HALIFAX REGIONAL MUNICIPALITY
FUTURE SERVICED COMMUNITIES

FINAL REPORT
VOLUME 2: SANDY LAKE STUDY AREA
REPORT – LAND SUITABILITY ANALYSIS

October 18, 2024

Prepared for:
Halifax Regional Municipality

Prepared by:
Stantec Consulting Ltd

Project Number:
160410459

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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 section discusses the work completed in the Sandy Lake Study Area (SLSA; Figure 3.1). The terms "SLSA" 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. 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 as well as potential implications of climate change on future development.

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. Modelling these changes and related timeframes in localized candidate development areas would be challenging and is beyond the scope of this analysis.

3.1 Overall Study Approach

The land suitability analysis for the SLSA 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 SLSA, 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 SLSA

- 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

Stantec also reviewed regional and local studies completed by other organizations, including:

- Land Suitability Analysis (January 2023)– Englobe - Sandy Lake Holdings Limited
- Sandy Lake Ecological Features Assessment (June 2022) - McCallum Environmental Ltd- Halifax Regional Municipality
- Wildlife Corridor Landscape Design Charrette Chebucto to Timberlea Sandy Lake area (March 2021). Nova Scotia Crown Share Land Legacy Trust
- Sandy Lake Development Sites1-3 Archaeological Resources Impact Assessment-Archaeological Shovel Testing (October 2022)-CRM Group Ltd-Clayton Development Limited
- Future Serviced Communities Draft Report - Volume 2: Sandy Lake Study Area Report – Land Suitability Analysis - Comments on Watercourses, Wetlands and Water Quality (May 2024) - David Patriquin
- Sackville River Regional Park Coalition Steering Committee (May 2024)
- Historical and current biophysical Information provided by the Sandy Lake Coalition and Ecology Action Center (2023-2024)

The reports for these studies offer valuable information; however, supplemental desktop and field work was required to address gaps. In particular, some of these studies lacked field confirmation, particularly related to wetland functional assessments, forest inventory, and additional areas from the previous Archaeology assessment.

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

Note that multiple extreme weather events throughout the 2023 field season (i.e., wildfires and floods) resulted in some unsafe and/or inaccessible areas within the SLSA. Existing developed properties and lands that did not provide access permission were not visited during 2023 field surveys.

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.

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

Utilities
- Transmission Line
- Pipeline

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NW on 2023-07-19
Reviewed by MB on 2024-03-18
Revised by NW on 2024-05-29

Fig ID: 160410459_006

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure No.
3.1

Title
Sandy Lake Study Area (SLSA)

\\ca0213-ppfss01\work_group\1214active\160410459\gis_data\mapping\ArcGIS ProHRM FCM 2022.aprx: HRM_FCM_006 HRM Base Map AerialRevised: 2024-05-29 By: niwhite

3.2 Wetland Habitat

The objective of the wetland work was to determine where wetland habitat exists within the SLSA and determine if any Wetlands of Special Significance (WSS) are present. Having a general understanding of where the wetland boundaries are within the SLSA 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 developed using LiDAR and aerial imagery. During field surveys, boundaries of these preliminary wetland areas were verified as they were encountered. Any additional wetlands encountered during field surveys (i.e., that had not been identified through desktop review) were noted. Wetlands in the SLSA 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-four wetlands were identified within the SLSA and thirteen of these were evaluated using WESP (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 SLSA. Based on Provincial mapping and aerial imagery, the field program assumed no more than 10 wetlands would be present in the Study Area and land access to all properties within the SLSA 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 and/or are generally located outside the areas within the SLSA proposed for development (Table 3.1,Figure 3.3 and Figure 3.2 – the areas with no score). 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 Wetlands in the SLSA

Wetland ID	Wetland Class and Type	Approximate Wetland Area (ha)	Evaluated using WESP-AC	WSS[1]
SL1	Tall Shrub Swamp	0.03	Yes	No
SL2	Graminoid Freshwater Marsh	0.09	Yes	No
SL3	Mixedwood Treed Swamp, Tall Shrub Swamp	0.68	Yes	No
SL4	Mixedwood Treed Swamp	2.02	Yes	No
SL5	Mixedwood Treed Swamp, Graminoid Freshwater Marsh, Tall Shrub Swamp	23.06	Yes	No
SL6	Mixedwood Treed Swamp	2.11	Yes	No
SL7	Tall Shrub Swamp, Mixedwood Treed Swamp, Graminoid Freshwater Marsh	4.00	Yes	No
SL8	Mixedwood Treed Swamp, Fen	8.05	Yes	No
SL9	Mixedwood Treed Swamp	5.09	Yes	No
SL10	Mixedwood Treed Swamp, Low Shrub Swamp, Graminoid Freshwater Marsh	0.87	Yes	No
SLA	Mixedwood Treed Swamp, Tall Shrub Swamp, Graminoid Freshwater Marsh	0.12	Yes	No
SLB	Mixedwood Treed Swamp, Tall Shrub Swamp, Graminoid Freshwater Marsh	0.44	Yes	No
SLC	Mixedwood Treed Swamp, Tall Shrub Swamp, Graminoid Fen	1.52	Yes	No
SL11	Mixedwood Treed Swamp	0.10	No	NE
SL12	Tall Shrub Swamp, Graminoid Freshwater Marsh	0.24	No	NE
SL13	Mixedwood Treed Swamp	0.34	No	NE
SL14	Mixedwood Treed Swamp	0.34	No	NE
SL15	Hardwood Treed Swamp, Tall Shrub Swamp	0.49	No	NE
SL16	Tall Shrub Swamp	0.53	No	NE
SL17	Tall Shrub Swamp	0.08	No	NE
SL18	Coniferous Treed Swamp	0.02	No	NE
SL19	Tall Shrub Swamp, Mixedwood Treed Swamp	0.30	No	NE
SL20	Tall Shrub Swamp	0.03	No	NE
SL21	Mixedwood Treed Swamp	0.28	No	NE

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 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.

NE – Not Evaluated – these wetlands were not evaluated using WESP-AC and therefore, details of the WESP-AC functional WSS interpretation tool are not available at this time.

SL – Sandy Lake

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Service Nova Scotia NSTDB; Government of Nova Scotia Environment and Climate Change
3. Background: ESRI 2023

- Study Area
- Wetlands (Stantec, 2023)
- Wetlands Evaluated Using WESP-AC (Stantec, 2023)

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Utilities
- Transmission Line
- Pipeline

Other Features
- Waterway
- Waterbody

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N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-07-25
Revised by NWhite on 2024-10-02

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_011a

Figure No.
3.2

Title
Wetlands in the SLSA

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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). 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 3.2.1, 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
**51 is the highest possible score

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 as defined 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 only one scoring Lower (SL6).

Table 3.3 Ecological Condition Scores

Wetland ID	Ecological Condition Score	Ecological Condition Ranking	Land Suitability Ranking[1]
SL1	7.10	Higher	1
SL2	4.20	Moderate	2
SL3	7.68	Higher	1
SL4	7.10	Higher	1
SL5	6.23	Moderate	2
SL6	3.04	Lower	3
SL7	8.26	Higher	1
SL8	10.00	Higher	1
SL9	6.52	Higher	1
SL10	7.10	Higher	1
SLA	8.26	Higher	1
SLB	8.26	Higher	1
SLC	4.78	Moderate	2

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. All 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
SL1	9.60	Higher	1
SL2	7.66	Higher	1
SL3	7.72	Higher	1
SL4	8.39	Higher	1
SL5	7.84	Higher	1
SL6	7.29	Higher	1
SL7	7.62	Higher	1
SL8	7.33	Higher	1
SL9	7.69	Higher	1
SL10	7.10	Higher	1
SLA	6.73	Higher	1
SLB	7.16	Higher	1
SLC	7.81	Higher	1

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)

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 reviewed if one or more functions are deemed to be of greater value when considering future development scenarios. For example, the function scores for water storage could be reviewed to understand which wetlands provide that function, and to what degree. 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 SL1 as an example, Table 3.7 indicates that this wetland scored a 5.90 for water storage, which (according to Table 3.6) is considered moderate. SL2, on the other hand, scored a 0.96 for water storage, which is considered low.

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”).

Table 3.5 Wetland Functions

Function		Description
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).
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 were evaluated and thresholds were determined, 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 Higher, Moderate, and Lower respectively. The sum of these values was calculated for each wetland evaluated by WESP-AC and assigned an overall score (Table 3.7). The scores were then ranked based on suitability for development, 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 have Moderate land suitability function scores and were assigned a land suitability ranking of 2 (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
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		
SL1	5.90	0.00	6.75	10.00	10.00	10.00	1.35	5.60	0.00	0.00	4.42	3.84	6.49	4.35	6.76	8.07	0.67	**35**	2
SL2	0.96	1.14	3.60	1.04	0.00	2.19	0.81	5.95	0.00	0.00	4.09	7.43	6.55	6.62	8.01	9.79	0.66	**30**	2
SL3	1.17	4.34	6.05	3.47	0.38	2.45	2.88	8.17	0.00	2.77	5.66	3.99	5.49	3.88	8.32	9.28	4.07	**33**	2
SL4	2.04	6.00	7.40	4.87	1.70	3.73	3.64	8.58	0.00	4.62	5.20	3.94	4.29	5.96	8.57	8.78	3.60	**36**	2
SL5	1.57	6.69	6.80	3.88	1.34	3.32	3.20	9.77	0.00	7.40	7.85	5.49	7.69	7.50	7.50	8.32	5.01	**38**	2
SL6	8.71	0.00	0.00	7.15	1.86	10.00	7.88	7.39	0.00	0.00	5.16	2.35	0.00	0.00	4.93	3.68	0.00	**29**	2
SL7	0.97	5.31	8.30	3.30	1.19	2.79	3.88	9.37	0.00	6.98	8.35	5.09	6.74	7.77	8.95	7.54	3.93	**38**	2
SL8	0.54	6.00	7.55	3.52	2.50	2.95	4.94	10.00	0.00	5.87	9.74	5.59	7.48	7.26	9.08	8.46	3.95	**39**	2
SL9	6.45	0.00	4.50	10.00	10.00	10.00	4.17	5.97	0.00	0.00	3.49	6.24	5.37	5.40	8.72	8.44	1.69	**35**	2
SL10	1.72	2.69	6.10	4.72	2.55	3.92	1.67	9.56	0.00	0.00	9.35	7.93	9.27	9.86	5.65	8.25	5.03	**36**	2
SLA	4.34	1.63	6.35	5.12	2.94	4.14	2.72	10.00	0.00	0.00	9.79	4.89	8.51	7.22	8.47	7.01	3.32	**35**	2
SLB	3.29	3.83	9.70	5.28	3.04	3.99	1.99	10.00	0.00	4.43	9.67	4.61	8.60	7.07	8.88	7.14	5.51	**37**	2
SLC	4.22	2.55	9.55	5.06	2.36	4.41	2.18	9.65	0.00	5.67	7.60	4.62	8.57	6.95	7.50	6.60	5.12	**37**	2

Notes:

1 – The normalised function scores (found in the scores tab of each WESP-AC form) are summarized here for the 13 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-four wetlands were identified in the SLSA using the approach described in Section 3.2.2. Due to the operational constraints (discussed in Section 3.1), thirteen of the twenty-four 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, wetland risk, the composite function score, 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	
SL1	1	1	2	1.3
SL2	2	1	2	1.6
SL3	1	1	2	1.3
SL4	1	1	2	1.3
SL5	2	1	2	1.6
SL6	3	1	2	2
SL7	1	1	2	1.3
SL8	1	1	2	1.3
SL9	1	1	2	1.3
SL10	1	1	2	1.3
SLA	1	1	2	1.3
SLB	1	1	2	1.3
SLC	2	1	2	1.6

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 (SL11 to SL21) 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 SLSA evaluated using WESP-AC (i.e., 13 out of 24) 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 SLSA being considered a WSS.

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.

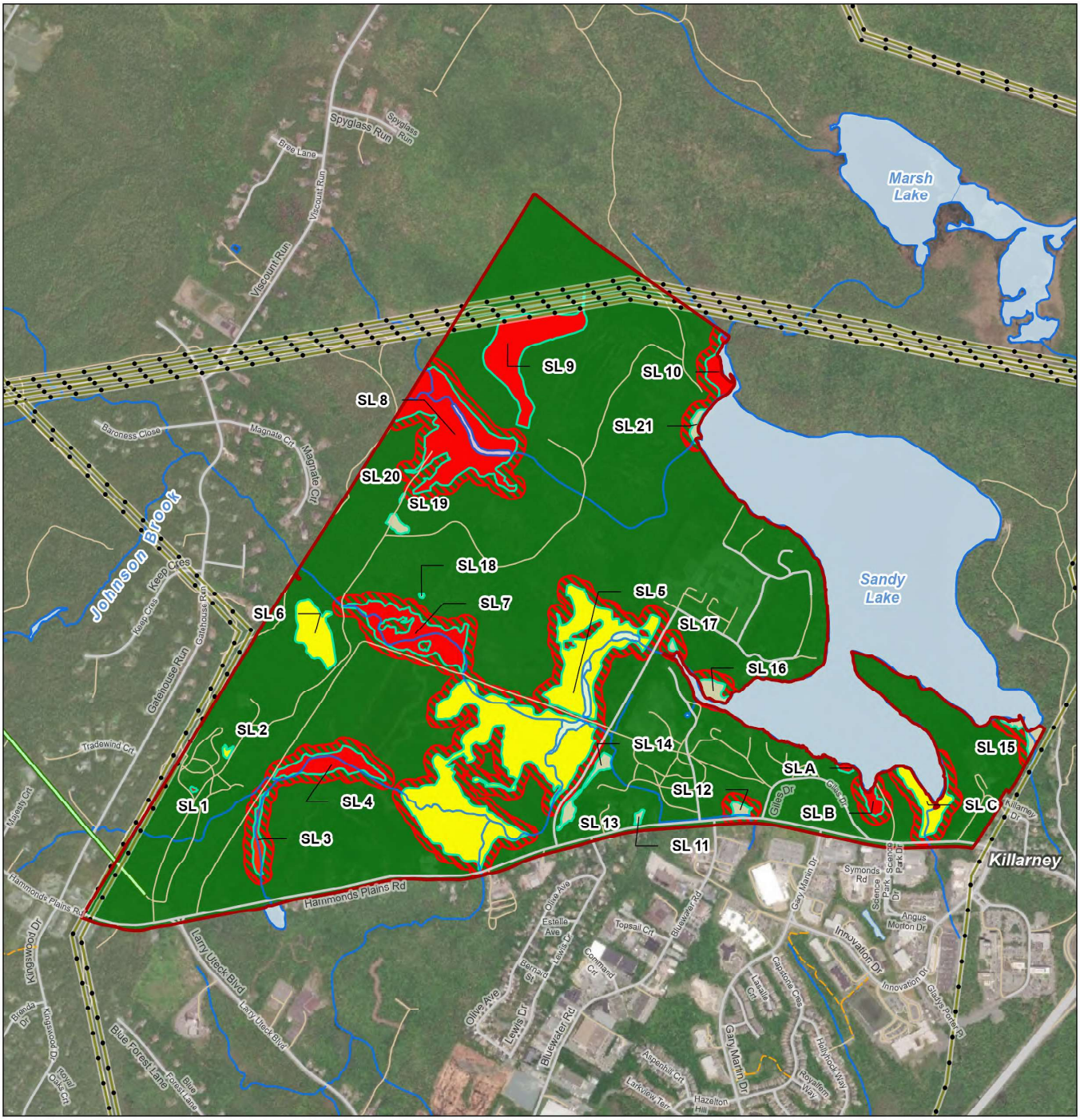
The first step in the sequence (and the priority) is avoidance. This option involves avoiding alteration to wetlands, forcing the consideration of alterative options for the project that may result in fewer impacts to wetlands. If no other alternative option exists, minimization is recommended, meaning 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).

If 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. Areas such as this are also considered in landscape connectivity planning (refer to Section 3.5). 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. Areas such as this are also considered in landscape connectivity planning (refer to Section 3.5). Additional consideration was taken when scoring wetlands to manually adjust the weighting of policy-protected constraints including established environmental buffers such as a 30m wetland setback for wetlands intersected by watercourses. This is portrayed by the red hatching in Fig 3.3. Per the mitigative sequence, areas outside delineated wetlands are considered to have higher suitability for development, since development in these areas would avoid impacting wetlands.

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).



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

- Study Area
- Wetlands (Stantec, 2023)
- Setback on Wetlands Contiguous with Watercourses (30 m)

Land Suitability Score

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

Utilities

- Transmission Line
- Pipeline

Transportation

- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-20
Revised by NWhite on 2024-08-29

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_006

Figure No.
3.3

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

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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 SLSA 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 SLSA using field and desktop methods
- describe the aquatic habitat in the watercourses within the SLSA
- 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

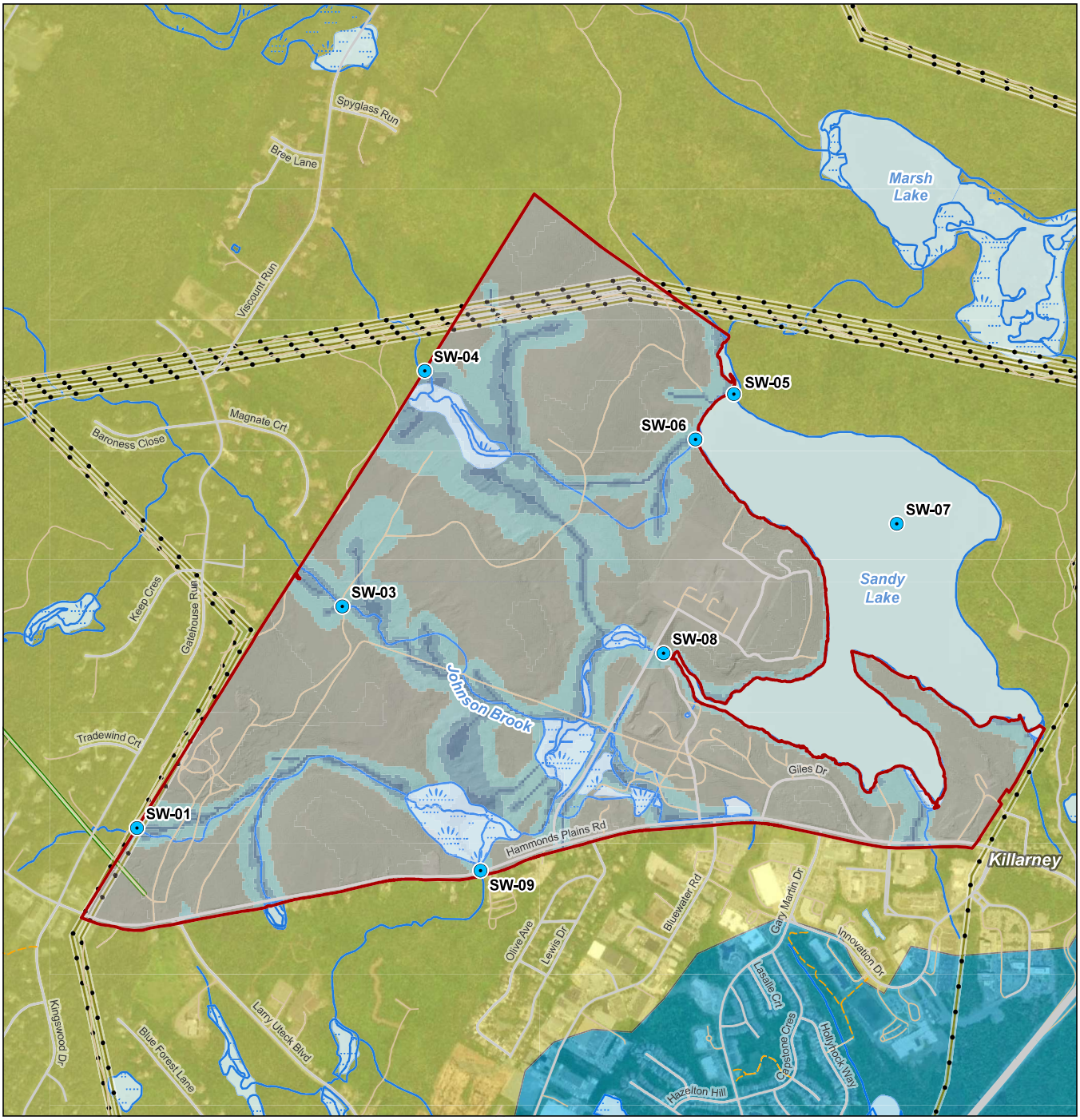
3.3.1 DESKTOP AND FIELD SUMMARY

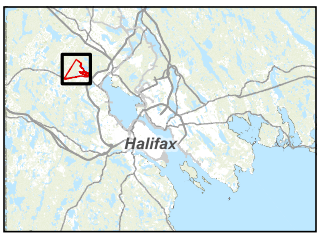
Stantec completed a desktop inventory of watercourses using LiDAR, aerial imagery, and flow accumulation mapping (also known as wet areas mapping; Figure 3.4). The wet areas mapping indicates depth to water table and can be used to predict what areas may accumulate surface water in watercourses and wetlands. 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. Wet areas mapping was used to inform water sampling location only and did not play a direct influence on land suitability analysis due to its lack of accuracy in the data set. Section 3.6.3 provides additional desktop data on existing ground water wells in the area. 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

- Kearney Run
- Sackville River

Other Features

- Waterway
- Waterbody
- Wetland (NSECC)

Utilities

- Transmission Line
- Pipeline

Transportation

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

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

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
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_009

Figure No.
3.4

Title
Watershed and Wet Area Mapping in the SLSA

\\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

3.3.1.1 Watercourses

The SLSA is located within the Sackville River Watershed. Sandy Lake discharges to Marsh Lake, which drains through Peverills Brook to the Sackville River.

Preliminary mapping identified nine mapped watercourses, one mapped waterbody and six topographic features which may contain water. Five of the mapped watercourses were confirmed during the water quality monitoring program and each contained at least one surface water monitoring station (Figure 3.5).

Sandy Lake has a surface area of 78.5 ha. The northwestern part of Sandy Lake is the deepest at 21.7 m; the southwestern portion is much shallower with depths generally less than 6.0 m (White et al. 1984). A detailed bathymetric profile of Sandy Lake is presented in Conrad et al. 2002, who calculate a lake volume of approximately 6 M m^3. White et al. (1984) indicated the lake has a relatively short retention time of approximately four months.

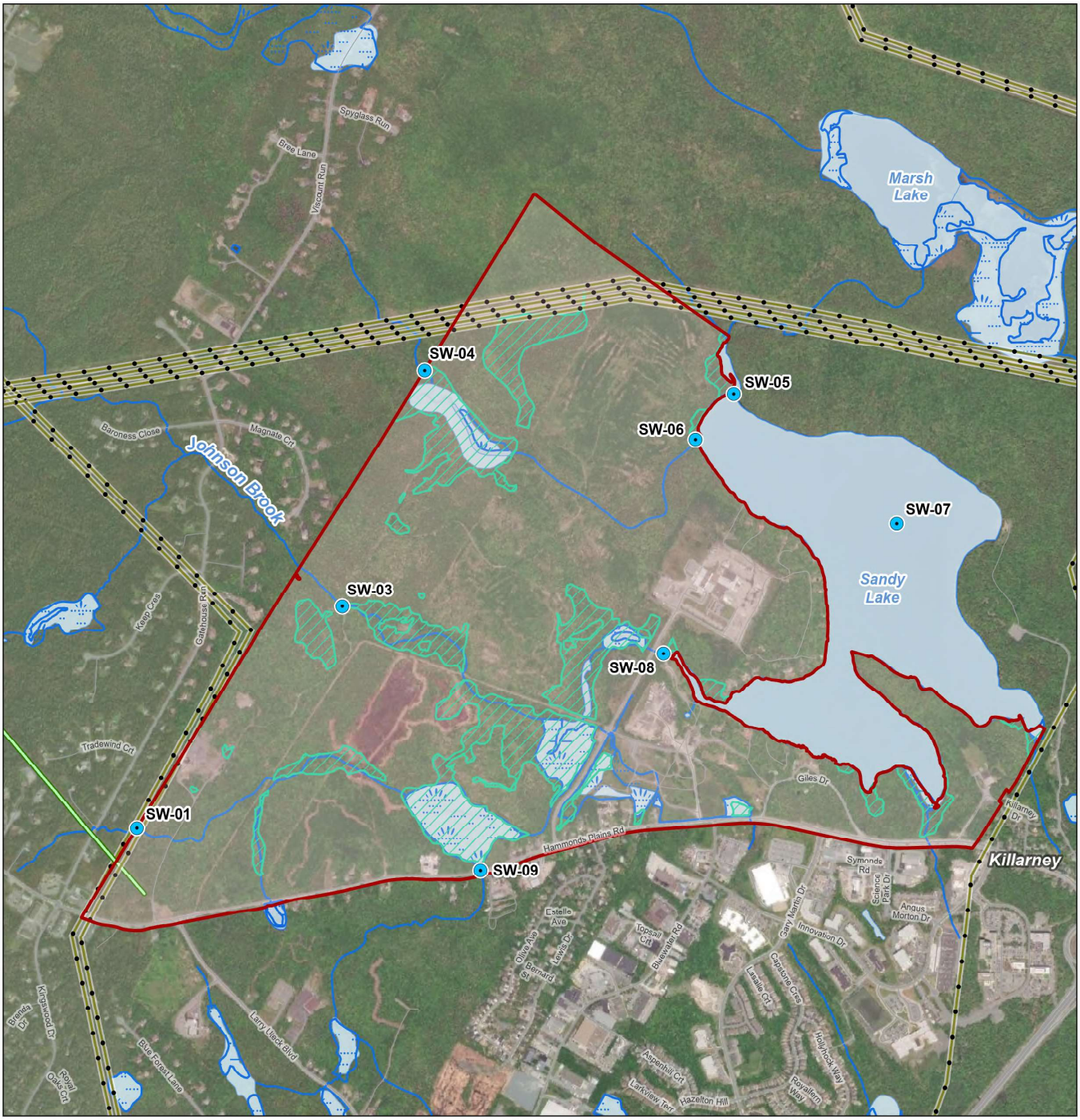
Water quality station SW-01 (Figure 3.5) is on an unnamed stream in the southwest portion of the SLSA. This unnamed watercourse originates from beyond the western boundary of the SLSA and eventually flows into Sandy Lake through wetlands SL 4 and SL 5 South. This unnamed watercourse joins with an unnamed watercourse (SW-09) and Johnson Brook (SW-03) before draining into Sandy Lake.

SW-03 and SW-08 are located on Johnson Brook. The headwaters for Johnson Brook begin approximately 2.5 km to the west of the SLSA and this is the largest drainage area providing flow to Sandy Lake. Within the SLSA, Johnson Brook flows through wetlands SL-6, SL-7 and SL-5 before entering Sandy Lake.

SW-04 and SW-06 are located on an unnamed stream in the northwest portion of the SLSA. The headwaters originate approximately 500 m to the west of the SLSA. This watercourse flows through wetland SL 8 before entering Sandy Lake.

SW-05 is located on the outlet of Sandy Lake (Pevrills Brook). This unnamed watercourse flows between Sandy Lake and Marsh Lake to the north.

SW-09 is located on an unnamed stream in the southern portion of the SLSA. The headwaters originate approximately 1 km to the south of Larry Uteck Boulevard. This watercourse flows through wetland SL-4 and joins the unnamed watercourse SW-01.



Water Sampling Location
Waterway
Waterbody
Wetlands (Stantec, 2023)
Wetland (NSECC)
Study Area

Utilities
Transmission Line
Pipeline
Transportation
Highway
Road

0 250 500 Metres
(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Revised by NWhite on 2024-07-25

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 SLSA

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

\\ca021\c-pdfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM FCM 2022.aprx: HRM_FCM_008 Fig 3.5 Lake Watercourse InventoryRevised: 2024-08-30 By: niwhite

3.3.1.2 Fish and Fish Habitat

Historically, the SLSA contained spawning grounds for Atlantic salmon with Atlantic salmon harvested from Sandy Lake (SRA 2013). In 2012, the Sackville River Association completed restoration along Peverills Brook to improve spawning conditions upstream and downstream of Marsh Lake. Spawning habitat is currently present along Peverills Brook between Marsh Lake and the Sackville River and between Marsh Lake and Sandy Lake (SRA 2013).

Sandy Lake is used for sport fishing and contains Atlantic salmon (*Salmo salar*), brook trout (*Salvelinus fontinalis*), smallmouth bass (*Micropterus dolomieu*), yellow perch (*Perca flavescens*), gaspereau (*Alosa pseudoharengus*), American eel (*Anguilla rostrata*), lake chub (*Couesius plumbeus*), stickleback species (*Gasterosteidae* spp.), common shiner (*Luxilus cornutus*), shad (*Alosa sapidissima*), brown trout (*Salmo trutta*) and brown bullhead (*Ameiurus nebulosus*) (Dalhousie 2002). Note that American eel is considered Threatened by COSEWIC; while it is not currently listed on Schedule 1 of the SARA, it is under consideration for inclusion. This species is not included in the NS ESA. Atlantic salmon is also under consideration for inclusion on schedule 1 of SARA, but is considered endangered by COSEWIC.

While fish community surveys were not requested 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. Prior to the development of lands within the SLSA, it is recommended that dedicated fish habitat assessments be conducted to determine the use of habitats by fish and to provide data to fulfill applicable regulatory requirements at the time of construction.

All the watercourses encountered from desktop and field surveys drained into Sandy Lake. Connectivity is sufficient to provide fish passage into the drainage areas above Sandy Lake; therefore, these watercourses are expected to contain a fish community which contains American eel, Atlantic salmon, stickleback species, common shiner, brook trout and brown trout.

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

Table 3.9 Physical Watercourse Characteristics – SLSA

Watercourse	Channel Width (m)	Wetted Width (m)	Substrate Composition	Riparian Habitat Description
SW-01	1.8 to 3.4	1.6 to 3.2	Rubble sized rock with smaller amounts of cobble and fines.	Grassy low-lying banks with woody shrubs and predominantly deciduous mixed wood forest. At points contiguous with wetlands.
SW-03 and SW-08 (Johnson Brook)	3.1 to 4.3	2.8 to 4.3	Cobble sized rock with smaller amounts of rubble and fines.	Grassy low-lying banks with woody shrubs and predominantly deciduous mixed wood forest. At points contiguous with wetlands.

Table 3.9 Physical Watercourse Characteristics – SLSA

Watercourse	Channel Width (m)	Wetted Width (m)	Substrate Composition	Riparian Habitat Description
SW-04 and SW-06	1.3 to 3.6	1.1 to 3.4	Rubble sized rock with smaller amounts of cobble and fines.	Grassy low-lying banks with woody shrubs and predominantly deciduous mixed wood forest. At points contiguous with wetlands.
SW-05 (Pevrills Brook)	8 to 23	8 to 23	Fines and organic material with occasional boulder	Grassy low-lying banks with minimal woody vegetation. Contiguous with wetlands within the SLSA.
SW-09	1.3 to 3.6	1.1 to 3.4	Rubble sized rock with smaller amounts of cobble and fines.	Grassy low-lying banks with woody shrubs and predominantly deciduous mixed wood forest. At points contiguous with wetlands.
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 SLSA was obtained using historical water quality reports, as well as field-based data collected monthly since April 2023. Water quality in SLSA has been monitored on an irregular basis since 1980. Table 3.10 presents data sources used to infer historical water quality in the SLSA for this report.

Table 3.10 Historical Water Quality Data Sources

Organization	Sampling Location	Period of Record	Number of Samples	Parameters Sampled
DFO	Sandy Lake	1980,1991,2000,2011	4	Nutrients, General Chemistry, pH, Bacteria, Ammonia, Metals, Chlorophyll-a
HRM	Sandy Lake	2006 to 2011	14	Nutrients, General Chemistry, Bacteria, Ammonia, Metals, Chlorophyll-a
HRM – Lake Watchers	Sandy Lake and Sandy Lake Outlet	2022-2023	4	Total Phosphorus, Chloride, Chlorophyll-a, Metals, and *E. coli*
HRM	Sandy Lake Outlet	2007 to 2011	11	Bacteria
Nova Scotia Environment	Marsh Lake	2007	1	Nutrients, General Chemistry, Chlorophyll-a
AECOM	Sandy Lake Outlet and Peverills Brook (Marsh Lake Outlet)	August and November 2013; April 2014	3	Nutrients, Bacteria, Metals, Chlorophyll-a

Water quality in Sandy Lake, historically, is low in alkalinity (<10 mg/L) and has neutral pH (values ranging between 6.45 to 7.36); most of these values were 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). Total phosphorus values range from 2 ug/L to 43 ug/L between 2006 and 2013. In cases such as this where water quality data does not follow a normal distribution (e.g., due to varying pollution sources, natural variation), the median provides a measure of the central tendency. The median reflects the typical water quality conditions that most of the watershed experiences and gives an accurate picture of what the majority of the watershed is like within Sandy Lake the median concentration of total phosphorus is 12 ug/L which is indicative of mesotrophic conditions. Historical sources of chloride within the watershed include septic systems, animal waste, potash fertilizer, and drainage from contact with road-salt chemicals. Chloride concentrations in Sandy Lake are low, with median concentration of 28 mg/L and maximum concentration of 50 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 in Sandy Lake with a median value of 2 mg/L and a maximum value of 5 mg/L. The low chloride and TSS concentrations suggest that Sandy Lake is not significantly affected by urban runoff or erosion within the watershed. The bacteria concentrations in Sandy Lake have historically been present but low in concentration (2 MPN/100 mL). In 2023, Sandy Lake Beach was closed for four days between July 13 and July 17 due to high bacterial levels, with samples showing concentrations exceeding 500 CFU/100 mL. A wastewater pumping station failure the same year led to a second closure from July 21 to August 2, caused by high water levels and potential exposure to fecal matter from the overflow. Two samples taken by Stantec after the failure showed bacterial concentrations above 25 MPN/100 mL; however, all samples remained below the Health Canada guideline for recreational water quality of 200 MPN/100 mL (Health Canada, 2012).

Water quality sampling began in April 2023 and was continued monthly in the SLSA until November 2023 at the stations shown in Figure 3.5. Water quality samples are submitted under chain of custody protocols to Bureau Veritas Labs in Bedford, NS for laboratory analysis of bacteria, total suspended solids (TSS), Total Phosphorus (TP), turbidity, colour, and chloride. Statistical summaries of water quality results are presented in Table 3.11.

Table 3.11 Water Quality Results from the SLSA collected during Spring/Summer 2023

	Units	Value	SW-01	SW-03	SW-04	SW-05	SW-06	SW-07	SW-08	SW-09	Sandy Lake
Microbiological											
Escherichia coli	CFU/100mL	Mean	108	44	342	53	487	13	143	180	<10
		Median	100	20	85	50	140	10	130	110	<10
		Min	10	10	20	10	10	10	10	40	<10
		Max	200	100	1300	100	2200	20	400	540	<10
Total Coliforms	CFU/100mL	Mean	1767	871	973	519	1244	146	874	911	96
		Median	1350	855	910	400	1100	140	640	750	100
		Min	1100	340	380	30	100	20	470	400	20
		Max	3600	1600	2300	1200	3700	300	2200	2000	270
Inorganics											
Dissolved Chloride (Cl-)	mg/L	Mean	77	19	29	33	26	34	40	52	40
		Median	68	16	27	30	27	32	34	42	41
		Min	40	13	20	21	18	20	19	22	30
		Max	140	34	37	49	32	47	79	110	48
Colour	TCU	Mean	30	104	121	67	111	65	78	64	49
		Median	29	103	140	76	85	74	73	63	46
		Min	20	44	21	27	25	29	33	19	26
		Max	41	180	210	100	240	100	130	120	73
Total Phosphorus	mg/L	Mean	0.5413	0.0199	0.0269	0.0125	0.0193	0.0115	0.0196	0.0150	0.0194
		Median	0.5350	0.0190	0.0265	0.0130	0.0185	0.0125	0.0240	0.0180	0.0090
		Min	0.2600	0.0110	0.0070	0.0040	0.0060	0.0050	0.0080	0.0050	0.0060
		Max	0.9800	0.0330	0.0420	0.0220	0.0330	0.0180	0.0280	0.0230	0.0500
Total Suspended Solids	mg/L	Mean	5.6	1.5	5.4	1.7	3.0	1.5	1.9	1.6	13.3
		Median	5.2	1.4	6.1	1.4	1.7	1.6	1.6	1.2	2.2
		Min	2.0	1.0	1.2	1.0	1.2	1.0	1.0	1.0	1.0
		Max	13.0	2.0	10.0	2.8	7.2	2.2	3.0	2.8	39.0
Turbidity	NTU	Mean	1.8	1.2	10.4	2.4	3.5	1.7	1.6	1.8	3.2
		Median	1.8	1.1	10.5	1.3	2.2	1.6	1.7	1.5	2.3
		Min	0.7	0.4	0.9	0.9	0.6	1.0	1.0	0.2	0.8
		Max	2.5	2.3	25.0	10.0	10.0	2.6	2.0	5.4	8.4

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, similarly water quality is regulated under the provincial Environmental Act, as well as the *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.” In addition, stormwater discharges are managed in accordance with the Halifax Stormwater Management Standards for Development Activities (Halifax Regional Municipality 2020).

