB	CB4	Mature	2	Mid	2
ML54	mature coniferous forest	mesic	60	SP	SP7	Mature	2	Edaphic	2
ML55	mature hardwood forest	mesic	50	IH	IH8	Mature	2	Early	3
ML56	mixedwood treed woodland	mesic	40	IH	IH8	Mature	2	Early	3
ML57	coniferous treed basin swamp	hygric	30	WC	WC1	Mature	2	Edaphic	2
ML58	mixedwood treed woodland	mesic	50	MW	MW9	Mature	2	Early	3
ML59	mature mixedwood forest	mesic	30	MW	MW9	Mature	2	Early	3
ML60	coniferous treed basin swamp	hygric	40	WC	WC7	Mature	2	Edaphic, Early to	2
ML61	mixedwood woodland	mesic	70	MW	MW9	Mature	2	Early	3
ML62	mature mixedwood forest	mesic	50	MW	MW9	Mature	2	Early	3
ML63	mature mixedwood forest	mesic	40	MW	MW9	Mature	2	Early	3
ML64	coniferous treed basin swamp	hygric	40	WC	WC2	Mature	2	Edaphic	2
ML65	mixedwood woodland	imperfectly	40	MW	MW9	Mature	2	Early	3
ML66	mixedwood treed swamp	hygric	50	WM	WM3	Mature	2	Edaphic, Mid	2
ML67	coniferous treed swamp	hygric	40	WC	WC11	Mature	2	Edaphic	2
ML68	coniferous treed woodland/swamp	mesic	40	WC	WC11	Mature	2	Edaphic	2
ML69	deciduous treed stream swamp	hygric	70	WD	WD2	Mature	2	Edaphic, Early to	2
ML70	coniferous treed swamp	hygric	60	WC	WC11	Mature	2	Edaphic	2
ML71	coniferous treed swamp	hygric	50	WC	WC11	Mature	2	Edaphic	2
ML72	coniferous treed woodland	mesic	50	OW	OW2	Mature	2	Early	3
ML73	mature mixedwood forest	mesic	50	MW	MW9	Mature	2	Early	3
ML74	mature mixedwood forest	mesic	50	MW	MW9	Mature	2	Early	3
ML75	coniferous treed swamp	hygric	40	WC	WC11	Mature	2	Edaphic	2
ML76	immature mixedwood forest	well drained	15	MW	MW9	Immature	3	Early	3
ML77	mature mixedwood forest	well drained	40	MW	MW9	Mature	2	Early	3
ML78	mature mixedwood forest	mesic	50	MW	MW9	Mature	2	Early	3
ML79	early successional balsam fir	mesic	10	SP	SP6	Immature	3	Early to Mid	3
ML80	mid-successional red spruce (may be hybrid), small stand	mesic	50	SH	SH4	Mature	2	Late	1
ML81	mid successional mixedwood	well to rapid	35	MW	MW2	Mature	2	Mid	2
ML82	mid-successional mixedwood	well to rapid	30	MW	MW2	Mature	2	Mid	2
ML83	early to mid successional intolerant hardwood with sparse spruc	well to rapid	30	IH	IH8	Mature	2	Early	3
ML84	mid-successional mixedwood	well	45	MW	MW2	Mature	2	Mid	2
ML85	early to mid successional mixedwood	well	35	MW	MW2	Mature	2	Mid	2
ML86	mid-successional mixedwood	well	60	MW	MW2	Mature	2	Mid	2
ML87	mid-successional mixedwood	mesic	40	MW	MW7	Mature	2	Early to Mid	3
ML88	early-successional mixedwood	mesic	40	SP	SP6	Mature	2	Early to Mid	3

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Coastal Boreal Forest (CB)			Intolerant Hardwood Forest (IH)									Mixedwood Forest (MW)																			Open Woodland (OW)			
Vegetation Type (VT)		CB3	CB4	CB4	IH8	IH8	IH8	IH8	IH8	IH8	IH8	IH8	IH8	MW2	MW2	MW2	MW2	MW2	MW7	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	N/A	OW2	OW2	OW2	OW2
Vegetation Type	Species Name	ML39	ML52	ML53	ML15	ML17	ML36	ML45	ML47b	ML49	ML55	ML56	ML83	ML81	ML82	ML84	ML85	ML86	ML87	ML6	ML46	ML58	ML59	ML61	ML62	ML63	ML65	ML73	ML74	ML76	ML77	ML78	ML38a	ML1	ML5	ML24	ML72
Tree	*Abies balsamea*	30	40	10	0	0	0	2	0	0	1	0	0	0	0	0	0	5	35	0	0	2	40	8	0	0	1	15	15	0	20	10	0	0	0	1	0
	Acer pensylvanicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acer rubrum	7	20	8	15	0	3	40	50	30	20	8	45	20	40	35	10	0	25	20	15	15	30	10	15	25	8	20	10	0	20	30	8	0	0	0	1
	Betula alleghaniensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula papyrifera	8	2	3	40	0	5	25	10	25	45	10	20	0	10	20	55	0	0	5	2	0	0	5	20	20	2	15	5	0	10	20	0	0	0	0	0
	Hamamelis virginiana	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Larix laricina	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	1	0	0	0	0	0	0	0	0	0	5	5	5	10
	Picea glauca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	Picea mariana	10	2	2	0	0	0	5	0	0	2	2	0	0	0	0	0	0	0	15	35	20	0	0	0	0	0	20	0	0	0	0	0	20	30	20	1
	Picea mariana x rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	5	15	10	10	15	0	25	0	0	15	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	0	0	0	15	30	0	20	15	25	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pinus strobus	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Populus grandidentata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Populus tremuloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Prunus pensylvanica	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sorbus americana	0	0	0	10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shrub	*Abies balsamea*	10	3	0	0	0	0	0	0	0	0	0	0	10	0	0	0	25	5	0	0	0	10	0	0	0	0	5	0	1	5	2	0	0	0	0	1
	Acer rubrum	0	0	0	0	10	10	2	0	20	0	0	0	0	0	0	0	0	0	0	3	0	1	1	5	0	0	0	0	2	0	0	0	0	0	0	10
	Alnus incana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0
	Alnus viridis	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	Amelanchier sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Aralia nudicaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aronia melanocarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
	Betula papyrifera	0	2	0	0	30	30	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	40	15	0	1	0	0	0	2
	Chamaedaphne calyculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Frangula alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gaylussacia baccata	0	1	0	30	20	0	30	15	35	5	0	25	2	20	60	60	0	10	0	40	0	0	40	25	50	60	0	15	2	1	5	0	0	0	0	10
	Hamamelis virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	0	0	0	0	2	4	1	0	0	0	0	0	0	0	0	0	0	0
	Ilex mucronata	2	15	20	0	15	20	0	8	0	0	30	0.5	0	10	15	0	0	5	2	1	10	1	10	2	2	3	0	0	0	5	0	0	30	5	10	20
	Ilex verticillata	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Juniperus communis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Kalmia angustfolia	10	20	50	5	2	60	40	50	10	60	40	25	15	10	10	35	0	20	0	50	60	1	60	30	30	35	40	25	10	65	60	0	50	40	20	60
	Kalmia polifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Larix laricina	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.5	0	0	1	0	0	1	2	0	0	0	0	0	5
	Lonicera villosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Morella pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myrica gale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea mariana	3	0	5	0	0	0	15	0	0	10	20	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	5	0	30	10
	Picea mariana x rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	10	4	15	10	20	20	20	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	0	0	0	0	10	10	0	2	2	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Prunus pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhododendron canadense	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	1	5	1
	Rhododendron groenlandicum	0	0	0.5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rosa blanda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rosa nitida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rosa palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rosa virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sorbus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spiraea alba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0
	Vaccinium myrtilloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Viburnum lantanoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Viburnum nudum	0	0.5	30	20	15	3	20	5	5	30	20	1	5	5	5	0	0	0	15	5	10	0.5	2	5	10	5	0	1	0	0	0	0	2	10	2	2

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Coastal Boreal Forest (CB)			Intolerant Hardwood Forest (IH)									Mixedwood Forest (MW)																				Open Woodland (OW)			
Vegetation Type (VT)		CB3	CB4	CB4	IH8	IH8	IH8	IH8	IH8	IH8	IH8	IH8	IH8	MW2	MW2	MW2	MW2	MW2	MW7	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	N/A	OW2	OW2	OW2	OW2
Ground Vegetation	*Abies balsamea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acer rubrum	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aralia nudicaulis	0	0	0	2	0.5	0	0	0	0.5	0	0	10	0	1	2	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bazzania trilobata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0	1	0	1	10	0	5	5	0	0	0	0	0
	Betula papyrifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Calamagrotis canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex folliculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex gracillima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Carex leptalea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0
	Carex stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex tripserma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cladonia sp.	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	0	0	0	0	0	10	0	15	0
	Clintonia borealis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coptis trifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cornus canadensis	0	0	10	0	0	5	10	10	5	5	10	0	0	0	5	0.5	0	0	0	1	0	0	0	15	0	2	0	0	0	2	0	0	0	0	2	0
	Cypripedium acaule	0	0	0	0	0	0	0	0	0.5	2	0	0.5	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dennstaedtia punctilobula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Deschampsia flexuosa	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dicranium sp.	0	1	2	0	0.5	0	0	0	1	3	0	0	0	0	0	0	0	0	0	2	1	10	0	1	2	0.5	0	10	2	2	0	0	0	5	0	0
	Doellingeria umbellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dryopteris carthusiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dryopteris cristata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Epigaea repens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
	Eriophorum virginicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eurybia radula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gaultheria hispidula	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gaultheria procumbens	0	0	0	1	0	5	0	0	5	0	2	0	15	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	5	0
	Glyceria canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glyceria grandis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glyceria striata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Impatiens capensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Iris versicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hylocomium splendens	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypnum imponens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	10	5	0	15	5	10	0	40	0	0	0	0	0
	Leucobryum glaucum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leucobryum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Linnaea borealis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ludwigia palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lycopus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lycopus uniflorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maianthemum canadense	1	1	0	0	0	3	0	0	0	0	0	5	1	0	0	2	1	7	40	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0
	Maianthemum trifoliata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mitchella repens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Monotropa uniflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oclemena acuminata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
	Oclemena x blakei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Onoclea sensibilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Osmunda cinnamomea	0	0	0	0	0	0	5	5	15	0	15	0	0	0	0	0	0	2	0	2	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0
	Osmunda claytoniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	15	0	0	0	2	0	1	0	0	0	0	0
	Osmunda regalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oxalis montana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Persicaria hydropiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pleurozium schreberi	20	0	20	0	0	0	0	10	2	2	0	0	0	0	0	0	0	0	0	20	20	1	0	0	2	0	5	5	0	0	0	0	15	70	60	5
	Polytrichum sp.	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pontederia cordata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Potentilla simplex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pteridium aquilinum	15	20	30	1	15	10	20	15	0	15	10	20	20	25	15	15	0	0	2	2	8	1	25	30	15	10	20	5	5	10	5	0	5	0	20	15
	Ptilium crista-castrensis	5	15	5	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhytidiadelphus triquetrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus chamaemorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus hispidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus idaeus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
	Rubus pubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Coastal Boreal Forest (CB)			Intolerant Hardwood Forest (IH)									Mixedwood Forest (MW)																				Open Woodland (OW)			
Vegetation Type (VT)		CB3	CB4	CB4	IH8	IH8	IH8	IH8	IH8	IH8	IH8	IH8	IH8	MW2	MW2	MW2	MW2	MW2	MW7	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	N/A	OW2	OW2	OW2	OW2
Ground Vegetation	*Sarracenia purpurea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scirpus cyperinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solidago canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
	Solidago rugosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	Solidago uliginosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sparganium americanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sphagnum sp.	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	15	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
	Symphotrichum puniceum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Thalictrum pubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Trientalis borealis	0.5	1	0	0	0	0	0	0	3	2	0	3	0.5	5	1	1	5	0	10	0	0	1	0	0	0	0	2	0	1	0	0	0	0	0.5	0	0
	Vaccinium angusifolium	0	0	0	0	1	5	2	5	0	10	2	2	1	2	5	0	0	2	0	1	5	1	5	0	0	2	0	0	0	10	0	0	20	1	0	2
	Vaccinium myrtilloides	0	0	5	0	0	0	2	10	0	0	0	30	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium oxycoccos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium vitis-idaea	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Barrens								Spruce Hemlock Forest (SH)	Spruce Pine Forest (SP)								Wetland									Wet Boreal Forest (WB)	
Vegetation Type (VT)		S1	S1	S1	S3	S5	S5	S5	S5	SH4	SP5	SP6	SP6	SP6	SP6	SP7	SP7	SP7	LSS	swamp	swamp	swamp	TSS	TSS	TSS	TSS	TSS	WB1	WB1
Vegetation Type	Species Name	ML18	ML41	ML48	ML16	ML21	ML29	ML40	ML47a	ML80	ML8	ML19	ML25a	ML79	ML88	ML42	ML44	ML54	ML37	ML4	ML14	ML38b	ML3	ML7	ML11	ML12	ML34	ML2	ML20
Tree	*Abies balsamea*	0	0	0	0	0	0	0	0	0	0	35	30	65	60	15	0	0	0	0	0	0	0.5	0	0	0.5	0	20	20
	Acer pensylvanicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acer rubrum	0	1	0	0	0	0	0	0	2	0	10	0	10	20	10	0	8	5	0	0.5	0	0	0.5	0	0.5	25	0	30
	Betula alleghaniensis	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula papyrifera	0	3	1	2	0.5	0	2	0.5	5	0	0	5	0	0	0	1	2	0	0	0	0	0.5	0	0	0	0	0	5
	Hamamelis virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Larix laricina	0	0	0	0	0	1	0	0	0	5	10	0	0	0	5	10	0	0	10	0	0	0	0	0	0	0	10	5
	Picea glauca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea mariana	0	0	0	0	0	5	0	0	0	50	25	20	5	0	30	50	50	0	30	0	0	0	0.5	0	0.5	1	15	0
	Picea mariana x rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pinus strobus	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Populus grandidentata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Populus tremuloides	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Prunus pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sorbus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Shrub	*Abies balsamea*	0	0	0	0	0	0	0	0	0	0	0	0.5	20	20	0.5	0	0	0	0	0	0	0	0	0	0	0	0	5
	Acer rubrum	2	25	3	2	2	0	1	2	0	0	0.5	0	0	0	1	2	2	0	0	0	0.5	0	0	0	0	0	0	5
	Alnus incana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	50	1	30	2	70	65	25	0	0
	Alnus viridis	0	0	0	1	1	0	15	1	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	60	0	0	0	0	0
	Amelanchier sp.	0	0	0	1	0	0	0	0	0	2	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aralia nudicaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aronia melanocarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Betula papyrifera	10	10	2	5	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	5	0	0	0	0	1	0
	Chamaedaphne calyculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Frangula alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Gaylussacia baccata	50	35	60	5	20	0	0	30	5	0	0	0	0	0	0	0	25	0	5	0	0	0	0	0	0	0	0	0
	Hamamelis virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ilex mucronata	2	0	20	4	10	5	2	15	0	0	0	0	0	10	20	15	30	0	40	0	0	0	0	0	0	0	0	10
	Ilex verticillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	65	5	0
	Juniperus communis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Kalmia angustfolia	35	30	50	20	60	60	70	50	5	0.5	0	20	0	15	30	55	20	0	20	0	0	0	0	0	0	2	0	20
	Kalmia polifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Larix laricina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
	Lonicera villosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Morella pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myrica gale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	1	0	0	0	0	0	0	0	0
	Picea mariana	2	0	0	0.5	1	25	2	0	0	0	5	10	15	0	10	35	5	0	10	0	0	1	0	0	0	0	10	0
	Picea mariana x rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Prunus pensylvanica	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhododendron canadense	1	0	0	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
	Rhododendron groenlandicum	0	0	1	5	0	10	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	Rosa blanda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0
	Rosa nitida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
	Rosa palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0
	Rosa virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0
	Sorbus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spiraea alba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	5	0	0	15	0	0	0	0	0
	Vaccinium myrtilloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Viburnum lantanoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0
	Viburnum nudum	0	10	2	2	5	2	3	5	0	10	0	0	0	2	10	0	10	0	2	2	0	2	2	0	0	0	5	15