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 3.12). 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. These land suitability rankings are somewhat different from the rankings used by MEL (2022) who used 0 – 50 m, 50- 100 m and 100 + m as their categories.

The objective 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 setback and buffer of 30 m proposed in the draft Regional Plan/Regional Plan review process in the Land Use By-Laws(Halifax Regional Municipality 2024). Wider buffers are more effective at filtering contaminants, encouraging infiltration and providing diversity of habitat (Collison and Gromack 2022). Buffer widths beyond the minimum standard should be evaluated on a case-by-case basis taking into account local site conditions and community needs.

Considering the effective width varies with soil type, slope, watercourse size, ecological habitat function and vegetative cover the draft Regional Plan/Regional Plan, setbacks are considered the minimum criteria levels and additional buffer width may be implemented during the Planning or Subdivision Approval process.

The land suitability analysis seeks to conserve the following ecological functions of watercourses:

- 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.

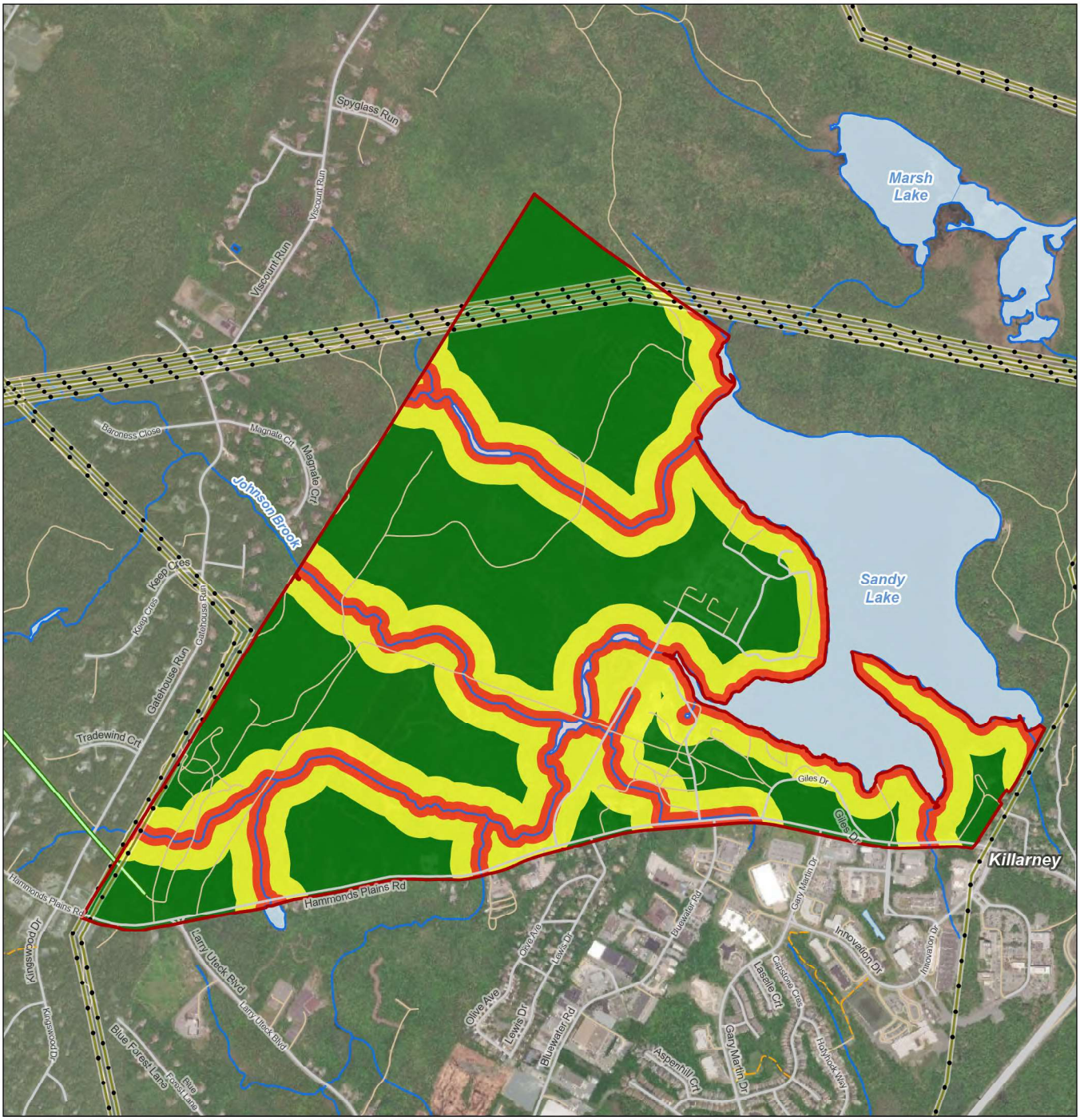
Areas immediately surrounding watercourses provide the greatest amount of riparian and aquatic habitat. Land within 30 m of mapped and field identified watercourses is considered to have low suitability for development. Land that extends from 30 m to 100 m from a watercourse is considered to have moderate suitability for development. Land with higher suitability for development is considered to be greater than 100m from watercourses as developing these areas would protect the greatest amount of riparian and aquatic habitat and therefore have a higher suitability for development (Table 3.12).

This process culminated in the creation of a map (Figure 3.6) that illustrates the land suitability rating related to development suitability. 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 value.

Note that recommendations for landscape connectivity have also considered the location of watercourses in the Study Area (refer to Section 3.5). If construction will impact watercourse bed and banks within the SLSA Stantec recommends additional fish and fish habitat surveys be completed in compliance with the provincial and federal regulations pertaining to watercourse alteration permitting and the alteration of fish habitat.

Table 3.12 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



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

Wetland Land Suitability Score
- 3 (High)
- 2
- 1 (Low)

Utilities
- Transmission Line
- Pipeline

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-08
Revised by NWhite on 2024-05-15

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_031

Figure No.
3.6

Title
Watercourses in the SLSA – Land Suitability Analysis

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3.4 Forest Habitat and Species at Risk

Forest habitat within the SLSA 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).

SAR presence noted within the study area was based on incidental observations, AC CDC data, and the Boreal Felt Lichen Predicative data layer. Though these data sources provide a good preliminary understanding, collecting more than one season of field survey data would provide a more complete picture of SAR presence. Some AC CDC data is also obscured for species safety and access was not requested as part of this analysis. Evaluating individual VTs for likelihood of providing SAR (e.g., boreal felt lichen) habitat was also considered outside the scope of this study.

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 SLSA 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.

Habitat VT types can also provide insight to community climate resilience planning. Some terrestrial VTs and wetland types are recognized to be effective carbon sinks and fire breaks, as well as attenuating stormwater flow. An evaluation of these services should be completed during any ensuing planning processes.

There were limitations of time, scope and resources in the completion of this study. Though useful as a multidiscipline decision-making tool, this report is not a complete representation of all ecological features present within the study area. Knowledge gaps that should be considered in future studies and planning efforts include targeted SAR surveys; it is noted that many VTs identified within the study area are known to be associated with rare plants. Though spot vegetation surveys were completed, it is possible that some rare species remained undetected within the study area.

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 Figure 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 SLSA is located within the Eastern Interior Ecodistrict (NSDNR 2017). 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 2019).

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 SLSA contains the following FEC FGs:

- Intolerant Hardwood Forest (IH)
- Mixedwood Forest (MW)
- Old Field (OF)
- Open Woodland (OW)
- Spruce Hemlock Forest (SH)
- Spruce Pine Forest (SP)
- Wet Coniferous Forest (WC)
- Wet Deciduous Forest (WD)
- Wet-Mixedwood (WM)

Dominant vegetation was described for 54 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 3.13 Summary of Vegetation Types in the SLSA

Vegetation Type (VT)	FEC VT Code	VT Frequency[1]	Forest Group (FG)
White birch – Red maple/Sarsaparilla – Bracken	IH6	3	IH
White birch – Red maple/Sarsaparilla – Bracken (Aspen variant)	IH6a	1	
White birch – Red maple/Sarsaparilla – Bracken (White Birch variant)	IH6b	2	
White birch – Red maple/Lambkill – Huckleberry	IH8	1	
Grey birch/Tall white aster/Hair-cap moss	IH9	3	
Red spruce – Yellow birch/Evergreen wood fern	MW1	3	MW
Red spruce – Red maple – White birch/Goldthread	MW2	11	
Hemlock – Yellow birch/Evergreen wood fern	MW3	1	
Hemlock – Red maple/Wood fern – Starflower (Aspen variant)	MW4a	1	
White spruce – Red maple (White birch)/Starflower/Scherber's moss	MW6	1	
Balsam fir – Red maple/Wood-sorrel – Goldthread	MW7	4	
White pine – Red maple/Velvet-leaf blueberry/Bracken	MW12	1	
Balsam fir – White spruce/Evergreen wood fern – Wood aster	OF4	1	OF
Ex Situ Conifer Planted Forest	PF2	1	PF
Hemlock/Needle carpet	SH1	1	SH
Red spruce – Hemlock/Wild lily-of-the-valley	SH3	4	
Red spruce – White pine/Lambkill/Bracken	SH4	1	
Red spruce – Balsam fir/Schreber’s moss – Stair-step moss	SH5	2	
Red spruce – Balsam fir/Schreber’s moss – Stair-step moss (Balsam fir variant)	SH5b	2	
Sugar maple/Wood fern – Hay-scented fern (Yellow birch variant)	TH1a	1	TH
Sugar maple/New York fern – Northern beech fern	TH2a	1	
Black spruce Woodland Bogs	WC11	1	WC
Red maple/Cinnamon fern/Sphagnum	WD2	3	WD
Red maple – Balsam fir/Wood aster/Sphagnum	WM1	5	WM
Red maple – Red spruce /Wood-sorrel – Sensitive fern	WM2	1	
Red maple – Black spruce/Lambkill/Cinnamon fern/Sphagnum	WM3	1	

Note:
1 – Frequency is the number of stands of each VT out of 54 total stands with VTs

3.4.2 FOREST ECOSYSTEM CLASSIFICATION

A total of 9 FGs represented the 26 individual VTs noted in Table 3.13. FGs are presented on Figure 3.7a and Figure 3.7b. The following sections describe each VT including successional stage, disturbance, and specific ecological features.

3.4.2.1 Intolerant Hardwood

Intolerant hardwoods (IH) are early to mid-successional closed canopy forest stands that are dominated by red maple, white birch (*Betula papyrifera*), grey birch (*Betula populifolia*) and aspen 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.

IH6 White birch-Red maple/Sarsaparilla-Bracken: White birch variant

Variants: IH6a & 6b

IH6a – Aspen variant: stands of this variant have abundant aspen species (trembling and/or large-tooth) and co-dominant white birch and red maple.

IH6b – White birch variant: stands of this variant are dominated by white birch, with little red maple and aspen.

- Succession: Early
- Typical Disturbance Type: Fire, windthrow, harvesting, insects/disease.
- Ecological Features: Red maple and white birch are favoured browse for moose and deer.

White birch and red maple are the dominant species in the IH6 vegetation type, with occasional balsam fir (*Abies balsamea*), red spruce, white spruce (*Picea glauca*), eastern white pine (*Pinus strobus*), and yellow birch. This VT establishes after disturbance events like fire, windthrow, or clearcutting on well-drained ecosites of moderate fertility. The shrub layer is well developed and is dominated by regenerating tree species and a variety of tall woody shrubs. The bryophyte layer is typically poorly developed.

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 and red maple are the dominant species in the IH6 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 is often present in the shrub layer. The bryophyte later is typically poorly developed due to restriction by leaf litter.

IH9 Grey birch/Tall white aster/Hair-cap moss

- Succession: Early
- Typical Disturbance Type: Stand-level disturbances
- Ecological Features: Has the shortest longevity of any VT which is less than 40 years.

The IH9 VT is associated with upland ecosites from fresh to moist, medium fertility, and coarse to fine soils. It is a pioneer community with short-lived grey birch trees and a well-developed understory. Other overstory species include choke cherry (*Prunus virginiana*), pin cherry (*Prunus pensylvanica*) and aspen. This VT will establish quickly on clear-cut old field forests. Earthworms are commonly present and are food sources for other wildlife, like moles, shrews, woodcock, and robins.

3.4.2.2 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.

MW1 Red spruce-Yellow birch/Evergreen wood fern

- Succession: Late
- Typical Disturbance Type: Gap replacement
- Ecological Features: Tree longevity, canopy structure, and old growth potential can provide habitat for various bird species, mammals, and amphibians.

The MW1 VT is a closed canopy mixed wood forest with an overstory dominated by red spruce and yellow birch, with other shade-tolerant trees including sugar maple, eastern hemlock, and American beech. MW1 is typically associated with fresh to fresh-moist sites and medium to rich nutrient content. The shrub layer is moderately developed and is mostly regenerating trees but can be variable depending on the overstory composition and relative ratio of hardwood to softwood species. The bryophyte development varies with coverage directly related to the softwood abundance in the overstory.

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 like other mixedwood VTs such as starflower, sarsaparilla and several fern species. MW2 also facilitates nutrient cycling, rapid site revegetation, and the establishment of nurse crops for late-successional species.

MW3 Hemlock-Yellow birch/Evergreen wood fern

- Succession: Late
- Typical Disturbance Type: Large-scale stand disturbance events
- Ecological Features: Shade tolerant and matrix-forming with uneven canopy and old growth trees.

Found in fresh to moist, nutrient medium to rich glacial soils, with the dominant canopy species being eastern hemlock. Eastern hemlock is a shade-tolerant species and facilitates the development of old forest characteristics. The shrub layer is moderately developed and has regenerative tree species (e.g., striped maple [*Acer pensylvanicum*]), and the herb layer is a common upland mixed wood forest flora. This VT occurs typically as a matrix and occupies transitional areas where softwood dominates low slope areas, and hardwood dominates upland areas.

MW4a Hemlock-Red maple/Wood fern-Starflower (aspen Variant)

- Succession: Early to Mid
- Typical Disturbance Type: Windthrow, harvesting, insect / disease, natural senescence.
- Ecological Features: Rapid nutrient cycling and site revegetation after a stand-level disturbance occurs and provides overwintering habitat for deer.

MW4 is a closed canopy type, with an aspen variant that is characterized by the presence of aspen in the canopy. This VT occurs in patches in large matrices. The shrub layer is moderately developed and includes regenerative species, with a sparce herbaceous layer. This VT contributes notably to wildlife habitat.

MW6 White spruce-Red maple (White birch)/Starflower/Scherber's moss

- Succession: Early to Mid
- Typical Disturbance Type: Stand-level disturbance (e.g., windthrow, fire, harvesting)
- Ecological Features: Occurs in large patches and provides nutrient cycling and rapid site revegetation.

MW6 is a closed canopy mixedwood forest associated with eastern Nova Scotia. Balsam fir and white birch provide moderate cover, and red spruce scattered as a result of the previous disturbance. It is associated with fresh to fresh-moist, medium rich nutrient soils. It is an even aged VT and typically has a high abundance of white birch or aspen trees which are shade intolerant. The frequency of white birch and aspen trees is dependent on past stand-level disturbances. Residual trees from earlier successional stages can offer significant wildlife habitat benefits and enhance forest structural complexity. For instance, large-diameter snags can serve as nesting sites for pileated woodpeckers and various raptors like the northern goshawk and barred owl, as well as provide denning opportunities for small to medium-sized mammals such as the American marten.

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, hemlock, and yellow birch.

MW12 White pine-Red maple/Velvet-leaf blueberry/Bracken

- Succession: Early to Mid
- Typical Disturbance Type: Stand-level disturbances (e.g., windthrow, fire and harvesting).
- Ecological Features: Several bird species may use this forest as nesting habitat in older sites.

MW12 is comprised of shade-intolerant hardwoods but defined by the abundant to dominant levels of white pine and red maple in the overstory. The shrub layer is well developed with high cover of ericaceous shrubs. MW12 occurs on fresh to dry, nutrient poor soils. The bryophyte layer is poorly developed.

3.4.2.3 Oldfield

Oldfield (OF) vegetation types develop after the abandonment of old farmland. The soils of such sites tend to be rich in organic matter, and the vegetation is composed mostly of early successional softwood species. The structure usually consists of a dense overstory of species such as white spruce, tamarack((*Larix laricina*), balsam fir, as well as a very patchy, but diverse, shrub and herb layer. Mosses, such as Schreber's moss (*Pleurozium schreberi*) and mycorrhizal mushrooms are very common under the dense canopy cover of the overstory.

OF4 Balsam fir-White spruce/Evergreen wood fern-Wood aster

- Succession: Early to Mid
- Typical Disturbance Type: Natural disturbance agents (e.g., insects and windthrow)
- Ecological Features: Rock walls and stone piles are common, and provide habitat for wildlife that uses cavities, such as rodents, snakes, and insects.

OF4 is an even-aged VT that is on fresh to fresh-moist, nutrient medium to rich soils. The canopy is dominated by balsam fir with other canopy associates of red maple, tamarack and white birch. The shrub layer is dominated by regenerating trees, while the herb layer presents common upland species often seen in natural stands such as evergreen wood fern (*Dryopteris intermedia*), wood aster(*Eurybia divaricate*), and sarsaparilla(*Aralia nudicaulis*).

3.4.2.4 Planted Forest

Planted forests (PF) have been altered by silvicultural activities and will contain both naturally occurring vegetation and structural features. Local harvesting activity, site preparation, weeding and grubbing will all contribute to the level of naturalness of the forest. Planted forest VTs will typically occur on imperfectly drained soils with medium to high fertility. In Nova Scotia, many planted forests are comprised of native species which are used for ecosystem restoration and enhancement.

PF2 Ex Situ Conifer Planted Forest

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

PF2 is an even aged closed canopy forest consisting of plantings of native trees growing in areas that would be uncharacteristic of a natural stand. Native tree species in this VT include red spruce, white spruce, black spruce, eastern white pine, red pine (*Pinus resinosa*), jack pine (*Pinus banksiana)*, tamarack, balsam fir and eastern hemlock.

3.4.2.5 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. SH can potentially provide habitat for small mammals, ungulates and diverse communities of birds and invertebrates. These species use these forests for shelter, foraging and/or reproduction.

SH1 Hemlock/Needle carpet

- Succession: Late
- Typical Disturbance Type: Windthrow or harvesting.
- Ecological Features: Large patches composed of softwood species promoting old growth development, supporting species such as coral lichen.

The SH1 VT has a closed canopy with the overstory dominated by eastern hemlock and other species including red spruce, eastern white pine, and/or yellow birch. Little light reaches the forest floor, and shrub, herbaceous, and bryophyte layers are likely to be absent. The long-lived and shade tolerant nature of eastern hemlock promotes the development of old forest characteristics. The shrub layer is primarily regenerative conifers. The sparse herbaceous layer is often composed of evergreen wood fern, rose twisted stalk (*Streptopus lanceolatus*) and starflower (*Lysimachia borealis*). There is low bryophyte coverage, and pin cushion moss (*Leucobryum glaucum*) is often the most abundant bryophyte. SH1 closed canopy creates decay-resistant snags and large coarse woody material, which provides habitat for a variety of bird and mammal species.

SH3 Red spruce-Hemlock/Wild lily-of-the-valley

- Succession: Late
- Typical Disturbance Type: Gap disturbances
- Ecological Features: Old growth forest that is closed canopy forming a matrix of large patch ecosystems

The SH3 VT occurs on fresh to fresh-moist, nutrient medium soils of glacial origin. It is a closed canopy forest that is dominated primarily by red spruce and eastern hemlock. The tree species found are shade tolerant and long-lived, developing into old growth features with only gap disturbances. The shrub layer is moderately developed and is primarily regenerating tree species including eastern hemlock, balsam fir, red spruce, and red maple. Hemlock components of SH3 are very rot resistant dead trees often take decades to decay. Advanced regeneration forms as small gap disturbances occur, creating dense understory patches, that can provide cover and nesting habitat for small bird species.

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.

SH5 Red spruce-Balsam fir/Schreber's moss-Stair-step moss

Variants: SH5b

SH5b – Balsam fir variant: This variant has abundant to dominant balsam fir (>26%) in the overstory.

- Succession: Mid
- Typical Disturbance Type: Windthrow or harvesting.
- Ecological Features: Occupies large areas forming matrix forests with many microhabitats. Mature stands can support multi-cohort structures and provide habitat complexity.

The SH5 VT occurs on fresh to moist, nutrient medium soils. The canopy is closed and is composed largely of balsam fir, while the shrub and herb layers are sparsely developed because of the heavy shade cast by the tree overstory. A needle carpet is common, as well as carpets of Schreber's moss. This VT provides habitat for wildlife including ruffed grouse (*Bonasa umbellus*) and black-backed woodpecker (*Picoides arcticus*).

3.4.2.6 Tolerant Hardwood

Tolerant hardwood (TH) vegetation types are typically comprised of mid to late successional shade-tolerant hardwoods on zonal Acadian Forest ecosites. Stands are dominated by sugar maple, yellow birch, and American beech. White ash (*Fraxinus americana*), ironwood (*Ostyra virginiana*), red maple (and in western Nova Scotia, red oak) are common associates. Spruce-fir understories are often common as well as an extensive shrub layer. The herbaceous layer is often dominated by ferns. Stand level disturbances are rare and most vegetation types maintain themselves through gap replacement. These vegetation types are typically large patches and matrix forests that have a high potential for old growth stands and numerous different microhabitats (e.g., vernal pools, seeps, abundant leaf litter).

TH1 Sugar Maple/Wood fern-Hay-scented fern

Variants: TH1a

TH1a – Yellow birch variant: This variant has yellow birch dominant in the overstory.

- Succession: Late
- Typical Disturbance Type: stand level disturbance is rare, gaps created by individual tree mortality, wind, or ice damage.
- Ecological Features: Due to the general longevity of this VT, it has high potential for old growth and provides habitat for many avian, amphibian and mammal species as well as microhabitats for bryophytes and fungi.

This VT is associated with dry to fresh-moist, nutrient medium to rich soils. The closed canopy is dominated by sugar maple, yellow birch, and beech. The shrub layer consists of regenerating tree species, while the herbaceous layer is diverse but dominated by hay-scented fern and evergreen wood fern. The bryophyte layer is poorly developed.

TH2 Sugar maple/New York fern-Northern beech fern

Variants: TH2a

TH2a – Yellow birch variant

- Succession: Late
- Typical Disturbance Type: stand level disturbance is rare, gaps created by individual tree mortality, wind, or ice damage.
- Ecological Features: Due to the general longevity of this VT, it has high potential for old growth. Vernal pools, seeps and spring are also common in this VT and provide habitat for amphibian and invertebrate species as well as increasing the habitat complexity.

This VT is associated with fresh-moist, nutrient medium to rich soils. The closed canopy is dominated by sugar maple and yellow birch. The shrub layer consists of regenerating tree species, while the herbaceous layer is diverse but dominated by ferns preferring moister soils such as lady, New York, oak and northern beech ferns. The bryophyte layer is poorly developed.

3.4.2.7 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.

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 found on nutrient poor wet soils that are primarily organic. The canopy is open with less than 30% tree cover and dominated by stunted black spruce. The herbaceous layer is well developed and dominated by ericaceous shrubs. Similarly the bryophyte layer is also well developed and dominated by sphagnum (*Sphagnum* spp.) moss species.

3.4.2.8 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 (*Fraxinus nigra*).

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.

3.4.2.9 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.

WM2 Red maple-Red spruce/Wood-sorrel-Sensitive fern

- Succession: Mid, Edaphic
- Typical Disturbance Type: Individual tree mortality, windthrow, timber harvest
- Ecological Features: Well-developed canopy with old growth characteristics

This VT occurs on moist to wet, nutrient medium environments that are poorly drained or organic deposits. The overstory includes yellow birch, eastern hemlock, and white ash. There is low to moderate canopy cover with a woody understory. The herbaceous layer is well developed and diverse and includes species characteristic of wet conditions. Forest patches typically are small and occur as transitional zones between wetlands and upland forests. These forests support old growth characteristics and a variety of wildlife.

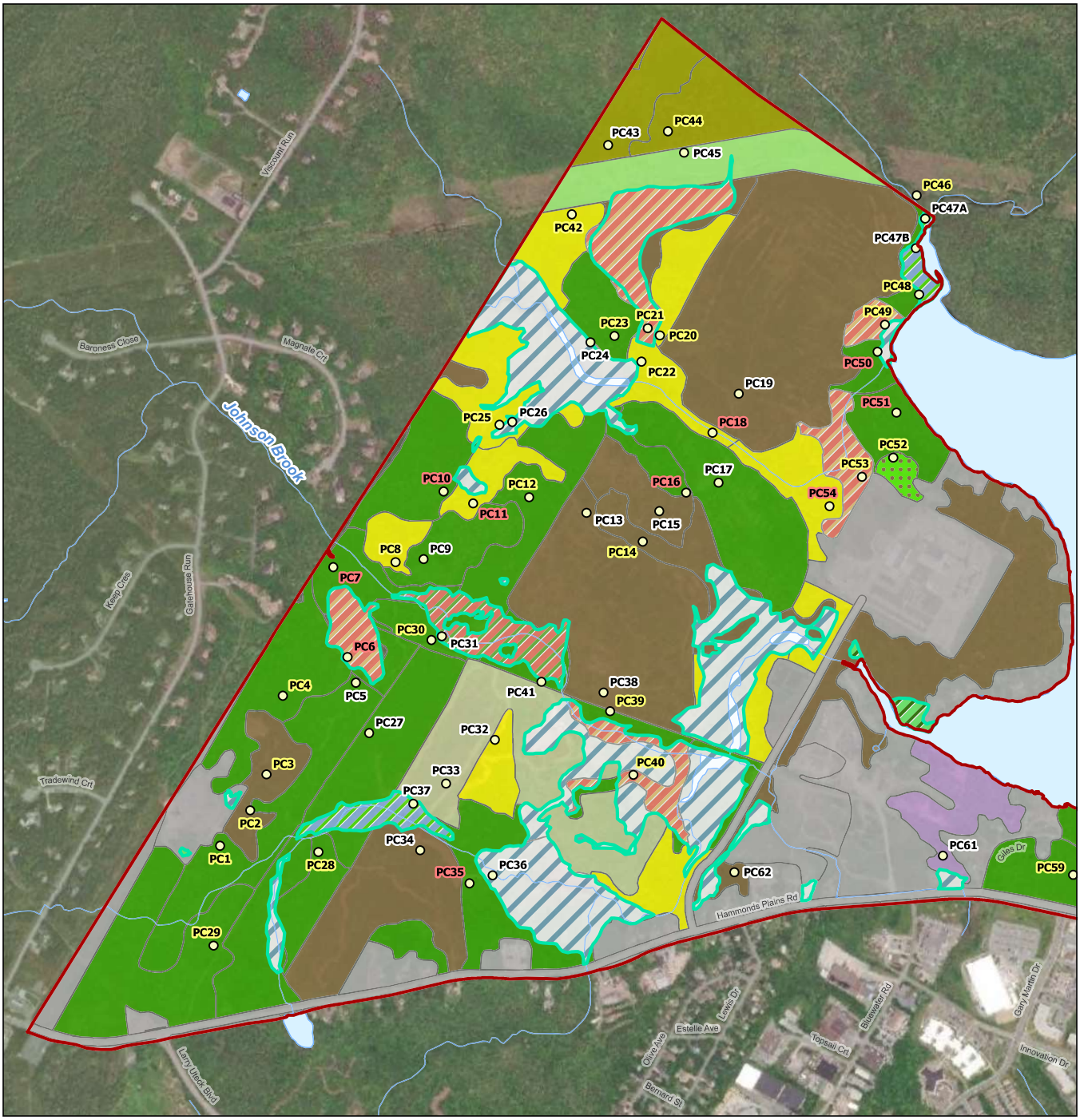
WM3 Red maple-Black spruce/Lambkill/Cinnamon fern/Sphagnum

- 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 VT's. 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.

3.4.2.10 Forested Wetlands

There are several wetlands within the SLSA, varying in size, type, and complexity. Many of these wetlands are complexes, containing more than one wetland community (i.e., 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 is also difficult to distinguish from digital data sources, therefore they were simply identified as 'wetland' in Figure 3.8.



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: ESRI; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Field Survey Location

Forest Group

- Intolerant Hardwood (IH)
- Tolerant Hardwood Forest (TH)
- Mixedwood (MW)
- Old Field (OF)
- Open Woodland (OW)
- Open Woodland / Spruce - Hemlock Forest (OW/SH)
- Deciduous Planted Forest (PF)
- Spruce - Hemlock Forest (SH)

Non-Forest Group

- Urban Other

Wetland

- Wet Mixedwood / Wet Confierous Forest (WM/WC)
- Wet Mixedwood Forest (WM)
- Wet Coniferous Forest (WC)
- Wet Deciduous Forest (WD)
- Wetland Other
- 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

0 200 400 Metres

(At original document size of 8.5x11)
1:15,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Revised by NWhite on 2024-10-02

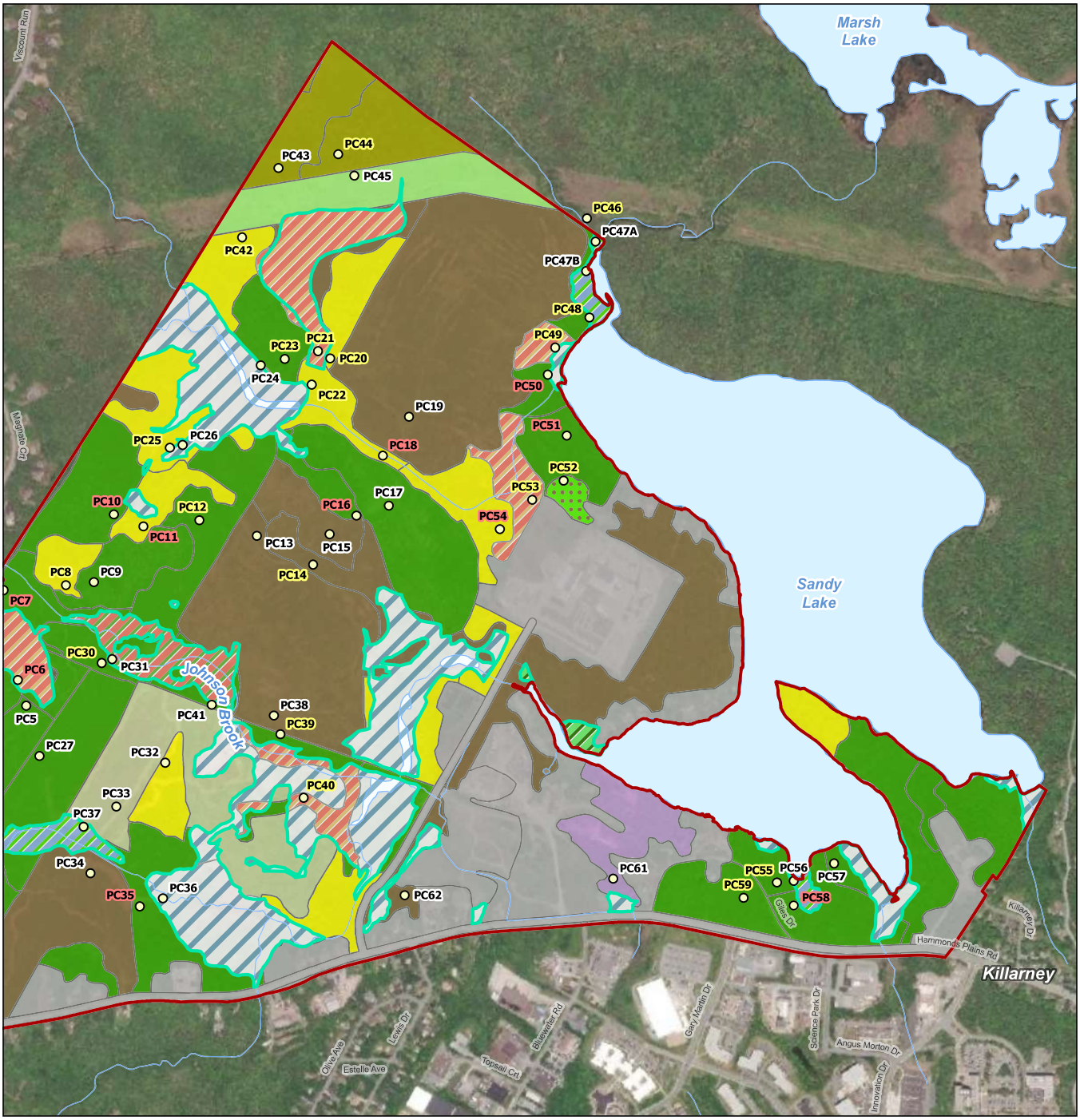
Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

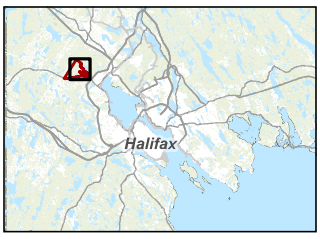
Fig ID: 160410459_021c

Figure No.
3.7a

Title
Forest Groups - SLSA

HRM FCM 2022.aprx Revised: 2024-10-02 By: niwhite





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: ESRI; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Field Survey Location

Forest Group

- Intolerant Hardwood (IH)
- Tolerant Hardwood Forest (TH)
- Mixedwood (MW)
- Old Field (OF)
- Open Woodland (OW)
- Open Woodland / Spruce - Hemlock Forest (OW/SH)
- Deciduous Planted Forest (PF)
- Spruce - Hemlock Forest (SH)

Non-Forest Group

- Urban Other

Wetland

- Wet Mixedwood / Wet Confierous Forest (WM/WC)
- Wet Mixedwood Forest (WM)
- Wet Coniferous Forest (WC)
- Wet Deciduous Forest (WD)
- Wetland Other
- 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

0 200 400 Metres

(At original document size of 8.5x11)
1:15,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Revised by NWhite on 2024-10-02

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_021c

Figure No.
3.7b

Title
Forest Groups - SLSA

HRM FCM 2022.aprx Revised: 2024-10-02 By: niwhite

3.4.3 SPECIES AT RISK

AC CDC records (AC CDC 2023) indicate that the SLSA and surrounding environment may support a variety of wildlife, including SAR and SOCC. These species can be adversely affected by development in a variety of ways. These include direct loss of habitat as well as indirect habitat loss caused by sensory disturbance which can prevent species from using existing suitable habitat. Fragmentation of habitat can prevent species from accessing suitable habitat patches or may result in the formation of isolated habitat patches that are too small to support species that require large home ranges. Development can also result in increased rates of mortality associated with collisions with automobiles and structures such as windows of buildings or guy wires, exposure to anthropogenic toxins, and predation by domestic pets and generalist predators such as crows, racoons, coyotes and foxes that are tolerant of the presence of humans.

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). Table 3.14 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 SLSA either during the field surveys or from existing records are presented on Figure 3.8. Some SAR are considered to be location sensitive since their populations may be placed at risk by illegal collection if their locations were publicly available. AC CDC does not provide location data for these species. For the purposes of this report, location sensitive species were presumed to have been recorded within 5 km of the SLSA in the same manner as SAR for which location data were available. Desktop data sources provide a preliminary baseline understanding; however collecting more than one season of field data would likely provide a more complete picture of SAR presence.

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 SLSA to confirm that suitable habitat was still present. If suitable habitat was still present, boreal felt lichen was considered to be potentially present. Predicted boreal felt lichen polygons are included on Figure 3.8.