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Barrens								Spruce Hemlock Forest (SH)	Spruce Pine Forest (SP)								Wetland									Wet Boreal Forest (WB)	
Vegetation Type (VT)		S1	S1	S1	S3	S5	S5	S5	S5	SH4	SP5	SP6	SP6	SP6	SP6	SP7	SP7	SP7	LSS	swamp	swamp	swamp	TSS	TSS	TSS	TSS	TSS	WB1	WB1
Ground	*Abies balsamea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vegetation	*Acer rubrum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aralia nudicaulis	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bazzania trilobata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula papyrifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Calamagrotis canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	5	15	0	0	0	0	0	0
	Carex folliculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Carex gracillima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex leptalea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Carex stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	4	0	0	0	0	25	0	0
	Carex tripserma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cladonia sp.	5	0	5	5	8	40	10	10	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	Clintonia borealis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Coptis trifolia	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cornus canadensis	8	0	0	2	0	10	2	0	0	2	0	2	0	5	12	1	0	0	0	0	0	0	0	0	0	0	1	8
	Cypripedium acaule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dennstaedtia punctilobula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Deschampsia flexuosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dicranium sp.	0	0	1	2	2	0	0	2	0	2	1	0	0	0	2	0	2	0	20	0	0	0	0	0	0	0	10	2
	Doellingeria umbellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0	15	20	10	0	0	0
	Dryopteris carthusiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dryopteris cristata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Epigaea repens	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eriophorum virginicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eurybia radula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gaultheria hispidula	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gaultheria procumbens	0	5	0	5	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glyceria canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glyceria grandis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	10	20	0	0	0
	Glyceria striata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0
	Impatiens capensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	2	0	0	0	0
	Iris versicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0
	Hylocomium splendens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0
	Hypnum imponens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
	Leucobryum glaucum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leucobryum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
	Linnaea borealis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ludwigia palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	0
	Lycopus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
	Lycopus uniflorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	Maianthemum canadense	0	3	0	0	0	0	0	0	0	0	0.5	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Maianthemum trifoliata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mitchella repens	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Monotropa uniflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oclemena acuminata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oclemena x blakei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Onoclea sensibilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0
	Osmunda cinnamomea	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	1	30
	Osmunda claytoniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Osmunda regalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	Oxalis montana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Persicaria hydropiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0
	Pleurozium schreberi	10	0	0	40	10	10	0	0	0	10	5	80	0	0	50	2	20	0	30	0	0	0	0	0	0	0	40	2
	Polytrichum sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pontederia cordata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
	Potentilla simplex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
	Pteridium aquilinum	0	10	10	10	15	0	10	20	0	0.5	0	0	0	0	5	1	15	0	0	0	0	0	0	0	0	0	0	0
	Ptilium crista-castrensis	0	0	0	0	0	0	0	0	0	5	0	10	0	0	0	0	5	0	5	0	0	0	0	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhytidiadelphus triquetrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
	Rubus canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus chamaemorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus hispidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Rubus idaeus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0
	Rubus pubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
	Rubus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Barrens								Spruce Hemlock Forest (SH)	Spruce Pine Forest (SP)								Wetland									Wet Boreal Forest (WB)	
Vegetation Type (VT)		S1	S1	S1	S3	S5	S5	S5	S5	SH4	SP5	SP6	SP6	SP6	SP6	SP7	SP7	SP7	LSS	swamp	swamp	swamp	TSS	TSS	TSS	TSS	TSS	WB1	WB1
Ground	*Sarracenia purpurea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vegetation	*Scirpus cyperinus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
	Solidago canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	10	0	0	0	0
	Solidago rugosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0
	Solidago uliginosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sparganium americanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	1	0	0	0	0	0	0	0
	Sphagnum sp.	0	0	0	10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	15	0	0	0	0	0	50	60	15	2
	Symphotrichum puniceum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
	Thalictrum pubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0
	Trientalis borealis	0	0	0	0	0	0	0	0	0	0.5	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Vaccinium angusifolium	4	5	2	15	10	5	1	1	0	0.5	0	0	0	1	5	1	0	0	2	0	0	0	0	0	0	0	0	10
	Vaccinium myrtilloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium oxycoccos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium vitis-idaea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Wet Coniferous Forest (WC)																			Wet Deciduous Forest (WD)		Wet Mixedwood Forest (WM)				
Vegetation Type (VT)		WC1	WC11	WC11	WC11	WC11	WC11	WC11	WC2	WC2	WC2	WC2	WC2	WC2	WC6	WC7	WC7	WC7	WC7	WC7	WC7	WD2	WD2	WM1	WM3	WM3	WM3	WM3
Vegetation Type	Species Name	ML57	ML27	ML67	ML68	ML70	ML71	ML75	ML9	ML10	ML23	ML26	ML28	ML64	ML25b	ML22	ML30	ML31	ML50	ML51	ML60	ML43	ML69	ML35	ML13	ML32	ML33	ML66
Tree	*Abies balsamea*	30	0	0	0	15	15	0	0	0	15	1	0	0	30	3	0	8	0	0	0	2	0	15	8	0	5	5
	Acer pensylvanicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acer rubrum	0	0	1	0	8	10	0	5	1	5	0	0	0	0	15	15	15	0	0	2	35	60	30	5	20	20	12
	Betula alleghaniensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula papyrifera	5	0	0	0	0	0	0	0	0	0	0	0	0	8	2	0	3	0	0	0	8	0	5	5	2	2	0
	Hamamelis virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Larix laricina	5	10	5	0	5	5	2	15	0	0	5	10	3	0	30	30	10	10	15	25	10	0	0	0	0	10	8
	Picea glauca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea mariana	35	25	15	20	5	1	1	35	50	30	35	40	80	5	10	15	2	25	20	10	1	1	10	15	25	25	15
	Picea mariana x rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pinus strobus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Populus grandidentata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Populus tremuloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Prunus pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sorbus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shrub	*Abies balsamea*	5	0	1	0	0	0	25	1	0	10	0	0	0	1	2	0	4	0	0	0	4	0	2	0	5	0	2
	Acer rubrum	0	0	0	0	2	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	Alnus incana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	0	0	0	15	0	1	40	0	0	0
	Alnus viridis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amelanchier sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aralia nudicaulis	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aronia melanocarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula papyrifera	2	0	0	0	4	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0.5	0	0	0	0	0	0	0
	Chamaedaphne calyculata	0	15	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	30	0	0	0	0	0
	Frangula alnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gaylussacia baccata	0	0	5	0	8	8	0	0	0	5	2	0	0.5	0	40	0	0	2	0	5	0	0	0	0	5	0	0
	Hamamelis virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ilex mucronata	0	0	40	15	15	15	10	5	20	30	30	1	20	10	5	0	0	1	80	2	3	20	3	0	0	2	30
	Ilex verticillata	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	10	0
	Juniperus communis	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Kalmia angustfolia	5	10	15	5	5	5	30	0	0	2	10	8	10	20	6	1	0	25	20	20	5	20	15	0	10	8	2
	Kalmia polifolia	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Larix laricina	0	15	0	0	15	15	20	0	0	0	0	0	0	0	0	1	1	10	0	0	0	1	0	0	0	0	0
	Lonicera villosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0
	Morella pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myrica gale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
	Picea mariana	3	12	1	20	2	10	15	1	20	10	2	15	0.5	5	2	10	5	8	10	5	5	0	5	5	15	5	1
	Picea mariana x rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Prunus pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhododendron canadense	0	5	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	30	15	0	0	2	0	0	0	0	0
	Rhododendron groenlandicum	0	20	1	10	10	5	5	0	0	1	2	2	2	2	1	0	5	30	10	35	1	5	0	0	0	0	0
	Rosa blanda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rosa nitida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Rosa palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rosa virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sorbus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	Spiraea alba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.5	0	0	0
	Vaccinium myrtilloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Viburnum lantanoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Viburnum nudum	0	15	5	2	4	0	0	20	0	0	0	2	2	0	5	15	0	20	50	0	10	5	5	0	10	15	0

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Wet Coniferous Forest (WC)																			Wet Deciduous Forest (WD)		Wet Mixedwood Forest (WM)				
Vegetation Type (VT)		WC1	WC11	WC11	WC11	WC11	WC11	WC11	WC2	WC2	WC2	WC2	WC2	WC2	WC6	WC7	WC7	WC7	WC7	WC7	WC7	WD2	WD2	WM1	WM3	WM3	WM3	WM3
Ground	*Abies balsamea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vegetation	*Acer rubrum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aralia nudicaulis	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Bazzania trilobata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula papyrifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Calamagrotis canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	15	0	0	0	0	0	0	2	0	0	0
	Carex folliculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex gracillima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex leptalea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0
	Carex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carex stricta	0	2	0	0	40	15	0	0	0	0	0	0	0	0	0	0	20	0	0.5	0	40	5	2	0	1	0	0
	Carex tripserma	15	0	5	0	0	0	10	2	10	0	5	0.5	2	15	0	15	0	0	0	0	0	5	5	0	4	2	8
	Cladonia sp.	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Clintonia borealis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coptis trifolia	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0.5
	Cornus canadensis	0	15	15	0.5	10	5	15	5	15	10	15	2	0	1	3	15	0	0	1	2	2	0	3	0	8	1	8
	Cypripedium acaule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
	Dennstaedtia punctilobula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Deschampsia flexuosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dicranium sp.	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Doellingeria umbellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
	Dryopteris carthusiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dryopteris cristata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0
	Epigaea repens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
	Eriophorum virginicum	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Eurybia radula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Gaultheria hispidula	0	0	0.5	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	5	0	0	0	0	5	0	0.5
	Gaultheria procumbens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glyceria canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Glyceria grandis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	5	10	0	0
	Glyceria striata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Impatiens capensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
	Iris versicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Hylocomium splendens	4	0	0	0	0	0	0	0	0	0	0	5	0	0	2	0	5	0	0	0	0	0	0	0	0	0	0
	Hypnum imponens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leucobryum glaucum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leucobryum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Linnaea borealis	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Ludwigia palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lycopus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lycopus uniflorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maianthemum canadense	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0
	Maianthemum trifoliata	0	0	0	0	0	0	0	0.5	0	0	1	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mitchella repens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Monotropa uniflora	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oclemena acuminata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oclemena x blakei	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	0	0
	Onoclea sensibilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Osmunda cinnamomea	0	0	0	0	30	60	60	0	0	0	0	0	5	2	20	0	0	0	0	50	5	10	15	0	1	15	30
	Osmunda claytoniana	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Osmunda regalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0
	Oxalis montana	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Persicaria hydropiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pleurozium schreberi	5	10	5	2	0	0	0	5	2	0	20	40	0	2	20	20	0	15	0	0	0	2	0	0	0	5	0
	Polytrichum sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pontederia cordata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Potentilla simplex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pteridium aquilinum	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5	0	0	0	1	0	0	0	0	0	0	0	0
	Ptilium crista-castrensis	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
	Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhytidiadelphus triquetrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	Rubus chamaemorus	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus hispidus	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	2	2	0	0	0	15	15	2	0	0	0	0
	Rubus idaeus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	8	0	0	0	0
	Rubus pubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rubus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B.3 - Vegetation Percent Cover Matrix for the MLSA

Forest Group (FG)		Wet Coniferous Forest (WC)																			Wet Deciduous Forest (WD)		Wet Mixedwood Forest (WM)				
Vegetation Type (VT)		WC1	WC11	WC11	WC11	WC11	WC11	WC11	WC2	WC2	WC2	WC2	WC2	WC2	WC6	WC7	WC7	WC7	WC7	WC7	WC7	WD2	WD2	WM1	WM3	WM3	WM3	WM3
Ground	*Sarracenia purpurea*	0	0	0.5	0	0	0	0	0	0	0	0.5	0	5	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0
Vegetation	*Scirpus cyperinus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solidago canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solidago rugosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solidago uliginosa	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sparganium americanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sphagnum sp.	80	2	80	5	50	40	90	80	60	80	40	0	90	90	40	0	0	60	70	90	70	60	70	30	80	60	90
	Symphotrichum puniceum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Thalictrum pubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Trientalis borealis	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium angusifolium	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Vaccinium myrtilloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium oxycoccos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	0	0	0	0	0	0	0
	Vaccinium vitis-idaea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX C

Wildlife Observations

Table C.1 **Incidental Wildlife Observations Recorded During Field Programs**

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Birds					
Archilochus colubris	Ruby-throated Hummingbird	-	-	-	S5B
Bombycilla cedrorum	Cedar Waxwing	-	-	-	S5B
Bonasa umbellus	Ruffed Grouse	-	-	-	S5
Branta canadensis	Canada Goose	-	-	-	SUB, S4N, S5M
Buteo platypterus	Broad-winged Hawk	-	-	-	S5B
Colaptes auratus	Northern Flicker	-	-	-	S5B
Cyanocitta cristata	Blue Jay	-	-	-	S5
Dryobates villosus	Hairy Woodpecker	-	-	-	S5
Falco columbarius	Merlin	NAR	-	-	S5B
Geothlypis trichas	Common Yellowthroat	-	-	-	S5B
Haemorhous purpureus	Purple Finch	-	-	-	S4S5B,S3S4N,S5M
Loxia leucoptera	White-winged Crossbill	-	-	-	S4S5
Megaceryle alcyon	Belted Kingfisher	-	-	-	S4S5B
Melospiza georgiana	Swamp Sparrow	-	-	-	S5B
Mniotilta varia	Black-and-White Warbler	-	-	-	S5B
Phasianus colchicus	Ring-necked Pheasant	-	-	-	SNA
Poecile atricapillus	Black-capped Chickadee	-	-	-	S5
Poecile hudsonicus	Boreal Chickadee	-	-	-	S3
Porzana carolina	Sora	-	-	-	S5B
Raptor sp.	Unknown Raptor	-	-	-	-
Regulus satrapa	Golden-crowned Kinglet	-	-	-	S5
Scolopax minor	American Woodcock	-	-	-	S5B
Setophaga magnolia	Magnolia Warbler	-	-	-	S5B
Setophaga palmarum	Palm Warbler	-	-	-	S5B
Setophaga virens	Black-throated Green Warbler	-	-	-	S5B
Sitta canadensis	Red-breasted nuthatch	-	-	-	S4S5
Spinus tristis	American Goldfinch	-	-	-	S5
Turdus migratorius	American Robin	-	-	-	S5B,S3N
Vireo olivaceus	Red-eyed Vireo	-	-	-	S5B
Zenaida macroura	Mourning Dove	-	-	-	S4B,S5M
Zonotrichia albicollis	White-throated Sparrow	-	-	-	S4S5B,S5M
Pandion haliaetus	Osprey	-	-	-	S4S5B,S5M
Setophaga ruticilla	American Redstart	-	-	-	S5B
Mammals					
Ursus americanus	American Black Bear	-	NAR	-	S5
Lynx rufus	Bobcat	-	-	-	S5
Canis latrans	Eastern Coyote	-	-	-	S5
Procyon lotor	Northern Raccoon	-	-	-	S5
Vulpes vulpes	Red Fox	-	-	-	S5
Tamiasciurus hudsonicus	Red Squirrel	-	-	-	S5
Lepus americanus	Snowshoe Hare	-	-	-	S5
Odocoileus virginianus	White-tailed Deer	-	-	-	S5
Amphibians					
Lithobates clamitans	Green Frog	-	-	-	S5
Lithobates palustris	Pickerel Frog	-	-	-	S5
Pseudacris crucifer	Spring Peeper	-	-	-	S5
Anaxyrus americanus	American Toad	-	-	-	S5
Reptiles					
Storeria occipitomaculata occipitomaculata	Northern Red-bellied Snake	-	-	-	S5
Thamnophis sirtalis pallidulus	Maritime Gartersnake	-	-	-	S5
Opheodrys vernalis	Smooth Greensnake	-	-	-	S4

Notes:

[1] Species at risk in Canada listed under Schedule 1 the federal *Species at Risk Act* as Endangered (EN), Threatened (TH), or Special Concern (SC) (Government of Canada 2023).

[2] Species of conservation concern in Canada assessed by COSEWIC as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC); not at risk species = NAR, Data Deficient = DD (Government of Canada 2023).

[3] Species at risk in Nova Scotia listed under the provincial *Endangered Species Act* (NS) as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC; Government of Nova Scotia 2023).

[4] Species ranked as Critically Imperiled (S1), Imperiled (S2), or Vulnerable (S3) by the Atlantic Canada Conservation Data Centre (AC CDC 2023) and recorded within 5 km of the Project by desktop data source, where:
S1: Critically Imperiled – Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences). May be especially vulnerable to extirpation.
S2: Imperiled – Imperiled in the province because of rarity due to very restricted range, very few populations (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3: Vulnerable – Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer).
S4: Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors (80+ occurrences).
S5: Secure – Common, widespread, and abundant in the province.
S#S#: A numeric range rank (*e.g.* , S2S3) is used to indicate any range of uncertainty about the status of the species or community.
SH: Possibly Extirpated (Historical) – Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
SU: Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

APPENDIX D

ARIA Report

HRM Serviced Communities Background Study: Eastern Passage (Morris Lake Expansion) Archaeological Resource Impact Assessment, Halifax Regional Municipality, NS (2023)

HRP #A2023NS168

Final Report

May 22, 2024

Submitted to:
Nova Scotia Department of Communities, Culture, Tourism & Heritage
1741 Brunswick Street 3rd Floor
PO Box 456, STN Central
Halifax, NS B3J 2R5

Prepared for:
Halifax Regional Municipality
5251 Duke Street, 3rd floor, Suite 300, Duke Tower
Halifax, Nova Scotia B3J 1P3

Prepared by:
Stantec Consulting Ltd.
102-40 Highfield Park Drive
Dartmouth, Nova Scotia B3A 0A3

File: 160410459

HRM SERVICED COMMUNITIES BACKGROUND STUDY: EASTERN PASSAGE (MORRIS LAKE EXPANSION) ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT, HALIFAX REGIONAL MUNICPILITY, NS (2023)

This document entitled HRM Serviced Communities Background Study: Eastern Passage (Morris Lake Expansion) Archaeological Resource Impact Assessment, Halifax Regional Municipality, Nova Scotia (2023) was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Halifax Regional Municipality (HRM), (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Kyte, Jonathan
Digitally signed by Kyte, Jonathan
Date: 2024.05.22 10:14:58 -03'00'

Prepared by_____
(signature)

Jonathan Kyte, M.A., Archaeologist

Chris Blair
Digitally signed by Chris Blair
Date: 2024.05.22 11:00:34 -03'00'

Review by_____
(signature)

Chris Blair, BA., Senior Archaeologist

McFarlane, Shawn
Digitally signed by McFarlane, Shawn
Date: 2024.05.22 10:27:58 -03'00'

Review by_____
(signature)

Shawn McFarlane, B.ScF, RPF, Project Manager

Table of Contents

PROJECT PERSONNEL ..... **I**

1.0 INTRODUCTION **1**

2.0 PROJECT DEVELOPMENT AREA **1**

3.0 METHODOLOGY **2**
3.1 BACKGROUD RESEARCH 2
3.2 ARCHAEOLOGICAL WALKOVER 2

4.0 BACKGROUND RESEARCH RESULTS **3**
4.1 THE NATURAL ENVIRONMENT 3
4.2 CULTURAL AND HISTORICAL BACKGROUND 4
4.2.1 Pre-Contact Period 4
4.2.2 Historic Period 5
4.2.3 Registered Archaeological Sites near the PDA 7
4.2.4 Previous Archaeological Resource Impact Assessments 7

5.0 FIELD SURVEY RESULTS **8**
5.1 WATERCOURSES 8
5.1.1 Cow Bay River 8
5.1.2 Eastern Shore of De Said Lake 10
5.1.3 Smelt Brook 10
5.1.4 Morris Lake North of Caldwell Road 11

6.0 SUMMARY AND RECOMMENDATIONS **11**

7.0 CLOSING **12**

8.0 REFERENCES **13**

LIST OF FIGURES

Figure 1 Project Development Area: Eastern Passage (Morris Lake Exp.) ..... Appendix A
Figure 2a Prior Archaeological Assessment ..... Appendix A
Figure 2b Survey Results ..... Appendix A
Figure 3 LiDAR with Survey Tracklogs ..... Appendix A
Figure 4 Cole Harbour Indian Reserve No. 30 Ca. 1879 ..... Appendix A
Figure 5 Bayfield Chart 1853 ..... Appendix A
Figure 6 Church Map 1865 ..... Appendix A
Figure 7 Faribault Map 1906 & 1908 ..... Appendix A
Figure 8 Aerial Photograph 1939 ..... Appendix A
Figure 9 Aerial Photograph 1945 ..... Appendix A
Figure 10 Aerial Photograph 1954 ..... Appendix A

LIST OF PHOTOGRAPHS

Photo 1	View southeast at conditions encountered at MPR-ARCH-265	Appendix B
Photo 2	View east from JRK-ARCH-209 at the identified medium potential area JRK-POLY-016	Appendix B
Photo 3	View northeast at an old road or ATV trail encountered at MPR-ARCH-266	Appendix B
Photo 4	View southwest from MPR-ARCH-266 at a deer blind encounter along the old road	Appendix B
Photo 5	View north of the Cow Bay River from the west bank at MPR-ARCH2-267	Appendix B
Photo 6	View southeast of the flooded-out area encountered at MPR-ARCH-267	Appendix B
Photo 7	View north of beaver dam encountered at MPR-ARCH-269	Appendix B
Photo 8	View north from JRK-ARCH-210 of the identified medium potential area JRK-POLY-020 located between the old trail and the Cow Bay River	Appendix B
Photo 9	View south at a bedrock oxbow feature or slight bend in the river, taken from JRK-ARCH-210	Appendix B
Photo 10	View north from MPR-ARCH-272 at the very rocky surface conditions encountered along the river	Appendix B
Photo 11	View south or the mainly slate bedrock and boulders encountered along the Cow Bay River at MPR-ARCH-272	Appendix B
Photo 12	View northwest from MRP-ARCH-273 of wet conditions encountered	Appendix B
Photo 13	View southwest from MPR-ARCH-273 at a flooded-out section of the river from beaver activity within the area	Appendix B
Photo 14	View north at JRK-ARCH-213 at surface conditions encountered along the east bank of the Cow Bay River	Appendix B
Photo 15	View southwest from CKM-ARCH-166 of the low wet area encountered along the east bank of the Cow Bay River	Appendix B
Photo 16	View east at JRK-ARCH-214 at a small drainage running east off the Cow Bay River along a higher boulder swale	Appendix B
Photo 17	View south at CKM-ARCH-167 showing a rocky boulder swale encountered along the river on the east bank	Appendix B
Photo 18	View east of a branch of the Cow Bay River encountered at JRK-ARCK-215	Appendix B
Photo 19	View north from JRK-ARCH-215 at the Cow Bay River	Appendix B
Photo 20	View west from JRK-ARCH-217 at the northern end of De Said Lake	Appendix B
Photo 21	View east up slope from CKM-ARCH-171 showing surface conditions encountered during the walkover	Appendix B

Photo 22 View north at a potential fox hole or trench feature encountered at CKM-ARCH-172 with 20 cm scale ..... Appendix B
Photo 23 View south at forest and surface conditions encountered at JRK-ARCH-218 ..... Appendix B
Photo 24 View east at the remains of an abandoned camp encountered at assessment note JRK-ARCH-219 ..... Appendix B
Photo 25 View west at the trail from the lake to an abandoned camp encountered at assessment note JRK-ARCH-219 ..... Appendix B
Photo 26 View north of the entrance of Smelt Brook which flows out form the southern end of De Said Lake at CKM-ARCH-174 ..... Appendix B
Photo 27 View south of Smelt Brook at the southern end of De Said Lake and being a low wetland environment ..... Appendix B
Photo 28 View south at JRK-ARCH-220 of the boggy wetland encountered along Smelt Brook ..... Appendix B
Photo 29 View west from JRK-ARCH-220 at the east bank of Smel Brook from the foot of the former CNR bridge ..... Appendix B
Photo 30 View northwest at the bridge for the former CNR rail line taken at assessment note JRK-ARCH-220 ..... Appendix B
Photo 31 View south at JKR-ARCH-221 of conditions encountered whilst walking south along both banks of Smelt Brook ..... Appendix B
Photo 32 View west at JKR-ARCH-221 of conditions encountered along Smelt Brook ..... Appendix B
Photo 33 View west from CKM-ARCH-177 of conditions encountered along Smelt Brook ..... Appendix B
Photo 34 View north of the confluence of Smelt Brook near a deer crossing at JRK-ARCH-222 ..... Appendix B
Photo 35 View west at the deer blind identified at JRK-ARCH-223 near a dear crossing ..... Appendix B
Photo 36 View south from CKM-ARCH-177 showing conditions encountered at the lower end of Smelt Brook ..... Appendix B

LIST OF APPENDICES

Appendix A Figures
Appendix B Photographs

Project Personnel

Project Manager:	Shawn McFarlane, B.ScF., RPF
Background Research:	Jonathan Kyte, MA.
Site Visit:	Jonathan Kyte, MA., Mike Rooney, BA., Chase McLean, MA.
Report Writer:	Jonathan Kyte, MA.
GIS Specialist:	Megan Blackwood, Mike Rooney, B.A.
Quality Review:	Chris Blair, BA
Independent Review:	Robert Federico, MPA

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by the Halifax Regional Municipality (HRM) to conduct an Archaeological Resource Impact Assessment (ARIA), for the HRM Future Serviced Communities Background Study; Morris Lake Expansion study area, located in Eastern Passage, Nova Scotia (the Project). An ARIA is required to determine if there are heritage resources that may be affected by future ground disturbance in relation to housing and transportation developments. The ARIA was carried out as part of the background study for environmental, land-use suitability, transportation, and infrastructure for the Eastern Passage (Morris Lake Expansion) study area (Figure 1, Appendix A).