Table 3.14 SAR and SOCC Within 5 km of the SLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4DC]
Birds					
Falco sparverius	American Kestrel				S3B,S4S5M
Riparia riparia	**Bank Swallow**	TH	TH	EN	S2B
Hirundo rustica	**Barn Swallow**	TH	SC	EN	S3B
Bucephala islandica	**Barrow's Goldeneye**	SC	SC		S1N,SUM
Setophaga castanea	Bay-breasted Warbler				S3S4B,S4S5M
Poecile hudsonicus	Boreal Chickadee				S3
Perisoreus canadensis	Canada Jay				S3
Cardellina canadensis	**Canada Warbler**	TH	SC	EN	S3B
Chaetura pelagica	**Chimney Swift**	TH	TH	EN	S2S3B,S1M
Bucephala clangula	Common Goldeneye				S2S3B, S5N, S5M
Chordeiles minor	**Common Nighthawk**	SC	SC	TH	S3B
Sterna hirundo	Common Tern		NAR		S3B
Accipiter cooperii	Cooper's Hawk		NAR		S1?B, SUN, SUM
Contopus virens	**Eastern Wood-Pewee**	SC	SC	VU	S3S4B
Coccothraustes vespertinus	**Evening Grosbeak**	SC	SC	VU	S3B, S3N, S3M
Passerella iliaca	Fox Sparrow				S3S4B, S5M
Mareca strepera	Gadwall				S2B, SUM
Charadrius vociferus	Killdeer				S3B
Accipiter gentilis	Northern Goshawk		NAR		S3S4
Mimus polyglottos	Northern Mockingbird				S1B
Anas acuta	Northern Pintail				S1B, SUM
Spatula clypeata	Northern Shoveler				S2B, SUM
Contopus cooperi	**Olive-sided Flycatcher**	SC	SC	TH	S3B
Spinus pinus	Pine Siskin				S3
Setophaga pinus	Pine Warbler				S2S3B, S4S5M
Loxia curvirostra	Red Crossbill				S3S4
Mergus serrator	Red-breasted Merganser				S3S4B, S5M, S5N
Euphagus carolinus	**Rusty Blackbird**	SC	SC	EN	S2B
Piranga olivacea	Scarlet Tanager				S2B, SUM
Actitis macularius	Spotted Sandpiper				S3S4B, S5M
Leiothlypis peregrina	Tennessee Warbler				S3S4B, S5M
Cathartes aura	Turkey Vulture				S2S3B, S4S5M
Gallinago delicata	Wilson's Snipe				S3B, S5M

Table 3.14 SAR and SOCC Within 5 km of the SLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4DC]
Cardellina pusilla	Wilson's Warbler				S3B, S5M
Mammals					
Myotis and Perimyotis	**Bats or Bat hibernaculum†**	EN	EN	EN	S1
Amphibians					
Hemidactylium scutatum	Four-toed Salamander		NAR		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					
Salmo salar pop.6	**Atlantic Salmon** NS southern upland population		EN		S1
Anguilla rostrata	**American Eel**		TH		S3N
Alsoa pseudoharengus	Alewife				S3B
Insects					
Myzia pullata	Streaked Lady Beetle				S3
Dicerca tuberculata	Swollen Jewel Beetle				S3
Bombus terricola	**Yellow-banded Bumble Bee**	SC	SC	VU	S3
Amblyscirtes hegon	Pepper and Salt Skipper				S3S4
Satyrium calanus	Banded Hairstreak				S3
Callophrys lanoraieensis	Bog Elfin				S3
Cupido comyntas	Eastern Tailed Blue				S3S4
Polygonia interrogationis	Question Mark				S3B
Nymphalis l-album	Compton Tortoiseshell				S2S3
Danaus plexippus	**Monarch**	EN	EN	EN	S2?B, S3M
Epitheca princeps	Prince Baskettail				S3
Nannothemis bella	Elfin Skimmer				S3S4
Lichens and Mosses					
Fuscopannaria sorediata	a Lichen				S2S3
Scytinium tenuissimum	Birdnest Jellyskin Lichen				S2S3
Leptogium corticola	Blistered Jellyskin Lichen				S3S4

Table 3.14 SAR and SOCC Within 5 km of the SLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4DC]
Pectenia plumbea	**Blue Felt Lich**en	SC	SC	VU	S3
Moelleropsis nebulosa	Blue-gray Moss Shingle Lichen				S2S3
Heterodermia neglecta	Fringe Lichen				S3S4
Stereocaulon intermedium	Pacific Brain Foam Lichen				S1S3
Cystocoleus ebeneus	Rockgossamer Lichen				S2
Racodium rupestre	Rockhair Lichen				S2S3
Coccocarpia palmicola	Salted Shell Lichen				S3S4
Anaptychia palmulata	Shaggy Fringed Lichen				S3S4
Peltigera collina	Tree Pelt Lichen				S3
Fuscopannaria leucosticta	**White-rimmed Shingle Lichen**		TH		S3
Usnocetraria oakesiana	Yellow Band Lichen				S2S3
Ditrichum rhynchostegium	a Moss				S2?
Vascular Plants					
Fagus grandifolia	American Beech				S3S4
Juglans cinerea	**Butternut**	EN	EN		SNA
Potentilla canadensis	Canada Cinquefoil				S2S3
Proserpinaca pectinata	Comb-leaved Mermaidweed				S3S4
Ranunculus sceleratus	Cursed Buttercup				S2
Dichanthelium clandestinum	Deer-tongue Panic Grass				S3S4
Mononeuria groenlandica	Greenland Stitchwort				S3
Vaccinium corymbosum	Highbush Blueberry				S3S4
Carex livida	Livid Sedge				S2
Amelanchier spicata	Running Serviceberry				S3S4
Polygonum oxyspermum	Sharp-fruit Knotweed				S2S3
Neottia bifolia	Southern Twayblade				S3
Carex swanii	Swan's Sedge				S3
Symphyotrichum undulatum	Wavy-leaved Aster				S3
Ulmus americana	White Elm				S3S4

Table 3.14 SAR and SOCC Within 5 km of the SLSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4DC]
Fragaria vesca	Woodland Strawberry				S3S4
Caltha palustris	Yellow Marsh Marigold				S2S3

Notes:
Bold 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 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.

Incidental observations of wildlife were recorded during wetland, vegetation, water, and archeology field programs. Stantec observed 58 species (45 birds, 7 mammals, 4 amphibians, 2 reptiles) including 2 SAR and 4 SOCC. American Beech was the only vascular plant SOCC observed during field surveys. The only SAR observed during field studies were the snapping turtle and common nighthawk. SAR and SOCC species observed in the field are identified in Table 3.15 and shown on Figure 3.8. A full list of species observed during field studies is available in Appendix C.

Table 3.15 Incidental Observations of SAR and SOCC

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Birds					
Chordeiles minor	**Common Nighthawk**	SC	SC	TH	S3B
Perisoreus canadensis	Canada Jay				S3
Spinus pinus	Pine Siskin				S3
Vegetation					
Fagus grandifolia	American Beech				S3S4
Reptiles					
Chelydra serpentina	**Snapping Turtle**	SC	SC	VU	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 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 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 at Risk (Incidental Observation)
- Species of Conservation Concern (Incidental Observation)
- Species at Risk and Species of Conservation Concern (ACCDC)
- Wood Turtle Observation (ECA, 2016)
- Transmission Line
- Pipeline
- Highway
- Road
- Resource / Seasonal Road
- Trail
- Waterway
- Waterbody
- Wetland (Stantec, 2023)
- Wetland (NSECC)
- Significant Habitat - Species at Risk
- Boreal Felt Lichen Predicted Habitat (NSECC, 2010)
- Study Area

0 250 500 Metres
(At original document size of 8.5x11)
1:21,000

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 - SLSA

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

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 (*).

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 2013a). The nest burrows are excavated in vertical or near vertical slopes (76- 105^{o} 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 26 records of bank swallow within approximately 5 km of the Study Area with the nearest record 2 km from the center of the Site (Figure 3.8). This consisted of six bank swallows that were observed near the Killarney area of Bedford on July 20, 2000. No bank swallows were observed during the field surveys. No natural potential nesting sites (lake bluffs and stream banks) were observed within the Study Area; however, stockpiles of earth are visible on aerial imagery of the Study Area on a property near the southern boundary of the Study Area. These stockpiles could potentially provide nesting sites for bank swallows if the material is friable enough for bank swallows to excavate, has steep embankments and is not disturbed during the nesting season.

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 rural settlements, and other structures (e.g., culverts; COSEWIC 2011b). Before European settlement, the barn swallow's 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 conducted in mid-July when this species would be present in Nova Scotia. There were five records of barn swallows reported by the AC CDC (2023) within 5 km of the Study Area. Four of the records are from the Bedford Maritime Breeding Bird Atlas (MBBA) square which is 100 km^2 in size. The center of the MBBA square is used as the location of all bird records within the MBBA square so it is not possible to determine whether the records are located near the Study Area. The fifth and most recent record (2019) and was recorded in Lucasville approximately 3.4 km from the Study Area. There are houses and other anthropogenic structures located in the eastern half of the Study Area that could provide suitable nesting habitat for Barn Swallows.

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, 2011). 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 are nine records of Barrow's goldeneye in the vicinity of Bedford presumably in Bedford Basin. The nearest record is 3.9 km away from the Study Area. The Study Area provides neither suitable breeding nor wintering habitat for this species. No Barrow's goldeneye were encountered during field survey.

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 2020) making it eligible for a status change under the federal SARA. Close to 80% of the Canada warbler population breeds in Canada (COSEWIC, 2020). Many key threats identified by COSEWIC (2020) 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 stands, eastern white cedar (*Thuja occidentalis*) stands, conifer swamps dominated by black spruce and tamarack, and riparian woodlands along rivers and lakes.

No Canada warblers were encountered during the field surveys. However, 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. There are two AC CDC records of Canada warbler within approximately 5 km of the Study Area. The closest record is from the Bedford MBBA in 1988. Given the large size of the MBBA square and the lack of georeferenced bird records from within the MBBA square, it is not possible to determine if the Canada warbler was recorded close to the Study Area. The second record is more recent (2019) but is 6.3 km from the Study Area.

There is suitable habitat for Canada warblers within the Study Area. Three 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.

Chimney Swift

Chimney swift is listed as Threatened under the federal SARA and Endangered under the NS ESA. The species has been assessed by COSEWIC twice, first in 2007, followed by a confirmatory report in 2018 (COSEWIC 2007b; 2018a). Chimney swift is a small areal insectivore which be 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 two records of chimney swift recorded within 5 km of the Study Area. Both are from the Bedford MBBA which amalgamates bird records from a 100 km^2 MBBA square. It is, therefore, impossible to determine with precision where these birds were observed. No chimney swifts were observed during the field surveys. No large masonry chimneys are present in the Study Area; however, there are mature forest stands in the Study Area that may be old enough to support large hollow trees.

Common Nighthawk*

Common nighthawk is listed as Special Concern under the federal SARA and as Threatened under the provincial 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 (2018b) 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.

Common nighthawks were observed at six locations in the Study Area during the field surveys (Figure 3.8). In all instances common nighthawks were observed foraging, calling, or displaying while in flight. Given the large areas over which common nighthawks forage and display, it was not possible to isolate areas where nests were present. Given the nesting habitat preferences of this species, it is possible to identify areas in the Study Area where nesting could potentially occur. These include disturbed areas associated with industrial facilities near the center of the Study Area, the small borrow pit in the southwest corner of the Study Area, burned areas in the center of the Study Area, a large open low shrub swamp near the northern end of the Study Area, and the transmission line RoW at the northern tip of the Study Area.

Eastern Wood-Pewee

Eastern wood-pewee is listed as Special Concern under the federal SARA and Vulnerable under the provincial 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 2022). 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 2012a).

The AC CDC data request (2023) indicates that there are six records of eastern wood-pewee within approximately 5 km of the Study Area. All but one of these records were collected within the 100 km^2 Bedford MBBA square so it is not possible to determine with any precision where these birds were observed. The sixth record is from Birch Cove 5.9 km from the Study Area. No eastern wood-pewees were recorded during the field surveys; however, the FEC forest stand mapping for the Study Area suggests that suitable nesting habitat may be present in the Study Area. This would include mature deciduous and mixedwood forest stands in the western and northern portions of the Study Area that border open habitats such as transmission lines and recently harvested forest stands.

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, white spruce or trembling aspen (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 (AC CDC 2023) indicated that there is one record of evening grosbeak within 5 km of the Study Area. An evening grosbeak was confirmed as nesting within the Bedford MBBA square in 1990. It is not possible to determine the precise location where it was observed. The Study Area contains old relatively open-canopied mixed forest that contain balsam fir as one of the dominant species. As such, there is some potential for evening grosbeak to nest in the Study Area. There are residences located within the Study Area and it is likely that some of these residences feed birds which may attract evening grosbeaks to the Study Area outside of the breeding season.

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 official federal SARA status was downgraded from Threatened to Special Concern in 2023. In Nova Scotia, olive-sided flycatchers are found in forested areas where scattered trees remain after clear-cutting or fire, as well as mature stands of black spruce 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 two olive-sided flycatchers have been recorded within approximately 5 km of the Study Area. The nearest bird was observed in the Bedford MBBA square in 1988. The second record is more recent (2019) and was reported from Hammonds Plains, 6.8 km from the Study Area. Habitat mapping for the Study Area indicates that suitable nesting habitat for olive-sided flycatcher may be present in a large low shrub dominated swamp at the northern end of the Study Area. This wetland contains a mixture of open wetland, scattered patches of black spruce, adjacent stands of black spruce, and areas of open water.

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 2017a). 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 are three records of rusty blackbird located within approximately 5 km of the Study Area. The nearest records are from the Bedford MBBA square in 1988. No precise location data are available for these records other than that they were recorded somewhere within the 100 km^2 square whose center is located 2 km from the Study Area. The third record is more recent (2008) and is from the English Corner MBBA square 5.7 km from the Study Area. The habitat mapping for the Study Area reveals that potential rusty blackbird nesting habitat may be present in a large low shrub dominated swamp located near the northern end of the Study Area. This wetland contains both shallow water areas and patches of low open coniferous cover.

Myotis and Perimyotis Bats

The AC CDC data request results indicate that bats may be present near the Study Area. Information regarding bat habitat (particularly bat hibernacula sites) are listed as area sensitive in the AC CDC data report; consequently, no information is available regarding the type of habitat present or which bat species are present. Three species of hibernating bat have been recently 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, 2013b). The populations of these three bat species have been severely reduced by white-nose syndrome, an introduced disease caused by a 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 reports.

Habitat for these three species consists of hibernacula for overwinter survival and summering areas with suitable foraging areas within commuting range to 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 Study Area. The nearest area known to provide bat hibernacula are near Centre Rawdon approximately 30 km to the north. No Myotis and Perimyotis Bats were encountered during field survey.

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 Study Area 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 in the eastern half of the Study Area could provide maternity colony sites for little brown myotis and possibly tri-colored bat. Suitable foraging habitat would be present throughout most of the Study Area.

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 throughout Nova Scotia, New Brunswick, Quebec, Ontario, and in parts of Saskatchewan (COSEWIC 2008). 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 several records of snapping turtles in or near the Study Area. On July 18, 2023, a juvenile snapping turtle was observed crossing a dirt road near the western edge of the Study Area (Figure 3.8). This is an unusual location for a snapping turtle to be found since it was not located near any permanent water bodies other than a small wetland found in the ditch of the road. There are two AC CDC records of snapping turtles from Sandy Lake (Figure 3.8). There are 27 other snapping turtle records within 5 km of the Study Area. Snapping turtles are known to be present in Sandy Lake and can also be expected to be present along any of the streams that flow in or out of Sandy Lake. The best foraging and hibernation habitat for snapping turtles would be found in Sandy Lake as well as in ponds, still waters, and slow flowing streams located in the Study Area. Faster flowing hard-bottomed streams could provide travel corridors for mating snapping turtles and for females travelling to nesting sites. Sandy and gravelly areas located adjacent to the foraging and travel routes could provide potential nesting sites.

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 two AC CDC records of this species from within approximately 5 km of the Study Area. Suitable habitat is present for eastern painted turtles within the Study Area. These areas include Sandy Lake (particularly shallow weedy coves), ponds, sluggish streams, and wastewater treatment lagoons.

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.

A population of wood turtles is present on the Sackville River (East Coast Aquatics 2016). A two-year monitoring study of this population demonstrated a high degree of site fidelity with none of the 11 marked wood turtles leaving the Sackville River. However, incidental observations compiled by East Coast Aquatics (2016) indicated that wood turtles have been observed away from the Sackville River. A wood turtle was observed and photographed in the Kingswood subdivision which is located just outside of the western boundary of the Study Area (Figure 3.8). It is likely that this wood turtle used Johnson Brook as a travel route to get to the Kingswood Subdivision. Johnson Brook flows through the Study Area into Sandy Lake which drains into the Sackville River via Peverill Brook and Drain Lake. The Study Area does not contain good wood turtle nesting or hibernation habitats, but wood turtles may occasionally forage along the banks of the streams that feed into Sandy Lake.

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 2010). 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.

Aquatic species surveys were outside the scope of this work and there were no incidental observations of American eels while conducting other field-based work. There are four AC CDC records of American eel within approximately 5 km of the SLSA with the nearest observations in Lower Sackville, 2.8 km north of the center of the SLSA. American eels could be expected to be present in the SLSA at several locations including Sandy Lake and the streams that flow through the SLSA into Sandy Lake.

Atlantic Salmon

The Atlantic salmon is listed as Endangered by COSEWIC but is not listed under either the federal SARA or the NS ESA. The Atlantic salmon is an anadromous fish which spawns in freshwater and matures in salt water. During the freshwater phase of their lives, Atlantic salmon are generally found in clear, cool, and well oxygenated rivers and streams with low to moderate gradients and having substrates composed of gravel, cobble and boulder (COSEWIC 2012b). There is a small population of Atlantic salmon present in the Sackville River. Records indicate that some of these fish enter Peverills Brook which flows out of Sandy Lake. Spawning habitat along Peverills Brook have been enhanced in recent years. Historically, Atlantic salmon have been reported in Sandy Lake and in at least one of the streams that flows into Sandy Lake (Figure 3.8). There are four recent records of Atlantic salmon from within 5 km of the SLSA. The nearest record is from the Sackville River, 4.5 km north of the SLSA. Historical records suggest that Atlantic salmon could potentially be present in Sandy Lake and in the northern most stream in the SLSA. Presence of Atlantic Salmon fry have been recently documented in June 2024 (McKendry, 2024).

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 2022a).

There are two records of yellow-banded bumble bee within approximately 5 km of the Study Area with the nearest record 3.6 km away. 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 Study Area.

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. 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 35 times within approximately 5 km of the Study Area. The nearest record is 2.7 km from the Study Area. The two records closest to the Study Area were of larval monarchs indicating that suitable host plants were present. Neither common milkweed nor swamp milkweed was noted in the Study Area 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 Study Area with the greatest potential to provide breeding habitat for monarchs would be relatively rich swamps and shorelines where swamp milkweed may be present. Patches of common milkweed could potentially be present on roadsides. Residential areas 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. Suitable feeding areas for adult monarchs in the SLSA would include the margins of trails and disturbed areas where preferred food plants such as asters and goldenrod produce abundant flowers. The SLSA could provide habitat for both larval and adult monarchs.

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 in Nova Scotia 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.

Three wetlands in the SLSA overlap with predicted habitat polygons (Figure 3.8). Although predictive mapping indicates the presence of habitat conditions that may be suitable for boreal felt lichen, it is Stantec's professional opinion that it is not likely to be present in the SLSA. Two of the polygons are small (less than 1 ha in area) and occur adjacent to Farmers Dairy Lane and Hammonds Plains Road near Larry Uteck Boulevard. The Hammonds Plain Road wetland includes disturbed mixedwood along a riparian zone, with limited cover of balsam fir. The Farmers Dairy Lane polygon was casually observed by wetland surveyors to be disturbed and combined with proximity to commercial development unlikely to support boreal felt lichen. The third, larger polygon is associated with a wetland stream buffer in the northwest of SLSA. Coniferous cover in the larger polygon has been almost entirely cut-over and remaining habitat consists of open riparian wetland or discontinuous swamp dominated primarily by hardwood species. The nearest known location of a boreal felt lichen indicator species is an occurrence of salted shell lichen (*Coccocarpia palmicola*) 4 km to the northwest within intact habitat near Webber Lake. There is not comparable habitat within the SLSA.

Blue Felt Lichen

The blue felt lichen is a cyanolichen that is listed as Special Concern under the federal SARA and Vulnerable under the NS ESA. Blue felt lichen requires cool, moist growing conditions with cool summers and moderate winters (ECCC 2022b). It is typically found within 30 km of the ocean which fosters these conditions. Blue felt lichen is typically found in cool, moist microsites such as valleys, gullies, wetlands, and near water bodies such as lakes and streams. This species is epiphytic and is typically found on mature deciduous trees with rough bark, particularly red maple and yellow birch. In Nova Scotia, blue felt lichen is frequently found in mature deciduous or mixedwood forested wetlands. Blue felt lichen is sensitive to air pollution, particularly sulphur dioxide and nitrogen oxides.

There are two records of blue felt lichen within approximately 5 km of the SLSA. One record is from Webber Lake 4.9 km northwest of the Study Area. The second record is 6.7 km to the west of the Study Area in Hammonds Plains. No directed searches were made for blue felt lichen during the field surveys. The SLSA contains a number of mature deciduous and mixedwood forested wetlands that could provide suitable habitat for blue felt lichens. These are scattered throughout the western half of the Study Area.

White-rimmed Shingle Lichen

The white-rimmed shingle lichen is listed as Threatened by COSEWIC but is not listed under either the federal SARA or the NS ESA. This species is an arboreal cyanolichen that grows in cool moist habitats. In Nova Scotia it is typically found in forested wetlands where red maple is present in the canopy. Understory species that white-rimmed shingle lichen is associated with include cinnamon fern (*Osmundastrum cinnamomeum*), royal fern (*Osmunda regalis*), winterberry (*Ilex verticillata*), mountain holly, and sphagnum moss (COSEWIC 2019). White-rimmed shingle lichen grows on medium to large red maple that are leaning.

There is one record of white-rimmed shingle lichen within 5 km of the SLSA which is 4.8 km south of the SLSA near Kearney Lake. No directed surveys were made for white-rimmed shingle lichen during the field surveys. There are forested wetlands at the SLSA Site that may provide suitable habitat for white-rimmed shingle lichen. These are scattered throughout the western half of the Study Area.

Black Ash

Black ash is listed as Threatened under the NSESA; however, it is not listed under the SARA. This species is associated with forested swamps and fens. The black ash is capable of growing to 20 m in height; however, mature black ash are rarely seen in Nova Scotia. This species is typically found in poorly drained areas that are often seasonally flooded (Hurlburt 2011). It is most common on peat and muck soils but also grows on fine sands over sands and loams. Black ash can tolerate still semi-stagnant conditions; however, it prefers to grow along swampy woodland streams and riverbanks with moving water. It is usually associated with species such as red maple, speckled alder, balsam poplar (*Populus balsamifera*), and black spruce. This species is widely distributed but rare in Nova Scotia. Local populations are small usually consisting of only a few individuals. Black ash is intolerant of shade and seed production is typically restricted to open areas in the forest canopy. It is considered a culturally important species.

Black ash is considered a location sensitive species in Nova Scotia, and thus location data for individual sightings of black ash are not provided in the AC CDC data report. No black ash were encountered during the field surveys. The habitat mapping for the Study Area suggests that suitable habitat for this species may be present at several locations in the Study Area. These include a relatively large seasonally flooded deciduous treed swamp near the outflow of Sandy Lake, a relatively rich tall shrub swamp near the southern edge of the Study Area and the flood plain of Johnson Brook.

Butternut

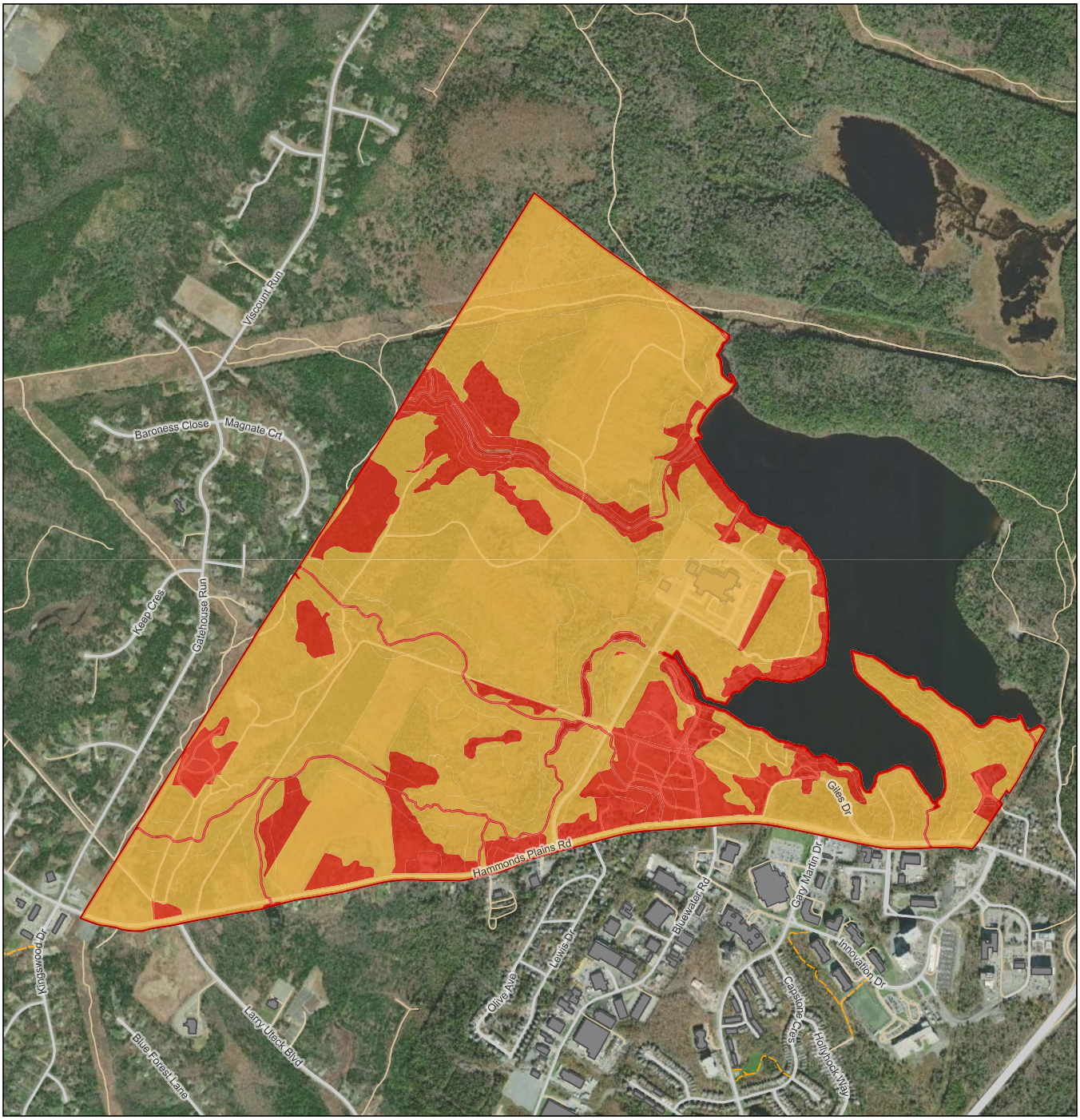
The butternut (*Juglans cinerea*) is medium to large tree in the walnut family that is listed as Endangered under the federal SARA but is not listed under the NS ESA. It typically grows on pH neutral to alkaline soils and grows best in deep well drained soils on floodplains, streambanks, terraces, and on ravine slopes (COSEWIC 2017b). It is generally absent from acidic soils. Butternuts are not native to Nova Scotia but are occasionally grown as ornamental trees.

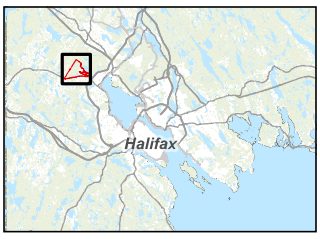
There is one record of butternut within approximately 5 km of the SLSA. This record is located 4.2 km south of the Study Area on Colins Road near Kearney Lake golf course. This record would be a planted ornamental tree. There are a number of residences present in the SLSA so there is some potential for butternut to be present there as an ornamental tree.

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 SLSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present at the SLSA. Instead, SAR that are or could potentially be present in the SLSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the SLSA. The habitat preferences of these species were compared to the results of the upland, wetland and aquatic surveys conducted on the SLSA 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 SLSA, those species were considered potentially present. The habitat mapping was then used to map the potential distribution of various SAR on the site.

The distribution of each SAR that could potentially be present in the SLSA 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 support. Habitat areas that support multiple species of SAR were given the lowest priority for development, while habitat areas that do not support any SAR species 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 incorporates the potential suitable habitat for all SAR that may be present in the SLSA (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

Other Features

- Highway
- Road
- Resource / Seasonal Road
- Trail
- Buildings

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2023-03-21

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- Sandy Lake

HRM FCM 2022.aprx Revised: 2024-03-22 By: schubbs

Several patterns are visible in the SAR distribution mapping (Figure 3.9). There are no areas in the SLSA where no SAR could potentially be present. This was attributable to the potential presence of yellow-banded bumblebee which has an extremely broad niche. This species can potentially be found in all terrestrial habitat types in the SLSA.

Areas in the SLSA potentially capable of supporting multiple SAR are typically associated with four habitat features including watercourses, wetlands, mature forests, and anthropogenic habitats. Watercourses provide habitat and travel routes for a variety of SAR that have been recorded in the vicinity of the SLSA including Atlantic salmon, American eel, common snapping turtle, eastern painted turtle, and wood turtle. SAR associated with wetlands include Canada warbler, olive-sided flycatcher, rusty blackbird, yellow-banded bumblebee, and black ash. SAR that are associated with mature forests include chimney swift, eastern wood pewee, evening grosbeak, little brown myotis, northern myotis, tri-colored bat, and yellow-banded bumblebee.

Many of the areas where SAR are potentially concentrated are linked by watercourses. 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 water courses 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 in the SLSA have 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 17 SAR that have been identified as potentially present in the SLSA are known to make use of anthropogenic habitat for at least part of their life history. These include barn swallow, chimney swift, common nighthawk, evening grosbeak, little brown myotis, common snapping turtle, yellow-banded bumblebee, 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 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 3.16. 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 3.16 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 vegetation compared to the mature stands which have progressed towards the climax community seen in old growth forests. Many VTs identified within the study area are immature, successional dynamics suggest that many could support the development of old growth characteristics given enough time. For this analysis forested stands above 80 years of age are considered to have the potential to be old growth forest. The distribution of mature and potential old growth forest stands in the SLSA is presented in Figure 3.7a and Figure 3.7b.

The amount of mature and potential old growth forest in the SLSA is lower than previously estimated (MEL 2022) largely because the previous estimates were based on existing forest inventory data which is not always current. MEL noted this limitation and recommended that ground truthing be incorporated into subsequent investigations which in turn has been incorporated into this investigation.

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 (Natural Resources and Renewables, 2022, 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.

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 priority for development as they generally do not support key habitat and are not close to progression to later more structurally complex successional stages. 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 previously mentioned, they will not reach a climax stage but can provide distinct habitat types. While 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.

Upon final community design additional consideration for forested wetland VTs should be considered to consider these VTs as effective carbon sinks and wildfire breaks, in addition to attenuating stormwater flow.

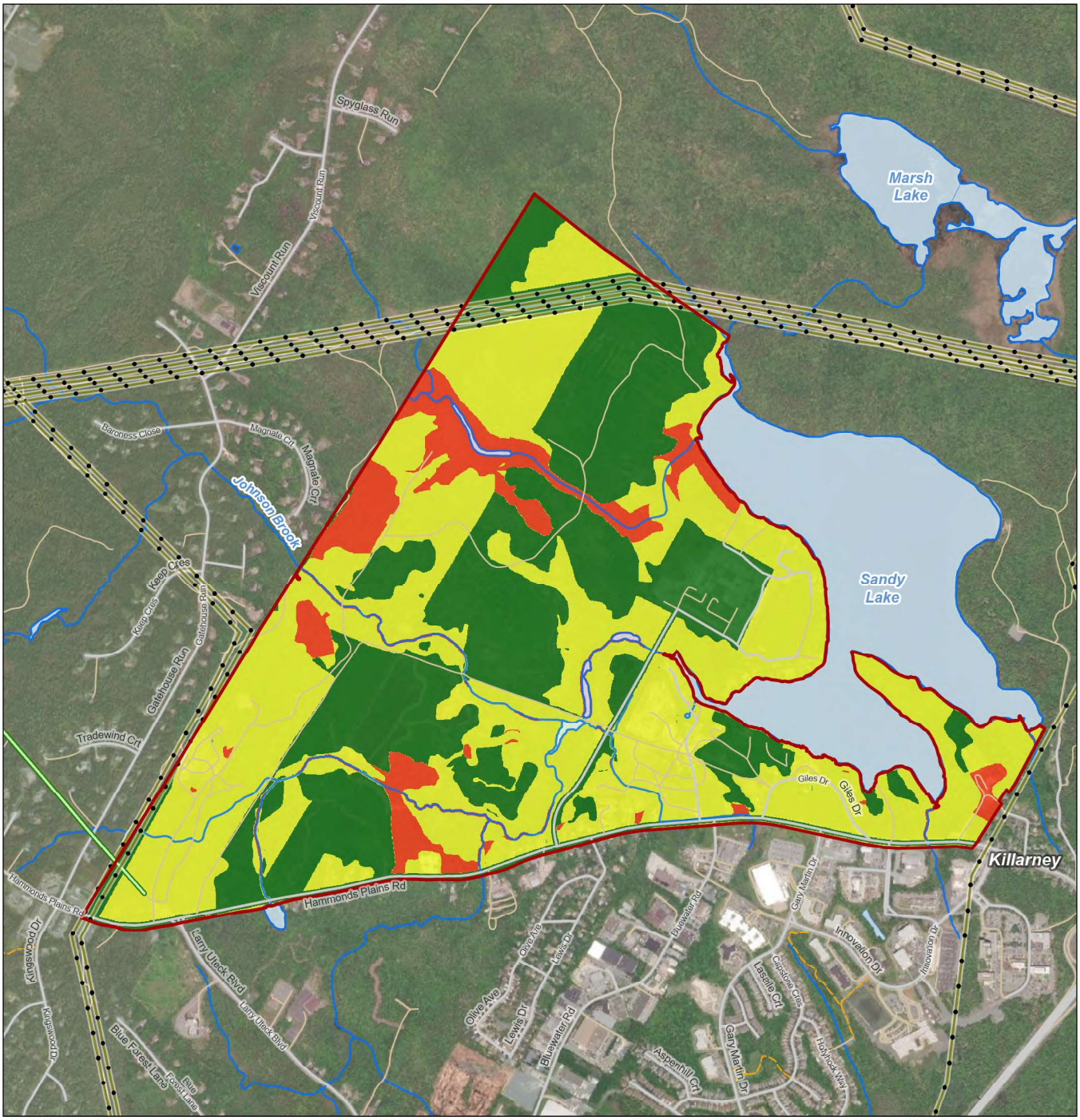
There is an old growth policy applicable to crown lands in Nova Scotia and it provides accepted survey methods for confirming old growth forests within the province. Stantec recommends HRM consider these surveys in the event the municipality wishes to develop a provincially acceptable inventory of old growth forests within the municipality. Although applicable to crown land only, the policy also encourages projects on private lands to survey for old growth forests (Natural Resources and Renewables, 2022).

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 SLSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present at the SLSA. Instead, SAR that are or could potentially be present in the SLSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the SLSA. The habitat preferences of these species were compared to the results of the upland, wetland and aquatic surveys conducted on the SLSA along with available habitat mapping. Where matches were found between SAR habitat preferences and the habitats that had been mapped in the SLSA, 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 considered and evaluated as part of the landscape connectivity exercises.

SAR identified in the AC CDC (2023) report that have suitable habitat within the SLSA 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., 3 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 3.9 incorporates the potential suitable habitat for all SAR that may be present in the SLSA.

It is important to note that 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 SLSA. 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

- Transmission Line
- Pipeline

Transportation

- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

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 - SLSA

\\ca0213-ppfss01\work_group\1214active\160410459\gis_data\mapping\ArcGIS Pro\HRM_FCM_2024_Synthesis.aprx: HRM_FCM_033_Forest_SAR_LSARevised: 2024-05-26 By: niwhite

3.5 Landscape Connectivity

The land suitability mapping derived from the integration of the forest maturity / succession, and SAR mapping exercises, wetland and watercourse mapping were used in conjunction with existing studies of landscape connectivity in HRM to identify potential wildlife corridors within the SLSA. 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 passes through the SLSA that connects an undeveloped area along the Sackville River to an Essential Corridor near Upper Tantallon (HRM 2018). The HGNP identifies one Important Corridor that extends north/south across the western half of the SLSA. The HGNP recommends that Important Corridors be at least 100 m wide to facilitate movement of wildlife.