HRM is planning to expand housing development approvals in the Morris Lake Expansion Development Area to accelerate the provision of land for new housing. As part of the land-use suitability analysis, an ARIA must be completed to assess the potential for archaeological resources, including Mi'kmaw and African Nova Scotian communities, to be affected by the Project. The ARIA consisted of background research, and a field-based archaeological survey (walkover). During the background research for the Project, it was noted that a large section of the PDA was previously assessed as having low potential for archaeological resources (CRM Group 2023a, 2023b), but it appeared that two watercourses as well as the eastern shore of De Said Lake within the PDA may not have been covered in that previous assessment and thus were the focus of this ARIA. All work was completed in compliance with Nova Scotia's Archaeological Resource Impact Assessment (Category C) Guidelines (2014) as well as the *Special Places Protection Act* (Chapter 438 of the Revised Statutes, 1989).

The ARIA was conducted under Heritage Research Permit (HRP) No. A2023NS168 issued to Jonathan Kyte of Stantec. The fieldwork for the walkover component of the ARIA was conducted by Jonathan Kyte, MA, Mike Rooney, BA., and Chase McLean, MA., on November 22, 23, 29 and 30, 2023.

2.0 PROJECT DEVELOPMENT AREA

For the purposes of this report, the Project Development Area (PDA) is the area may be affected by the potential housing development and that was the subject of the ARIA. This area mainly consists of undeveloped lands to the north of Cow Bay Road and South of Caldwell Road in Eastern Passage, Nova Scotia. HRM initiated the background study to establish the appropriate portion of the PDA that are suitable for new housing development and future community planning work. The total size of the PDA is approximately 500 ha. The PDA is identified with the red outline in Figure 1 (Appendix A).

3.0 METHODOLOGY

3.1 BACKGROUD RESEARCH

Desktop historical background research was conducted for the Project using digital and archival information available from various government and non-government sources including published, unpublished, and on-line historical and environmental records. The scope of work for the desktop historical background research included, but was not limited to, the sources of information list below to gather information on general and specific history, including the Pre-Contact and Historic Periods, and known archaeological resources within the study area, to determine the potential for archaeological resources to be within the PDA:

- Review of relevant Maritime Archaeological Resource Inventory (MARI) forms for information relating to recorded archaeological sites within a 1 km radius of the PDA
- Review of previous archaeological investigations conducted within or near the PDA through consultations with Special Places Coordinator from the Nova Scotia Department of Communities, Culture, Tourism, and Heritage (NSCCTH)
- Review of historical maps and aerial photographs, maps, published sources, and historical and archival records of the PDA and adjoining properties to gain information on historical land use
- A review of the Canadian Register of Historic Places (CRHP)
- Engagement with the Kwilmu'kw Maw-klusuaqn Negotiation Office's Archaeological Research Division (KMKNO's ARD) to gather information pertaining to traditional or historical use of the PDA
- Review of LiDAR and base mapping of the subject property to identify environmental and physiographic features such as topography and historic water margins that would influence human settlement and resource exploitation patterns
- Knowledge of the Stantec Archaeology Team
- Consultations with local historical experts, and archaeologist, as applicable

The results of the historical background research were used to identify leading archaeological and environmental indicators for the potential presence of archaeological resources within the PDA. The results of the research are presented in the sections that follow.

3.2 ARCHAEOLOGICAL WALKOVER

Stantec conducted the walkover of the PDA, to identify, visually inspect, and document previously unknown heritage resources, and identify areas of elevated archaeological potential. The walkover was completed via transects through the subject property to assess ground and topographical conditions. The findings of the walkover were documented, taking into consideration the results of the desktop historical background study, and following the Provincial Guidelines (Category C, 2014) as well as the experience, knowledge, and professional judgement of the Stantec Archaeology Team. Assessment notes were taken as reference points during the walkover for discussion and recorded into Field maps mobile phone application and labeled with the initials of the archaeologist and number of the assessment note

(e.g., JRK-ARCH-###). Where areas of elevated archaeological potential were identified, these locations were delineated using a mobile mapping device and labeled as polygons, with the initials of the archaeologist, “POLY”, and the number of the polygon (e.g., “Polygon JRK-POLY-###”). During the walkover, surface-visible cultural features were noted and recorded as appropriate. These locations were recorded and labeled as archaeological assessment notes, or as “historically significant features,” and labelled (e.g., “JRK-HSF-###”).

Field data were collected using a mobile phone device running field maps, a data collection and field mapping software developed by ESRI. Digital field maps were generated for the Project that combine relevant environmental and project data in GIS-based layers. A digital copy of all data collected in the field is provided in the Survey Results plan, see Figure 2b, Appendix A. Additional field data collected using Field Maps included tracklogs.

4.0 BACKGROUND RESEARCH RESULTS

This section details the results of the historical background research gathered on the geology, environment, and cultural and historical background review of the PDA and broader area around the PDA.

4.1 THE NATURAL ENVIRONMENT

The PDA is located within the Quartzite Barrens Theme Region (Theme Region 833). The bedrock in the area is dominated by graywacke, with bands of slate, folded parallel to the coastline. The coastline in this area is divided up into headlands separated by long inlets where most are drowned river estuary and are not fault-controlled. Loose cobbly quartzite till forms the ground moraine and is overlain by drumlin composed of red brown Lawrencetown Till and can be seen as an eroding coastal bluff at Hartlen Point (Davis and Brown 1996).

The PDA is part of an indented drowned coastline where Cole Harbour forms a headland. Due to its exposure, there is an active reworking of the coastal sediment which has built a barrier beach at Rainbow Haven formed by Cow Bay. The irregular shape of the coastline is actively being smoothing out having sediments redistributed where sand and gravel are supplied from the erosion of deep glacial tills and glacial outwash deposited on the coast. This forms spits and barrier beaches which protect the shallow estuaries from ocean waves which allow marshland to develop within this area. The soils consist of well-drained Halifax gravelly sandy loams derived from quartzite. In areas of less relief, imperfectly drained Danesville soils is common, with peat, Rockland, and some small areas of poorly drained, mottled Aspotogan soil. Some areas of shaly loam Bridgewater soil have developed from parent material derived from slate. Finer textured Hansport soils being imperfectly drained, sandy clay is found in Eastern Passage (Davis and Brown 1996).

Coastal white spruce and balsam fir forests with maple and birch trees predominates. In areas containing farmland and drumlins, pure stands of with white spruce are common. Further inland the forest changes to spruce, fir, and pine stands (Davis and Brown 1996).

4.2 CULTURAL AND HISTORICAL BACKGROUND

4.2.1 Pre-Contact Period

The earliest period of human occupation in Nova Scotia is *Sa'qewe'l L'nu'k* (the Ancient People) or "Palaeo-Indian" period (12,000 – 8,000 BP), which saw the arrival of peoples who harvested caribou, possibly along with a variety of other fauna, following deglaciation of the region (Bonnichsen, Keenlyside and Turnmire 1991; Deal 2023). This period is best represented in Nova Scotia by the Debert-Belmont site complex near Truro, NS.

Sites of the following *Mu Awsami Kejihaw'k L'nu'k* (the Not so Recent People) or the Archaic Period (8,000-3,000 BP), are characterized in part by distinctive ground stone tool industries. In Nova Scotia, sites of this period are known primarily from interior locations, and for the most part date only to the latter half of this period (the Late Archaic). Nevertheless, it is inferred that people were present in the province throughout this period, and that their lifeways included a focus on harvesting the resources of the coast as well as interior waterways. The scarcity of evidence for occupation early in the period and on the coast is seen to reflect the effects of rising sea levels; such sites now being situated in marine environments (Deal 2023; Kyte 2024).

The last phase of the Pre-Contact Period, *Kejihawek L'nu'k* (the Recent People) or Woodland/Ceramic period (3,000- 500 BP), sees the appearance of ceramic technology in the context of wide-ranging interactions with other peoples of the greater northeast. Coastal archaeological sites are more clearly documented (albeit still threatened by rising sea levels and coastal erosion) and, in some cases, include substantial shell middens, indicating the harvesting of marine shellfish. Nevertheless, both marine and terrestrial resources figured in the seasonal round during this time, with some regional variation (Nash and Miller 1987; Davis 1991).

The PDA is within an area once part of a greater Mi'kmaw territory known as *Eskikewa'kik*, meaning "Skin dressers" (CMM 2007). The coastlines, Islands, bays, harbours, and water systems would have been an important transportation route and resource base of the local Mi'kmaq and their ancestors for a long time prior to the founding of Halifax. A research inquiry was submitted for the PDA with KMKNO-ARD and their review revealed four traditional use sites within a one-kilometre distance of, but outside, the PDA used for fishing. There are no recorded archaeological sites within the PDA. There are three Mi'kmaw archaeological sites within a 5 km distance to the PDA: BdCu-02, BdCu-11, and BdCv-04 and are recorded diagnostic lithics, flakes, and shell midden (KMKNO-ARD 2024). More information on these sites is provided in Section 4.2.3 below.

The Mi'kmaw name for Eastern Passage is *Tuitnuk*, which means "the big passage" and the name for Morris Lake is *Loqutujk*, which means "place of scaffold or drying fish." Mi'kmaw methods for naming a place is verb based, frequently reflecting the meaning of the area to the Mi'kmaq, such as resources available or the landscape features of the area. This type of naming relies on an intimate understanding and repeated use of an area (KMKNO-ARD 2024). The PDA is located 300 m to the southwest of the Cole Harbour Indian Reserve No.30 which is the closest Mi'kmaw Community and a part of Millbrook First Nation; this is situated between Morris and Bassitt Lakes.

Historic references show during the mid to late eighteenth century that descendants of the Morris Family camped for many years at the outlet of Morris Lake (back of the Asylum), near Dartmouth. During the turn of the twentieth century Morris Lake was referenced as being named after an old Mi'kmaq family (Maurice) who resided at the outlet of Morris Lake for a long time. The Mi'kmaw name for this location was previously mentioned as a "place of scaffold or drying fish," suggesting the area was used for dried smoke meat and fish (eels, etc.) (KMKNO-ARD 2024). Soap was also noted as being produced in this location using a method of hollowing out a tree into a cauldron and using fire heated beach stones to boil and render. By 1877, Mi'kmaq woman from this area were noted for regularly selling trout in the Halifax Market (KMKNO-ARD 2024).

4.2.2 Historic Period

The Historic Period is defined as the period from the arrival of mostly European-derived peoples to North America, approximately 500 years ago, until the modern era. For Mi'kmaq communities, this period is referred to as *Kiskukew'k L'nu'k* (Today's People) or Contact Period (500 BP- Present), which saw the growth of European settlement in the region, and with it, a variety of changes for *Kiskukew'k L'nu'k* associated with trade, conflict, and disease (Whitehead 1991).

The first European population to have a presence at the mouth of Halifax Harbour were the Acadians during the late seventeenth century. There was some seasonal use by New Englanders during the first half of the eighteenth century for the fishery, although, there was not a large population of European settlement until the British founded Halifax in 1749. The community of Dartmouth was founded a year after on the east side of Hallifax Harbour (Ward 1971).

The PDA is within an area originally considered a part of the Dartmouth Township. Most of the land was surveyed in 1772 for Joseph Chadwick, Benjamin Gerrish, and Jacob Hurd at South East Passage, being the name used during that time for Eastern Passage, and most of the land was granted about 1785. Land was surveyed for Martin Soward, Lieutenant Joseph Hawkins, and Colonel Hamilton and the grants extended from Horton's Brook to Hartlen's Point (PANS 1967). The majority of these grantees chose to live elsewhere but some of them settled within the community concentrated along Main Road in Eastern Passage.

The PDA is also near the community of Cow Bay. The community is named after one of the original grantees, Robert Cowie, who with Roger Hill, received a 1,400-acre grant in 1763, and Charles Palmer and Richard Monday had land there by 1772 (PANS 1967). Cow Bay was a summer resort area from Dartmouth and by about 1866 and sometime before 1923 the nearby beach was renamed Silver Sands (PANS 1967). The first gold discovery in Nova Scotia was made in 1857 during gold panning in the Cow Bay and Cow Bay River Area (CRM 2023). Several gold claims were made within the area called the Cow Bay Gold District (Faribault 1906), where a significant discovery of gold was made by D. M. Thomson in 1895. Following that a mill and rock crusher were erected on the Cow Bay River (PAND 1967). Under the name Cow Bay Mining Company, the crusher and mill operated for a short time then closed for several years before it was sold and reopened by I.W. Horn in 1899, and the name changed with transferred of ownership several more times before mining halted in the area shortly after 1905 (CRM 2023). The location of the mill and crusher were identified on the Faribault map just outside the PDA to the south along the Cow Bay River and just north of Cow Bay Road.

A review of historical maps and land documents was conducted for the properties within the PDA and indicated that four historic land grants were issued for this location. The largest lot of 1,031-acres was originally granted to Jacob Horn Sr. et al, in 1798 (Crown Record Book 20 page 55). The lot consisted of land within the PDA from De Said Lake to Bissett Lake in the east and from De Said Lake south to just past the former Canadian National Railway (CNR) rail line. The lot was escheated in 1804 (Crown Record Book 18 page 50). Two historic lots consisting of 150-acres each located to the west of the previous lot were granted in 1786 to Benjamin Whitear (Crown Record Book 18 page 32) and Nathan Young (Crown Records Book 18 page 61). These three lots once had a section of the CNR Plan Mile 19 to 20 and crossed Smelt Brook and Cow Bay River. The fourth lot was granted in 1786 to John Forsythe et. al. and consisted of a 900-acre lot located to the north of Jacob Horn's Lot from De Said Lake to the tip of the peninsula of land that stretches north into Morris Lake (Crown Record Book 18 page 47). The Cole Harbour Indian Reserve No.30 was proposed and granted in 1879 and located just outside the PDA along the east side of Morris Lake (Anonymous 1879). A potential path or portage route is noted on the Reserve Plan in the general location of the PDA and is interpreted as forming a part of Cadwell Road (see Figure 4, Appendix A).

A review of historic maps revealed settlement had concentrated along Route 322 (sections of Main Road in Eastern Passage as well as the Cow Bay Road). The Bayfield Chart of 1853 (Figure 5, Appendix A) shows a concentration of buildings in Eastern Passage with both the locations of St. Peters Anglican Church (1832-1960) and St. Andrews's Roman Catholic Church (1850) and as well as other buildings are located outside of and to the west of the PDA (PANS 1967). Two buildings were noted on the eastern side of Cow Bay but are located outside the PDA (Bayfield 1853). No development within the vicinity of the PDA was noted on the A. F. Church Map of 1865 (Figure 6, Appendix A) as well as on the Geological Survey of Canada Maps (Figure 7, Appendix A) (Church 1865; Faribault 1906, 1908). A woods road is noted between De Said Lake and Morris Lake and stretched through the north section of the PDA near the same location of Caldwell Road. A building was marked along the road to the west but outside the PDA.