The Nova Scotia Crown Share Land Legacy Trust (NSCSLLT) has also assessed the SLSA regarding landscape connectivity (2021). NSCSLLT also recognised that the SLSA could provide an important north/south wildlife corridor linking the Sackville River to the Blue Mountain Birch Cove Lakes Wilderness along the same route as the HGNP Important Corridor. There is a pinch point along this corridor near the intersection of the Hammonds Plains Road and Larry Uteck Boulevard. Given the presence of the pinch point, NSCSLLT recommended that a wildlife corridor should run north/south along the western boundary of the SLSA.

The presence of a potential north/south corridor connecting Sandy Lake Park to the Blue Mountain Birch Cove Lakes Wilderness Area was also recognized in the Sandy Lake Ecological Features Assessment (MEL 2022).

An analysis of the distribution of sensitive ecological features in the SLSA such as species at risk, potential old growth forests, wetlands and watercourses has been undertaken to identify which areas of the SLSA are of the greatest ecological importance. Many of the species at risk and species of conservation concern recorded during the field surveys were found along the western margin of the SLSA. The SAR habitat modelling indicates that the western margin of the SLSA has high potential to provide species at risk habitat. The western margin of the SLSA also supports a large proportion of the potential old growth forest. The western margin of the SLSA typically has the lowest land suitability rankings.

Watercourses and wetlands are important ecological features that are partially protected 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.

Considering the distribution of ecologically sensitive habitats in the SLSA and the wildlife corridor recommendations from HRM (2018) and NSCSLLT (2021) a wildlife corridor system has been developed that balances the need to protect sensitive ecological features and to provide a wildlife corridor. The proposed landscape connectivity options are presented on Figure 3.11. The corridor consists of a band of mostly mature forest with high potential as species at risk habitat that runs north/south along the western margin of the SLSA. Many of the potential old growth forest stands in the SLSA are found in this area. This north/south corridor would accommodate the wildlife corridor recommendation from both HRM (2018) and NSCSLLT (2021).

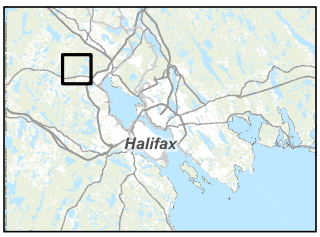
The three largest streams that flow into Sandy Lake from west to east will be buffered 30 m to protect the watercourses and riparian habitats associated with them (see Section 3.3). Most of the wetlands present in the SLSA are found along these streams. HRM regulations require that wetlands situated along watercourses be buffered by 30 m. Although there are no provincial regulations that require wetland margins to be buffered, the Province of Nova Scotia does recommend that, where feasible, wetlands should be buffered in the same manner as watercourses (Government of NS 2011). The margins of wetlands in the SLSA will 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. These buffered watercourses and wetlands will provide east/west wildlife corridors which would aid in the movement of both aquatic and upland organisms. In areas where the combined buffering of water courses and/or wetlands along these east/west corridors is insufficient to provide a 100 m wide corridor, additional buffering has been applied to make the corridor 100 m wide. East/west movement of wildlife between Sandy Lake and the two streams in the southwest corner of the SLSA that flow into it may be impeded by the culvert and steep embankments at the location where Farmers Dairy Lane crosses Johnson Brook (Figure 3.11).

To better facilitate the movement of wildlife north/south along the western shore of Sandy Lake to the buffered watercourses, it is recommended that the mature forest stands located along the western shore of the lake be incorporated into a second north/south corridor that would extend south from the outflow of Sandy Lake to the intersection of Hammonds Plains Road and Farmers Dairy Lane. This would connect several potential old growth forests including the oldest forest stand in the SLSA.

Area potentially best suitable for development occurs as four patches, three of which are surrounded by recommended wildlife corridors. It would be necessary to cross the corridors with roads and utilities to develop these areas. It is recommended that road and utility crossings occur mainly across the streams and associated wetlands running east/west and utilize bridges where feasible. This would have two benefits: it would retain the integrity of the main north/south wildlife corridor and would facilitate the use of bridges to cross the secondary wildlife corridors. Bridges allow for the maintenance of plant communities at the crossing site which provides some habitat continuity and reduces sensory disturbance that might deter wildlife from crossing at these locations. Bridges also permit wildlife to cross under the road reducing the potential for collisions between vehicles and wildlife. To enhance public safety and maintain ecological connectivity, the number of locations where roads or utilities intersect wildlife corridors should be kept as low as possible to reduce traffic and wildlife interactions.

The existing transmission line corridor present at the northern end of the SLSA may act as a barrier to wildlife movement although its effect on wildlife movement would be minor in comparison to the Hammonds Plains Road. The transmission line currently supports immature forest cover which would provide sufficient security cover for most wildlife species that would frequent the area. Periodically, this cover is harvested to prevent trees from growing into the electrical conductors. At these times, security cover for wildlife attempting to cross the transmission line would be low. Staggering the timing of brush cutting on the portion of the transmission line inside the wildlife corridors could be used to ensure that patches of security cover are available for wildlife at all times.

The recommended wildlife corridors will provide several benefits. They will help to maintain movement of wildlife between the proposed Sandy Lake Park to the north and the Blue Mountain - Birch Cove Lakes Wilderness Area to the south. They will protect much of the sensitive habitat (watercourses, wetlands SAR habitat, mature forest) present in the SLSA. Preservation of these features provides aesthetic benefits and recreational opportunities such as hiking which would benefit adjacent communities. Conservation easements would provide a means to protect the required lands and reap the environmental and social benefits that they can provide. To be effective, the wildlife corridors established within the SLSA must be integrated with similar wildlife corridors in adjacent areas.



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. GIS Note: Only labels for public parks larger than 1 hectare are active in figure. Aquatic corridor digitized from Nova Scotia Crown Share Land Legacy Trust (NSCSLLT) Wildlife Corridor Charrette Halifax Summary Report (2021).
3. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services, NSCSLLT
4. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Study Area
- Proposed Corridor (Stantec 2024)
- Potential Corridor Barrier
- Halifax Green Network Plan Important Corridor
- Halifax Regional Municipality Parks

Other Features

- Highway
- Road
- Resource / Seasonal Road
- Trail
- Buildings

0 250 500 Metres
(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2023-04-09

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_025

Figure No.
3.11

Title
Proposed Landscape Connectivity Options for Sandy Lake Study Area

HRM FCM 2022.aprx Revised: 2024-04-09 By: schubbs

3.6 Surficial and Bedrock Geology

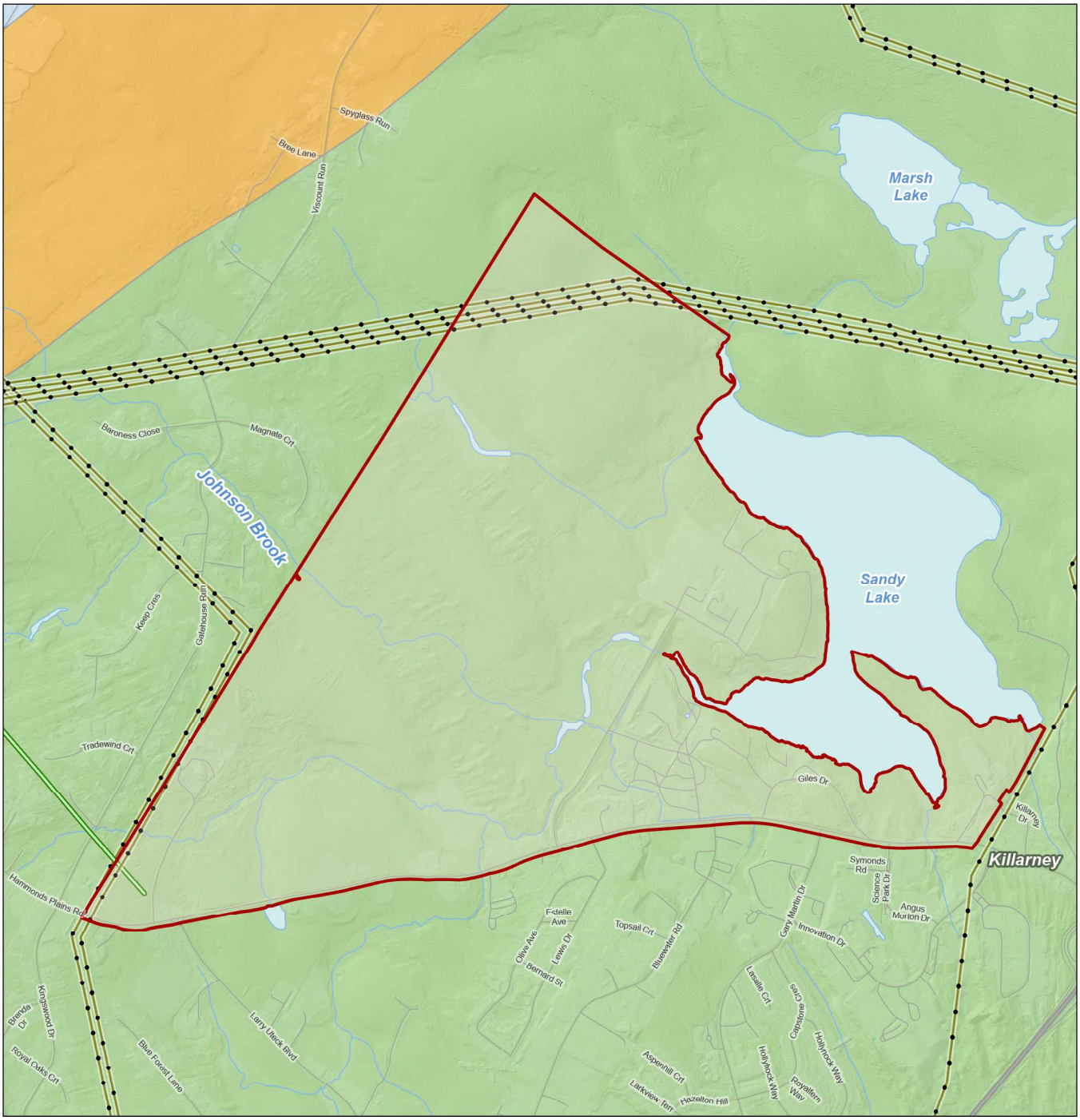
A desktop assessment was conducted using provincial bedrock and surficial geology mapping and GIS layers to delineate and inventory the acid generating potential of bedrock and the amount of overburden that may be covering the bedrock (i.e., surficial geology). An inventory of acid rock potential was developed for the SLSA 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) and is also noted through wet area mapping noted in Figure 3.4.

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 SLSA is underlain by the Cambrian to Early Ordovician age metamorphosed sedimentary bedrock of the Goldenville Group (White et. al. 2014; Figure 3.12). In this area, 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 SLSA is wholly underlain by the Taylors Head Formation, but the geological contact between the Taylors Head and Beaverbank Formations lies within approximately 250 m of the northern tip of the development area. Based on the resolution of mapping, it is possible that the potentially acid producing Beaverbank Formation will be encountered along the north margin of the SLSA.



Study Area

Halifax Group
- Cunard Formation

Goldenville Group
- Beaverbank Formation
- Taylors Head Formation

Utilities
- Transmission Line
- Pipeline

Other Features
- Highway
- Road
- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

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 2024-05-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure ID: 003

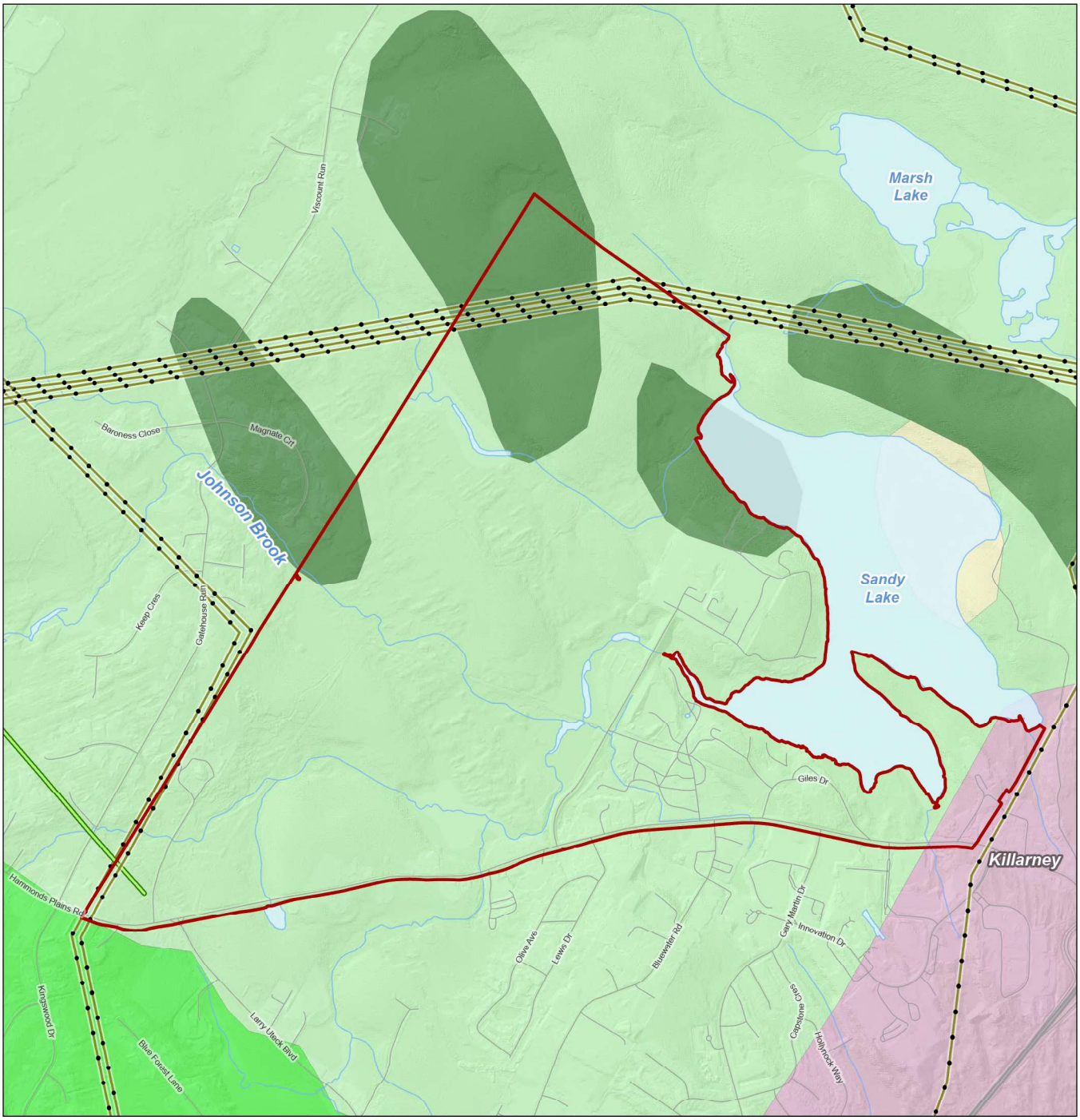
Figure No.
3.12

Title
Bedrock Geology - SLSA

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)

Surficial geology in the vicinity of the SLSA consists primarily of stony till plains and silty drumlins ranging from approximately 2 m to 20 m thick. Overburden thins near the southeastern boundary of the development area, where exposed bedrock, or bedrock concealed by veneers of soil and vegetation, is expected. These areas of exposed bedrock correspond to the non-acid producing Taylors Head Formation discussed in the previous section.



Study Area

Surficial Geologic Units

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

Utilities

- Transmission Line
- Pipeline

Other Features

- Highway
- Road
- Waterway
- Waterway

0 250 500 Metres

(At original document size of 8.5x11)
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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 2024-05-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure ID: 002

Figure No.
3.13

Title
Surficial Geology - SLSA

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3.6.3 DEPTH TO WATER TABLE

Depth to water table in the SLSA 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, if the water level is 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 SLSA are shown in Table 3.17.

Table 3.17 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)
Sandy Lake	17	1.52	12.18	5.95	4.57

Notes:
1 – Includes wells with static water level data within the SLSA boundary and any well within a 100 m radius of the SLSA 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 6 m of ground surface). Shallow groundwater table is also inferred from nearby surface water bodies and wetlands in the vicinity of the development area.

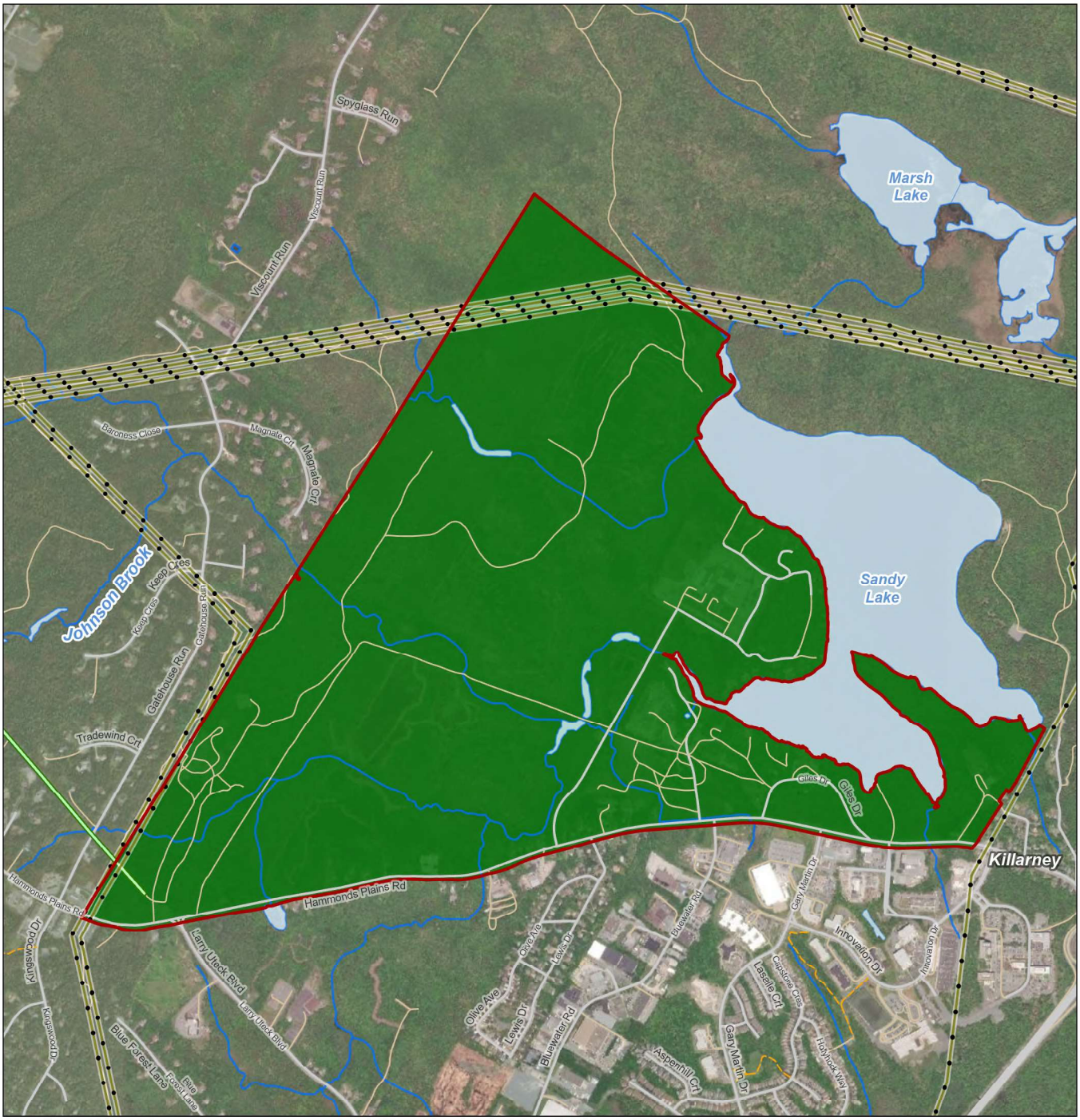
3.6.4 LAND SUITABILITY ANALYSIS – GEOLOGY

For the geology component of the land suitability analysis, bedrock was classified based on its acid producing potential (Table 3.18; 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. Surficial geology and the depth to groundwater have been excluded from this analysis due to the lack of Potentially Acid-Producing bedrock in the SLSA.

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 3.18 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 (N/A)	Beaverbank Formation	Taylors Head Formation



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 Analysis

- 3 (I ligh)
- 2
- 1 (Low)

Transportation

- Highway
- Road
- Resource / Seasonal Road
- Trail

Utilities

- Transmission Line
- Pipeline

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

N

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 - SLSA

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

3.7 Topography

Stantec processed LiDAR data provided by HRM to classify slopes within the SLSA. 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

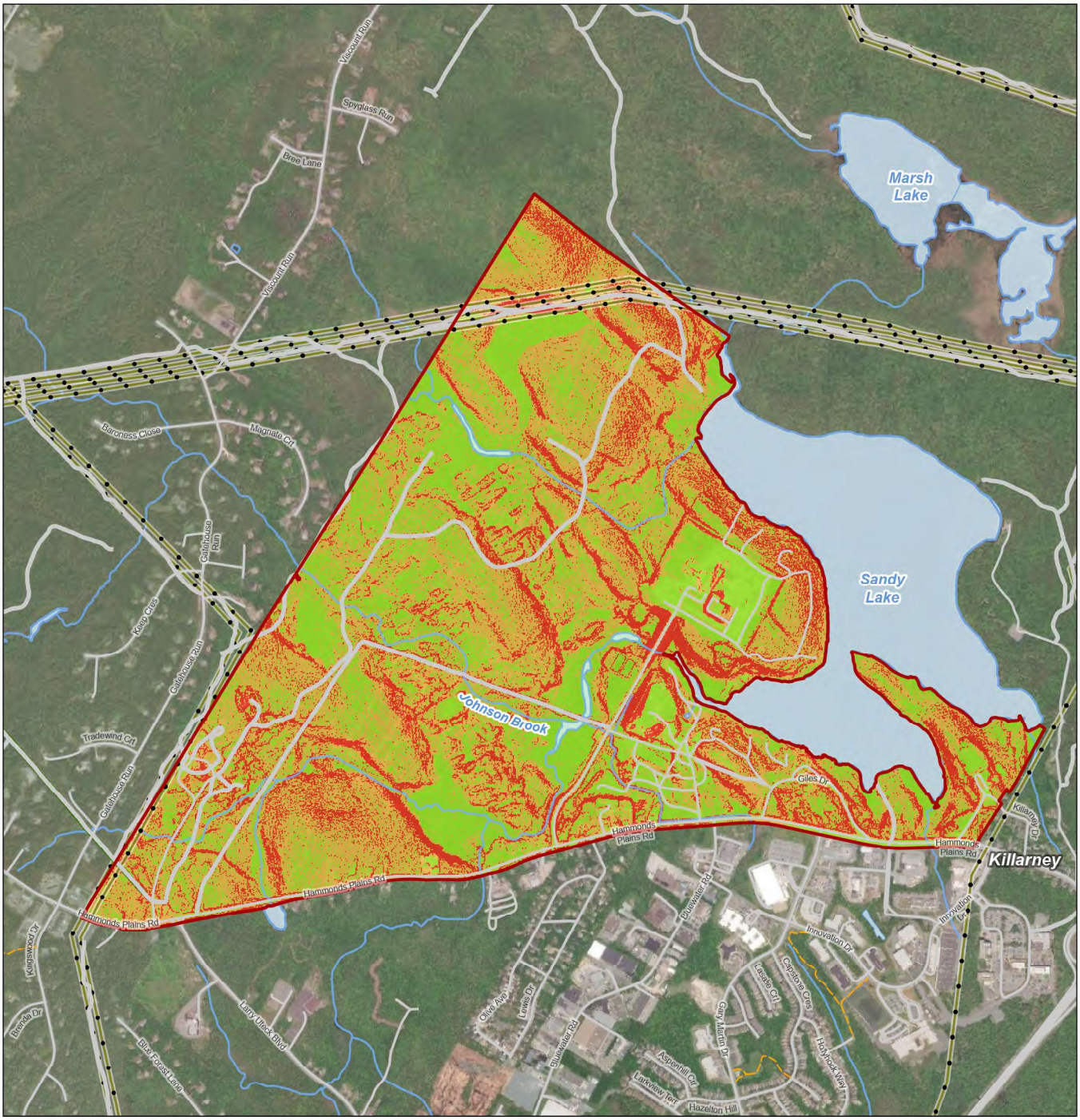
Steep slopes can be associated with environmental features such as rock outcrops, shallow soils, and groundwater springs. These features can have various impacts on development planning including surface water flow, water quality, erosion, and sediment patterns. These factors also influence microclimate 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 development while the relatively flatter topography is ranked higher for development (Table 3.19). 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 3.19 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%



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

Slope Analysis (Percent Rise)

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

Transportation

- Trail
- Highway
- Other Road

Utilities

- Transmission Line
- Pipeline

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

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 - Sandy Lake

HRM FCM 2022.aprx Revised: 2024-05-29 By: niwhite

3.8 Contaminated Sites

Stantec conducted a contaminated sites review of the SLSA. 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 Study Area includes a variety of users including industrial sites along Farmer Dairy Lane (745 Hammonds Plains Road), residential properties along Hammonds Plains Road and on the western perimeter of Sandy Lake, HRM owned undeveloped lands, utility corridors, commercial proprieties along Hammonds Plains Road, and Sandy Lake Academy on Killarney Drive (off Hammonds Plains Road).

From at least 1954 until the early 1970s the Study Area was generally undeveloped woodland with some rural residential properties along Hammonds Plains Road.

From at least 1977 to the present, Agropur (745 Hammonds Plains Road, PID 40098592 and PID 40098683) and Sandy Lake Academy (PID 40098139) occupied portions of the Study Area. Since at least 1981 there were residential dwellings east of the Agropur industrial operation along the western shore of Sandy Lake.

The commercial property located at 675 Hammonds Plains Road (PID 00428284) started development in the early 1970s and by the late 1970s had grown into a larger development. By the early 1990s the cleared area appeared to have been expanded to Hammonds Plains Road (property was only partially visible on the reviewed aerial photography). By the early 2000s the original building was no longer present, and the property was occupied by various access roads, small buildings, and vehicles/scrap materials.

LiDAR imagery shows the presence of potential berms, likely the result of property development/redevelopment over time at 675 and 745 Hammonds Plains Road and at Killarney Drive. Several disturbed areas are present on PID 40202806 in the areas proximal to where recreational activity and debris were noted during the field verification.

The following concerns regarding potential environmental contamination issues were noted:

- Fill of unknown origin may have been used either as part of the development or when the buildings were demolished throughout the Study Area.
- Evidence of human activity on PID 40202806.
- Schools are known to historically use furnace oil for building heating.
- The presence of an industrial operation, Agropur (745 Hammonds Plains Road) from the late 1970s to the present. Details of the operation are unknown, including historical fuel storage, waste disposal, etc.
- The presence of a commercial operation located at 675 Hammonds Plains Road, including various iterations of buildings, roadways, and storage of vehicles/scrap materials on the property.

Regulatory Request

NSECC was queried for information about the SLSA and received NSECC's Environmental Registry response. The information is summarized below.

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 municipal solid waste investigation/enforcement file (file #94400-35-BED-3588496) containing inspection reports and correspondence pertaining to 1081 Hammonds Plains Road, Bedford (PID 00645135).

- A dangerous goods transportation/storage file (file #30100-31-BED-2023-3360268) containing application, an air quality complaint file (file #91100-40-3313498), three industrial investigation / enforcement files (file #92100-35-BED-3035458, 92100-35-BED-3237201, 92100-35-BED-1759903M) containing inspection reports and correspondence and an industrial complaint file (file #92100-40-BED-3311939) pertaining to 745 Hammonds Plains Road, Bedford (PID 40098683).
- A municipal solid waste investigation/enforcement file (file #94400-35-BED-4529999) containing inspection reports, correspondence, notes, photos, and intake form pertaining to 20 Farmers Dairy Lane, Bedford (PID 00429266).
- Two contaminated sites file (file #33000-30-BED-2019-4096362, 3000-35-BED-3225431) containing checklists, notifications, inspection reports and correspondence; and four water resources investigation/enforcement files (file #95100-35-BED-325877), 95100-35-BED-3804902, 95100-30-BED-2016-097470, 95100-40-BED-3227443) containing application, inspection reports, maps, photos, and correspondence pertaining to 675 Hammonds Plains Road (PID 00428284).
- An evaluation project file (file #40100-34-089) containing correspondence pertaining to 671 Hammonds Plains Road (PID 00417139 and PID 40098717).
- A water resources investigation/enforcement files (file # 95100-35-BED-3221409) and a water approval file (file #95100-30-BED-2016-097141) containing application, reports, and correspondence pertaining to 661 Hammonds Plains Road (PID 00417113).

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

Tank Registrations: Information from the NSECC Petroleum Storage Tank Registry indicated that the following tanks were registered to the Study Area:

745 Hammonds Plains Road (PID 40098683) – Farmers Cooperative Dairy Ltd.:

- Two 45,400 litre (L) steel underground storage tank (UST) containing bunker were installed in 1975 and removed in 1991. Soil contamination was noted, and 1,500 sq. yards of soil was disposed of at a landfill.
- Two 18,160 L steel USTs, one containing fuel oil and one containing gasoline were installed in 1975 and removed in 1989 and 1992, respectively. Soil contamination was noted, and 139 tons of soil was disposed of at Envirosoil.
- One 36,320 L steel UST containing fuel oil was installed in 1975 and removed in 1992. Soil contamination was noted, and 110 tons of soil was disposed of at Envirosoil.
- One 13,620 L steel UST containing fuel oil was installed in 1982.
- Two 34,125 L welded steel aboveground storage tank (AST) containing bunker were installed in 1991 and removed in 2013. The tanks were corrosion free, soil contamination was not noted, and closure protocol was followed. No consultant was on site during the removal.
- One 34,000 L welded steel AST containing diesel was installed in 1992.
- One 4,540 L welded steel AST containing fuel oil was installed in 2001.

The presence of the former and current storage tanks represents an environmental concern to the Study Area.

671 Hammonds Plains Road – David B. Giles Trucking Ltd. (PID 00428284):

- Two 9,495 L steel USTs containing gasoline and diesel were installed in 1986 and removed in 1993. Letter from 2002 documented that the two buried storage tanks were removed by the property owner and placed in the storage yard, after they were emptied. The were removed from the site in 2002. Test pits were advanced, and the test report indicated that there were no detectable petroleum hydrocarbons in the two samples collected.

The presence of the former and current storage tanks represents an environmental concern to the Study Area.

Other:

745 Hammonds Plains Road

- *Environment Act* Directives for 745 Hammonds Plains Road (PID 40098683), dated April 28, 2015 and June 8, 2015: Submit an application to NSECC under the Activity Designation Regulations Division III – Municipal Waste, Part 1: Sewage/Store Drainage/Septage: Section 7(2).
- Certificate of Installation, on-site sewage system as built construction details for 745 Hammonds Plains Road (PID 40098683) dated May 11, 2016-Agropur Cooperative.
- *Environment Act* Directive for 745 Hammonds Plains Road (PID 40098683), dated June 28, 2016: Submit a Sludge Management Plan and Contingency Plan, submit a Complaint Response Procedure.

These may represent a potential environmental concern to the SLSA.

675 Hammonds Plains Road

- *Environment Act* Directive for 675 Hammonds Plains Road (PID 00428284), dated March 15, 2016. No fill can be placed at the site, removed from the site, or redistributed at the site until a wetland alteration approval is granted for the site.
- Inspection Report follow up for 675 Hammonds Plains Road (PID 00428284), dated April 12, 2016. The Department received a Verification for 3-Day Clean-up Exemption Form associated with a release on the property.
- *Environment Act* Directive for 675 Hammonds Plains Road (PID 00428284), dated August 10, 2016. No fill can be placed at the site or removed from the site until further notice from NSECC.
- *Environment Act* Directive for 675 Hammonds Plains Road (PID 00428284), dated August/September/October/ 2016: submit the following to NSECC-monitoring results, including baseline and six rainfall events as outlined in #3 of the Erosion and Sedimentation control plan.

- *Environment Act* Directive for 675 Hammonds Plains Road (PID 00428284), dated March 28, 2018. Submit the report by May 4, 2018. The report must contain monitoring information that was proposed and accepted by NSECC in the Wetland Monitoring Plan submitted by Strum, dated August 26, 2016.
- Inspection Report follow up for 675 Hammonds Plains Road (PID 00428284), dated August 1, 2019. The Department has received the Record of Site condition (RSC) associated with the remediation at the property.

The presence of a historical release on the property represents a potential environmental concern to the SLSA.

1081 Hammonds Plains Road

- *Environment Act* Directive dated May 29, 2017: Materials at 1081 Hammonds Plains Road (PID 00645135), defined as litter, must be cleaned up and taken to a disposal facility, receipts must be submitted by July 21, 2017. This is not expected to represent an environmental concern to the SLSA.

19 Granter Road

- On-site sewage system 24-hour construction alert dated December 8, 2018 for 19 Granter Road (PID 00419564)-Steven R Williams. This is not expected to represent an environmental concern to the SLSA.

91 Giles Drive, Bedford

- On-site sewage system 24-hour construction alert dated May 28, 2018 for 91 Giles Drive, Bedford (PID 00419549). This is not expected to represent an environmental concern to the SLSA.

75 Giles Drive, Bedford

- On-site sewage disposal system field audit was completed on December 14, 2018 for 75 Giles Drive, Bedford (PID 00417980). This is not expected to represent an environmental concern to the SLSA.

<u>Approvals:</u>

- Approval for the construction of a Wetland Alteration on PID 00417113, at or near 661 Hammonds Plains Road, Bedford dated October 4, 2016. This approval is not expected to represent an environmental concern to the SLSA.
- Approval for the operation of a Dangerous Goods Storage Facility and associated works at or near 671 Hammonds Plans Road, Bedford, (PID 00428284) dated March 5, 2003. This approval is not expected to represent an environmental concern to the SLSA.
- Approval for the construction of a Wetland Alteration on PID 00428284, at or near 675 Hammonds Plains Road, Bedford. This approval is not expected to represent an environmental concern to the SLSA.

- Approval for construction and operation of a Dairy Products Plant, and associated works, at or near 745 Hammonds Plains Road, Bedford (PID 40098683), dated March 29, 2016. This approval is not expected to represent an environmental concern to the SLSA.
- Approval for construction and installation of an on-site sewage disposal system to service and Industrial structure with a design flow of 2,250 litres per day at PID 40098683, lot G-2B, 745 Hammonds Plains Road, Bedford, (PID 40098683) dated October 16, 2018. This approval is not expected to represent an environmental concern to the SLSA.
- Approval for Dangerous Goods – Petroleum Storage Tanks, dated January 22, 2020 for 745 Hammonds Plains Road, Bedford, (PID 40098683). The presence of the former and current storage tanks represents an environmental concern to the SLSA.

3.8.3 FIELD RESULTS

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

- Potential Contaminated Site S1: PID 40202806-Sandy Lake Holdings Limited on the western portion of the Study Area-debris (vehicle parts, scrap metal, building materials, AST, etc.) surrounding the stream bed and sloping upwards on the embankment.
- Potential Contaminated Site S2: PID 41374760-Armco Capital Inc. on the western portion of the Study Area-evidence of recreational activities in the gravel pit (picnic table, jerry-can of fuel, etc.).
- Potential Contaminated Site S3: PID 00417949-Sandy Lake Holdings Limited on the western portion of the Study Area-evidence of recreational activities (deer baiting).
- Potential Contaminated Site S4: 119 Farmers Dairy Lane, Bedford (PID 40440752)-HRM-various rusted drums, former contents unknown. Note: This property is adjacent to 745 Hammonds Plains Road, Bedford, (PID 40098592).
- Potential Contaminated Site S5: 25 Giles Drive, Bedford (PID 40098097)-Sandy Lake Developments (2006) Limited-debris (rusted paint cans).
- Potential Contaminated Site S6: 25 Giles Drive, Bedford (PID 40098097)-Sandy Lake Developments (2006) Limited-debris (recyclables, household garbage).
- Potential Contaminated Site S7: 675 Hammons Plains Road, Bedford (PID 00428284)-Sandy Lake Holdings-debris (metal, concrete blocks, plastic, etc.).
- Potential Contaminated Site S8: 745 Hammonds Plains Road, Bedford, (PID 40098592)-Agropur Cooperative-various rusted drums, former contents unknown.

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:

- Fill of unknown origin may have been used either as part of the development or when the buildings were demolished throughout the Study Area.
- PID 40202806-Sandy Lake Holdings Limited on the western portion of the Study Area-debris noted and various signs of human activity.

- The presence of a school from at least 1977; schools are known to historically use furnace oil for building heating.
- 745 Hammonds Plains Road, Bedford, (PID 40098683 and 40098592)-Agropur Cooperative-former historical land use (debris waste materials, drums, contaminated soil, former underground storage tanks, and potential fill of unknown origin).
- The presence of a commercial operation located at 671 and 675 Hammonds Plains Road and Giles Drive, including various iterations of buildings, roadways, and storage of vehicles/scrap materials on the property. Further, this property has two contaminated sites files with NSECC, likely related to a historical release. The presence of the former and current storage tanks represents an environmental concern to the Study Area.
- 119 Farmers Dairy Lane, Bedford (PID 40440752)-HRM-various rusted drums, former contents unknown.

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 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)
- NSECC Contaminated Sites File
- Study Area

Utilities
- Transmission Line
- Pipeline

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody
- Property Boundary

0 250 500 Metres
(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-05-13

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_036

Figure No.
3.16

Title
Contaminated Sites in the SLSA

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3.9 Areas of Cultural Significance

Stantec conducted an archaeological and cultural study that includes an Archaeological Resource Impact Assessment (ARIA) which was conducted under Heritage Research Permit (HRP) A2023NS154 and identified areas of archaeological potential within the SLSA. The scope of the assessment included a site walkover carried out on September 21, 2023, and a background study (including environmental setting, Pre-Contact and Historic Period land use, property history, and past archaeological assessments, and engagement with stakeholders and land users). 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 SLSA. 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 of the components on their own 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: biological components and 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.

Stantec divided the final mapping into two cumulative analyses: one focusing on the project's biological components and the other on geological/topographic information. While acknowledging the relationship between these analyses, this approach was chosen to enhance the decision-making process for users from a landscape planning perspective, whether for development or conservation pathways.

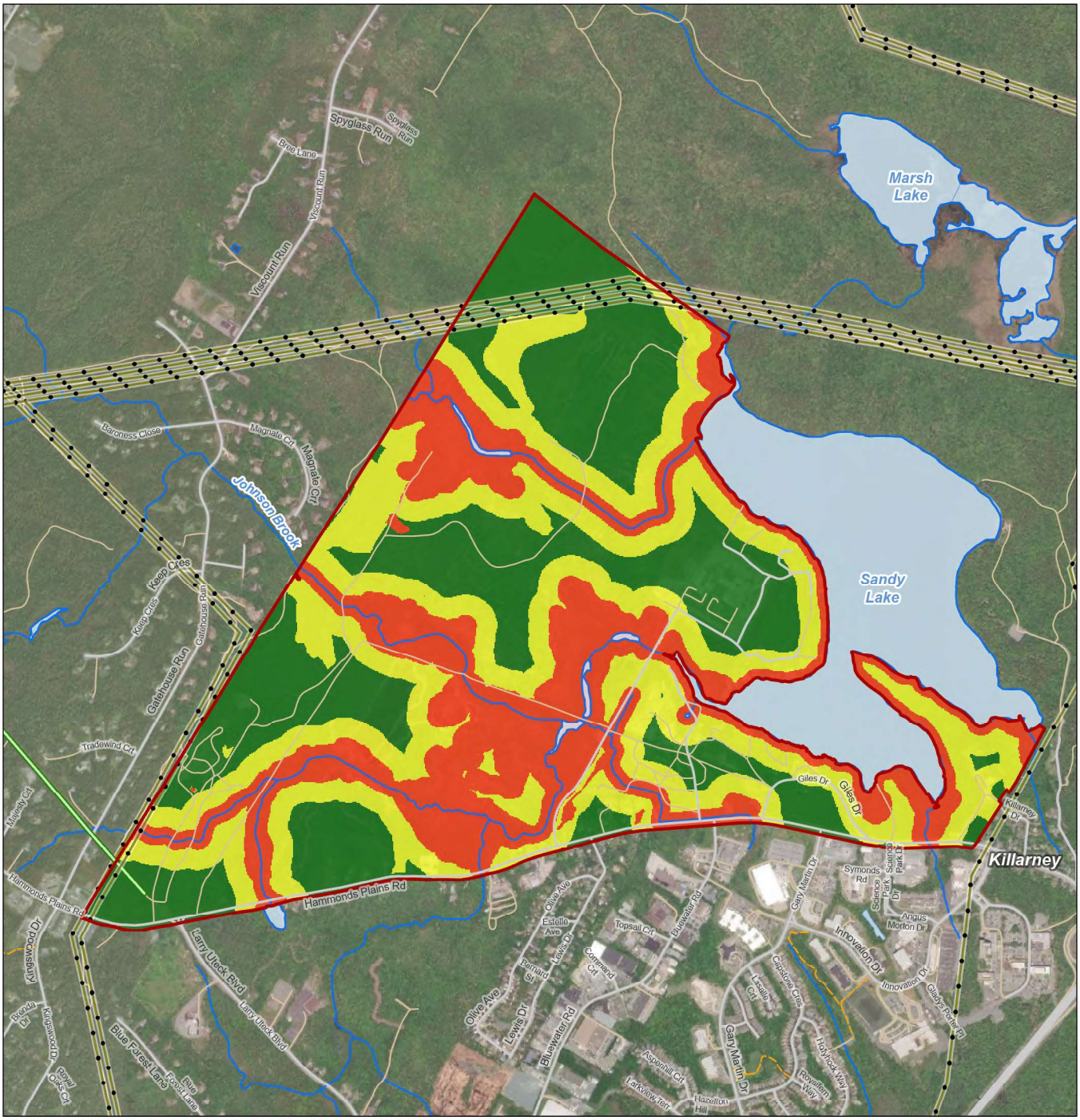
3.10.1 BIOLOGICAL COMPONENTS

This section combines the LSA figures for wetlands (Section 3.2.2; 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-four wetlands were identified within the SLSA and thirteen of these were evaluated using WESP (Table 3.1). As not all the wetlands in the Study Area could be evaluated using WESP-AC (refer to Section 3.2.2), wetlands that were not evaluated using WESP-AC were not included in the land suitability analysis. Wetlands not evaluated using WESP-AC are among the smallest wetlands on site and/or are generally located outside the areas within the SLSA proposed for development (Table 3.1 and Figure 3.3 – the areas with no score). As per NSECC guidance, further wetland evaluation (i.e., delineation and functional assessment) will be required (prior to construction) to support permitting applications,

The forest habitat and species at risk analysis combines three layers: the Forest Maturity and Forest Succession and Species at Risk. For the forest maturity layer, 54 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 SLSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present at the SLSA. Instead, SAR that are or could potentially be present in the SLSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the SLSA. Where matches were found between SAR habitat preferences and habitats mapped in the SLSA, 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

- Transmission Line
- Pipeline

Transportation

- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-20
Revised by NWhite on 2024-05-30

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 - SLSA

HRM FCM 2022.aprx Revised: 2024-05-30 By: niwhite

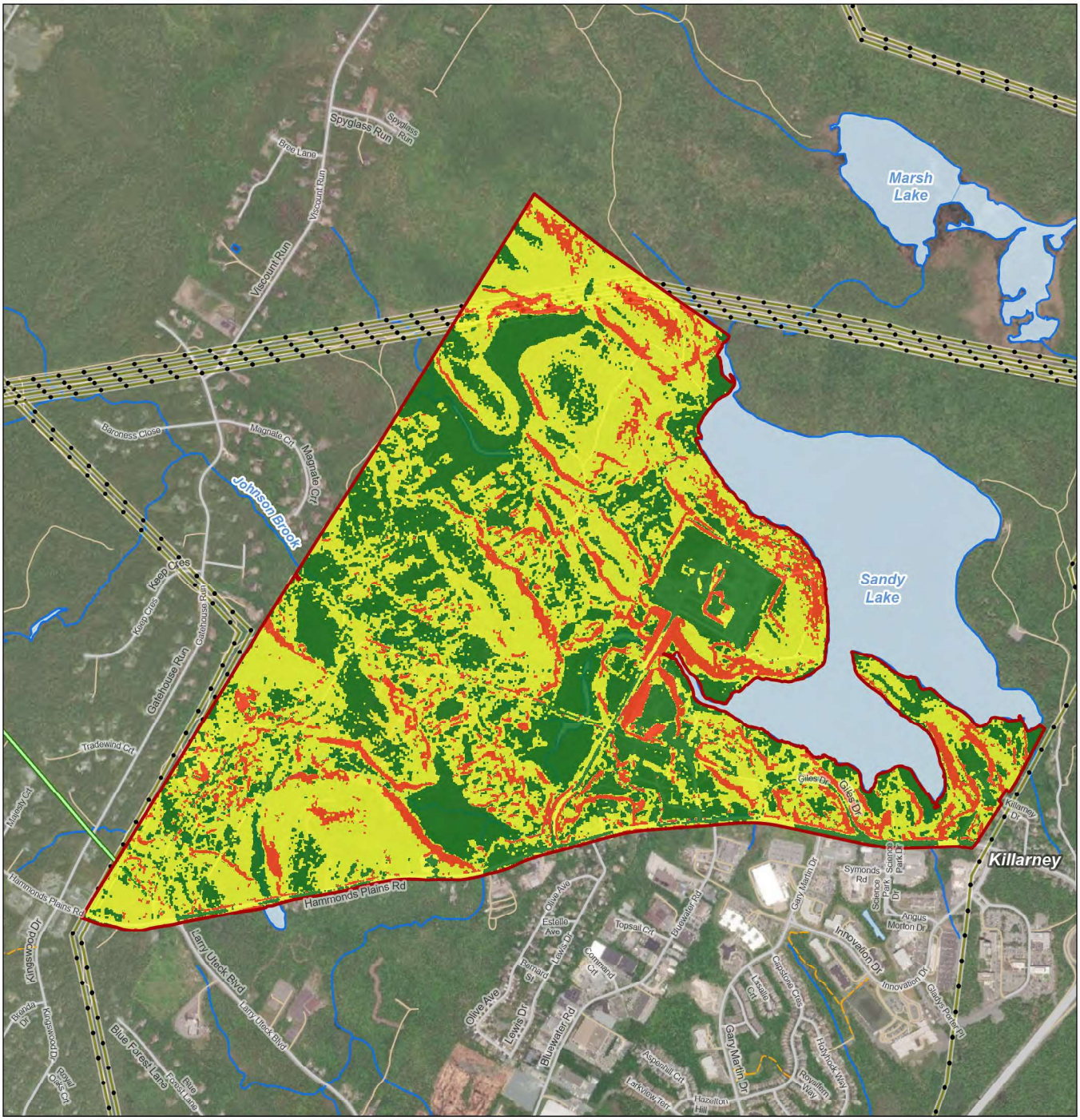
3.10.2 GEOLOGY AND TOPOGRAPHY COMPONENTS

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 SLSA 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 SLSA. 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 SLSA. 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).



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
- Transmission Line
- Pipeline

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbodies

0 250 500 Metres
(At original document size of 8.5x11)
1:21,000

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 - SLSA

HRM FCM 2022.aprx Revised: 2024-06-10 By: niwhite

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APPENDIX A

AC CDC Report

DATA REPORT 7794: Sandy Lake, NS

Prepared 4 August 2023
by J. Churchill, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

Filename	Contents
SandyLkNS_7794ob.xls	Rare or legally-protected Flora and Fauna in your study area
SandyLkNS_7794ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
SandyLkNS_7794msa.xls	Managed and Biologically Significant Areas in your study area
SandyLkNS_7794ff_py.xls	Rare Freshwater Fish in your study area (DFO database)

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

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

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney
Senior Scientist / Executive Director
(506) 364-2658
sean.blaney@accdc.ca

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

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

Billing
Jean Breau
Financial Manager / Executive Assistant
(506) 364-2657
jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Western: Emma Vost
(902) 670-8187
Emma.Vost@novascotia.ca

Western: Sarah Spencer
(902) 541-0081
Sarah.Spencer@novascotia.ca

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Shavonne.Meyer@novascotia.ca

Central: Kimberly George
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Eastern: Harrison Moore
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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

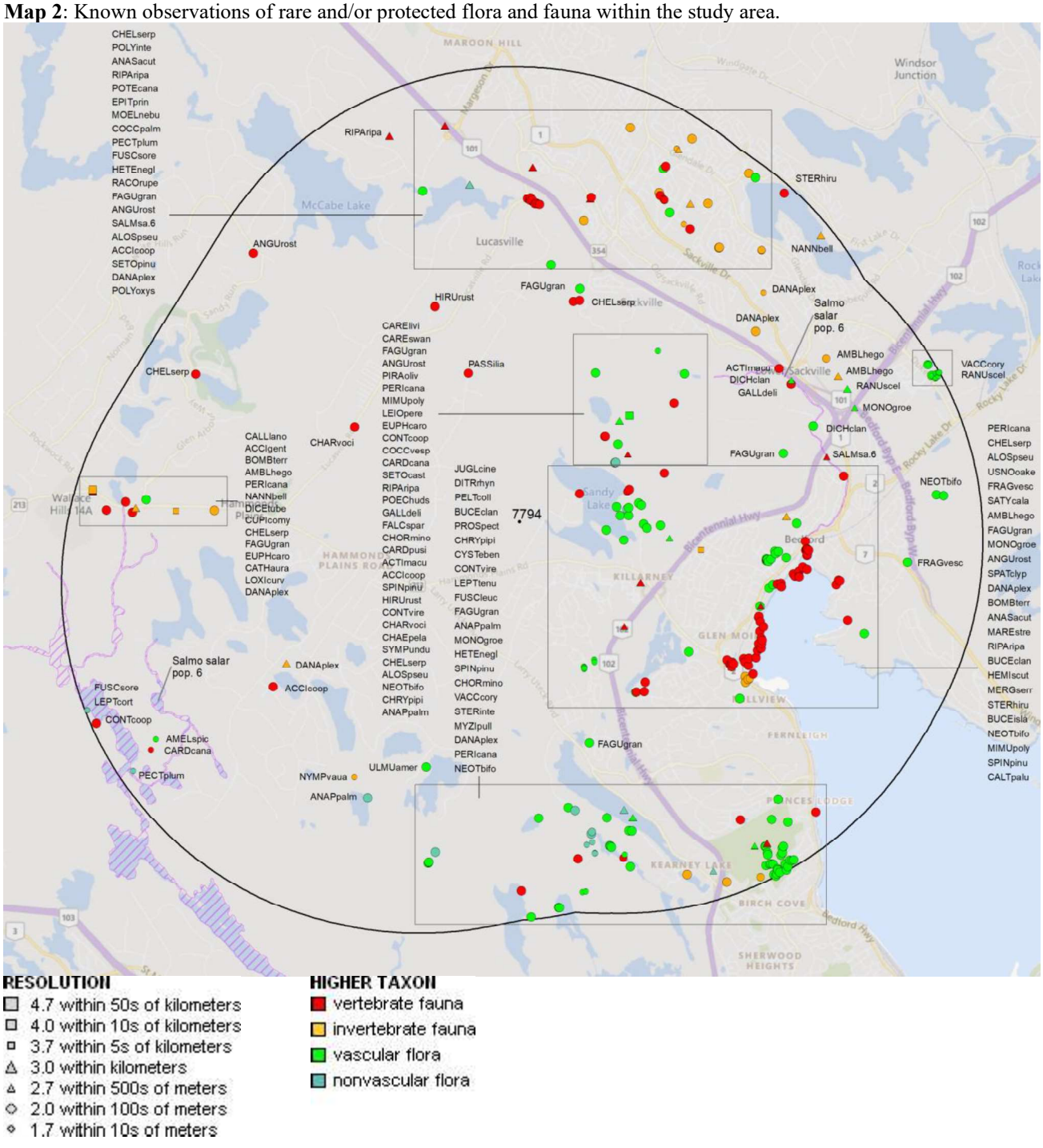
2.1 FLORA

The study area contains 129 records of 17 vascular and 24 records of 15 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 FAUNA

The study area contains 195 records of 40 vertebrate and 64 records of 12 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

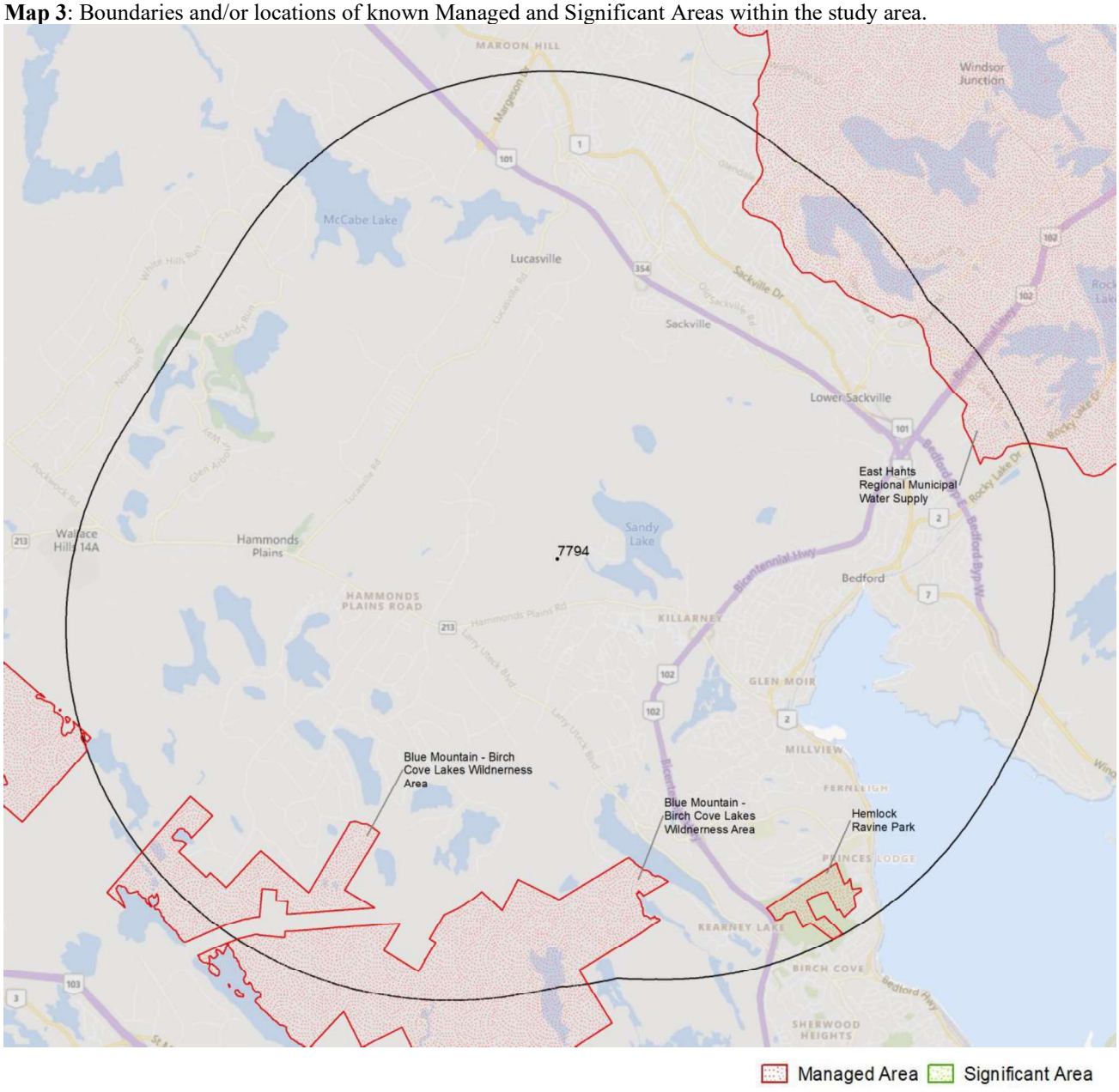
3.1 MANAGED AREAS

The GIS scan identified 4 managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

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

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



4.0 RARE SPECIES LISTS

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

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S3	1	4.8 ± 0.0
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	2	4.9 ± 1.0
N	*Stereocaulon intermedium*	Pacific Brain Foam Lichen				S1S3	1	5.8 ± 0.0
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S2	2	4.6 ± 0.0
N	*Ditrichum rhynchostegium*	a Moss				S2?	1	4.4 ± 1.0
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S2S3	1	4.9 ± 1.0
N	*Usnocetraria oakesiana*	Yellow Band Lichen				S2S3	1	1.6 ± 0.0
N	*Scytinium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	1	4.8 ± 0.0
N	*Racodium rupestre*	Rockhair Lichen				S2S3	1	4.9 ± 1.0
N	*Fuscopannaria sorediata*	a Lichen				S2S3	2	4.9 ± 1.0
N	*Peltigera collina*	Tree Pelt Lichen				S3	1	4.3 ± 0.0
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3S4	1	6.8 ± 0.0
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	1	4.9 ± 1.0
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	5	1.6 ± 0.0
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	3	4.9 ± 0.0
P	*Juglans cinerea*	Butternut	Endangered	Endangered		SNA	1	4.2 ± 0.0
P	*Ranunculus sceleratus*	Cursed Buttercup				S2	12	5.1 ± 1.0
P	*Carex livida*	Livid Sedge				S2	1	3.2 ± 0.0
P	*Polygonum oxyspermum*	Sharp-fruit Knotweed				S2S3	1	3.8 ± 0.0
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	1	4.1 ± 0.0
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	1	5.5 ± 0.0
P	*Symphyotrichum undulatum*	Wavy-leaved Aster				S3	2	2.1 ± 1.0
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	14	2.2 ± 0.0
P	*Carex swanii*	Swan's Sedge				S3	1	3.2 ± 0.0
P	*Neottia bifolia*	Southern Twayblade				S3	14	1.8 ± 0.0
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	3	6.3 ± 0.0
P	*Fagus grandifolia*	American Beech				S3S4	71	1.3 ± 0.0
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3S4	1	4.6 ± 1.0
P	*Amelanchier spicata*	Running Serviceberry				S3S4	1	6.1 ± 0.0
P	*Fragaria vesca*	Woodland Strawberry				S3S4	2	1.8 ± 0.0
P	*Ulmus americana*	White Elm				S3S4	1	3.8 ± 0.0
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3S4	2	4.4 ± 0.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Salmo salar pop. 6*	Atlantic Salmon - Nova Scotia Southern Upland population	Endangered			S1	4	4.5 ± 0.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	26	2.0 ± 1.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	2	2.2 ± 7.0
A	*Anguilla rostrata*	American Eel	Threatened			S3N	4	2.8 ± 0.0
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	9	3.9 ± 0.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	3	2.2 ± 7.0
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	29	1.6 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	5	2.2 ± 7.0
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	2	2.2 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	3	2.2 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	2	2.2 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	1	2.2 ± 7.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	6	2.2 ± 7.0
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	2	1.8 ± 0.0
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	4	2.2 ± 7.0
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	1	2.1 ± 0.0
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	4	3.7 ± 0.0
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	4	6.2 ± 9.0
A	*Mimus polyglottos*	Northern Mockingbird				S1B	2	2.2 ± 7.0
A	*Anas acuta*	Northern Pintail				S1B,SUM	2	4.7 ± 0.0
A	*Spatula clypeata*	Northern Shoveler				S2B,SUM	1	4.2 ± 0.0
A	*Mareca strepera*	Gadwall				S2B,SUM	1	4.7 ± 0.0
A	*Piranga olivacea*	Scarlet Tanager				S2B,SUM	1	2.2 ± 7.0
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	1	6.0 ± 0.0
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	1	4.9 ± 0.0
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	28	3.6 ± 0.0
A	*Perisoreus canadensis*	Canada Jay				S3	7	2.2 ± 0.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3	2.2 ± 7.0
A	*Spinus pinus*	Pine Siskin				S3	4	2.2 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3B	3	2.2 ± 7.0
A	*Alosa pseudoharengus*	Alewife				S3B	4	1.0 ± 0.0
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	1	2.2 ± 7.0
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	3	2.2 ± 7.0
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	1	2.2 ± 7.0
A	*Loxia curvirostra*	Red Crossbill				S3S4	1	5.6 ± 0.0
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	2	2.2 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	3	2.2 ± 7.0
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	1	2.2 ± 7.0
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	1	2.3 ± 0.0
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	13	3.7 ± 0.0
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	36	2.7 ± 6.0
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	2	3.6 ± 0.0
I	*Nymphalis l-album*	Compton Tortoiseshell				S2S3	1	4.4 ± 0.0
I	*Myzia pullata*	Streaked Lady Beetle				S3	1	5.7 ± 0.0
I	*Dicerca tuberculata*	Swollen Jewel Beetle				S3	1	6.2 ± 9.0
I	*Satyrium calanus*	Banded Hairstreak				S3	2	3.9 ± 2.0
I	*Callophrys lanoraieensis*	Bog Elfin				S3	2	6.2 ± 9.0
I	*Epitheca princeps*	Prince Baskettail				S3	1	6.0 ± 0.0
I	*Polygonia interrogationis*	Question Mark				S3B	3	5.2 ± 2.0
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S3S4	6	3.9 ± 2.0
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	6	6.2 ± 9.0
I	*Nannothemis bella*	Elfin Skimmer				S3S4	3	6.0 ± 1.0

4.3 LOCATION SENSITIVE SPECIES

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

Nova Scotia

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
Fraxinus nigra	**Black Ash**		**Threatened**	**YES**
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	No
Bat hibernaculum or bat species occurrence		**[Endangered][1]**	**[Endangered][1]**	**YES**

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

4.4 SOURCE BIBLIOGRAPHY

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

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 44546 records of 165 vertebrate and 2079 records of 74 invertebrate fauna; 10947 records of 289 vascular and 3210 records of 200 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	147	78.6 ± 1.0	NS
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	342	3.3 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Myotis	Endangered	Endangered	Endangered	S1	32	35.5 ± 0.0	NS
A	*Perimyotis subflavus*	Tricolored Bat	Endangered	Endangered	Endangered	S1	34	35.5 ± 0.0	NS
A	*Emydoidea blandingii*	Blanding's Turtle	Endangered	Endangered	Endangered	S1	2428	14.8 ± 0.0	NS
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered		S1	38	14.6 ± 0.0	NS
A	*Salmo salar pop. 6*	Atlantic Salmon - Nova Scotia Southern Upland population	Endangered			S1	29	4.5 ± 0.0	NS
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	1082	20.6 ± 0.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	65	21.8 ± 0.0	NS
A	*Dermochelys coriacea pop. 2*	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered		S1S2N	3	27.3 ± 5.0	NS
A	*Morone saxatilis pop. 2*	Striped Bass - Bay of Fundy population	Endangered			S2S3B,S2S3N	4	26.0 ± 0.0	NS
A	*Melanerpes erythrocephalus*	Red-headed Woodpecker	Endangered	Threatened		SNA	1	75.0 ± 0.0	NS
A	*Protonotaria citrea*	Prothonotary Warbler	Endangered	Endangered		SNA	1	31.8 ± 0.0	NS
A	*Icteria virens*	Yellow-Breasted Chat	Endangered	Endangered		SNA	24	12.1 ± 0.0	NS
A	*Lamna nasus*	Porbeagle Shark	Endangered			SNR	1	98.4 ± 0.0	NS
A	*Lasiurus cinereus*	Hoary Bat	Endangered			SUB, S1M	35	28.2 ± 0.0	NS
A	*Lasionycteris noctivagans*	Silver-haired Bat	Endangered			SUB,S1M	12	15.8 ± 0.0	NS
A	*Lasiurus borealis*	Eastern Red Bat	Endangered			SUB,S1M	1	62.6 ± 0.0	NS
A	*Colinus virginianus*	Northern Bobwhite	Endangered	Endangered			7	12.9 ± 0.0	NS
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern		S1B	31	14.4 ± 7.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	1197	3.0 ± 0.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	1486	2.0 ± 1.0	NS
A	*Thamnophis saurita*	Eastern Ribbonsnake	Threatened	Threatened	Threatened	S2S3	449	77.7 ± 1.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	937	2.2 ± 7.0	NS
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S2S3M	102	24.3 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2S3N	12	37.3 ± 0.0	NS
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S3B	30	7.8 ± 1.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	934	7.8 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S3N	115	2.8 ± 0.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	3	14.7 ± 0.0	NS
A	*Melanerpes lewis*	Lewis's Woodpecker	Threatened	Threatened		SNA	2	29.9 ± 0.0	NS
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened		SUB	2	16.9 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	39	38.2 ± 7.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1?B	13	10.3 ± 0.0	NS
A	*Passerculus sandwichensis princeps*	Ipswich Sparrow	Special Concern	Special Concern		S1B	30	22.4 ± 0.0	NS
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	20	3.9 ± 0.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	243	2.2 ± 7.0	NS
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	3	31.8 ± 0.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	12	24.8 ± 0.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S2S3N,SUM	71	17.4 ± 0.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	481	1.6 ± 0.0	NS
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	1141	2.2 ± 7.0	NS
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	1034	2.2 ± 7.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	578	2.2 ± 7.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	903	2.2 ± 7.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Vulnerable	S3B	729	6.8 ± 0.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	598	2.2 ± 7.0	NS
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern		S3N,SUM	21	22.4 ± 0.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	962	2.2 ± 7.0	NS
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern			S4	16	14.5 ± 0.0	NS
A	*Phocoena phocoena pop. 1*	Harbour Porpoise - Northwest Atlantic Population	Special Concern			S4	2	68.5 ± 0.0	NS
A	*Chrysemys picta*	Painted Turtle	Special Concern	Special Concern		S4	81	6.6 ± 0.0	NS
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	678	1.8 ± 0.0	NS
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	52	25.7 ± 0.0	NS
A	*Zonotrichia querula*	Harris's Sparrow	Special Concern			SNA	1	15.2 ± 0.0	NS
A	*Anarhichas lupus*	Atlantic Wolffish	Special Concern	Special Concern		SNR	5	24.8 ± 0.0	NS
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern			1	75.1 ± 0.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	12	2.2 ± 7.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	41	7.3 ± 0.0	NS
A	*Chlidonias niger*	Black Tern	Not At Risk			S1B	1	36.9 ± 0.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk		Vulnerable	S1B,SUM	119	10.3 ± 2.0	NS
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	2	76.6 ± 0.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B,SUM	4	46.8 ± 7.0	NS
A	*Lynx canadensis*	Canada Lynx	Not At Risk		Endangered	S2S3	2	73.2 ± 1.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	3	25.3 ± 0.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	35	2.1 ± 0.0	NS
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	3	22.9 ± 0.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	297	3.7 ± 0.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	69	16.9 ± 0.0	NS
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	1	25.6 ± 0.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	132	6.2 ± 9.0	NS
A	*Glaucomys volans*	Southern Flying Squirrel	Not At Risk			S3S4	8	22.4 ± 2.0	NS
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	5	25.9 ± 0.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	145	21.8 ± 7.0	NS
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	644	24.8 ± 0.0	NS
A	*Calidris canutus*	Red Knot	E,SC	E,T		S2M	4	25.9 ± 1.0	NS
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3B,S2S3N	30	14.3 ± 0.0	NS
A	*Gadus morhua*	Atlantic Cod	E,SC,DD			SNR	11	22.1 ± 0.0	NS
A	*Salmo salar*	Atlantic Salmon	E,T,SC			S1B,S1N	14	21.7 ± 0.0	NS
A	*Alces alces americana*	Moose			Endangered	S1	33	13.3 ± 0.0	NS
A	*Alces alces*	Moose				S1	8	13.2 ± 0.0	NS
A	*Uria aalge*	Common Murre				S1?B	7	14.4 ± 0.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B,SUM	27	10.0 ± 0.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	13	14.3 ± 0.0	NS
A	*Gallinula galeata*	Common Gallinule				S1B	8	14.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	28	8.6 ± 7.0	NS
A	*Cistothorus palustris*	Marsh Wren				S1B	2	67.0 ± 0.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	84	2.2 ± 7.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	16	14.4 ± 7.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S4M	1885	7.7 ± 0.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S4M	1349	7.6 ± 0.0	NS
A	*Anas acuta*	Northern Pintail				S1B,SUM	70	4.7 ± 0.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B,SUM	21	8.6 ± 7.0	NS
A	*Vespertilionidae sp.*	bat species				S1S2	249	1.8 ± 0.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S1S2B,SUM	42	14.3 ± 7.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B,SUM	35	21.0 ± 0.0	NS
A	*Alca torda*	Razorbill				S2B	26	10.5 ± 0.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S2B	31	31.3 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	30	11.1 ± 0.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	160	11.9 ± 7.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B,SUM	28	4.2 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B,SUM	35	4.7 ± 0.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B,SUM	48	2.2 ± 7.0	NS
A	*Calidris alba*	Sanderling				S2N,S3M	1466	21.3 ± 0.0	NS
A	*Martes americana*	American Marten			Endangered	S2S3	3	36.5 ± 0.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	22	8.6 ± 7.0	NS
A	*Rallus limicola*	Virginia Rail				S2S3B	19	24.5 ± 7.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S2S3B	17	31.3 ± 0.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	251	8.5 ± 7.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3B,S2S3N	77	10.6 ± 0.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	107	6.0 ± 0.0	NS
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	45	4.9 ± 0.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	285	3.6 ± 0.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B,SUM	87	8.6 ± 7.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	258	24.8 ± 0.0	NS
A	*Numenius phaeopus*	Whimbrel				S2S3M	21	24.1 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Whimbrel				S2S3M	256	24.8 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	4	24.8 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	559	2.2 ± 0.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	533	2.2 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S3	501	2.2 ± 7.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	140	7.3 ± 0.0	NS
A	*Salvelinus namaycush*	Lake Trout				S3	2	37.1 ± 0.0	NS
A	*Sorex maritimensis*	Maritime Shrew				S3	1	64.5 ± 1.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	1	76.6 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	13	42.1 ± 0.0	NS
A	*Calcarius lapponicus*	Lapland Longspur				S3?N,SUM	7	22.4 ± 0.0	NS
A	*Spatula discors*	Blue-winged Teal				S3B	71	11.7 ± 7.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	592	2.2 ± 7.0	NS
A	*Tringa semipalmata*	Willet				S3B	1847	20.3 ± 7.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	63	16.3 ± 7.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	48	16.4 ± 7.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	220	7.7 ± 0.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	419	8.8 ± 0.0	NS
A	*Alosa pseudoharengus*	Alewife				S3B	33	1.0 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3B,S3M,S3N	927	10.5 ± 0.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S4M	2077	6.4 ± 7.0	NS
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	271	2.2 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	594	2.2 ± 7.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3B,S5M	135	8.8 ± 0.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	88	2.2 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	138	8.5 ± 7.0	NS