Due to German U-boat activity off the coast of Nova Scotia during the First World War, in 1918 the Canadian Government built an airbase for the use of American naval aircraft, located west of the PDA. The following year the base was turned over to full ownership to the Canadian Government and was named the Shearwater Naval Air Station (PANS 1967). During the 1920s and 1930s, development on the base had concentrated on waterfront infrastructure for utilizing floating aircraft. During the late 1930s with the war in Europe approaching, a land-based airstrip was constructed in 1938. During the Second World War additional land was purchased to expand the base (CRM 2023). By the middle of the 1950s the population increased within the area due to residential developments in relation to the base (PANS 1967). Review of aerial photographs showed activities relating to development of the Shearwater Base on the west shore of De Said Lake (Figures 8 and 10, Appendix A). Development or stripping of surface soils was noted on aerial photographs between 1931 and 1954 in the northwest section of the PDA to the south of Caldwell Road as well as the CNR rail line spanning east to west through the middle of the PDA (NSDNR 1931,1945, 1954). The section of the CNR rail line within the PDA was constructed by the Federal government sometime between 1910 and 1916 for a branch line between Dartmouth and Musquodoboit Harbour (Verlinden 2018).

A review of the Canadian Register of Historic Places (CRHP 2024) and the HRM Heritage Property Registry (HRM 2024) found four registered historic places or heritage sites located within 5 km of the PDA. These are: the Cole Harbour Farm built in 1801 by Loyalist Joseph Giles located to the north of the PDA along Cole Harbour Road; the Cole Harbour Meeting House (1830-1831) located on the Cole Harbour Road also north of the PDA; the Kaiser-Bell House (1821) located across the road from the Cole Harbour Meeting House, and the Lawlors Point Cemetery (1836) located along Cole Harbour. None of these historic places or buildings of heritage value will be impacted by the Project.

4.2.3 Registered Archaeological Sites near the PDA

A review of the NSCCTH MARI online database indicates that there are fifteen registered archaeological sites within a 5 km radius of the PDA including BdCu-2, BdCu-11, and BdCv-04. BdCu-2 was recorded in 1990 and is a pre-contact archaeological site located at Hartlen Point. It consists of two isolated finds; one quartz corner notched point recovered during shellfish harvesting along the shoreline; and one small end scraper. Both artifacts likely date to the Ceramic Period (Preston 1990). The nearest site to the PDA is BdCu-11 and was identified in 2013 as another isolated find consisting of a segment of a slate bayonet recovered along a trail next to the Cow Bay River, approximately 350 m south from the PDA, that dates to the late Maritime Archaic Period. BdCv-4 was documented in 1969, revisited in 1991, and consists of a Ceramic Period shell midden site located along the north shore of Back Cove (Wreck Cove) on McNab's Island, approximately 4 km from the PDA (JWEL 1991). Finds from these sites included historic period ceramics and pre-contact material consisting of quartz and chalcedony flakes, some quartzite, and ceramics which dated to the Middle Woodland Period prior to 1600 BP (Sheldon 1992).

In addition to the three registered pre-contact archaeological sites noted above, there are 12 historic archaeological sites within a 5 km distance of the PDA. Archaeologist Helen Sheldon's assessment for the Green Bay Estates development located in Cow Bay focused on mitigating BdCu-7 which was three historic foundations (Renarc Consulting 1996). Four other historic sites have also been reported around the Cole Harbour Provincial Park (BdCu-3, BdCu-4, BdCu-5, and BdCu-6). The remaining registered archaeological sites are located on McNabs Island and consist of six historic cellar features: (BdCv-10, BdCv-11, BdCv-12, BdCv-13, BdCv-14, and BdCv-15) and the A. J. Davis Bottling Plant being BdCv-10 (Stantec 2023).

4.2.4 Previous Archaeological Resource Impact Assessments

CRM Group Limited (CRM Group) completed two previous ARIAs within the PDA earlier in 2023.

The most recent ARIA report conducted by CRM Group noted above was provided to Stantec by NSCCTH staff which indicated that prior archaeological assessment work was carried out by CRM Group earlier in 2023 for Clayton Developments Limited. The reports consisted of the results from the shovel testing phase based the conclusions and recommendations made in the initial ARIA carried out earlier in the season (CRM Group 2023a, 2023b). CRM carried out testing within three identified areas of high archaeological potential with negative results. CRM recommended to be clear for development and no further investigation required, seen Figure 2b, Appendix A (CRM Group 2023b).

A large section of the PDA was previously assessed as low in archaeological potential by CRM Group although it appears that two watercourse sections within the PDA where not previously covered by a walkover, nor was the eastern shore of De Said Lake (see Figure 2a; Appendix A). No other previous archaeological resources impact assessments were conducted within the PDA. Relevant, information provided by these assessments is presented below.

5.0 FIELD SURVEY RESULTS

The walkover of the PDA focused on identified areas not previously walked over and assessed by CRM Group Ltd. earlier in the field season. The identified areas included sections of two watercourses that drain into Cow Bay and the eastern shore of De Said Lake in the northwestern section of the PDA. The results of the walkover, including assessment notes referenced in the text, can be seen in Figure 2b. Appendix A. The tracklogs from the walkover are overlayed over a LiDAR hill shade rendering of the PDA in Figure 3 (Appendix A).

5.1 WATERCOURSES

The walkover focused on segments of two watercourses that flow into Cow Bay: one is located in the south section of the PDA and consists of the Cow Bay River; the other is the eastern shore of De Said Lake and Smelt Brook in the western section. The only area not assessed during the walkover is the area north of Calwell Road along Morris Lake as the northern section of the PDA will not be impacted by future development.

5.1.1 Cow Bay River

The walkover began from the former CNR line called the Shearwater Flyer Trail (Shearwater Trail) heading southeast along the west bank of the Cow Bay River. Forest conditions consisted of a black spruce bog and or forested wetland environment that transitioned into undulating but dry mossy and rocky terrain (MPR-ARCH-265; Photo 1, Appendix B). There was however a small slightly higher terrace identified along the river at assessment note JRK-ARCH-209 (Photo 2, Appendix B), that was determined to have medium archaeological potential area and was identified at JRK-POLY-016 (Figure 2b, Appendix A). In general, however, the wider area was found to be low and wet with patches of sphagnum moss bog mixed with a rocky and undulating terrain especially along the riverbank. The JRK-POLY-016 was determined to be suitable for archaeological shovel testing and stood out from the general terrain along this section of the river and has medium potential.

Continuing southeast along the river, an open spruce bog was encountered where an ATV trail or old road was identified as well as a deer hunting blind at assessment note MPR-ARCH-266 (Photos 4 and 5, Appendix B) The trail led to a small lot of land situated along the river to the east of this area and located outside the PDA. Further down, the river had swelled due to recent seasonal rains as seen at MPR-ARCH-267 (Photo 3, Appendix B). Beaver dam activity exacerbated the flooding as observed at assessment notes MPR-ARCH-267 and MPR-ARCH-269 (Photos 6 and 7, Appendix B). This flooded out area was not found to have elevated archaeological potential due to the low, saturated, boggy ground conditions.

The lower section of the west bank of Cow Bay River was accessed from the Cow Bay Road located to the south of the PDA. The shoreline was found to be low laying and level with the river in this location. The forest changed to a mix wood over dry duff terrain, with patches of standing water throughout. Frequent boulder scatters and deadfalls were observed. A trail was encountered along the river and ended in a relatively flat area between the trail and the river. The location was determined to have medium archaeological potential (JRK-POLY-020) due to the topographical conditions as noted at JRK-ARCH-210 (Photos 8 and 9, Appendix B). The river bends and forms a slight oxbow around a section of exposed slate bedrock in this area which also raises the archaeological potential of this location. JRK-POLY-020 is also approximately 350 m upstream from a known Pre-Contact period site BdCu-11.

Further north, the forest consisted of a mix of mainly semi-immature hard and soft wood. Several tree throws were encountered revealing poor soil development and having frequent cobbles and boulders beneath the humic layer. The tree throws were investigated, and no cultural material encountered. The bedrock is mostly slate in this location and the terrain is very undulating with a boulder ridden swale along the river (MPR-ARCH-272; Photos 10 and 11, Appendix B). The wet flooded out area was encountered again at assessment note MPR-ARCH-273 (Photos 12 and 13, Appendix B). The walkover continued back south along the west bank of the Cow Bay River and ended at the southern end of the PDA completing this section of the walkover. Overall, the area was found to have low archaeological potential due to low wet ground conditions encountered and in general the area was found to not have been suitable for past habitation or use, except for the two relatively flat areas with dry duff terrain that were identified as having medium archaeological potential based on suitable ground conditions and being near a registered archaeological site.

The east bank of the Cow Bay River was accessed from the for CNR line, now Shearwater Trail, and the walkover continued south along the river. The forest conditions consisted of a black spruce bog and wetland environment. The terrain was found to be very undulating with poor soil development as observed from tree throws and being very mossy having open bog and barren patches. The east bank was found to be dryer than the west bank although still had low wet areas that were encountered at assessment note JKR-ARCH-213 (Photos 14 and 15, Appendix B). The shoreline along the east bank was found to be relatively flat and low at the river at assessment note CKM-ARCH-166 (Photo 16, Appendix B) and the ground was saturated. The walkover continued southeast along the river and at JKR-ARCH-214 a small drainage at a confluence with the Cow Bay River was encountered (Photo 16, Appendix B). At CKM-ARCH-167 along the shoreline conditions included a rock and boulder swale along the river (Photo 18, Appendix A). The small watercourse follows the boulder swale feature into the landscape orientated to the east of Cow Bay River. This area had low potential for archaeological resources.

Further southeast down the river surface conditions remains the same mostly consisting of a black spruce bog forest with some alder growth and immature hardwood trees. The terrain continued to be undulating with frequent boulder scatters and having exposed bedrock and poor soil development as observed in tree throws present in this area. The river branches out at assessment note JRK-ARCH-215 (Photos 18 and 19, Appendix B) and the banks were found to be swollen at the time of the walkover due to recent seasonal snow melt and rain events. The edge of the PDA was reached, and the walkover continued back along the river to the northeast. Overall, the east bank of the Cow Bay River was found to be low in

archaeological potential due to low, wet, rocky surface conditions encountered during the walkover as this section of the PDA would not have been suitable for settlement or other uses that would leave an archaeological footprint. No locations suitable for shovel testing identified in this area.

5.1.2 Eastern Shore of De Said Lake

The eastern shoreline of De Said Lake was accessed from a small property south of Caldwell Road. The property showed signs of disturbance to the surface soils in this location and this area may have been used by the military in relation to the Shearwater base as seen in aerial photos (NSDNR 1945). The property is currently in use and has a commercial fishing equipment storge area as observed during the walkover. Forest conditions consisted of a mix of spruce, alder and other hardwoods consisting of mostly immature growth. The area showed signs of past forest clearing activities. The terrain has a slope > 25° to the east from the shoreline of the lake at assessment notes JRK-ARCH-217 and CKM-ARCH-171 (Photos 20 and 21, Appendix B). A feature in the landscape was observed and appeared not to be natural. The feature appears to be a potential fox hole or trench emplacement encountered on a ridge along the lake at assessment note CKM-ARCH-172 (Photo 22, Appendix B). The feature appeared to be too small for a small outbuilding or camp, and resembles similar features observed by the permit holder at other former DND properties such as in Debert, Nova Scotia and typically created for military training purposes.

Further south along the lake forest conditions changed to a mix of immature to semi-mature mix of softwood and hardwood. The forest floor was sloped from the east down to the shoreline and was found to be undulating, very rocky, with patches of sphagnum (JRK-ARCH-218; Photo 23, Appendix B). Further south close to the end of the lake the remains of an abandoned camp with a path to the Lake was encountered at assessment note JRK-ARCH-219 (Photos 24 and 25, Appendix B). The southern end of the De Said Lake was reached at the start of Smelt Brook CKM-ARCH-174 (Photos 26 and 27, Appendix B). Smelt Brook flows in a south direction and empties into Cow Bay. The brook was easily transversed within this location and ended the walkover within this section of the PDA. Overall, this section of the PDA was found to be low in archaeological potential due to the sloped, wet, and rocky surface conditions encountered during the assessment and would have not been suitable for settlement or other uses that would leave an archaeological footprint. Some evidence of previous disturbance was noted that may be the result of DND activities from the middle of the twentieth century near the northern section of the lake, however, are interpreted as having historical or cultural significance.

5.1.3 Smelt Brook

The final section of the walkover was conducted along both banks of Smelt Brook. The section walked over was accessed from the Shearwater Trail and began from the foot of the former CNR rail line bridge at assessment note JKR-ARCH-220 (Photos 29 and 30, Appendix B) and continued south along the watercourse. Conditions were found to be low and wet with mostly alder growth that predominates the area on both banks of the watercourse (JRK-ARCH-221 (Photos 31 and 32, Appendix B) and CKM-ARCH-177 (Photo 33, Appendix B). Several animal paths were encountered at a point where the watercourse broke up into two branches at assessment note JRK-ARCH-222 (Photo 34, Appendix B). A deer blind was encountered at JRK-ARCH-223 (Photo 3, Appendix B) near the location of the confluence

and deer crossing. Continuing from assessment note CKM-ARCH-179 (Photo 35, Appendix B) conditions remained the same while walking south for the remainder of Smelt Brook to the end of the PDA near the Cow Bay Road. Due to the saturation, alder swale condition of the riparian area to the watercourse, this section of the PDA was determined to have low archaeological potential as it would have not been suitable for past settlement or other uses that would leave an archaeological footprint.

5.1.4 Morris Lake North of Caldwell Road

The only area of the PDA not assessed during the walkover is the area north of Calwell Road along Morris Lake. The permit holder did not have access to the property at the time of the walkover and was informed by HRM that the northern part of the PDA was not to be impacted by future development. If future development or groundbreaking activities are planned for the area, then an additional ARIA will be required to properly assess the potential within this section of the PDA.