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A	*Setophaga tigrina*	Cape May Warbler				S3B,SUM	152	8.6 ± 7.0	NS
A	*Branta bernicla*	Brant				S3M	3	25.7 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	2038	21.4 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	795	17.3 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	1679	17.2 ± 0.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	349	7.7 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	1294	22.7 ± 0.0	NS
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	30	13.7 ± 0.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	157	8.5 ± 7.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	250	5.6 ± 0.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B,S4S5M	187	8.6 ± 0.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	381	2.2 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	803	2.2 ± 7.0	NS
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	393	2.2 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	79	2.3 ± 0.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	325	3.7 ± 0.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3S4N	202	14.4 ± 0.0	NS
A	*Lanius borealis*	Northern Shrike				S3S4N	2	22.8 ± 0.0	NS
A	*Morus bassanus*	Northern Gannet				SHB	62	13.8 ± 0.0	NS
A	*Aythya americana*	Redhead				SHB	5	13.6 ± 0.0	NS
A	*Leucophaeus atricilla*	Laughing Gull				SHB	13	22.3 ± 0.0	NS
A	*Progne subis*	Purple Martin				SHB	4	28.7 ± 0.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N,S5M	28	16.4 ± 7.0	NS
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	28	12.3 ± 5.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	1013	2.7 ± 6.0	NS
I	*Danaus plexippus plexippus*	Monarch	Endangered	Special Concern		S2?B,S3M	2	35.6 ± 0.0	NS
I	*Barnea truncata*	Atlantic Mud-piddock	Threatened	Threatened		S1	10	63.7 ± 0.0	NS
I	*Bombus suckleyi*	Suckley's Cuckoo Bumble Bee	Threatened			SH	4	36.3 ± 5.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Threatened	S3	5	42.1 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	161	3.6 ± 0.0	NS
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern		Endangered	SH	4	30.6 ± 2.0	NS
I	*Gomphurus ventricosus*	Skillet Clubtail	Special Concern	Endangered		SH	2	22.2 ± 1.0	NS
I	*Cicindela formosa*	Big Sand Tiger Beetle				S1	1	70.6 ± 1.0	NS
I	*Erora laeta*	Early Hairstreak				S1	1	11.7 ± 1.0	NS
I	*Ophiogomphus anomalus*	Extra-Striped Snaketail				S1	3	98.4 ± 0.0	NS
I	*Pachydiplax longipennis*	Blue Dasher				S1	28	11.1 ± 0.0	NS
I	*Atlanticoncha ochracea*	Tidewater Mucket				S1	2	99.9 ± 1.0	NS
I	*Polygonia comma*	Eastern Comma				S1?	21	12.7 ± 2.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	7	12.4 ± 2.0	NS
I	*Boloria chariclea*	Arctic Fritillary				S1S2	3	88.4 ± 2.0	NS
I	*Somatochlora brevicincta*	Quebec Emerald				S1S2	1	31.7 ± 0.0	NS
I	*Tharsalea dospassosi*	Maritime Copper				S2	6	14.4 ± 5.0	NS
I	*Satyrium acadica*	Acadian Hairstreak				S2	4	80.3 ± 2.0	NS
I	*Coenagrion resolutum*	Taiga Bluet				S2	2	11.9 ± 1.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	75	31.7 ± 1.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	6	15.7 ± 1.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S2S3	19	4.4 ± 0.0	NS
I	*Aglais milberti*	Milbert's Tortoiseshell				S2S3	22	12.7 ± 2.0	NS
I	*Somatochlora kennedyi*	Kennedy's Emerald				S2S3	3	20.5 ± 1.0	NS
I	*Somatochlora williamsoni*	Williamson's Emerald				S2S3	1	93.7 ± 0.0	NS
I	*Enallagma geminatum*	Skimming Bluet				S2S3	2	77.7 ± 0.0	NS
I	*Stylurus scudderi*	Zebra Clubtail				S2S3	6	26.4 ± 0.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	27	6.3 ± 0.0	NS
I	*Strophiona nitens*	Chestnut Bark Long-horned Beetle				S3	4	6.7 ± 0.0	NS
I	*Psephenus herricki*	Herrick's Water Penny				S3	1	77.3 ± 0.0	NS

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I	*Lebia ornata*	Ornate Harp Ground Beetle				S3	1	89.7 ± 0.0	NS
I	*Carabus serratus*	Serrated Ground Beetle				S3	1	77.8 ± 0.0	NS
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	3	20.7 ± 0.0	NS
I	*Disonycha pensylvanica*	Pennsylvania Flea Beetle				S3	1	70.6 ± 0.0	NS
I	*Chrysochus auratus*	Dogbane Leaf Beetle				S3	2	41.4 ± 0.0	NS
I	*Naemia seriata*	Seaside Lady Beetle				S3	30	23.4 ± 0.0	NS
I	*Elateroides lugubris*	Sapwood Ship-timber Beetle				S3	1	12.5 ± 0.0	NS
I	*Chilocorus stigma*	Twice-stabbed Lady Beetle				S3	10	8.0 ± 0.0	NS
I	*Myzia pullata*	Streaked Lady Beetle				S3	5	5.7 ± 0.0	NS
I	*Monochamus marmorator*	Balsam Fir Sawyer				S3	1	18.9 ± 0.0	NS
I	*Trachysida aspera*	Rough Flower Longhorn Beetle				S3	1	12.8 ± 0.0	NS
I	*Dicerca tuberculata*	Swollen Jewel Beetle				S3	1	6.2 ± 9.0	NS
I	*Astylopsis sexguttata*	Six-speckled Long-horned Beetle				S3	2	11.0 ± 0.0	NS
I	*Satyrium calanus*	Banded Hairstreak				S3	73	3.9 ± 2.0	NS
I	*Callophrys lanoraieensis*	Bog Elfin				S3	22	6.2 ± 9.0	NS
I	*Strymon melinus*	Gray Hairstreak				S3	13	12.7 ± 1.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S3	2	20.3 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S3	7	65.7 ± 0.0	NS
I	*Ophiogomphus rupinsulensis*	Rusty Snaketail				S3	23	26.3 ± 0.0	NS
I	*Epitheca princeps*	Prince Baskettail				S3	14	6.0 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4	12.9 ± 1.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	5	19.5 ± 1.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	168	5.2 ± 2.0	NS
I	*Lepturopsis biforis*	Two-spotted Long-horned Beetle				S3S4	1	50.0 ± 0.0	NS
I	*Cecropterus pylades*	Northern Cloudywing				S3S4	5	76.6 ± 2.0	NS
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S3S4	29	3.9 ± 2.0	NS
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	28	6.2 ± 9.0	NS
I	*Argynnis aphrodite*	Aphrodite Fritillary				S3S4	40	22.1 ± 2.0	NS
I	*Polygonia faunus*	Green Comma				S3S4	14	12.7 ± 2.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3S4	7	20.3 ± 1.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3S4	11	7.4 ± 1.0	NS
I	*Aeshna constricta*	Lance-Tipped Darner				S3S4	21	17.1 ± 0.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3S4	6	35.8 ± 1.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3S4	15	9.8 ± 0.0	NS
I	*Somatochlora franklini*	Delicate Emerald				S3S4	2	22.2 ± 1.0	NS
I	*Erythrodiplax berenice*	Seaside Dragonlet				S3S4	7	24.1 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3S4	20	6.0 ± 1.0	NS
I	*Enallagma vesperum*	Vesper Bluet				S3S4	4	25.9 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3S4	2	78.0 ± 1.0	NS
I	*Sphaerophoria pyrrhina*	Violaceous Globetail				SH	1	77.2 ± 5.0	NS
I	*Icaricia saepiolus*	Greenish Blue				SH	1	11.2 ± 2.0	NS
I	*Polygonia gracilis*	Hoary Comma				SH	1	78.8 ± 2.0	NS
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1	19	37.0 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	255	11.7 ± 0.0	NS
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened	Threatened	S1	140	51.3 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S2S3	195	18.8 ± 13.0	NS
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened	Threatened	S3	52	29.6 ± 1.0	NS
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S3	27	4.8 ± 0.0	NS
N	*Heterodermia squamulosa*	Scaly Fringe Lichen	Threatened			S3	95	61.0 ± 0.0	NS
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	235	4.9 ± 1.0	NS
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S3S4	29	23.1 ± 0.0	NS

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N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	30	14.1 ± 0.0	NS
N	*Fissidens exilis*	Pygmy Pocket Moss	Not At Risk			S3	16	38.3 ± 1.0	NS
N	*Chaenotheca servitii*	Flexuous Golden Stubble	Data Deficient			S1	1	98.9 ± 1.0	NS
N	*Aloina brevirostris*	Short-Beaked Rigid Screw Moss				S1	2	36.0 ± 2.0	NS
N	*Orthotrichum gymnostomum*	Aspen Bristle Moss				S1	1	95.6 ± 0.0	NS
N	*Sematophyllum demissum*	a Moss				S1	2	12.6 ± 2.0	NS
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				S1	1	99.0 ± 0.0	NS
N	*Blennothallia crispa*	Crinkled Jelly Lichen				S1	1	58.5 ± 0.0	NS
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1	1	12.3 ± 5.0	NS
N	*Usnea perplexans*	Powdered Beard Lichen				S1	1	59.0 ± 0.0	NS
N	*Scytinium dactylinum*	Brown-buttoned Jellyskin Lichen				S1	1	84.6 ± 0.0	NS
N	*Lathagrium cristatum*	Fingered Jelly Lichen				S1	3	43.5 ± 0.0	NS
N	*Ephebe perspinulosa*	Thread Lichen				S1	1	84.5 ± 1.0	NS
N	*Fuscopannaria praetermissa*	Moss Shingles Lichen				S1	1	40.8 ± 0.0	NS
N	*Scytinium schraderi*	Wrinkled Jellyskin Lichen				S1	1	58.7 ± 0.0	NS
N	*Lichina confinis*	Marine Seaweed Lichen				S1	4	31.6 ± 0.0	NS
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S1	1	80.6 ± 0.0	NS
N	*Pseudevernia consocians*	Common Antler Lichen				S1	1	71.3 ± 0.0	NS
N	*Sticta limbata*	Powdered Moon Lichen				S1	4	32.2 ± 3.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	7	39.5 ± 0.0	NS
N	*Bryoria nitidula*	Tundra Horsehair Lichen				S1	2	29.4 ± 0.0	NS
N	*Hypogymnia hultenii*	Powdered Honeycomb Lichen				S1	14	35.6 ± 1.0	NS
N	*Calypogeia neogaea*	Common Pouchwort				S1?	2	57.8 ± 0.0	NS
N	*Jubula pennsylvanica*	a liverwort				S1?	1	29.9 ± 0.0	NS
N	*Aloina rigida*	Aloe-Like Rigid Screw Moss				S1?	3	36.0 ± 2.0	NS
N	*Imbribryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1?	2	51.6 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	1	30.5 ± 2.0	NS
N	*Tortula obtusifolia*	a Moss				S1?	3	75.6 ± 0.0	NS
N	*Didymodon tophaceus*	Olive Beard Moss				S1?	2	58.1 ± 4.0	NS
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	1	71.5 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	3	37.0 ± 0.0	NS
N	*Physcomitrium immersum*	a Moss				S1?	6	71.9 ± 0.0	NS
N	*Schistostega pennata*	Luminous Moss				S1?	2	34.4 ± 0.0	NS
N	*Trichodon cylindricus*	Cylindric Hairy-teeth Moss				S1?	2	86.2 ± 0.0	NS
N	*Enchylium limosum*	Lime-loving Tarpaper Lichen				S1?	2	58.1 ± 4.0	NS
N	*Scytinium intermedium*	Forty-five Jellyskin Lichen				S1?	1	58.1 ± 4.0	NS
N	*Melanelia culbersonii*	Appalachain Camouflage Lichen				S1?	1	36.1 ± 0.0	NS
N	*Porella pinnata*	Pinnate Scalewort				S1S2	1	82.5 ± 0.0	NS
N	*Arrhenopterum heterostichum*	One-sided Groove Moss				S1S2	3	35.9 ± 2.0	NS
N	*Brachythecium turgidum*	Thick Ragged Moss				S1S2	2	95.9 ± 3.0	NS
N	*Hypnum pratense*	Meadow Plait Moss				S1S2	1	81.4 ± 3.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	1	41.6 ± 2.0	NS
N	*Tortula acaulon*	Cuspidate Earth Moss				S1S2	4	77.3 ± 0.0	NS
N	*Plagiothecium latebricola*	Alder Silk Moss				S1S2	2	44.4 ± 5.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	1	39.6 ± 0.0	NS
N	*Sematophyllum marylandicum*	a Moss				S1S2	2	12.8 ± 3.0	NS
N	*Timmia megapolitana*	Metropolitan Timmia Moss				S1S2	3	77.0 ± 1.0	NS
N	*Tortula mucronifolia*	Mucronate Screw Moss				S1S2	1	77.5 ± 3.0	NS
N	*Syntrichia papillosa*	a Moss				S1S2	1	96.5 ± 0.0	NS
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	2	72.9 ± 0.0	NS

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N	*Haplocladium microphyllum*	Tiny-leaved Haplocladium Moss				S1S2	1	67.3 ± 5.0	NS
N	*Rhynchostegium serrulatum*	Dark Beaked Moss				S1S2	1	28.7 ± 2.0	NS
N	*Enchylium bachmanianum*	Bachman's Jelly Lichen				S1S2	2	43.7 ± 0.0	NS
N	*Placidium squamulosum*	Limy Soil Stipplescale Lichen				S1S2	1	74.5 ± 6.0	NS
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	1	78.8 ± 3.0	NS
N	*Rhizoplaca subdiscrepans*	Scattered Rock-posy Lichen				S1S2	1	37.6 ± 1.0	NS
N	*Parmotrema reticulatum*	Netted Ruffle Lichen				S1S2	7	69.2 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1S2	9	41.1 ± 0.0	NS
N	*Umbilicaria polyrhiza*	Ballpoint Rocktripe Lichen				S1S3	1	80.7 ± 0.0	NS
N	*Lecanora polytropa*	a lichen				S1S3	2	31.5 ± 1.0	NS
N	*Acarospora sinopica*	a cracked lichen				S1S3	2	11.6 ± 0.0	NS
N	*Heterodermia galactophylla*	Branching Fringe Lichen				S1S3	1	37.8 ± 0.0	NS
N	*Xylopsora friesii*	a Lichen				S1S3	2	14.9 ± 0.0	NS
N	*Stereocaulon grande*	Grand Foam Lichen				S1S3	1	87.8 ± 0.0	NS
N	*Stereocaulon intermedium*	Pacific Brain Foam Lichen				S1S3	5	5.8 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2	4	12.1 ± 30.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S2	2	17.0 ± 3.0	NS
N	*Sphagnum subnitens*	Lustrous Peat Moss				S2	1	64.6 ± 2.0	NS
N	*Usnea flavocardia*	Blood-splattered Beard Lichen				S2	1	11.8 ± 4.0	NS
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S2	5	4.6 ± 0.0	NS
N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S2	9	37.3 ± 0.0	NS
N	*Scytinium imbricatum*	Scaly Jellyskin Lichen				S2	2	55.4 ± 4.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2	1	23.6 ± 1.0	NS
N	*Nephroma resupinatum*	a lichen				S2	11	16.5 ± 0.0	NS
N	*Placynthium flabellosum*	Scaly Ink Lichen				S2	1	43.7 ± 17.0	NS
N	*Cololejeunea biddlecomiae*	Biddlecome's Pouncewort				S2?	1	99.6 ± 0.0	NS
N	*Moerckia flotoviana*	Flotow's Ruffwort				S2?	1	58.9 ± 0.0	NS
N	*Riccardia multifida*	Delicate Germanderwort				S2?	3	33.6 ± 0.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	1	79.8 ± 0.0	NS
N	*Weissia muhlenbergiana*	a Moss				S2?	6	41.6 ± 1.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	2	80.2 ± 5.0	NS
N	*Ptychostomum pendulum*	Drooping Bryum				S2?	1	35.9 ± 2.0	NS
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2?	5	12.6 ± 2.0	NS
N	*Pseudocampylium radicale*	Long-stalked Fine Wet Moss				S2?	1	81.4 ± 3.0	NS
N	*Climacium americanum*	American Tree Moss				S2?	1	94.3 ± 0.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	3	24.3 ± 0.0	NS
N	*Ditrichum rhynchostegium*	a Moss				S2?	1	4.4 ± 1.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	1	54.0 ± 1.0	NS
N	*Kiaeria starkei*	Starke's Fork Moss				S2?	1	51.2 ± 10.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	2	42.9 ± 2.0	NS
N	*Philonotis marchica*	a Moss				S2?	2	85.7 ± 0.0	NS
N	*Physcomitrium collenchymatum*	a Moss				S2?	1	95.9 ± 0.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	1	44.0 ± 0.0	NS
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	1	12.8 ± 5.0	NS
N	*Platylomella lescurii*	a Moss				S2?	7	30.7 ± 0.0	NS
N	*Phylliscum demangeonii*	Black Rock-wafer Lichen				S2?	5	42.8 ± 0.0	NS
N	*Oxyrrhynchium hians*	Light Beaked Moss				S2S3	4	10.5 ± 5.0	NS
N	*Platydictya subtilis*	Bark Willow Moss				S2S3	2	86.3 ± 3.0	NS
N	*Plagiomnium rostratum*	Long-beaked Leafy Moss				S2S3	1	94.9 ± 2.0	NS
N	*Scorpidium revolvens*	Limprichtia Moss				S2S3	3	30.9 ± 2.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S2S3	48	4.9 ± 1.0	NS

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N	*Moelleropsis nebulosa ssp. frullaniae*	Blue-gray Moss Shingle Lichen				S2S3	3	57.9 ± 0.0	NS
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S2S3	11	25.6 ± 5.0	NS
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2S3	76	9.5 ± 1.0	NS
N	*Usnea ceratina*	Warty Beard Lichen				S2S3	2	71.2 ± 0.0	NS
N	*Usnea rubicunda*	Red Beard Lichen				S2S3	6	42.9 ± 0.0	NS
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S2S3	18	7.7 ± 0.0	NS
N	*Usnocetraria oakesiana*	Yellow Band Lichen				S2S3	12	1.6 ± 0.0	NS
N	*Cladonia mateocyatha*	Mixed-up Pixie-cup				S2S3	5	7.0 ± 5.0	NS
N	*Cladonia parasitica*	Fence-rail Lichen				S2S3	3	9.5 ± 0.0	NS
N	*Chaenotheca gracilenta*	a lichen				S2S3	1	15.4 ± 0.0	NS
N	*Scytinium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	9	4.8 ± 0.0	NS
N	*Melanohalea septentrionalis*	Northern Camouflage Lichen				S2S3	1	59.1 ± 0.0	NS
N	*Myelochroa aurulenta*	Powdery Axil-bristle Lichen				S2S3	3	64.9 ± 2.0	NS
N	*Parmelia fertilis*	Fertile Shield Lichen				S2S3	8	50.6 ± 0.0	NS
N	*Hypotrachyna minarum*	Hairless-spined Shield Lichen				S2S3	3	54.7 ± 0.0	NS
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	2	14.6 ± 0.0	NS
N	*Racodium rupestre*	Rockhair Lichen				S2S3	4	4.9 ± 1.0	NS
N	*Umbilicaria polyphylla*	Petalled Rocktripe Lichen				S2S3	2	27.4 ± 0.0	NS
N	*Usnea cavernosa*	Pitted Beard Lichen				S2S3	4	59.0 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	1	59.0 ± 0.0	NS
N	*Fuscopannaria sorediata*	a Lichen				S2S3	8	4.9 ± 1.0	NS
N	*Stereocaulon condensatum*	Granular Soil Foam Lichen				S2S3	1	88.7 ± 0.0	NS
N	*Physcia subtilis*	Slender Rosette Lichen				S2S3	2	27.4 ± 0.0	NS
N	*Dimelaena oreina*	Golden Moonglow Lichen				S2S3	2	21.8 ± 0.0	NS
N	*Cetraria arenaria*	Sand-loving Icelandmoss Lichen				S2S3	24	57.1 ± 0.0	NS
N	*Cladonia coccifera*	Eastern Boreal Pixie-cup Lichen				S2S3	4	29.7 ± 2.0	NS
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S2S3	3	45.7 ± 4.0	NS
N	*Cladonia phyllophora*	Felt Lichen				S2S3	2	77.0 ± 4.0	NS
N	*Usnea flammea*	Coastal Bushy Beard Lichen				S2S3	1	31.5 ± 1.0	NS
N	*Ephemerum serratum*	a Moss				S3	6	43.3 ± 5.0	NS
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S3	15	35.5 ± 0.0	NS
N	*Anomodon tristis*	a Moss				S3	10	60.7 ± 15.0	NS
N	*Sphagnum contortum*	Twisted Peat Moss				S3	5	57.5 ± 4.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3	3	64.6 ± 2.0	NS
N	*Rostania occultata*	Crusted Tarpaper Lichen				S3	1	84.6 ± 0.0	NS
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	41	15.2 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S3	11	43.6 ± 0.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	80	14.2 ± 0.0	NS
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	33	11.8 ± 0.0	NS
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S3	16	36.8 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	8	8.3 ± 0.0	NS
N	*Placynthium nigrum*	Common Ink Lichen				S3	1	75.6 ± 0.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	1	66.3 ± 0.0	NS
N	*Punctelia appalachensis*	Appalachian Speckleback Lichen				S3	111	77.2 ± 0.0	NS
N	*Viridothelium virens*	a lichen				S3	4	9.2 ± 2.0	NS
N	*Ephebe lanata*	Waterside Rockshag Lichen				S3	4	43.7 ± 17.0	NS
N	*Phaeophyscia adiastola*	Powder-tipped Shadow Lichen				S3	1	14.3 ± 0.0	NS
N	*Phaeophyscia pusilloides*	Pompom-tipped Shadow Lichen				S3	9	10.1 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S3	11	4.3 ± 0.0	NS
N	*Metzgeria conjugata*	Rock Veilwort				S3?	1	99.8 ± 0.0	NS

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N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3?	3	7.8 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	2	33.2 ± 3.0	NS
N	*Drummondia prorepens*	a Moss				S3?	3	41.4 ± 5.0	NS
N	*Elodium blandowii*	Blandow's Bog Moss				S3?	5	19.5 ± 7.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	3	36.8 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3?	1	78.4 ± 0.0	NS
N	*Sphagnum riparium*	Streamside Peat Moss				S3?	2	50.9 ± 0.0	NS
N	*Cladonia stygia*	Black-footed Reindeer Lichen				S3?	8	42.5 ± 0.0	NS
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	3	77.3 ± 0.0	NS
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S3S4	3	8.6 ± 3.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	1	30.2 ± 0.0	NS
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	2	77.6 ± 3.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	1	50.4 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	13	60.5 ± 0.0	NS
N	*Tomentypnum nitens*	Golden Fuzzy Fen Moss				S3S4	4	37.1 ± 0.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	3	54.0 ± 1.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	1	14.7 ± 0.0	NS
N	*Bryoria pseudofuscescens*	Mountain Horsehair Lichen				S3S4	4	19.7 ± 5.0	NS
N	*Enchylium tenax*	Soil Tarpaper Lichen				S3S4	10	37.0 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3S4	65	9.3 ± 0.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	86	8.9 ± 0.0	NS
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	14	22.5 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	36	9.0 ± 0.0	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3S4	26	16.7 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	4	29.7 ± 0.0	NS
N	*Vahliella leucophaea*	Shelter Shingle Lichen				S3S4	17	82.5 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3S4	68	42.1 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3S4	90	6.8 ± 0.0	NS
N	*Melanohalea olivacea*	Spotted Camouflage Lichen				S3S4	2	59.0 ± 0.0	NS
N	*Parmeliopsis hyperopta*	Gray Starburst Lichen				S3S4	1	84.3 ± 0.0	NS
N	*Parmotrema perlatum*	Powdered Ruffle Lichen				S3S4	35	30.4 ± 0.0	NS
N	*Peltigera hymenina*	Cloudy Pelt Lichen				S3S4	2	29.7 ± 2.0	NS
N	*Sphaerophorus fragilis*	Fragile Coral Lichen				S3S4	11	28.1 ± 0.0	NS
N	*Sclerophora peronella*	Frosted Glass-whiskers Lichen				S3S4	2	72.0 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	376	4.9 ± 1.0	NS
N	*Physcia caesia*	Blue-gray Rosette Lichen				S3S4	3	30.1 ± 0.0	NS
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	7	9.8 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	162	1.6 ± 0.0	NS
N	*Evernia prunastri*	Valley Oakmoss Lichen				S3S4	38	34.9 ± 0.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	122	4.9 ± 0.0	NS
P	*Rhynchospora macrostachya*	Tall Beakrush	Endangered	Endangered	Endangered	S1	7	95.4 ± 0.0	NS
P	*Clethra alnifolia*	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S2	3	19.7 ± 0.0	NS
P	*Juglans cinerea*	Butternut	Endangered	Endangered		SNA	32	4.2 ± 0.0	NS
P	*Fraxinus nigra*	Black Ash	Threatened		Threatened	S1S2	807	6.4 ± 0.0	NS
P	*Liatris spicata*	Dense Blazing Star	Threatened	Threatened		SNA	4	14.4 ± 0.0	NS
P	*Lachnanthes caroliniana*	Redroot	Special Concern	Special Concern	Vulnerable	S2	316	94.4 ± 0.0	NS
P	*Lophiola aurea*	Goldencrest	Special Concern	Special Concern	Vulnerable	S2	462	79.6 ± 1.0	NS
P	*Lilaeopsis chinensis*	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	S3	154	70.8 ± 1.0	NS
P	*Scirpus longii*	Long's Bulrush	Special Concern		Vulnerable	S3	151	88.4 ± 0.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S3	13	83.4 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2S3	39	76.8 ± 1.0	NS
P	*Acer saccharinum*	Silver Maple				S1	12	63.1 ± 0.0	NS
P	*Osmorhiza depauperata*	Blunt Sweet Cicely				S1	1	64.9 ± 5.0	NS
P	*Andersonglossum boreale*	Northern Wild Comfrey				S1	5	39.1 ± 1.0	NS

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P	*Turritis glabra*	Tower Mustard				S1	1	70.0 ± 0.0	NS
P	*Lobelia spicata*	Pale-Spiked Lobelia				S1	8	70.7 ± 7.0	NS
P	*Silene antirrhina*	Sleepy Catchfly				S1	4	97.8 ± 0.0	NS
P	*Ribes americanum*	Wild Black Currant				S1	4	38.4 ± 3.0	NS
P	*Trichostema dichotomum*	Forked Bluecurls				S1	9	93.5 ± 0.0	NS
P	*Fraxinus pennsylvanica*	Red Ash				S1	11	20.3 ± 5.0	NS
P	*Persicaria careyi*	Carey's Smartweed				S1	1	63.0 ± 3.0	NS
P	*Phytolacca americana*	Common Pokeweed				S1	4	9.4 ± 0.0	NS
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S1	4	79.9 ± 0.0	NS
P	*Montia fontana*	Water Blinks				S1	1	14.6 ± 1.0	NS
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	1	15.3 ± 0.0	NS
P	*Amelanchier nantucketensis*	Nantucket Serviceberry				S1	1	90.2 ± 1.0	NS
P	*Salix myrtillifolia*	Blueberry Willow				S1	1	51.7 ± 0.0	NS
P	*Salix serissima*	Autumn Willow				S1	2	51.6 ± 0.0	NS
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S1	2	94.6 ± 1.0	NS
P	*Carex garberi*	Garber's Sedge				S1	4	87.0 ± 0.0	NS
P	*Carex laxiflora*	Loose-Flowered Sedge				S1	2	76.5 ± 1.0	NS
P	*Carex ormostachya*	Necklace Spike Sedge				S1	1	83.9 ± 5.0	NS
P	*Carex plantaginea*	Plantain-Leaved Sedge				S1	4	81.9 ± 0.0	NS
P	*Carex prairea*	Prairie Sedge				S1	2	78.5 ± 1.0	NS
P	*Carex viridula var. saxilittoralis*	Greenish Sedge				S1	5	78.6 ± 2.0	NS
P	*Scirpus atrovirens*	Dark-green Bulrush				S1	4	38.3 ± 0.0	NS
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S1	6	92.4 ± 0.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	1	75.8 ± 100.0	NS
P	*Sisyrinchium fuscatum*	Coastal Plain Blue-eyed-grass				S1	1	77.8 ± 0.0	NS
P	*Juncus secundus*	Secund Rush				S1	1	80.8 ± 0.0	NS
P	*Juncus vaseyi*	Vasey Rush				S1	1	87.7 ± 0.0	NS
P	*Trillium grandiflorum*	White Trillium				S1	3	78.5 ± 1.0	NS
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	5	70.7 ± 10.0	NS
P	*Spiranthes casei var. casei*	Case's Ladies'-Tresses				S1	1	58.7 ± 0.0	NS
P	*Dichanthelium xanthophysum*	Slender Panic Grass				S1	10	75.3 ± 1.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	11	36.2 ± 0.0	NS
P	*Torreyochloa pallida var. pallida*	Pale False Manna Grass				S1	1	97.6 ± 1.0	NS
P	*Adiantum pedatum*	Northern Maidenhair Fern				S1	26	31.3 ± 1.0	NS
P	*Dryopteris goldieana*	Goldie's Woodfern				S1	1	61.7 ± 1.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	1	72.9 ± 5.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	10	28.7 ± 0.0	NS
P	*Selaginella rupestris*	Rock Spikemoss				S1	1	38.2 ± 0.0	NS
P	*Solidago hispida*	Hairy Goldenrod				S1?	1	14.4 ± 7.0	NS
P	*Suaeda rolandii*	Roland's Sea-Blite				S1?	5	39.4 ± 2.0	NS
P	*Carex pensylvanica*	Pennsylvania Sedge				S1?	3	21.3 ± 0.0	NS
P	*Allium schoenoprasum*	Wild Chives				S1?	2	6.6 ± 0.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S1?	1	78.2 ± 7.0	NS
P	*Crocanthemum canadense*	Long-branched Frostweed			Endangered	S1S2	78	10.4 ± 1.0	NS
P	*Cypripedium arietinum*	Ram's-Head Lady's-Slipper			Endangered	S1S2	308	34.0 ± 2.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1S2	10	36.4 ± 0.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1S2	2	78.3 ± 0.0	NS
P	*Proserpinaca intermedia*	Intermediate Mermaidweed				S1S2	5	44.2 ± 0.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	5	78.2 ± 7.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1S2	4	71.6 ± 1.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	1	36.5 ± 10.0	NS

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P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S1S2	1	99.3 ± 7.0	NS
P	*Euphrasia farlowii*	Farlow's Eyebright				S1S3	2	78.0 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	1	69.8 ± 0.0	NS
P	*Zizia aurea*	Golden Alexanders				S2	41	58.9 ± 0.0	NS
P	*Antennaria parlinii ssp. fallax*	Parlin's Pussytoes				S2	34	35.8 ± 0.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S2	30	21.7 ± 7.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S2	1	78.1 ± 0.0	NS
P	*Cardamine maxima*	Large Toothwort				S2	2	64.9 ± 0.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	254	10.1 ± 0.0	NS
P	*Desmodium canadense*	Canada Tick-trefoil				S2	12	65.9 ± 1.0	NS
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S2	23	38.9 ± 0.0	NS
P	*Conopholis americana*	American Cancer-root				S2	21	71.3 ± 1.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	16	13.6 ± 0.0	NS
P	*Hepatica americana*	Round-lobed Hepatica				S2	74	34.0 ± 0.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S2	24	5.1 ± 1.0	NS
P	*Galium boreale*	Northern Bedstraw				S2	7	70.7 ± 7.0	NS
P	*Gratiola neglecta*	Clammy Hedge-Hyssop				S2	6	55.7 ± 0.0	NS
P	*Dirca palustris*	Eastern Leatherwood				S2	75	33.3 ± 0.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S2	2	51.7 ± 0.0	NS
P	*Carex pellita*	Woolly Sedge				S2	2	74.3 ± 10.0	NS
P	*Carex livida*	Livid Sedge				S2	13	3.2 ± 0.0	NS
P	*Juncus greenei*	Greene's Rush				S2	5	13.5 ± 10.0	NS
P	*Allium tricoccum*	Wild Leek				S2	84	65.0 ± 0.0	NS
P	*Lilium canadense*	Canada Lily				S2	73	32.5 ± 0.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	27	11.6 ± 7.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	13	36.3 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	58	31.6 ± 0.0	NS
P	*Platanthera flava var. flava*	Southern Rein Orchid				S2	11	63.8 ± 7.0	NS
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S2	15	62.6 ± 1.0	NS
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	5	45.9 ± 1.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S2	28	71.5 ± 0.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S2	60	71.7 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S2	6	14.4 ± 7.0	NS
P	*Festuca subverticillata*	Nodding Fescue				S2	13	50.3 ± 7.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	11	64.0 ± 10.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S2	3	43.8 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	1	27.2 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	1	43.4 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	5	33.6 ± 7.0	NS
P	*Carex peckii*	White-Tinged Sedge				S2?	4	38.4 ± 5.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S2S3	15	21.3 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2S3	18	39.3 ± 0.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2S3	2	75.1 ± 1.0	NS
P	*Lactuca hirsuta*	Hairy Lettuce				S2S3	4	31.6 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2S3	4	66.7 ± 0.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2S3	80	30.7 ± 7.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2S3	13	76.5 ± 1.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2S3	10	76.5 ± 1.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2S3	4	66.3 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2S3	2	78.6 ± 2.0	NS
P	*Hypericum majus*	Large St John's-wort				S2S3	5	6.7 ± 0.0	NS
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	5	7.0 ± 10.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	5	14.3 ± 7.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	12	56.4 ± 3.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2S3	9	21.2 ± 1.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	17	29.8 ± 5.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2S3	8	18.5 ± 7.0	NS
P	*Polygala polygama*	Racemed Milkwort				S2S3	5	13.5 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	8	42.6 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	4	40.0 ± 1.0	NS
P	*Polygonum oxyspermum*	Sharp-fruit Knotweed				S2S3	1	3.8 ± 0.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2S3	10	35.9 ± 0.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2S3	17	78.2 ± 7.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2S3	15	15.1 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	27	4.1 ± 0.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	1	74.1 ± 7.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	11	5.5 ± 0.0	NS
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2S3	1	91.5 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	3	57.3 ± 2.0	NS
P	*Tiarella cordifolia*	Heart-leaved Foamflower				S2S3	17	45.8 ± 0.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S2S3	1	87.0 ± 0.0	NS
P	*Boehmeria cylindrica*	Small-spike False-nettle				S2S3	56	35.3 ± 0.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	8	9.4 ± 0.0	NS
P	*Carex capillaris*	Hairlike Sedge				S2S3	1	86.6 ± 0.0	NS
P	*Carex comosa*	Bearded Sedge				S2S3	7	42.4 ± 7.0	NS
P	*Carex houghtoniana*	Houghton's Sedge				S2S3	1	60.3 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2S3	8	73.2 ± 0.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2S3	5	22.8 ± 5.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2S3	7	37.1 ± 0.0	NS
P	*Vallisneria americana*	Wild Celery				S2S3	11	39.1 ± 1.0	NS
P	*Najas gracillima*	Thread-Like Naiad				S2S3	2	28.0 ± 0.0	NS
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S2S3	20	34.5 ± 0.0	NS
P	*Spiranthes casei*	Case's Ladies'-Tresses				S2S3	1	99.4 ± 0.0	NS
P	*Spiranthes casei var. novaescotiae*	Case's Ladies'-Tresses				S2S3	3	57.6 ± 0.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2S3	13	39.1 ± 0.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2S3	10	71.8 ± 1.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2S3	2	85.0 ± 1.0	NS
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	4	59.3 ± 5.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	4	44.0 ± 1.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	5	11.3 ± 50.0	NS
P	*Potamogeton pulcher*	Spotted Pondweed			Vulnerable	S3	19	71.3 ± 0.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	1	74.2 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S3	2	48.0 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S3	2	77.4 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S3	59	38.2 ± 0.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S3	29	23.8 ± 0.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S3	7	21.7 ± 5.0	NS
P	*Symphyotrichum undulatum*	Wavy-leaved Aster				S3	129	2.1 ± 1.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S3	20	38.8 ± 0.0	NS
P	*Alnus serrulata*	Smooth Alder				S3	320	78.1 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S3	69	17.8 ± 0.0	NS
P	*Betula pumila*	Bog Birch				S3	3	49.2 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S3	15	27.0 ± 50.0	NS
P	*Palustricodon aparinoides*	Marsh Bellflower				S3	18	42.5 ± 1.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	235	2.2 ± 0.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S3	57	23.8 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S3	10	30.5 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S3	11	43.5 ± 5.0	NS
P	*Ceratophyllum echinatum*	Prickly Hornwort				S3	7	71.7 ± 3.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S3	47	34.2 ± 0.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S3	1	31.2 ± 0.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	94	14.3 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	4	28.0 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S3	3	28.8 ± 0.0	NS
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	22	39.5 ± 0.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	3	42.4 ± 7.0	NS
P	*Utricularia resupinata*	Inverted Bladderwort				S3	2	89.1 ± 0.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	7	43.6 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	34	6.6 ± 0.0	NS
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S3	13	48.9 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	8	13.2 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	25	71.7 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	50	8.9 ± 1.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	2	22.0 ± 0.0	NS
P	*Anemone virginiana*	Virginia Anemone				S3	19	36.3 ± 5.0	NS
P	*Cephalanthus occidentalis*	Common Buttonbush				S3	624	14.6 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S3	79	48.8 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S3	130	42.8 ± 0.0	NS
P	*Salix sericea*	Silky Willow				S3	124	24.5 ± 1.0	NS
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S3	4	70.7 ± 7.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	10	38.3 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	51	35.5 ± 0.0	NS
P	*Pilea pumila*	Dwarf Clearweed				S3	9	8.6 ± 0.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S3	7	52.4 ± 1.0	NS
P	*Carex bebbii*	Bebb's Sedge				S3	24	36.3 ± 0.0	NS
P	*Carex castanea*	Chestnut Sedge				S3	39	48.8 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	12	22.7 ± 6.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	11	58.5 ± 1.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S3	32	36.3 ± 2.0	NS
P	*Carex lupulina*	Hop Sedge				S3	68	7.5 ± 0.0	NS
P	*Carex rosea*	Rosy Sedge				S3	43	35.8 ± 2.0	NS
P	*Carex swanii*	Swan's Sedge				S3	4	3.2 ± 0.0	NS
P	*Carex tenera*	Tender Sedge				S3	7	38.3 ± 0.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	13	38.3 ± 0.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	32	36.5 ± 2.0	NS
P	*Carex atratiformis*	Scabrous Black Sedge				S3	3	88.5 ± 0.0	NS
P	*Eleocharis nitida*	Quill Spikerush				S3	11	36.6 ± 5.0	NS
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S3	8	12.4 ± 0.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S3	6	32.7 ± 7.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S3	13	59.9 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S3	578	15.4 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	126	1.8 ± 0.0	NS
P	*Platanthera flava*	Southern Rein-Orchid				S3	33	74.8 ± 0.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	90	12.8 ± 0.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	18	38.4 ± 1.0	NS
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S3	10	42.4 ± 7.0	NS
P	*Piptatheropsis canadensis*	Canada Ricegrass				S3	20	24.3 ± 1.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S3	8	39.0 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	3	64.2 ± 5.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	7	47.9 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	15	43.7 ± 5.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	12	77.0 ± 7.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3	15	84.5 ± 0.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	4	70.4 ± 0.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	23	14.6 ± 0.0	NS
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S3?	20	37.2 ± 0.0	NS
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3?	39	11.9 ± 7.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	5	77.2 ± 0.0	NS
P	*Bidens vulgata*	Tall Beggarticks				S3S4	6	10.4 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3S4	25	35.7 ± 7.0	NS
P	*Hieracium paniculatum*	Panicled Hawkweed				S3S4	29	33.7 ± 11.0	NS
P	*Bidens beckii*	Water Beggarticks				S3S4	8	43.6 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3S4	104	33.9 ± 0.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	14	44.6 ± 0.0	NS
P	*Shepherdia canadensis*	Soapberry				S3S4	113	28.3 ± 7.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3S4	3	57.0 ± 0.0	NS
P	*Vaccinium cespitosum*	Dwarf Bilberry				S3S4	55	31.2 ± 0.0	NS
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	15	6.3 ± 0.0	NS
P	*Fagus grandifolia*	American Beech				S3S4	795	1.3 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3S4	31	24.5 ± 7.0	NS
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3S4	48	4.6 ± 1.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3S4	3	39.1 ± 0.0	NS
P	*Nuphar microphylla*	Small Yellow Pond-lily				S3S4	1	29.8 ± 0.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3S4	26	33.6 ± 7.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	18	21.0 ± 0.0	NS
P	*Rumex pallidus*	Seabeach Dock				S3S4	1	46.5 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3S4	10	40.5 ± 1.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3S4	271	32.4 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3S4	51	6.1 ± 0.0	NS
P	*Crataegus succulenta*	Fleshy Hawthorn				S3S4	1	6.6 ± 0.0	NS
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	68	33.2 ± 1.0	NS
P	*Fragaria vesca*	Woodland Strawberry				S3S4	16	1.8 ± 0.0	NS
P	*Galium aparine*	Common Bedstraw				S3S4	48	15.8 ± 0.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3S4	5	48.7 ± 0.0	NS
P	*Limosella australis*	Southern Mudwort				S3S4	10	21.3 ± 3.0	NS
P	*Ulmus americana*	White Elm				S3S4	78	3.8 ± 0.0	NS
P	*Verbena hastata*	Blue Vervain				S3S4	170	11.5 ± 0.0	NS
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S3S4	33	8.5 ± 0.0	NS
P	*Viola selkirkii*	Great-Spurred Violet				S3S4	5	33.3 ± 4.0	NS
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3S4	10	14.6 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	9	45.0 ± 1.0	NS
P	*Sisyrinchium atlanticum*	Eastern Blue-Eyed-Grass				S3S4	33	59.5 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	29	28.8 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	7	6.7 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3S4	24	7.7 ± 0.0	NS
P	*Luzula parviflora ssp. melanocarpa*	Black-fruited Woodrush				S3S4	2	75.9 ± 0.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3S4	6	49.8 ± 0.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	9	6.7 ± 0.0	NS
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	8	14.4 ± 10.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3S4	14	33.3 ± 4.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3S4	11	41.3 ± 0.0	NS
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3S4	298	4.4 ± 0.0	NS
P	*Coleataenia longifolia*	Long-leaved Panicgrass				S3S4	427	88.2 ± 0.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	10	38.3 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Koeleria spicata*	Narrow False Oats				S3S4	16	35.9 ± 0.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3S4	15	60.0 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3S4	16	36.3 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	14	9.1 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3S4	2	64.9 ± 1.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3S4	18	62.6 ± 7.0	NS
P	*Sceptridium multifidum*	Leathery Moonwort				S3S4	10	53.0 ± 10.0	NS
P	*Botrychium matricariifolium*	Daisy-leaved Moonwort				S3S4	5	28.9 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	2	42.7 ± 0.0	NS
P	*Greeneochloa coarctata*	Small Reedgrass				SH	1	12.1 ± 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.

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1766	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
1397	McNeil, J.A. 2010. Blandings Turtle (Emydoidea blandingii) sightings, 1946-2009. Parks Canada, 12,871 recs of 597+ individuals.
1140	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.
845	Eaton, S. 2014. Nova Scotia Wood Turtle Database. Environment and Climate Change Canada, 4843 recs.
812	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
666	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
622	Cameron, E. 2008. Canadian Gypsum Co. survey 2007-08. Conestoga-Rovers & Assoc., 623 recs.
585	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.
571	Toms, Brad. 2012. Atlantic Coastal Plain Flora records, 2011. Mersey-Tobiatic Research Institute, 1109 recs.
562	SwiftWatch. 2022. Total Chimney Swift counts from roost watches for the duration of the SwiftWatch program (2011-2021). Birds Canada.
548	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
532	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
524	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
472	Clayden, S. Digitization of Wolfgang Maass Nova Scotia forest lichen collections, 1964-2004. New Brunswick Museum. 2018.
459	Belliveau, A.G. 2020. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2019, 2020. E.C. Smith Herbarium.
453	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
440	Phinney, Lori. 2020. Pre- and post White-nose Syndrome bat acoustic monitoring, NS. Mersey Tobeatic Research Institute, 1279 recs.
410	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
365	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.
361	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
345	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
338	McNeil, J.A. 2010. Ribbonsnake (Thamophis sauritus) sightings, 1900-2009. Parks Canada, 2521 recs of 716+ individuals.
330	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
321	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
309	Wildlife Division. 2021. Fraxinus nigra records assembled to define and model habitat. Nova Scotia Department of Natural Resources and Renewables.
298	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
286	Brazner, John. 2022. Clearcut Transect Study. Nova Scotia Department of Natural Resources and Renewables Wildlife Division.
258	Churchill, J.L. 2022. Atlantic Canada Conservation Data Centre Fieldwork 2022. Atlantic Canada Conservation Data Centre.
254	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.
243	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2018. Atlantic Canada Conservation Data Centre, 907 recs.

# recs	CITATION
229	McNeil, J.A. 2019. Blanding's Turtle records, 2017. Mersey Tobeatic Research Institute, 372 recs.
211	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
208	Toms, B. 2018. Bat Species data from www.batconservation.ca for Nova Scotia. Mersey Tobeatic Research Institute, 547 Records.
189	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
166	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
164	Brazner, J. 2016. Nova Scotia Forested Wetland Bird Surveys. Nova Scotia Department of Lands and Forestry.
159	Belliveau, A.G. 2021. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2021. E.C. Smith Herbarium.
156	Gallop, John. 2023. Species at Risk and Species of Conservation Interest records. McCallum Environmental.
154	Hagerman, Christianne. 2022. Wisqoq and Eastern White Cedar field work. E.C. Smith Herbarium, Acadia University.
153	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.
146	Munro, Marian K. Tracked lichen specimens, Nova Scotia Provincial Museum of Natural History Herbarium. Atlantic Canada Conservation Data Centre. 2019.
145	Bryson, I.C. 2020. Nova Scotia flora and lichen observations 2020. Nova Scotia Environment, 139 recs.
138	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
137	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
137	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
131	e-Butterfly. 2016. Export of Maritimes records and photos. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
130	Pepper, C. 2013. 2013 rare bird and plant observations in Nova Scotia. , 181 records.
124	McNeil, J.A. 2018. Blanding's Turtle records, 2018. Mersey Tobeatic Research Institute, 372 recs.
120	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
119	Chapman-Lam, C.J. 2021. Atlantic Canada Conservation Data Centre 2020 botanical fieldwork. Atlantic Canada Conservation Data Centre, 17309 recs.
116	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
116	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
115	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
112	e-Butterfly. 2019. Export of Maritimes records and photos. McFarland, K. (ed.) e-butterfly.org.
105	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
104	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
102	Staicer, C. 2021. Additional compiled Nova Scotia Species at Risk bird records, 2005-2020. Dalhousie University.
101	Belliveau, A. 2012. 2012 Atlantic Coastal Plain Flora observations. Mersey Tobeatic Research Institute, 1543.
99	McNeil, J.A. 2019. Eastern Painted Turtle trapping records, 2019. Mersey Tobeatic Research Institute.
96	Belliveau, A.G. & Churchill, J.L.; Anderson, F.; Brooks, F. 2023. Lichen Inventory of Blue Rocks, NS. E.C. Smith Herbarium.
96	Hubley, Nicole. 2022. Monarch (Danaus plexippus) records submitted to MTRI from the 2021 field season. Mersey Tobeatic Research Institute.
96	McNeil, J.A. 2018. Wood Turtle records, 2018. Mersey Tobeatic Research Institute, 68 recs.
95	Breen, A. 2019. 2019 Atlantic Whitefish observations. Coastal Action, 95 recs.
95	Richardson, Leif. 2018. Maritimes Bombus records from various sources. Richardson, Leif.
94	Staicer, Cindy. 2022. 2021 Landbird Species at Risk observations. Dalhousie University.
92	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
88	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
88	McNeil, J.A. 2019. Blanding's Turtle records, 2019. Mersey Tobeatic Research Institute.
84	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
83	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.
79	Staicer, Cindy. 2023. 2022 SAR Bird ARU occurrences. Dalhousie University, 379 records.
78	Toms, Brad. 2011. Atlantic Coastal Plain Flora records 2010. Mersey-Tobiatic Research Institute, 1074 recs.
76	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
76	Birds Canada. 2022. Maritimes Swiftwatch project data for 2022. Pers. comm., 155 records.
76	Toms, Brad & Pepper, Chris; Neily, Tom. 2022. Nova Scotia lichen database [as of 2022-04]. Mersey Tobeatic Research Institute.
74	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
73	Bryson, I. 2020. Nova Scotia and Newfoundland rare species observations, 2018-2020. Nova Scotia Environment.
72	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
72	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
70	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
70	Staicer, Cindy. 2023. 2022 SAR Bird field occurrences from the Landbirds at Risk Project, NS. Dalhousie University, 446 records.
68	Belliveau, A.G. 2014. Plant Records from Southern and Central Nova Scotia. Atlantic Canada Conservation Data Centre, 919 recs.
68	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
61	iNaturalist. 2020. iNaturalist butterfly records selected for the Maritimes Butterfly Atlas. iNaturalist.
60	McNeil, J.A. 2019. Eastern Painted Turtle trapping records, 2017. Mersey Tobeatic Research Institute.
59	Blaney, C.S. 2020. Sean Blaney 2020 field data. Atlantic Canada Conservation Data Centre, 4407 records.
58	Belliveau, A.G. 2018. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2018. E.C. Smith Herbarium, 6226 recs.
57	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.
55	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.

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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.
54	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
53	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
53	Churchill, J.L. 2020. Atlantic Canada Conservation Data Centre Fieldwork 2020. Atlantic Canada Conservation Data Centre, 1083 recs.
53	Feltham, Carter. 2022. Monarch (Danaus plexippus) and Milkweed MTRI records from the 2022 Field Season. Mersey Tobeatic Research Institute.
50	Mersey Tobetic Research Institute. 2021. 2020 Monarch records from the MTRI monitoring program. Mersey Tobetic Research Institute, 72 records.
49	Churchill, J.L. 2019. Atlantic Canada Conservation Data Centre Fieldwork 2019. Atlantic Canada Conservation Data Centre.
46	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
45	MacDonald, E.C. 2018. Piping Plover nest records from 2010-2017. Canadian Wildlife Service.
44	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
42	Nova Scotia Nature Trust. 2013. Nova Scotia Nature Trust 2013 Species records. Nova Scotia Nature Trust, 95 recs.
42	Stewart, J.I. 2010. Peregrine Falcon Surveys in New Brunswick, 2002-09. Canadian Wildlife Service, Sackville, 58 recs.
41	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
41	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
41	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
40	Cameron, E. 2007. Canadian Gypsum Co. survey 2005-07. Dillon Consulting Ltd, 40 recs.
38	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
37	McNeil, Jeffie. 2022. 2021 Turtle Records. Mersey Tobeatic Research Institute.
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.
34	McNeil, J.A. 2014. Blandings Turtle (Emydoidea blandingii) and Snapping Turtle (Chelydra serpentina) sightings, 2014. Mersey Tobeatic Research Institute.
34	McNeil, Jeffie. 2023. 2022 Turtle Records. Mersey Tobeatic Research Institute.
34	Westwood, A., Staicer, C. 2016. Nova Scotia landbird Species at Risk observations. Dalhousie University.
33	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.
33	Haughian, Sean. 2021. Update to lichen data from 2017-2021. Nova Scotia Museum.
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	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
32	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
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	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
30	Bayne, D.M. 2007. Atlantic Coastal Plain Flora record, 2004-06. Nova Scotia Nature Trust. Pers. comm. to C.S. Blaney, 57 recs.
30	Cameron, R.P. 2018. Degelia plumbea records. Nova Scotia Environment.
30	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
30	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
30	McLean, K. 2019. Wood Turtle observations . Clean Annapolis River Project.
30	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
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	MacDonald, E.C. 2018. CWS Piping Plover Census, 2010-2017. Canadian Wildlife Service, 672 recs.
29	McNeil, J.A. 2020. Snapping Turtle and Eastern Painted Turtle records, 2020. Mersey Tobeatic Research Institute.
28	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
28	Pepper, Chris. 2012. Observations of breeding Canada Warbler's along the Eastern Shore, NS. Pers. comm. to S. Blaney, Jan. 20, 28 recs.
27	Belliveau, A. 2013. Rare species records from Nova Scotia. Mersey Tobeatic Research Institute, 296 records. 296 recs.
27	LaPaix, Rich. 2022. Rare species observations, 2018-2022. Nova Scotia Nature Trust.
26	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
26	Porter, Caitlin. 2021. Field data for 2020 in various locations across the Maritimes. Atlantic Canada Conservation Data Centre, 3977 records.
25	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
25	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
24	Belliveau, A.G. 2021. New Black ash site records near Kentville, NS. Acadia University, 47 records.
24	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
23	Bryson, I. 2013. Nova Scotia rare plant records. CBCL Ltd., 180 records.
23	Richardson, D., Anderson, F., Cameron, R, McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen (Anzia colpodes). COSEWIC.
22	Breen, A. 2018. 2018 Atlantic Whitefish observations. Coastal Action.
22	Chapman, C.J. 2019. Atlantic Canada Conservation Data Centre 2019 botanical fieldwork. Atlantic Canada Conservation Data Centre, 11729 recs.
22	Nelly, T.H. 2006. Cypripedium arietinum in Hants Co. Pers. comm. to C.S. Blaney. 22 recs, 22 recs.
21	Hall, R.A. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 189 recs.
20	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
19	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.

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19	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
18	Basquill, S.; Sam, D. 2019. Crocanthemum canadense observations near Greenwood, NS, 2015-2019. pers. commun. from Nova Scotia Department of Lands and Forestry to AC CDC, 18 recs.
18	McNeil, Jeffie. 2022. Ribbonsnake records, 2021. Mersey Tobeatic Research Institute.
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	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
17	MacKinnon, D.S. & O'Brien, M.K.H.; Cameron, R.P. 2002. Fieldwork 2000. Dept of Environment & Labour, Protected Areas Branch, 252 recs.
17	McNeil, J.A. 2015. Blandings Turtle (Emydoidea blandingii), Eastern Ribbonsnake (Thamnophis sauritus), and Snapping Turtle (Chelydra serpentina) sightings, 2015. Mersey Tobeatic Research Institute.
17	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
17	Richardson, D., Anderson, F., Cameron, R, Pepper, C., Clayden, S. 2015. Field Work Report on the Wrinkled Shingle lichen (Pannaria lurida). COSEWIC.
16	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.
16	Nature Conservancy of Canada. 2022. NCC Field data for Nova Scotia. Nature Conservancy of Canada.
15	Basquill, S.P. 2011 vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
15	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
15	Pepper, C. 2021. Rare bird, plant and mammal observations in Nova Scotia, 2017-2021.
14	Cameron, R.P. 2014. 2013-14 rare species field data. Nova Scotia Department of Environment, 35 recs.
14	Chapman, C.J. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 11171 recs.
14	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
14	Keddy, C.J. 1989. Habitat securement for redroot, golden crest and Long's bulrush in Ponhook Lake, NS. World Wildlife Fund (Canada), 131 recs.
14	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
14	McNeil, J.A. 2019. Snapping Turtle records, 2017. Mersey Tobeatic Research Institute.
14	Powell, B.C. 1967. Female sexual cycles of Chrysemy spicta & Clemmys insculpta in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
13	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
13	McNeil, Jeffie. 2023. Ribbonsnake records from 2022. Mersey Tobeatic Research Institute.
13	Nova Scotia Nature Trust. 2014. Ladyslipper records from Saint Croix Nova Scotia, JLC Ed. Nova Scotia Nature Trust.
13	Robinson, S.L. 2015. 2014 field data.
13	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.
12	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
12	McLean, K. 2020. Wood Turtle observations . Clean Annapolis River Project.
12	Newell, R.E. 2019. Crocanthemum canadense records compiled for provincial status report. pers. comm. from Ruth Newell to AC CDC.
12	Patrick, Allison. 2021. Animal and plant records from NCC properties from 2019 and 2020. Nature Conservancy Canada.
11	Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
10	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
10	Belliveau, A.G. & Vail, Cole; King, Katie. 2020. New Allium tricoccum locations, Cornwallis River. Chapman, C.J. (ed.) Acadia University.
10	Bredin, K.A. 2002. NS Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centere, 30 recs.
10	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
10	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
10	McLean, K. 2020. Species occurrence records from Clean Annapolis River Project fieldwork in 2020. Clean Annapolis River Project, 206 records.
10	McNeil, J.A. 2011. Ribbonsnake (Thamophis sauritus) sightings, 2010. Parks Canada, 148 recs of 70+ individuals.
10	Neily, T. H. 2018. Lichen and Bryophyte records, AEI 2017-2018. Tom Neily; Atlantic Canada Conservation Data Centre.
9	Cameron, R.P. 2006. Erioderma pedicellatum 2006 field data. NS Dept of Environment, 9 recs.
9	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
9	Cameron, R.P. 2017. 2017 rare species field data. Nova Scotia Environment, 64 recs.
9	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
9	Haughian, S.R. 2018. Description of Fuscopannaria leucosticta field work in 2017. New Brunswick Museum, 314 recs.
9	Klymko, J.J.D. 2012. Odonata specimens & observations, 2010. Atlantic Canada Conservation Data Centre, 425 recs.
9	McNeil, J.A. 2018. Snapping Turtle records, 2018. Mersey Tobeatic Research Institute.
9	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-05-25]. Mersey Tobeatic Research Institute, 668 recs.
8	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
8	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
8	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
8	Cameron, R.P. 2005. Erioderma pedicellatum unpublished data. NS Dept of Environment, 9 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	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
8	King, Katie; Jean, Samuel. 2021. Black ash observations near Booklyn, NS. E.C. Smith Herbarium.
8	Klymko, J. Butterfly records at the Nova Scotia Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2017.
8	Neily, T.H. & Anderson, F. 2011. Lichen observations from NRC site at Sandy Cove. , 97.
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	Pohl, G.P. Specimen data from Northern Forest Research Centre. Northern Forest Research Centre. 2022.
8	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.

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8	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
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	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
6	Benjamin, L.K. 2006. Cypripedium arietinum. Pers. comm. to D. Mazerolle. 9 recs, 9 recs.
6	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
6	Blaney, C.S; Korol, J.B.; Crowell, I. 2023. 2022 AC CDC Botany program field data. Atlantic Canada Conservation Data Centre, 5293 records.
6	Brazner, J.; Hill, N. 2018. Plant observations along the Cornwallis River, Nova Scotia. Nova Scotia Department of Lands and Forestry.
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APPENDIX B

Vegetation Data

Table B.1 - Observed Vegetation in the SLSA

Species Name	Common Name
Abies balsamea	Balsam Fir
Acer pensylvanicum	Striped Maple
Acer rubrum	Red Maple
Acer spicatum	Mountain Maple
Agalinis neoscotica	Nova Scotia Agalinis
Agrostis capillaris	Colonial Bent Grass
Agrostis perennans	Upland Bent Grass
Agrostis scabra	Rough Bent Grass
Alnus alnobetula	Green Alder
Alnus incana	Speckled Alder
Amelanchier sp.	a Serviceberry
Anaphalis margaritacea	Pearly Everlasting
Anthoxanthum odoratum	Large Sweet Vernal Grass
Aralia hispida	Bristly Sarsaparilla
Aralia nudicaulis	Wild Sarsaparilla
Athyrium filix-femina	Northeastern Lady Fern
Bazzania trilobata	Bazzania
Betula alleghaniensis	Yellow Birch
Betula papyrifera	Paper Birch
Betula populifolia	Gray Birch
Brachyelytrum erectum	Bearded Shorthusk
Calamagrotis canadensis	Bluejoint Reed Grass
Carex arctata	Black Sedge
Carex debilis	White-edged Sedge
Carex echinata	Star Sedge
Carex folliculata	Northern Long Sedge
Carex gracillima	Graceful Sedge
Carex gynandra	Nodding Sedge
Carex intumescens	Bladder Sedge
Carex leptalea	Bristly-stalked Sedge
Carex lurida	Sallow Sedge
Carex michauxiana	Michaux's Sedge
Carex novae-angliae	New England Sedge
Carex pallescens	Pale Sedge
Carex scoparia	Broom Sedge
Carex sp.	a Sedge
Carex stricta	Tussock Sedge
Carex tripserma	Three-seeded Sedge
Centaurea nigra	Black Knapweed
Chamaedaphne calyculata	Leatherleaf
Chelone glabra	White Turtlehead
Cladonia sp.	a Reindeer Lichen
Claytosmunda claytoniana	Interrupted Fern
Clintonia borealis	Yellow Bluebead Lily
Coptis trifolia	Goldthread
Cornus canadensis	Bunchberry
Crataegus monogyna	English Hawthorn
Danthonia spicata	Poverty Oat Grass
Dendrolycopodium obscurum	Flat-branched Tree-clubmoss
Dennstaedtia punctilobula	Eastern Hay-Scented Fern
Deschampsia cespitosa	Tufted Hair Grass
Dianthus armeria	Deptford Pink
Dichanthelium villosissimum	White-Hair Witchgrass
Dicranium sp.	a Broom Moss
Diervilla lonicera	Northern Bush Honeysuckle
Doellingeria umbellata	Hairy Flat-top White Aster
Dryopteris carthusiana	Spinulose Wood Fern
Dryopteris cristata	Crested Wood Fern
Dryopteris intermedia	Evergreen Wood Fern
Dryopteris x bootii	a hybrid Wood Fern
Elaeagnus umbellata	Autumn Olive
Epigaea repens	Trailing Arbutus
Epipactis helleborine	Helleborine
Equisetum arvense	Field Horsetail
Equisetum sylvaticum	Woodland Horsetail
Erechtites hieraciifolius	Eastern Burnweed
Eurybia radula	Low Rough Aster
Euthamia graminifolia	Grass-leaved Goldenrod
Fagus grandifolia	American Beech
Festuca filiformis	Hair Fescue
Fragaria virginiana	Wild Strawberry
Fraxinus americana	White Ash
Galeopsis tetrahit	Common Hemp-nettle
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

Table B.1 - Observed Vegetation in the SLSA

Species Name	Common Name
Glyceria striata	Fowl Manna Grass
Gymnocarpium dryopteris	Common Oak Fern
Hamamelis virginiana	American Witch-Hazel
Hieracium umbellatum	Umbellate Hawkweed
Hylocomium splendens	Stairstep moss
Hypericum perforatum	Common St. John's-wort
Hypnom imponens	Plume moss
Ilex mucronata	Mountain Holly
Ilex verticillata	Common Winterberry
Impatiens capensis	Spotted Jewelweed
Juncus bufonius	Toad Rush
Juncus effusus	Soft Rush
Juncus militaris	Bayonet Rush
Juncus tenuis	Slender Rush
Juniperus communis	Common Juniper
Kalmia angustfolia	Lambkill
Kalmia angustifolia	Sheep Laurel
Lactuca sp.	a Lettuce
Larix laricina	Tamarack
Linnaea borealis	Twinflower
Lobelia inflata	Inflated Lobelia
Lolium pratense	Meadow Fescue
Lonicera canadensis	Canada Fly Honeysuckle
Lotus corniculatus	Garden Bird's-foot Trefoil
Lycopus uniflorus	Northern Water Horehound
Lysimachia borealis	Northern Starflower
Lysimachia terrestris	Swamp Yellow Loosestrife
Maianthemum canadense	Wild Lily-of-the-valley
Maianthemum trifolium	Three-leaved False Soloman's Seal
Medeola virginiana	Cucumber Root
Mitchella repens	Partridgeberry
Monotropa uniflora	Convulsion-Root
Moss sp.	a Moss
Myosotis laxa	Small Forget-Me-Not
Myrica gale	Sweet Gale
Nabalus trifoliolatus	Three-leaved Rattlesnakeroot
Nymphaea odorata	Fragrant Water-lily
Nymphoides cordata	Little Floatingheart
Oclemena acuminata	Whorled Wood Aster
Oenothera biennis	Common Evening Primrose
Onoclea sensibilis	Sensitive Fern
Osmunda regalis	Royal Fern
Osmundastrum cinnamomeum	Cinnamon Fern
Oxalis montana	Common Wood Sorrel
Persicaria punctata	Dotted Smartweed
Persicaria sagittata	Arrow-leaved Smartweed
Phegopteris connectilis	Northern Beech Fern
Picea glauca	White Spruce
Picea mariana	Black Spruce
Picea rubens	Red Spruce
Pilosella caespitosa	Meadow Hawkweed
Pinus resinosa	Red Pine
Pinus strobus	Eastern White Pine
Plantago major	Common Plantain
Pleurozium schreberi	Red-stemmed feathermoss
Poa pratensis	Kentucky Blue Grass
Polystichum acrostichoides	Christmas Fern
Polytrichum sp.	a Haircap moss
Pontederia cordata	Pickerelweed
Populus balsamifera	Balsam Poplar
Populus grandidentata	Large-toothed Aspen
Populus tremuloides	Trembling Aspen
Potamogeton epihydrus	Ribbon-leaved Pondweed
Potamogeton pusillus	Small Pondweed
Potentilla norvegica	Rough Cinquefoil
Potentilla simplex	Old Field Cinquefoil
Prunella vulgaris	Common Self-heal
Prunus pensylvanica	Pin Cherry
Pteridium aquilinum	Bracken Fern
Quercus rubra	Northern Red Oak
Ranunculus acris	Common Buttercup
Ranunculus repens	Creeping Buttercup
Rhododendron canadense	Rhodora
Rhododendron groenlandicum	Common Labrador Tea
Rhynchospora capitellata	Small-headed Beakrush
Rorippa palustris	Bog Yellowcress
Rosa multiflora	Multiflora Rose
Rosa nitida	Shining Rose
Rubus allegheniensis	Alleghaney Blackberry

Table B.1 - Observed Vegetation in the SLSA

Species Name	Common Name
Rubus canadensis	Smooth Blackberry
Rubus hispidus	Bristly Dewberry
Rubus idaeus	Red Raspberry
Salix bebbiana	Bebb's Willow
Salix discolor	Pussy Willow
Sambucus canadensis	Common Elderberry
Schoenoplectus pungens	Three-Square
Schoenoplectus subterminalis	Water Bulrush
Scirpus atrocinctus	Black-girdled Bulrush
Scirpus cyperinus	Common Woolly Bulrush
Scutellaria lateriflora	Mad-dog Skullcap
Solanum dulcamara	Bittersweet Nightshade
Solidago canadensis	Canada Goldenrod
Solidago juncea	Early Goldenrod
Solidago puberula	Downy Goldenrod
Solidago rugosa	Rough-stemmed Goldenrod
Sparganium americanum	American Burreed
Sparganium angustifolium	Narrow-leaved Burreed
Sparganium eurycarpum	Broad-fruited Burreed
Spiraea alba	White Meadowsweet
Spiraea tomentosa	Steeplebush
Symphyotrichum lateriflorum	Calico Aster
Taraxacum officinale	Common Dandelion
Thelypteris noveboracensis	New York Fern
Toxicodendron radicans	Poison Ivy
Trientalis borealis	Starflower
Tsuga canadensis	Eastern Hemlock
Tussilago farfara	Coltsfoot
Typha latifolia	Broad-leaved Cattail
Vaccinium angustifolium	Late Lowbush Blueberry
Vaccinium myrtilloides	Velvet-leaved Blueberry
Veronica officinalis	Common Speedwell
Viburnum nudum	Northern Wild Raisin
Vicia cracca	Tufted Vetch
Viola cucullata	Marsh Blue Violet
Viola macloskeyi	Small White Violet

Table B.2 - Stand Data for the SLSA

Site ID	Field Description	Estimated Stand Age	Forest Group (FG)	VT(2022)	Forest Maturity	Maturity Score	Forest Succession	Succession Score
PC1	mature mixwedood forest	40	MW	MW2	Mature	2	Mid	2
PC2	mature hardwood forest	30	IH	IH6	Mature	2	Early	3
PC3	mature mixwedood forest	30	IH	IH9	Mature	2	Early	3
PC4	mature mixedwood forest	60	MW	MW7	Mature	2	Early-to-Mid	3
PC5	immature mixedwood forest	15	MW	MW7	Immature	3	Early-to-Mid	3
PC6	mixedwood treed basin swamp	80	WM	WM3	Potential Old Growth	1	Mid	2
PC7	mature mixedwood forest	80	MW	MW2	Potential Old Growth	1	Mid	2
PC8	mature softwood forest	60	SH	SH5	Mature	2	Mid	2
PC9	immature mixedwood forest	15	MW	MW2	Immature	3	Mid	2
PC10	mature mixedwood forest	80	MW	MW2	Potential Old Growth	1	Mid	2
PC11	partially cut mature mixedwood forest	80	SH	SH3	Potential Old Growth	1	Late	1
PC12	mature mixedwood forest	30	MW	MW2	Mature	2	Mid	2
PC13	immature mixedwood forest	8	IH	IH9	Immature	3	Early	3
PC14	mature mixedwood forest	30	IH	IH6	Mature	2	Early	3
PC15	immature hardwood forest	5	IH	IH9	Immature	3	Early	3
PC16	mature mixedwood forest	80	MW	MW3	Potential Old Growth	1	Late	1
PC17	immature mixedwood forest	8	MW	MW6	Immature	3	Early-to-Mid	3
PC18	mature mixedwood forest	90	SH	SH3	Potential Old Growth	1	Late	1
PC19	immature hardwood forest	8	IH	IH6	Immature	3	Early	3
PC20	mature softwood forest	50	SH	SH5b	Mature	2	Mid	2
PC21	mixedwood treed stream swamp	50	WM	WM1	Mature	2	Mid	2
PC22	mature mixedwood forest	70	SH	SH3	Mature	2	Late	1
PC23	mature mixedwood forest, partially harvested	70	MW	MW12	Mature	2	Early-to-Mid	3
PC24	coniferous treed stream swamp	unknown	WC	WC11	N/A	N/A	Edaphic	2
PC25	mature softwood forest	50	SH	SH4	Mature	2	Late	1
PC26	mixedwood treed stream swamp	unknown	WM	WM1	N/A	N/A	Mid	2
PC27	immature mixedwood forest	20	MW	MW1	Immature	3	Late	1
PC28	mature mixedwood forest	70	MW	MW4a	Mature	2	Early-to-Mid	3
PC29	mature mixedwood forest	60	MW	MW2	Mature	2	Mid	2
PC30	mature mixedwood forest	50	MW	MW2	Mature	2	Mid	2
PC31	old beaver flooding	unknown	N/A	N/A	N/A	N/A	N/A	N/A
PC32	immature softwood forest	20	SH	SH5b	Immature	3	Mid	2
PC33	recent fire	unknown	N/A	N/A	N/A	N/A	N/A	N/A
PC34	immature hardwood forest	8	IH	IH6b	Immature	3	Early	3
PC35	mature hardwood forest	80	MW	MW2	Potential Old Growth	1	Mid	2
PC36	tall shrub dominated stream swamp	unknown	TS	TSS	N/A	N/A	N/A	N/A
PC37	mixedwood treed slope swamp	8	sw	swamp	Immature	3	Edaphic	2
PC38	immature mixedwood forest	8	IH	IH6b	Immature	3	Early	3
PC39	mature mixedwood forest	70	MW	MW2	Mature	2	Mid	2

Table B.2 - Stand Data for the SLSA

Site ID	Field Description	Estimated Stand Age	Forest Group (FG)	VT(2022)	Forest Maturity	Maturity Score	Forest Succession	Succession Score
PC40	mature mixedwood riparian forest	70	WM	WM1	Mature	2	Mid	2
PC41	immature mixedwood forest	20	MW	MW7	Immature	3	Early-to-Mid	3
PC42	mature softwood forest	60	SH	SH3	Mature	2	Late	1
PC43	immature hardwood forest	unknown	TH	TH2a	Immature*	3	Late	1
PC44	mature deciduous forest	70	TH	TH1a	Mature	2	Late	1
PC45	transmission line	unknown	N/A	N/A	N/A	N/A	N/A	N/A
PC46	mature mxedwood forest	70	MW	MW1	Mature	2	Late	1
PC47a	deciduous treed stream swamp	unknown	WD	WD2	N/A	N/A	Early-to-Mid, edaphi	2
PC47b	deciduous treed stream swamp	unknown	WD	WD2	N/A	N/A	Early-to-Mid, edaphi	2
PC48	mature mixedwood forest	60	WM	WM1	Mature	2	Mid	2
PC49	mature mixedwood forest	70	WM	WM1	Mature	2	Mid	2
PC50	mature mixedwood stand	80	MW	MW1	Potential Old Growth	1	Late	1
PC51	mature mixedwood forest	80	MW	MW2	Potential Old Growth	1	Mid	2
PC52	mature softwood plantation	40	PF	PF2	Mature	2	N/A	N/A
PC53	mature mixedwood forest	50	WM	WM2	Mature	2	Mid	2
PC54	mature softwood forest	100	SH	SH1	Potential Old Growth	1	Late	1
PC55	mid successional mixedwood	40	MW	MW7	Mature	2	Early-to-Mid	3
PC56	young Red Maple swamp	unknown	WD	WD2	Immature*	3	Early-to-Mid, edaphi	2
PC57	early succesional Red Maple / Intolerant hardwood	unknown	IH	IH8	Immature*	3	Early	3
PC58	mature red spruce stand	80	SH	SH5	Potential Old Growth	1	Mid	2
PC59	mid-succesional mixedwood	50	MW	MW2	Mature	2	Mid	2
PC61	edge of old field, early successional mixedwood regeneration	15	OF	OF4	Immature	3	Early-to-Mid	3
PC62	early successional, disturbed intolerant hardwood	20	IH	IH6a	Immature	3	Early	3