6.0 SUMMARY AND RECOMMENDATIONS

In general, most of the PDA was found to have low archaeological potential due to either sloping, saturated, or rocky conditions or a combination of these conditions that were encountered during the walkover, in combination with the general lack of documented use of the PDA noted during the background research. Despites these conditions, two areas within the PDA were identified as having elevated archaeological potential for archaeological resource along the west bank of Cow Bay River. If these areas cannot be avoided and are to be impacted due to Project related groundbreaking activities, then the following is recommended:

1. If the area identified as medium potential at JRK-POLY-016 will be impacted, then it is recommended that archaeological shovel testing be carried out at 10 m intervals within the identified area to property assess the potential of this identified area. It is further recommended to confirm the extent of the shovel testing with NSCCTH prior to this work.
2. If the area identified as medium potential at JRK-POLY-020 will be impacted, then it is recommended that archaeological shovel testing be carried out at 10 m intervals within the identified area to property assess the potential of this identified area. It is further recommended to confirm the extent of the shovel testing with NSCCTH prior to this work.

The area north of Calwell Road along Morris Lake was not included within this assessment. If future development or groundbreaking activities are planned for the area, then an additional ARIA will be required to properly assess the potential within this section of the PDA.

It is important to note that while no Pre-Contact Period archaeological resources were identified during the field assessment, there is still potential for sub-surface archaeological resources to be present. If any archaeological resources are discovered during development, contractors or HRM are required to contact NSCCTH if potential archaeological resources are encountered during ground-breaking activities to assess the discovery and develop appropriate mitigation.

7.0 CLOSING

This report has been prepared as a requirement of Heritage Research Permit No. A2023NS168 for the sole benefit of HRM and may not be used by any other person or entity, other than for its intended purposes, without the express written consent of Stantec Consulting Ltd. (Stantec) and HRM. Any use which a third party makes of this report is the responsibility of such third party.

The information and recommendations contained in this report are based upon work undertaken in accordance with generally accepted scientific practices current at the time the work was performed. Further, the information and recommendations contained in this report are in accordance with our understanding of the Project as it was presented at the time of our report. The information provided in this report was compiled from existing documents, design and planning information provided by HRM, data provided by regulatory agencies and others, as well as the field survey carried out in 2023 specifically in support of this report. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, Stantec requests that we be notified immediately, and permitted to reassess the conclusions provided herein. Any follow-up work recommended in this report must be reviewed and approved by Special Places, the Nova Scotia Department of Communities, Culture, Tourism, and Heritage.

8.0 REFERENCES

Anonymous. 1879. *"Cole Harbour Indian Reserve No. 30. Sketch Showing the Proposed Location of Indians at Dartmouth*," Catographic Material. Library and Archives Canda. Electronic reference accessed March 4, 2024: <https://recherche-collections-search.bac-lac.gc.ca/eng/home/record?app=founandcol&idNumber=3672449&q=Cole%20harbour.>

Bayfield, W. H. 1853. *Nova Scotia South East Coast Mars Head to Shut-In Island*, nautical chart surveyed by Capt. Bayfield in 1853. Electronic web reference accessed March 4, 2024, <https://easternshorearchives.ca/archivalcontent/historicmaps/Bayfield1853HalifaxtoPortersLake_web.pdf>

Bonnichsen, R., D. Keenlyside, and K. Turnmire. 1991. Palaeo-Indian Patterns in Maine and the Maritimes. *In Prehistoric Archaeology in the Maritime Provinces: Past and Present Research, Reports in Archaeology 8*. Edited by M. Deal and S. Blair, pp. 1-36. Fredericton: Council of Maritime Premiers Committee on Archaeological Cooperation.

Church, A.F. 1865. *Topographical Township Map of Halifax County, Nova Scotia*. Halifax: A.F. Church & Co.

Confederacy of Mainland Mi'kmaq (CMM). 2007. *Kekina'muek: Learning about Mi'kmaq of Nova Scotia*. Donald M. Juien (Ex. Dir.) Government of Canada, Human Resources and Social Development Canada, Turo, NS. Electronic web reference accessed on November 7, 2023, <https://native-land.ca/wp-content/uploads/2018/06/Mikmaq_Kekinamuek-manual.pdf>

CRHP (Canadian Register Historic Places). 2024. Electronic reference accessed on March 4, 2024. <https://www.historicplaces.ca/en/results-resultats.aspx?m=2&Keyword=grand%20falls.>

Cultural Resource Management Group Limited (CRM). 2023a. *Dartmouth East Development – Screening and Reconnaissance Archaeological Resource Impact Assessment Final Report*, conducted under Heritage Research Permit A2023NS010. Report on file at the Special Places division of the Nova Scotia Department of Communities, Culture, Tourism, and Heritage. Halifax, NS.

Cultural Resource Management Group Limited (CRM). 2023b. *Dartmouth East Development – Areas 1 & 2, Feature 1 Archaeological Resource Impact Assessment Archaeological Shovel Testing 2023, Eastern Passage, Halifax Regional Municipality Final Report*, conducted under Heritage Research Permit A2023NS079. Report on file at the Special Places division of the Nova Scotia Department of Communities, Culture, Tourism, and Heritage. Halifax, NS.

Davis, Stephen A. 1991. The Ceramic Period of Nova Scotia. *In Prehistoric Archaeology in the Maritime Provinces: Past and Present Research, Reports in Archaeology 8*. Edited by M. Deal and S. Blair, pp. 1-36. Fredericton: Council of Maritime Premiers Committee on Archaeological Cooperation.

Davis, Derek S., & Browne, Sue. 1996. *The Natural History of Nova Scotia. Vol 2. Theme Regions*. Nimbus Publishing and the Nova Scotia Museum, Halifax.

Deal, Michael. 2023. *Archaeology and The Indigenous Peoples of the Maritimes*, Memorial University Press.

Faribault, E. R. 1906. *Province of Nova Scotia, Halifax County, Lawrencetown Sheet #53*. Geological Survey of Canada. Geological Map.

Faribault, E. R. 1908. *Province of Nova Scotia, Halifax County, Halifax Sheet #68 & Lawrencetown Sheet #67*. Geological Survey of Canada. Geological Map.

Halifax Regional Municipality (HRM) 2024. The Halifax Data Mapping & Analytic Hub, Heritage Properties HRM Open Data. Electronic reference accessed on April 23, 2024: <http://www.halifax.ca>

Jacques Whitford Environment Limited (JWEL). 1991. *Heritage Research Permit A1991NS08. Heritage Resources Survey of McNabs Island*, written by Helen Sheldon archaeologist with JWEL. Report on file at the Special Places division of the Nova Scotia Department of Communities, Culture, Tourism, and Heritage. Halifax, NS.

Kyte, Jonathan R. 2024. *Maritime Archaeological Survey of Holland Cove Site (BcCw-13) Phase 2*, report submitted to the Nova Scotia Department of Communities, Culture, Tourism and Heritage for work caried out under Heritage Research Permit A2023NS112.

Kwilmu'kw Maw-klusuaqn Negotiation Office's - Archaeology Research Division (KMKNO-ARD). 2024. Response to request for information for traditional or historic Mi'kmaq land use via dated, February 14, 2024.

Nash, R.J. and V.P. Miller. 1987. Model Building and the Case of the Micmac Economy. *Man in the Northeast*, 34: 41-56.

Nova Scotia Department of Lands and Forests (NSDLF). 1946. *Crown Lands Grant Sheets #66.* Nova Scotia Department of Natural Resources (Revised). Halifax.

Nova Scotia Department of Natural Resources (NSDNR). 1786-1946. Crown Records Sheet #66: Crown Record Book 18 page 32, Crown Record Book 18 page 47, Crown Record Book 18 page 50, Record Book 18 page 61, Crown Record Book 20 page 55, Crown Records Displaced Plan No. 227.

Nova Scotia Department of Natural Resources (NSDNR). 1945-2002. Aerial photographs; 1945 (8781), 1954 (14228),1964 (18351), 1982 (82318), 1992 (92350), and 2002 (02318-9).

Preston, Brian. 1990. *Heritage Research Permit A1990NS05 Summary Report*, general permit to cover yearly general activities untaken by the Curator of Archaeology, including response to emergency situations. Report on file at the Special Places division of the Nova Scotia Department of Communities, Culture, Tourism, and Heritage. Halifax, NS.

Public Archives of Nova Scotia (PANS). 1967. Place-names and Places of Nova Scotia, Halifax: Nova Scotia: PANS.

Renarc Consulting. 1996. *Archaeological Impact Assessment of Green Bay Estates, Heritage Research Permit A1996NS27.* Report on file at the Special Places division of the Nova Scotia Department of Communities, Culture, Tourism, and Heritage. Halifax, NS.

Sheldon, Helen. 1992. *A Shell Midden In Halifax Harbour HRP A1992NS03*. Report on file at the Special Places division of the Nova Scotia Department of Communities, Culture, Tourism, and Heritage. Halifax, NS.

Stantec Consulting Ltd. (Stantec) 2023. *Archaeological Resources Impact Assessment for Construction of Land Based Test Facility at Hartlen Point, Eastern Passage, Nova Scotia (2023)*, Report on file at the Special Places division of the Nova Scotia Department of Communities, Culture, Tourism, and Heritage. Halifax, NS.

Verlinden, John. 2018 *Rail Service Begins on the Eastern Shore*, Musquodoboit Harbour Heritage Society, community heritage blog post. Electronic web reference accessed on March 4, 2024 <http:easternshorecooperator.ca/rail_service_begins_on_the_eastern_shore>

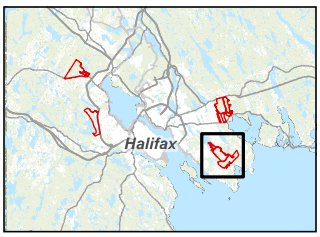
Ward, W. P. 1971. The Acadian Response To The Growth Of British Power In Nova Scotia, 1749-1755. *The Dalhousie Review*.

Whitehead, R.H. 1991. The Protohistoric Period in the Maritime Provinces. In *Prehistoric Archaeology in the Maritime Provinces: Past and Present Research, Reports in Archaeology 8*. Edited by M. Deal and S. Blair, pp. 1-36. Fredericton: Council of Maritime Premiers Committee on Archaeological Cooperation.

APPENDIX A

Figures





Legend

PDA

Transportation

- Trail
- Highway
- Other Road
- Railroad

Other Features

- Waterways
- Waterbodies
- Designated Wetland of Special Significance
- Wetland
- Property Boundary
- Buildings

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Stantec

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs 2024-04-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

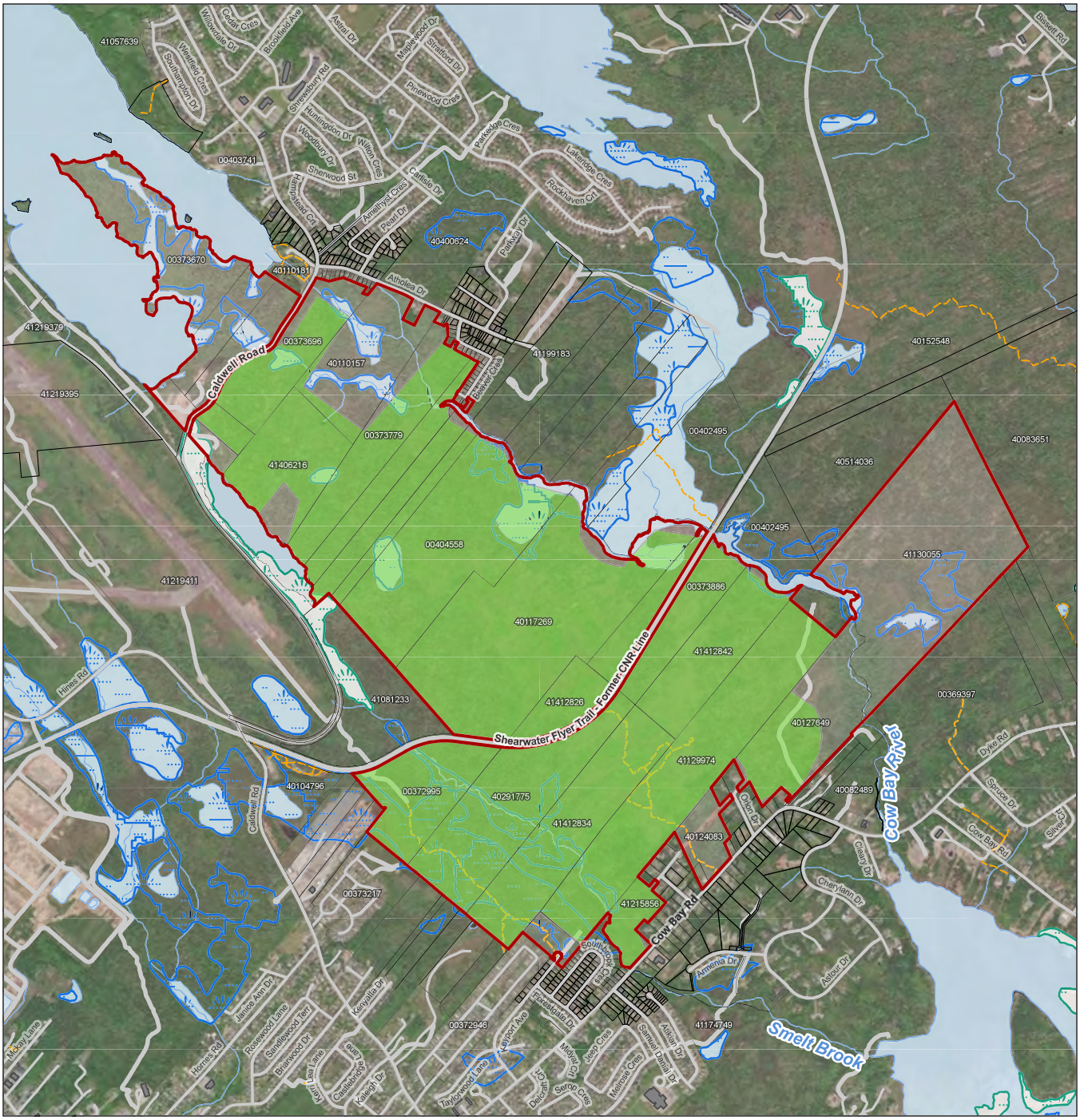
Fig ID: 160410459_040

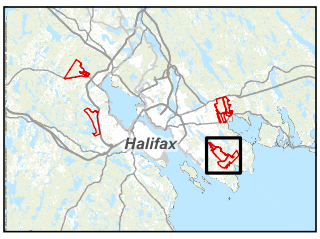
Figure No.
1

Title
Project Development Area: Eastern Passage (Morris Lake Expansion)

HRM FCM 2022.aprx Revised: 2024-04-17 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Legend

- PDA
- Archaeological Potential Area
- Area of Low Archaeological Potential - No Further Assessment Required
- Transportation
- Trail
- Highway
- Other Road

Other Features

- Waterways
- Waterbodies
- Designated Wetland of Special Significance
- Wetland
- Property Boundary
- Buildings

0 250 500 Metres

(At original document size of 8.5x11)
1:25,186

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by lPodrug on 2024-04-08

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

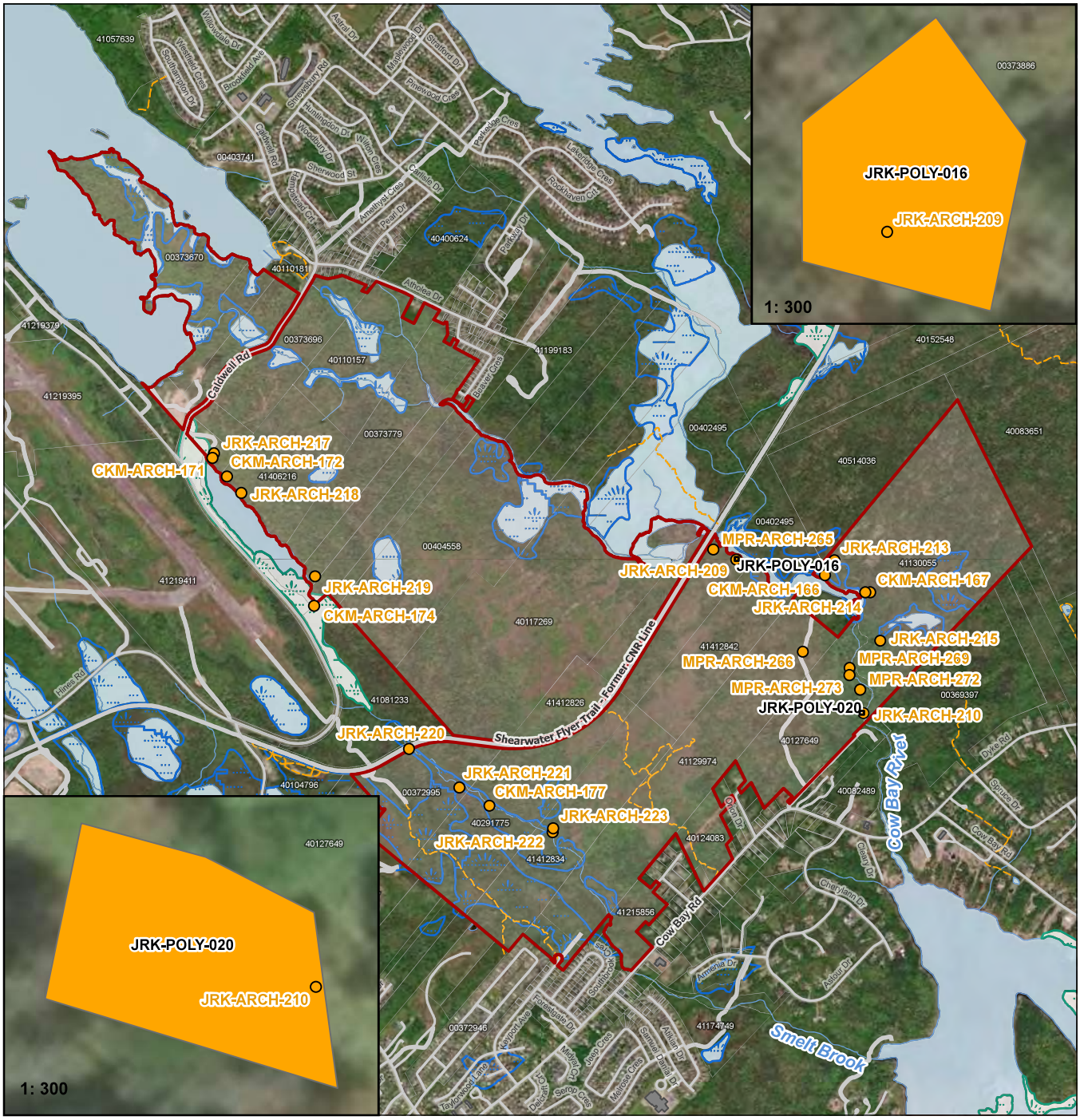
Fig ID: 160410459_040

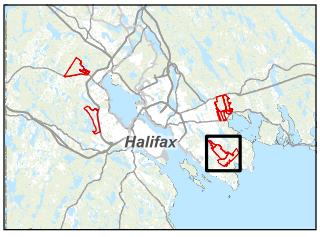
Figure No.
2a

Title
Prior Archaeological Assessment

HRM FCM 2022.aprx Revised: 2024-04-17 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Legend

- Archaeological Assessment Note
- PDA

Archaeological Potential Area

- Archaeological Potential Area

Transportation

- Trail
- Highway
- Other Road

Other Features

- Waterways
- Waterbodies
- Designated Wetland of Special Significance
- Wetland
- Protected Water Areas
- Natural Watershed Municipal Surface Water Supply Areas
- Property Boundary
- Buildings

0 250 500 Metres

(At original document size of 8.5x11)
1:25,000

N

Stantec

Project Location
Halifax Regional Municipality,
Nova Scotia

Prepared by lPodrug on 2024-04-08

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

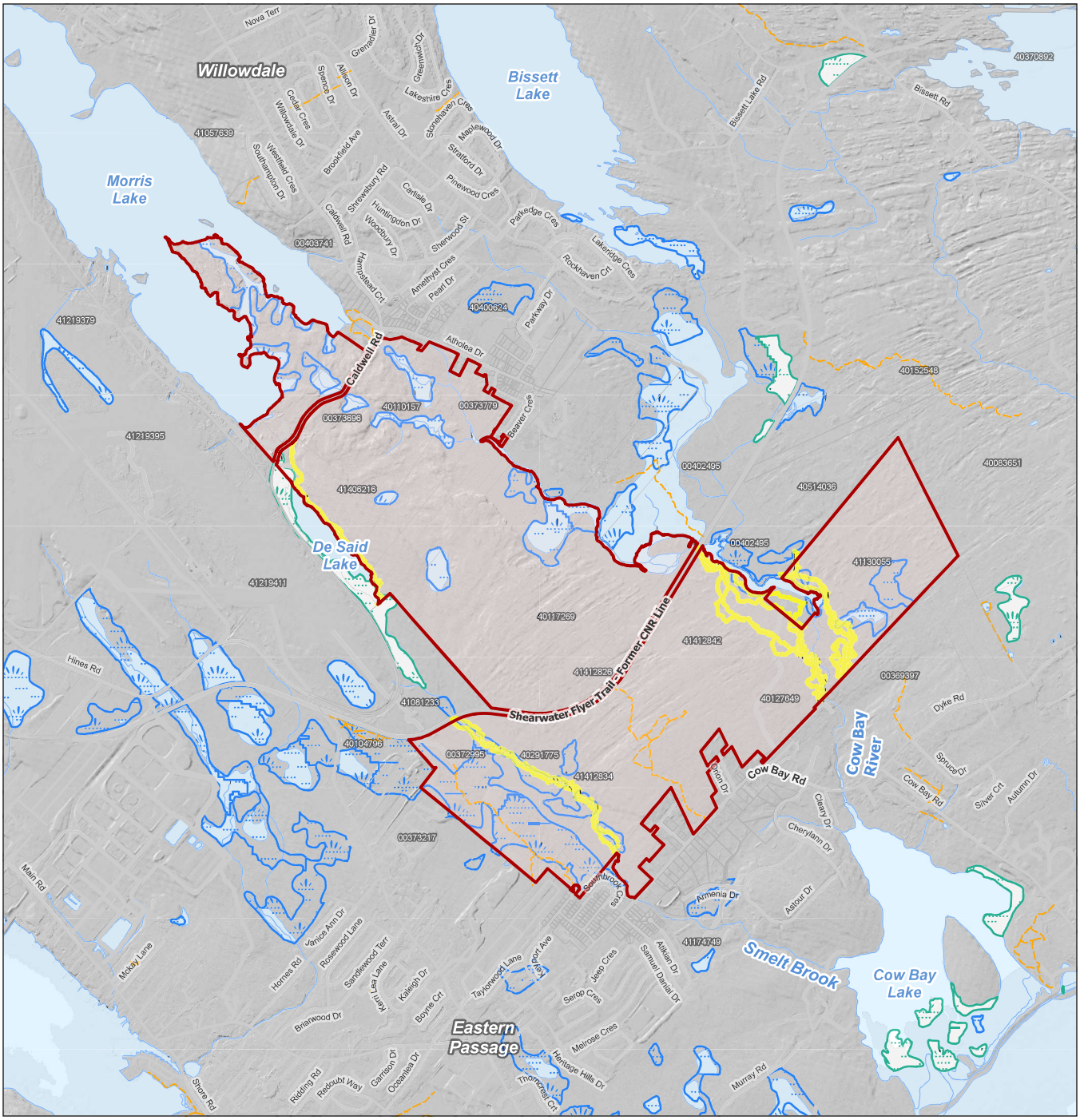
Fig ID: 160410459_041

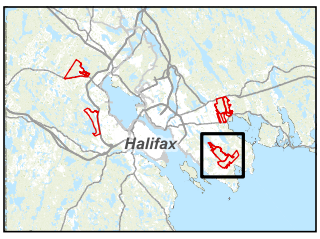
Figure No.
2b

Title
Survey Results

HRM FCM 2022.aprx Revised: 2024-04-23 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Legend

- PDA
- Archaeological Tracklog

Transportation

- Trail
- Highway
- Other Road
- Railroad

Other Features

- Waterways
- Waterbodies
- Designated Wetland of Special Significance
- Wetland
- Property Boundary

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-04-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_043

Figure No.
3

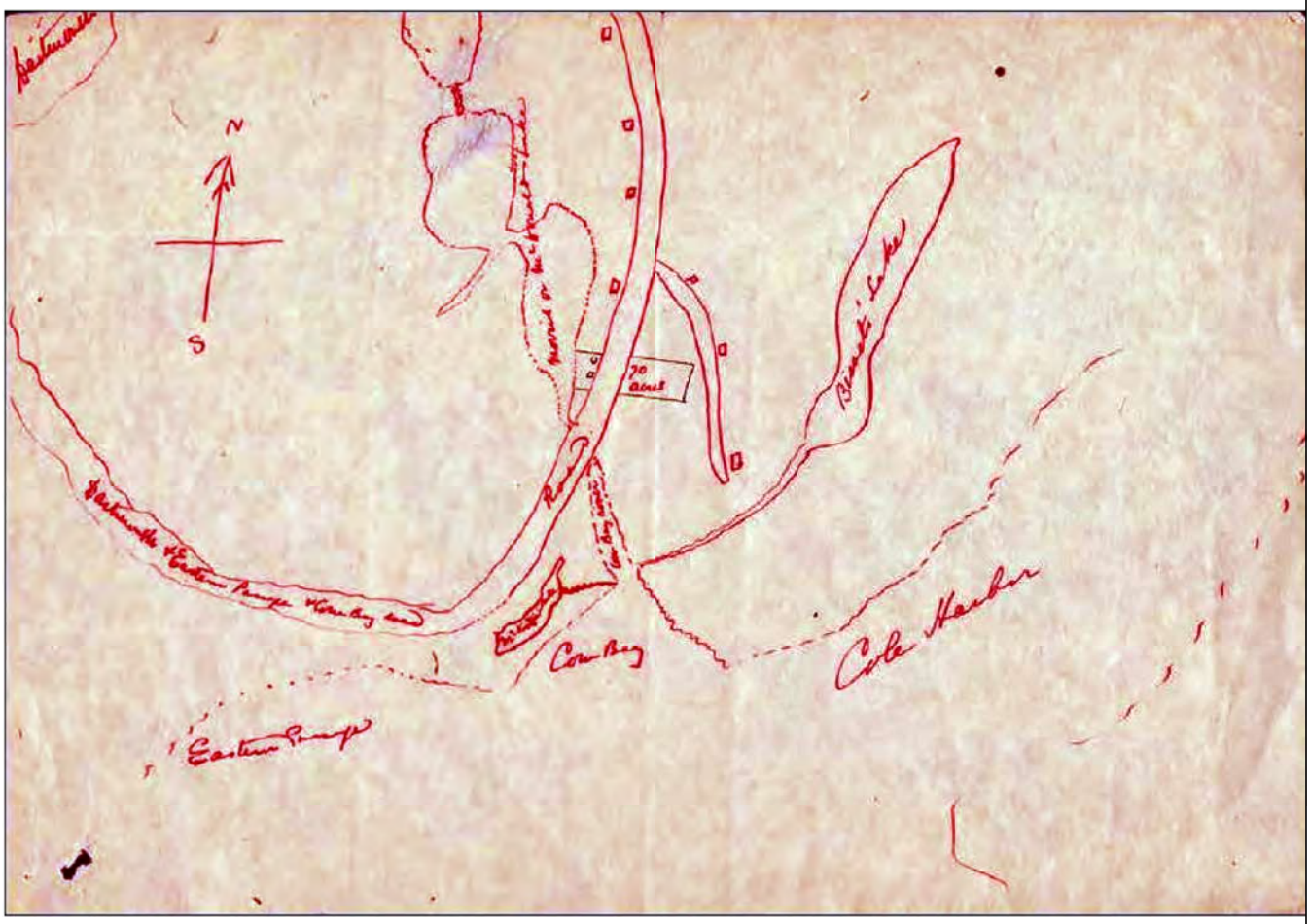
Title
LiDAR with Survey Tracklogs

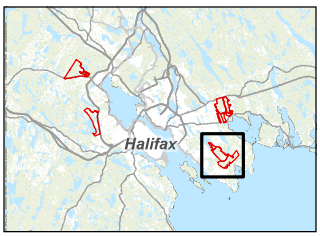
Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

HRM FCM 2022.aprx Revised: 2024-04-17 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-04-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_044

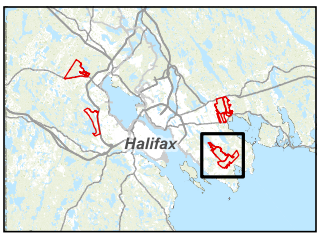
Figure No.
4

Title
Cole Harbour Indian Reserve No. 30
Ca. 1879

HRM FCM 2022.aprx Revised: 2024-04-23 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Legend

PDA

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Stantec

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-04-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_045

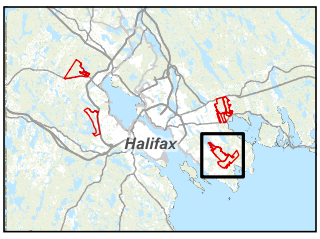
Figure No.
5

Title
Bayfield Chart 1853

HRM FCM 2022.aprx Revised: 2024-04-17 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Legend

PDA

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Stantec

Project Location
Halifax Regional Municipality,
Nova Scotia

Prepared by SChubbs on 2024-04-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_046

Figure No.
6

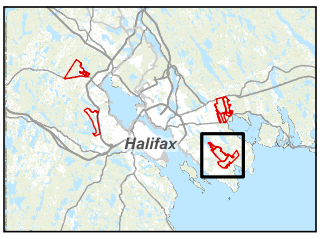
Title
Church Map 1865

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

HRM FCM 2022.aprx Revised: 2024-04-17 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Legend

PDA

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-04-17

Client/Project
Fig ID: 160410459_047
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure No.
7

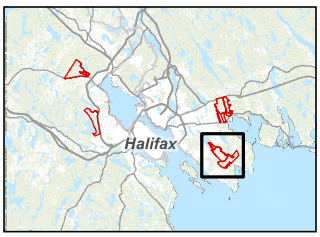
Title
Fairbank Maps 1906 and 1908

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

HRM FCM 2022.aprx Revised: 2024-04-17 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Legend

PDA

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Stantec

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-04-18

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_040

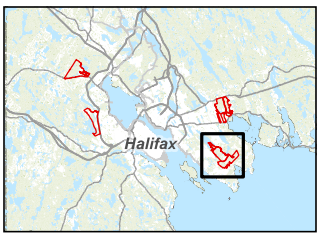
Figure No.
8

Title
Aerial Photograph 1939

HRM FCM 2022.aprx Revised: 2024-04-18 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Legend

PDA

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-04-18

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

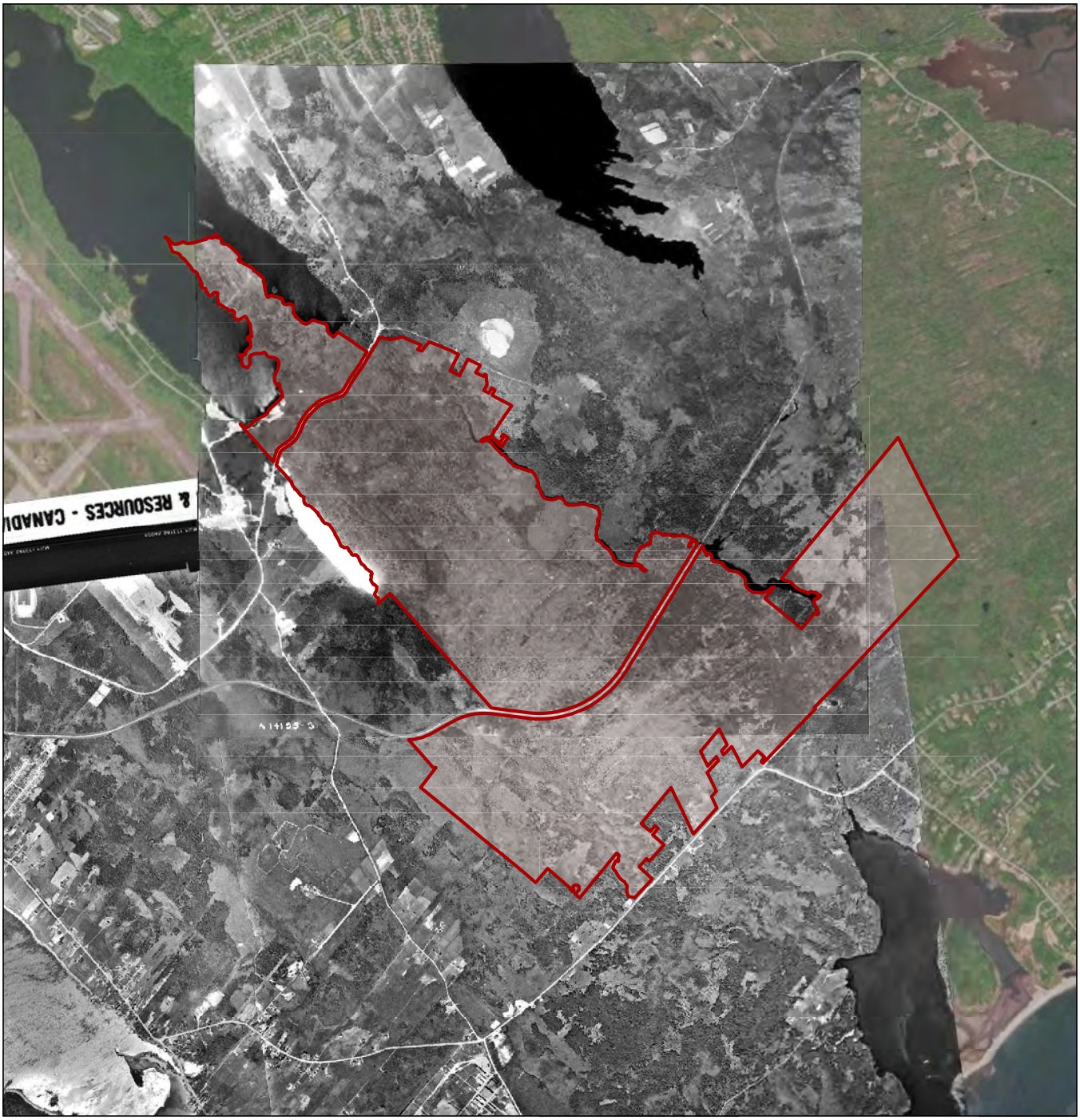
Fig ID: 160410459_048

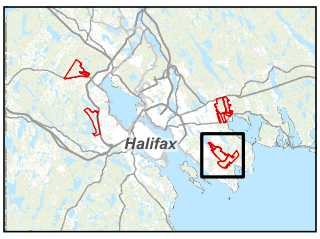
Figure No.
9

Title
Aerial Photograph 1945

HRM FCM 2022.aprx Revised: 2024-04-18 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Legend

PDA

0 250 500 Metres

(At original document size of 8.5x11)
1:31,000

N

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-04-18

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_040

Figure No.
10

Title
Aerial Photograph 1954

HRM FCM 2022.aprx Revised: 2024-04-18 By: schubbs

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

APPENDIX B

Photographs

A2023NS168	
	
Photo 1 View southeast at conditions encountered at MPR-ARCH-265	**Photo 2** View east from JRK-ARCH-209 at the identified medium potential area JRK-POLY-016
	
Photo 3 View northeast at an old road or ATV trail encountered at MPR-ARCH-266	**Photo 4** View southwest from MPR-ARCH-266 at a deer blind encounter along the old road

A2023NS168	
	
Photo 5 View north of the Cow Bay River from the west bank at MPR-ARCH2-267	**Photo 6** View southeast of the flooded-out area encountered at MPR-ARCH-267
	
Photo 7 View north of beaver dam encountered at MPR-ARCH-269	**Photo 8** View north from JRK-ARCH-210 of the identified medium potential area JRK-POLY-020 located between the old trail and the Cow Bay River

A2023NS168	
	
Photo 9 View south at a bedrock oxbow feature or slight bend in the river, taken from JRK-ARCH-210	Photo 10 View north from MPR-ARCH-272 at the very rocky surface conditions encountered along the river
	
Photo 11 View south or the mainly slate bedrock and boulders encountered along the Cow Bay River at MPR-ARCH-272	Photo 12 View northwest from MRP-ARCH-273 of wet conditions encountered

A2023NS168	
	
Photo 13 View southwest from MPR-ARCH-273 at a flooded-out section of the river from beaver activity within the area	**Photo 14** View north at JRK-ARCH-213 at surface conditions encountered along the east bank of the Cow Bay River
	
Photo 15 View southwest from CKM-ARCH-166 of the low wet area encountered along the east bank of the Cow Bay River	**Photo 16** View east at JRK-ARCH-214 at a small drainage running east off the Cow Bay River along a higher boulder swale

A2023NS168	
	
Photo 17 View south at CKM-ARCH-167 showing a rocky boulder swale encountered along the river on the east bank	**Photo 18** View east of a branch of the Cow Bay River encountered at JRK-ARCK-215
	
Photo 19 View north from JRK-ARCH-215 at the Cow Bay River	**Photo 20** View west from JRK-ARCH-217 at the northern end of De Said Lake

A2023NS168	
	
Photo 21 View east up slope from CKM-ARCH-171 showing surface conditions encountered during the walkover	**Photo 22** View north at a potential fox hole or trench feature encountered at CKM-ARCH-172 with 20 cm scale
	
Photo 23 View south at forest and surface conditions encountered at JRK-ARCH-218	**Photo 24** View east at the remains of an abandoned camp encountered at assessment note JRK-ARCH-219

A2023NS168	
	
Photo 25 View west at the trail from the lake to an abandoned camp encountered at assessment note JRK-ARCH-219	**Photo 26** View north of the entrance of Smelt Brook which flows out form the southern end of De Said Lake at CKM-ARCH-174
	
Photo 27 View south of Smelt Brook at the southern end of De Said Lake and being a low wetland environment at CKM-ARCH-174	**Photo 28** View south at JRK-ARCH-220 of the boggy wetland encountered along Smelt Brook

A2023NS168	
	
Photo 29 View west from JRK-ARCH-220 at the east bank of Smelt Brook from the foot of the former CNR bridge	**Photo 30** View northwest at the bridge for the former CNR rail line taken at assessment note JRK-ARCH-220
	
Photo 31 View south at JKR-ARCH-221 of conditions encountered whilst walking south along both banks of Smelt Brook	**Photo 32** View west at JKR-ARCH-221 of conditions encountered along Smelt Brook

A2023NS168	
	
Photo 33 View west from CKM-ARCH-177 of conditions encountered along Smelt Brook	**Photo 34** View north of the confluence of Smelt Brook near a deer crossing at JRK-ARCH-222
	
Photo 35 View west at the deer blind identified at JRK-ARCH-223 near a dear crossing	**Photo 36** View south from CKM-ARCH-177 showing conditions encountered at the lower end of Smelt Brook

APPENDIX E

NSNRR-Old Growth Forest Criteria

Table C.1 Old-Growth Forest Community Comparisons from Other Jurisdictions

Nova Scotia FEC Forest Group	Nova Scotia FEC Vegetation Types	Nova Scotia Old Growth Age-of-Onset (years)	ON [a] General Species Association	ON [a] Old Growth Age-of-Onset (years)	Minnesota [b] Old-Growth Forest Types	Minnesota [b] Old Growth Age-of-Onset (years)
Tolerant Hardwood	TH1, TH2, TH3, TH4, TH5, TH6, TH7, TH8	140	Hard Maple Yellow Birch Red Oak	120-140 150-160 110-120	Northern Hardwood Forests	120
Spruce-Hemlock	SH3, SH4, SH5, SH6, SH7	125	White Spruce	110-130	White Spruce Forests	90
Spruce-Hemlock	SH1, SH2	140	Hemlock	140-180	n/a	
Mixedwood	MW1, MW2, MW3	125	Yellow Birch Soft Maple Hemlock	150-160 80-120 140-180	Oak Forests	120
Spruce-Pine	SP4, SP5. SP7, SP9	125	White Pine Black Spruce	130-150 90-150	Red and White Pine Forests [c]	
Cedar	CE1	100	White Cedar	100-150	Upland White Cedar Forests	120
Wet Coniferous	WC1, WC2, WC5, WC8	100	Black Spruce	90-150	n/a	
Coastal	CO1, CO4	100	Black Spruce Balsam Fir	90-150 70-80	n/a	
Coastal	CO3, CO5, CO6	125	White Birch Soft Maple	90-110 80-120	n/a	
Highland	HL1, HL2	100	n/a		n/a	
Highland	HL3, HL4	140	Yellow Birch	150-160	n/a	
Wet Deciduous	WD3, WD4, WD6, WD8	115	Soft Maple	80-120	Lowland Hardwood Forests	120
Floodplain	FP1, FP2, FP3	125	Hard Maple Soft Maple Red Oak	120-140 80-120 110-120	Lowland Hardwood Forests	120
Karst	KA1, KA2	125	Hemlock	140-180	n/a	

a – Uhlig et al. (2001) b – Minnesota DNR (2021) c – Minnesota DNR (1989)

Table C.2 Maximum longevity for dominant tree species associated with the forest groups (and vegetation types) included in Nova Scotia's old-growth forest definition

Tree Species	Literature Max age [ab]	Literature Max age – 50%	L&F database Max age [cde]
Eastern Hemlock	800	400	520
Red Spruce	400	200	335
White Pine	450	225	288
Black Spruce	250	125	277
Black Spruce Coastal	250	125	150
Balsam Fir	200	100	160
Sugar Maple	400	200	276
Yellow Birch	366	183	370
Red Oak	400	200	205
Red Maple	300	150	188

a – Burns and Honkala (1990).
b – Loehle (1987).
c – Natural Resources and Renewables Permanent Sample Plot Database
d – Natural Resources and Renewables Forest Ecosystem Classification Plot Database
e – Natural Resources and Renewables Old-Forest Research Plot Database