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

Forest Group (FG)		Intolerant Hardwood (IH)									
Vegetation Type (VT)		IH6	IH6	IH6	IH6a	IH6b	IH6b	IH8	IH9	IH9	IH9
Vegetation Type	Species Name	PC2	PC14	PC19	PC62	PC34	PC38	PC57	PC3	PC13	PC15
Tree	*Abies balsamea*	0	2	0	0	0	0	0	0	0	0
	Acer pensylvanicum	0	0	0	0	0	0	0	0	0	0
	Acer rubrum	40	40	0	0	0	0	35	20	0	0
	Amelanchier sp.	0	0	0	0	0	0	5	0	0	0
	Betula alleghaniensis	5	15	0	0	0	0	0	0	0	0
	Betula papyrifera	10	15	0	50	0	0	0	5	0	0
	Betula populifolia	20	0	0	0	0	0	5	25	20	0
	Fagus grandifolia	0	0	0	0	0	0	0	0	0	0
	Fraxinus americana	0	0	0	0	0	0	0	0	0	0
	Larix laricina	0	0	0	0	0	0	0	20	0	0
	Picea glauca	1	0	0	0	0	0	0	0	0	0
	Picea mariana	0	0	0	0	0	0	0	0	0	0
	Pinus resinosa	0	0	0	0	0	0	0	0	0	0
	Picea rubens	1	5	0	0	0	0	0	2	0	0
	Pinus strobus	0	0	0	0	0	0	0	0	0	0
	Populus grandidentata	0	0	0	25	0	0	0	0	0	0
	Populus tremuloides	0	0	0	0	0	0	0	0	0	0
	Prunus pensylvanica	0	0	0	15	0	0	0	0	0	0
	Tsuga canadensis	0	0	0	0	0	0	0	0	0	0
Shrub	*Abies balsamea*	0	50	5	5	0	2	0	2	10	1
	Acer pensylvanicum	0	0	0	0	0	0	0	0	0	0
	Acer rubrum	5	1	10	20	15	5	0	0	2	40
	Alnus alnobetula	5	0	0	0	0	0	0	0	0	0
	Alnus incana	0	0	0	0	0	0	0	0	0	0
	Amelanchier sp.	0	0	0	0	0	0	0	0	0	0
	Betula alleghaniensis	2	1	2	0	2	0	0	20	0	5
	Betula papyrifera	0	0	40	0	60	20	0	0	0	0
	Betula populifolia	0	0	0	0	0	15	0	0	35	15
	Chamaedaphne calyculata	0	0	0	0	0	0	0	0	0	0
	Fagus grandifolia	0	0	0	0	0	0	0	0	0	0
	Gaylussacia baccata	0	0	0	0	0	0	0	0	0	0
	Hamamelis virginiana	0	0	0	0	0	0	0	0	0	0
	Ilex mucronata	0	0	0	0	0	0	5	0	0	0
	Ilex verticillata	0	0	0	0	0	0	0	0	0	0
	Kalmia angustfolia	0	0	0	0	0	0	35	0	0	0
	Larix laricina	0	0	0	0	0	0	0	0	0	0
	Picea glauca	0	0	0	0	0.5	3	0	10	5	10
	Picea mariana	0	0	0	0	0	0	0	5	0	0
	Picea rubens	2	5	0	15	0.5	0	0	0	0	0
	Pinus strobus	0	0	0	0	0	1	0	0	2	0
	Populus tremuloides	0	0	0	0	0	0	0	0	0	0
	Prunus pensylvanica	0	0	15	0	0	0.5	0	0	0	2
	Rhododendron canadense	0	0	0	0	0	0	0	0	0	0
	Rhododendron groenlandicum	0	0	0	0	0	0	0	0	0	0
	Rosa multiflora	0	0	0	0	0	0	0	0	0	0
	Salix bebbiana	0	0	1	0	0	0	0	0	0	0
	Spiraea alba	0	0	0	0	0	0	0	0	0	0
	Spiraea tomentosa	0	0	0	0	0	0	0	0	0	0
	Toxicodendron radicans	0	0	0	0	0	0	0	0	0	0
	Tsuga canadensis	0	0	0	0	0	1	0	0	0	0
	Viburnum nudum	0	0	0	0	0	0	10	0	0	0

Forest Group (FG)		Mixedwood Forest (MW)																					
Vegetation Type (VT)		MW1	MW1	MW1	MW1	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW3	MW4	MW6	MW7	MW7	MW7	MW7
Vegetation Type	Species Name	PC27	PC46	PC50	PC23	PC1	PC7	PC9	PC10	PC12	PC29	PC30	PC35	PC39	PC51	PC59	PC16	PC28	PC17	PC4	PC5	PC41	PC55
Tree	*Abies balsamea*	25	0	0	0	0	0	1	0	20	2	1	2	10	2	0	0	2	0	15	30	30	20
	Acer pensylvanicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	5
	Acer rubrum	5	15	30	25	5	25	10	20	25	35	15	40	20	30	25	5	20	0	25	15	15	20
	Amelanchier sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula alleghaniensis	10	15	15	0	0	5	0	0	0	5	2	5	2	10	0	20	5	0	30	10	15	0
	Betula papyrifera	0	0	0	0	10	10	2	0	5	10	15	0	0	0	0	0	0	0	0	5	5	10
	Betula populifolia	0	0	0	0	2	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Fagus grandifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fraxinus americana	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
	Picea glauca	0	0	0	0	10	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
	Picea mariana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pinus resinosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	35	40	25	0	40	30	10	40	30	20	40	10	40	25	20	25	5	0	10	25	20	13
	Pinus strobus	0	0	0	15	1	0	10	0	5	0	1	0	0	0	20	0	0	0	0	0	0	5
	Populus grandidentata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	15
	Populus tremuloides	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	5	0	0
	Tsuga canadensis	0	10	5	0	0	15	0	25	0	1	1	5	0	2	0	35	15	0	0	0	0	0
Shrub	*Abies balsamea*	1	5	5	40	2	2	0	0	0	5	5	25	20	20	0	10	20	20	5	10	2	15
	Acer pensylvanicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Acer rubrum	0	0	0	2	0	0	10	0	0.5	0	1	5	1	0	0	2	0	5	0	2	0	2
	Alnus alnobetula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Alnus incana	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
	Betula alleghaniensis	0	0	2	0	2	0	0	0	0	0	0	5	2	0	0	5	0	0	0	0	0	0
	Betula papyrifera	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0
	Betula populifolia	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	5	0	0	0	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
	Fagus grandifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Gaylussacia baccata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	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	10
	Ilex mucronata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
	Ilex verticillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Kalmia angustfolia	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	2	0	0
	Picea glauca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0
	Picea mariana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	5	0	10	30	5	10	15	10	2	20	10	25	10	40	5	25	25	0	10	5	1	1
	Pinus strobus	0	0	0	0	0	0	0	0	0	0	0	0	0.5	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
	Prunus pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0
	Rhododendron canadense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhododendron groenlandicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rosa multiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Salix bebbiana	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
	Spiraea tomentosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Toxicodendron radicans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tsuga canadensis	0	5	5	0	0	0	0	0	0	0	0	1	0.5	5	0	1	0	0	0	0	0	0
	Viburnum nudum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

Forest Group (FG)		Unknown				Old Field (OF)	Planted Forest (PF)	Spruce Hemlock (SH)									
Vegetation Type (VT)		N/A	N/A	N/A	N/A	OF4	PF2	SH1	SH3	SH3	SH3	SH3	SH4	SH5	SH5	SH5b	SH5b
Vegetation Type	Species Name	PC31	PC33	PC45	PC60	PC61	PC52	PC54	PC11	PC18	PC22	PC42	PC25	PC8	PC58	PC20	PC32
Tree	*Abies balsamea*	0	0	1		60	1	0	2	0	0	15	5	0	0	10	30
	Acer pensylvanicum	0	0	0		0	0	0	0	0	0	1	0	0	0	0	0
	Acer rubrum	2	0	0		5	1	5	5	15	20	10	5	5	1	5	10
	Amelanchier sp.	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Betula alleghaniensis	0	0	0		0	0	5	0	0	0	0	0	0	0	0	0
	Betula papyrifera	0	0	0		0	0	0	2	0	0	0	0	0.5	0	0	0
	Betula populifolia	0	0	0		0	2	0	2	0	0	0	0	0	0	0	2
	Fagus grandifolia	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Fraxinus americana	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
	Picea glauca	0	0	2		0	5	0	0	0	0	0	0	0	0	0	0
	Picea mariana	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Pinus resinosa	0	0	0		0	35	0	0	0	0	0	0	0	0	0	0
	Picea rubens	5	0	1		0	0	0	15	30	40	35	50	75	55	50	35
	Pinus strobus	0	0	0		0	0	0	2	0	0	0	10	0	0	0	0
	Populus grandidentata	0	0	0		0	0	0	0	0	0	0	0	0	1	0	0
	Populus tremuloides	0	0	0		5	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
	Tsuga canadensis	0	0	0		0	0	75	20	40	25	15	0	0	0	5	0
Shrub	*Abies balsamea*	5	0	0		35	1	0	10	0	0	0	1	0.5	7	0.5	1
	Acer pensylvanicum	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Acer rubrum	10	0	15		0	0.5	1	7	0.5	0	0	0	1	2	0	0
	Alnus alnobetula	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Alnus incana	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Amelanchier sp.	0	0	0		0	0	0	0	1	0	0	0	0	0	0	0
	Betula alleghaniensis	0.5	0	0		0	0	0	0	0	0	0.5	0	0	0	0	0
	Betula papyrifera	0	0	0		0	0	0	5	0	0	0	0	0	0	0	0
	Betula populifolia	10	0	0		0	1	0	0	0	0	0	0	0	0	0	0
	Chamaedaphne calyculata	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Fagus grandifolia	0	0	5		0	0	0	0	0	0	0	0	0	0	0	0
	Gaylussacia baccata	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0
	Hamamelis virginiana	0	0	0		0	0	0	0	1	0	0	0	0	0	0	0
	Ilex mucronata	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Ilex verticillata	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Kalmia angustfolia	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
	Picea glauca	0	0	5		0	2	0	0	0	0	0	0	0	0	0	0
	Picea mariana	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	0	0	5		0	0	30	30	25	5	2	5	2	2	5	10
	Pinus strobus	0	0	0		0	0	0	5	0	0	0	0	0	0	0	0
	Populus tremuloides	0	0	0		0	1	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
	Rhododendron canadense	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Rhododendron groenlandicum	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Rosa multiflora	0	0	0		0	0.5	0	0	0	0	0	0	0	0	0	0
	Salix bebbiana	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Spiraea alba	10	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Spiraea tomentosa	0	0	0.5		0	0	0	0	0	0	0	0	0	0	0	0
	Toxicodendron radicans	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Tsuga canadensis	0.5	0	0		0	0	0	2	2	0	1	0	0	0	0	0
	Viburnum nudum	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0

Forest Group (FG)		Wetland		Tolerant Hardwood (TH)		Wet Coni-ferous Forest (WC)	Wet Deciduous Forest (WD)			Wet Mixedwood Forest (WM)						
Vegetation Type (VT)		TSS	swamp	TH1a	TH2a	WC11	WD2	WD2	WD2	WM1	WM1	WM1	WM1	WM1	WM2	WM3
Vegetation Type	Species Name	PC36	PC37	PC44	PC43	PC24	PC47	PC47	PC56	PC21	PC26	PC40	PC48	PC49	PC53	PC6
Tree	*Abies balsamea*	0	0	0	0	0	0	0		25	20	15	15	15	20	0
	Acer pensylvanicum	0	0	30	20	0	0	0		0	0	0	0	0	0	0
	Acer rubrum	0.5	0	5	10	2	20	50		15	25	35	35	40	15	35
	Amelanchier sp.	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Betula alleghaniensis	0	0	40	35	0	0	2		20	0	5	5	5	2	0
	Betula papyrifera	0	0	0	0	0	0	0		0	2	0	0	0	0	0
	Betula populifolia	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Fagus grandifolia	0	0	0	15	0	0	0		0	0	0	0	0	0	0
	Fraxinus americana	0	0	0	0	0	0	0		0	0	0	0	1	0	0
	Larix laricina	0.5	0	0	0	0	0	0		1	0	0	0	0	0	0
	Picea glauca	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Picea mariana	0	0	0	0	10	0	0		5	20	0	5	0	10	30
	Pinus resinosa	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Picea rubens	0	0	2	0	0	0	0		0	0	0	10	5	20	0
	Pinus strobus	0	0	0	0	1	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
	Populus tremuloides	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
	Tsuga canadensis	0	0	1	0	0	2	0		0	0	20	0	10	1	0
Shrub	*Abies balsamea*	0	20	0	0	0	0	2		5	0	20	5	10	5	5
	Acer pensylvanicum	0	0	0.5	10	0	0	0		0	0	0	0	0	0	0
	Acer rubrum	0	15	0	2	5	0	5		0	0	5	0	0	0	0
	Alnus alnobetula	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Alnus incana	80	0	0	0	0	20	20		2	0	0	0	0	0	0
	Amelanchier sp.	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Betula alleghaniensis	0	0	0.5	0	0	0	0		0	0	0	0	0	1	1
	Betula papyrifera	0	2	0	0	0	0	0		0	0	0	0	0	0	0
	Betula populifolia	0	25	0	0	0	0	0		0	0	0	0	0	0	0
	Chamaedaphne calyculata	0	0	0	0	15	0	0		0	0	0	0	0	0	0
	Fagus grandifolia	0	0	0	2	0	0	0		0	0	0	0	0	0	0
	Gaylussacia baccata	0	0	0	0	30	0	0		0	0	0	0	0	0	0
	Hamamelis virginiana	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Ilex mucronata	0	0	0	0	2	0	0		0	0	0	0	0	0	0.5
	Ilex verticillata	0	0	0	0	10	1	15		0	0	0	0	0	0	0.5
	Kalmia angustfolia	0	1	0	0	0	0	0		0	0	0	0	0	0	0
	Larix laricina	0	1	0	0	0	0	0		0	0	0	0	0	0	0
	Picea glauca	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Picea mariana	0	5	0	0	0	0	5		1	15	0	0	0	0	2
	Picea rubens	0	1	1	0	0	0	0		0	0	0	20	5	2	0
	Pinus strobus	0	1	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
	Prunus pensylvanica	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Rhododendron canadense	0	0	0	0	35	0	0		0	0	0	0	0	0	0
	Rhododendron groenlandicum	0	0	0	0	10	0	0		0	0	0	0	0	0	0
	Rosa multiflora	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Salix bebbiana	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Spiraea alba	0	0	0	0	0	1	0		0	0	0	0	0	0	0
	Spiraea tomentosa	0	1	0	0	0	1	0		0	0	0	0	0	0	0
	Toxicodendron radicans	0	0	0	0	0	2	0		0	0	0	0	0	0	0
	Tsuga canadensis	0	0	0	0	0	0.5	0		0	0	0	0	0	1	0
	Viburnum nudum	0	0	0	0	5	1	0		0	0	0	0	0	0	0

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

Forest Group (FG)		Intolerant Hardwood (IH)										Mixedwood Forest (MW)																						Unknown				Old Field (OF)	Planted Forest (PF)	Spruce Hemlock (SH)										Wetland		Tolerant Hardwood (TH)		Wet Coniferous Forest (WC)	Wet Deciduous Forest (WD)			Wet Mixedwood Forest (WM)						
Vegetation Type (VT)		IH6	IH6	IH6	IH6a	IH6b	IH6b	IH8	IH9	IH9	IH9	MW1	MW1	MW1	MW1	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW3	MW4	MW6	MW7	MW7	MW7	MW7	N/A	N/A	N/A	N/A	OF4	PF2	SH1	SH3	SH3	SH3	SH3	SH4	SH5	SH5	SH5b	SH5b	TSS	swamp	TH1a	TH2a	WC11	WD2	WD2	WD2	WM1	WM1	WM1	WM1	WM1	WM2	WM3
Vegetation Type	Species Name	PC2	PC14	PC19	PC62	PC34	PC38	PC57	PC3	PC13	PC15	PC27	PC46	PC50	PC23	PC1	PC7	PC9	PC10	PC12	PC29	PC30	PC35	PC39	PC51	PC59	PC16	PC28	PC17	PC4	PC5	PC41	PC55	PC31	PC33	PC45	PC60	PC61	PC52	PC54	PC11	PC18	PC22	PC42	PC25	PC8	PC58	PC20	PC32	PC36	PC37	PC44	PC43	PC24	PC47	PC47	PC56	PC21	PC26	PC40	PC48	PC49	PC53	PC6
Ground Vegetation	*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	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	0	0	0	0	0	0
	Acer rubrum	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	0	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	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.5	2	0	0	0		0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1	2	0	4	2	1	0
	Agrostis capillaris	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	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	15	10	0	0	0	20	0	35	15	5	15	2	8	40	0	5	0	0	10	0	2	0	0	0	0		0	0	15	0	2	30	20	5	25	0	25	2	0	0	0	0	0	0	0		0	0	0	2	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	5	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	20		0	0	0	0	0	0	0
	Carex arctata	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	0	0	0	0	0		0	0	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 debilis	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0.5	0	0	0	0		0	0	0	0	0	0	0
	Carex michauxiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	5		0	0	0	0	0	0	0
	Carex novae-angliae	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	2	0	0	0		0	0	0	0	0	0	0
	Carex sp.	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	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
	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	40	60		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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1	10	0	0	0	0	0
	Cladonia 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	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Clatosmunda 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	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	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	1	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	0	0	0
	Cornus 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	1	20		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
	Danthonia spicata	5	0	0	0	0	8	0	0	0	0	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	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Dennstaedtia punctilobula	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	0	0	0	0	0	0	0	0	30		0	0	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	2	0	0	0	0	0	5	0	0	5	0	0	0	5	5	0	2	5	0	2	0	5	0	0	2	10	0	5	0	5	0	0	0	0		0	0	0	2	5	2	0.5	1	0	0	1	5	0	0	1	1	0	0	0		0	0	0	0	0	0	0
	Diervilla lonicera	0	0	15	0	8	10	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Doellingeria umbellata	1	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	0	0	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	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	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
	Dryopteris intermedia	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0.5	2	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	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	0		0	0	0	0	0	0	0
	Epipactis helleborine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	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
	Equisetum arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0
	Equisetum sylvaticum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	50	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	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
	Galium palustre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0
	Gaultheria procumbens	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	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	0	0	0	0	0	0	35	0	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
	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	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
	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	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
	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	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0		0	0	1	0	0	0	0
	Hylocomium splendens	0	0	0	0	0	0	0	0	0	0	2	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Hypnom imponens	0	10	0	0	0	0	0	1	0	3	5	5	2	0	0	15	0	0	10	0	2	0	5	10	0	0	15	0	15	10	5	0	0	0	0		0	0	2	0	20	5	2	5	10	0	5	1	0	0	2	8	0	0	0		0	0	0	15	0	0	0
	Kalmia angustfolia	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Lysimachia borealis	0	2	0	0	0	0	0	0	2	0	0	0	2	4	0	0	5	0	0	2	0	0	0	0	0	0.5	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		2	0	0	2	10	0	0
	Lysimachia terrestris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0		0	0	0	0	0	0	0
	Maianthemum canadense	0	1	0	0	1	0	0	0	0	5	0	0	1	1	0	0.5	0	0	0	10	0	0	15	0	0	10	0	10	0	0	0	1	0	0	0		0	0	0	2	0	0	0	0	0	0	0	0.5	0	0	0.5	0	0	0	0		2	0	0	10	5	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	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
	Moss sp.	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	0		0	0	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	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0		0	0	5	0	0	0	0
	Osmundastrum cinnamomeum	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	1	0	0	0	0	1	0	2	0	1	0	0	0	0	2	0	0	0	0	0		0	0	0	5	5	0	0	0	0	0	0	0	0	30	0	1	10	0	50		40	70	0	25	15	10	60
	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	10		0	0	0	0	0	0	0
	Persicaria punctata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0		0	0	0	0	0	0	0
	Persicaria sagittata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0		0	0	0	0	0	0	0
	Phegopteris connectilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
	Pleurozium schreberi	0	0	0	0	0	2	0	0	0	0	10	2	0	30	0	1	2	30	0	2	10	0	30	5	0	0	5	5	0	15	0	0	0	0	0		0	0	5	50	0	0	5	70	60	0	1	10	0	0	0	0	0	0	0		0	0	0	0	0	0	2
	Poa pratensis	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Polystichum acrostichoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
	Polytrichum sp.	10	0	0	0	10	0	0	25	0	1	0	0	0	1	15	0	1	0	0	0	5	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	2	0	0	0.5	5	0	0	0		0	0	0	0	0	0	0
	Potentilla simplex	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	0	0	0	0	0	0	0	0	0		0	0	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	30	0	0	0	0	10	10	0	0	0	0	0	0	20	0	0	40	0	0	0	0	0	0	0	2	15	0	0	0	0	0	0.5	0	90	15		0	0	0	10	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0

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

Forest Group (FG)		Intolerant Hardwood (IH)										Mixedwood Forest (MW)																					
Vegetation Type (VT)		IH6	IH6	IH6	IH6a	IH6b	IH6b	IH8	IH9	IH9	IH9	MW1	MW1	MW1	MW1	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW3	MW4	MW6	MW7	MW7	MW7	MW7
Vegetation Type	Species Name	PC2	PC14	PC19	PC62	PC34	PC38	PC57	PC3	PC13	PC15	PC27	PC46	PC50	PC23	PC1	PC7	PC9	PC10	PC12	PC29	PC30	PC35	PC39	PC51	PC59	PC16	PC28	PC17	PC4	PC5	PC41	PC55
Ground Vegetation (continued)	*Ranunculus 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	0	0	0	0
	Rubus canadensis	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
	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
	Rubus idaeus	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
	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
	Scirpus atrocinctus	0	0	0	0	0	0	0	0	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	0
	Solidago puberula	0	0	0	0	0	30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0
	Solidago rugosa	0	0	8	1	10	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
	Sphagnum 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
	Symphyotrichum lateriflorum	0	0	0	1	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
	Thelypteris noveboracensis	0	0	0	0	20	0	0	15	0	0	0	0	5	0	0	5	0	0	0	5	0	20	0	0	0	0	0	0	0	3	0	0
	Tussilago farfara	0	0	0	0	0	0	0	0	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 angusifolium	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
	Vaccinium myrtilloides	0	0	0	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
	Veronica officinalis	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
	Vicia cracca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Forest Group (FG)		Unknown				Old Field (OF)	Planted Forest (PF)	Spruce Hemlock (SH)									
Vegetation Type (VT)		N/A	N/A	N/A	N/A	OF4	PF2	SH1	SH3	SH3	SH3	SH3	SH4	SH5	SH5	SH5b	SH5b
Vegetation Type	Species Name	PC31	PC33	PC45	PC60	PC61	PC52	PC54	PC11	PC18	PC22	PC42	PC25	PC8	PC58	PC20	PC32
Ground Vegetation (continued)	*Ranunculus repens*	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
	Rubus hispidus	30	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
	Rubus sp.	0	0	5		0	0	0	0	0	0	0	0	0	0	0	0
	Scirpus atrocinctus	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Solidago canadensis	0	0	0		0	15	0	0	0	0	0	0	0	0	0	0
	Solidago puberula	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Solidago rugosa	20	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Sphagnum sp.	0	0	0		0	0	0	5	0	0	0	0	0	0	0	0
	Symphyotrichum lateriflorum	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	Thelypteris noveboracensis	10	0	25		0	0	0	0	0	0	0	0	0	0	0	0
	Tussilago farfara	0	0	0		0	25	0	0	0	0	0	0	0	0	0	0
	Vaccinium angusifolium	0	0	0		0	0	0	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	1
	Veronica officinalis	0	0	0		0.5	0	0	0	0	0	0	0	0	0	0	0
	Vicia cracca	0	0	0		0	20	0	0	0	0	0	0	0	0	0	0

Forest Group (FG)		Wetland		Tolerant Hardwood (TH)		Wet Coni-ferous Forest (WC)	Wet Deciduous Forest (WD)			Wet Mixedwood Forest (WM)						
Vegetation Type (VT)		TSS	swamp	TH1a	TH2a	WC11	WD2	WD2	WD2	WM1	WM1	WM1	WM1	WM1	WM2	WM3
Vegetation Type	Species Name	PC36	PC37	PC44	PC43	PC24	PC47	PC47	PC56	PC21	PC26	PC40	PC48	PC49	PC53	PC6
Ground Vegetation (continued)	*Ranunculus repens*	0	0	0	0	0	0	0		0	0	0.5	0	0	0	0
	Rubus canadensis	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Rubus hispidus	0	10	0	0	0	0	0		0	0	0	0	0	0	2
	Rubus idaeus	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
	Scirpus atrocinctus	0	10	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
	Solidago puberula	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Solidago rugosa	0	5	0	0	0	10	0		0	0	0	0	0	0	0
	Sphagnum sp.	0	70	0	0	70	0	70		70	70	30	2	30	0	90
	Symphyotrichum lateriflorum	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Thelypteris noveboracensis	0	0	0	10	0	0	2		30	35	5	0	0	0	30
	Tussilago farfara	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Vaccinium angusifolium	0	0	0	0	0	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
	Veronica officinalis	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	Vicia cracca	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					
Corvus brachyrhynchos	American Crow	-	-	-	S5
Spinus tristis	American Goldfinch	-	-	-	S5
Setophaga ruticilla	American Redstart	-	-	-	S5B
Turdus migratorius	American Robin	-	-	-	S5B, S3N
Scolopax minor	American Woodcock	-	-	-	S5B
Haliaeetus leucocephalus	Bald Eagle	-	NAR	-	S5
Mniotilta varia	Black-and-White Warbler	-	-	-	S5B
Setophaga fusca	Blackburnian Warbler	-	-	-	S4B, S5M
Poecile atricapillus	Black-capped Chickadee	-	-	-	S5
Setophaga virens	Black-throated Green Warbler	-	-	-	SNA
Cyanocitta cristata	Blue Jay	-	-	-	S5
Buteo platypterus	Broad-winged Hawk	-	-	-	S5B
Certhia americana	Brown Creeper	-	-	-	S5
Branta canadensis	Canada Goose	-	-	-	SUB, S4N, S5M
Perisoreus canadensis	Canada Jay	-	-	-	S3
Bombycilla cedrorum	Cedar Waxwing	-	-	-	S5B
Setophaga pensylvanica	Chestnut-sided Warbler	-	-	-	S5B
Chordeiles minor	**Common Nighthawk***	TH	SC	TH	S3B
Corvus corax	Common Raven	-	-	-	S5
Geothlypis trichas	Common Yellowthroat	-	-	-	S5B
Junco hyemalis	Dark-eyed Junco	-	-	-	S4S5
Regulus satrapa	Golden-crowned Kinglet	-	-	-	S5
Dumetella carolinensis	Grey Catbird	-	-	-	S4B
Dryobates villosus	Hairy Woodpecker	-	-	-	S5
Catharus guttatus	Hermit Thrush	-	-	-	S5B
Setophaga magnolia	Magnolia Warbler	-	-	-	S5B
Zenaida macroura	Mourning Dove	-	-	-	S5
Leiothlypis ruficapilla	Nashville Warbler	-	-	-	S4B, S5M
Colaptes auratus	Northern Flicker	-	-	-	S5B
Setophaga americana	Northern Parula	-	-	-	S5B
Seiurus aurocapilla	Ovenbird	-	-	-	S5B
Setophaga palmarum	Palm Warbler	-	-	-	S5B
Spinus pinus	Pine Siskin	-	-	-	S3
Haemorhous purpureus	Purple Finch	-	-	-	S4S5B, S3S4N, S5M
Sitta canadensis	Red-breasted Nuthatch	-	-	-	S4S5
Vireo olivaceus	Red-eyed Vireo	-	-	-	S5B
Buteo jamaicensis	Red-tailed Hawk	-	NAR	-	S5

Table C.1 Incidental Wildlife Observations Recorded During Field Programs

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Agelaius phoeniceus	Red-winged Blackbird	-	-	-	S4B
Melospiza melodia	Song Sparrow	-	-	-	S5B
Melospiza georgiana	Swamp Sparrow	-	-	-	S5B
Zonotrichia albicollis	White-throated Sparrow	-	-	-	S4S5B, S5M
Troglodytes hiemalis	Winter Wren	-	-	-	S5B
Setophaga petechia	Yellow Warbler	-	-	-	S5B
Sphyrapicus varius	Yellow-bellied Sapsucker	-	-	-	S5B
Setophaga coronata	Yellow-rumped Warbler	-	-	-	S5B
Mammals					
Lynx rufus	Bobcat	-	-	-	S5
Tamias striatus	Eastern Chipmunk	-	-	-	S5
Canis latrans	Eastern Coyote	-	-	-	S5
Erethizon dorsata	North American Porcupine	-	-	-	S5
Procyon lotor	Northern Raccoon	-	-	-	S5
Lepus americanus	Snowshoe Hare	-	-	-	S5
Odocoileus virginianus	White-tailed Deer	-	-	-	S5
Amphibians					
Lithobates catesbeianus	American Bullfrog	-	-	-	S5
Anaxyrus americanus	American Toad	-	-	-	S5
Lithobates clamitans	Green Frog	-	-	-	S5
Ambystoma maculatum	Spotted Salamander	-	-	-	S5
Reptiles					
Thamnophis sirtalis	Common Gartersnake	-	-	-	S5
Chelydra serpentina	**Snapping Turtle***	SC	SC	VU	S3

Notes:
* Indicates the species is considered a SAR; all others are SOCC.
[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: Sandy Lake Archaeological Resource Impact Assessment, Halifax Regional Municipality, NS (2023)

HRP #A2023NS154

Final Report

April 11, 2024

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HRM SERVICED COMMUNITIES BACKGROUND STUDY: SANDY LAKE ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT, HALIFAX REGIONAL MUNICPILITY, NS (2023)

This document entitled HRM Serviced Communities Background Study: Sandy Lake Archaeological Resource Impact Assessment Bedford, 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.

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Shawn McFarlane, B.ScF, RPF, Project Manager

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Halifax Regional Municipality (HRM) to conduct an Archaeological Resource Impact Assessment (ARIA), for the HRM Future Serviced Communities Background Study; Sandy Lake Study Area, located in Bedford, 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. HRM has retained Stantec to carry out an ARIA as part of the background study for environmental, land-use suitability, transportation, and infrastructure for the Sandy Lake study area in Bedford, Nova Scotia (Appendix A, Figure 1).

HRM is planning to expand housing development approvals in the Sandy Lake 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). 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. A2023NS154 issued to Jonathan Kyte of Stantec. The fieldwork for the walkover component of the ARIA was conducted by Jonathan Kyte, MA, and Chase McLean, MA., on September 21, 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 east and south side of Sandy Lake in Bedford Regional Municipality, 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 400 ha. The PDA is identified with the red outline in Figure 1 (Appendix A).

The Sandy Lake Expansion Area was previously assessed by CRM Group Ltd., (CRM) in 2008 and again in 2022. CRM identified areas of elevated archaeological potential to be avoided by future development. No further archaeological mitigation was recommended by CRM for the remaining areas assessed having low archaeological potential during the 2008 and 2022 ARIAs (CRM 2022). If the areas of avoidance identified by CRM are to be impacted by future development additional mitigation may be required (CRM 2022). Two properties that formed part of the Sandy Lake Expansion Area were not assessed during the 2008 and 2022 ARIAs, and it is these properties that were the subject of the ARIA conducted by Stantec in 2023. These properties are located between Giles Drive (Giles Drive Developments) and Sandy Lake and is the focus of the background and walkover survey for the PDA (Figure 2a and 2b, 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 XXX-POLY-###"). During the walkover, and 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. "XXX-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 Project Site Plan and with this report (Figure 2, Appendix A)

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 (Study Area).

4.1 THE NATURAL ENVIRONMENT

The Study Area is within the Quartzite Barrens Theme Region (Theme Region 413). "The mantle of quartzite till ranges in thickness from 1 – 10 m in this Unit but averages less than 3 m. There are several areas of exposed rock where till has been scraped off by the glacial ice" (Davis & Brown 1996:56). The bedrock-dominated topography of these extensive barrens within this region is described as "ridge-swamp-swale." Where greater thickness of glacial till has accumulated, drumlins and drumlinoid till features are found (Davis & Brown 1996). In the Halifax area the many long sub-parallel faults create linear valleys are followed by rivers and sometime filled by Lakes.

The area is covered in Halifax soils and well drained, stony, sandy loam, which developed on till derived principally from quartzite. The poorly drained associated Dansville soils occur in areas of lower relief, together with Aspotogan soils and peat. Also, some Bridgewater soils, derived from metamorphic slates are also located within the area (Davis & Brown 1996). Sandy Lake is a natural freshwater body, and the current shorelines are believed to represent the historic shoreline for this waterbody.

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 (13,000 – 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.

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 Study Area 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 Study Area with KMKNO-ARD and their review revealed seven traditional use sites within a one-kilometre distance of the Study Area used for fishing. There are two Mi'kmaw archaeological sites within a five-kilometre distance to the study area; BeCv-15, and BeCw-02 and are recorded sites containing diagnostic lithics and petroglyphs (KMKNO-ARD 2023). There is no known Mi'kmaw name for Sandy Lake, although the names for places nearby such as Bedford is, *Kwipek*, which has a "meaning uncertain," and the name for Lower Sackville is *Alusulue'katik*, which means "at the measles place." 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 2023). The study area is located east of the contemporary Hammonds Plains Reserve and located east of the contemporary Wallace Hills Reserve and are the closest Mi'kmaw communities.

During the Historic Period the Mi'kmaw were noted by 1746 to favor two summer camp locations on the shore of the Sackville River where it empties into Bedford Basin, and at the present-day site of St. Peters Church in Birch Cove. This place was known as "warm" cove and was known as a place where the leaves first shown through in Spring. (KMKNO-ARD 2023). During the 19th century Mi'kmaw were known to have lived within the area principally by fishing, hunting, basket-making, and cooperage such as for producing barrels etc. It appears the concentration or presence of historic Mi'kmaw were in the vicinity of Bedford and along the Sackville River to the east of the Study Area.

A review of the NSCCTH MARI online database indicates that there are five registered archaeological sites within a 5 km radius of the Study Area contained within the 'BeCw' & 'BeCv' Bordon grid reference block and consists of the following sites: BeCw-1, BeCw-2, BeCw-3, BcCv-11, and BcCv-15. The first site is located approximately 5 km from the study area, (BeCw-1) and is an isolated find consisting of a diagnostic Late-Archaic Period grooved axe located near a brook that connects to Duck Pond and Beaver Pond at Beaver Bank Station. The Bedford Barrens Petroglyphs site (BeCw-2) consist of carvings edged into a series of roughly parrel quartzite ridges (Goldenville Formation) that follows the contours of the high ground overlooking the head of the Bedford Basin (Molyneaux 1990). Another registered site is a Historic Period Acadian Paper Mill (BeCw-3), originally established in 1818 by Anthony Holland on Paper Mill Lake. Archaeological features include, dikes, sluice channels, stone walls visible both on the island and underwater in this location (Thomson 1990). Another registered archaeological site is the Prince's Lodge site (BcCv-11) dating to 1795 and consists of the surviving surface features of the Duke of Kents Country Residence (Davis 1983). The final registered archaeological site was located close to Prince's Lodge, (BcCv-15) and consisted of a diagnostic lithic stemmed projectile point that was reported by Preston in 1985 and dating to the Late Archaic or Early Woodland Period. The presence of diagnostic lithic artifacts and a petroglyph site near the Study Area shows evidence of strong presence for past traditional Indigenous use of the Study Area.

While knowledge from oral histories can be used to understand information on past ways of life of Indigenous peoples, the most readily available source of information on the Pre-Contact Period in Nova Scotia is through reports from previous archaeological research conducted in the general area. Two ARIAs have been completed within the Study Area. Two reports provided to Stantec by NSCCTH staff indicated that prior archaeological assessments were carried out by CRM in 2008 and in 2022. Four high potential areas for Pre-Contact Period archaeological resources were identified at the north-east end of Sandy Lake and were recommended for avoidance for future development. Three other sites for high potential for Historic Period archaeological resources were identified by CRM along Hammonds Plains Road which were subject to subsurface archaeological shovel testing which revealed negative results (CRM 2022). No pre-contact archaeological resources were identified during testing, and it was recommended that no further mitigation is warranted. Relevant, information provided by these assessments is presented below.

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 17th century. There was some seasonal use by New Englanders during the first half of the 18th century for the fishery, although, there was not a large population of European settlement until the British founded Halifax in 1749 (Ward 1971).

The nearest community to the PDA, Hammonds Plains Road, is named after Sir Andrew Snape Hammond, who was Lieutenant-Governor from 1781 to 1782 (PANS 1965). The first Hammond Plains land was granted in 1786 although the road had been constructed prior and may have incorporated an older Mi'kmaq trail which apparently connected Pockwock Lake with the Bedford Basin (CRM 2008). The old Annapolis Road constructed in 1785 included portions of the present-day Hammonds Plains Road. The first land grants had a requirement to clear the land and establish a settlement. The access to lumber resources in the area is what attracted settlement and land use where several mills were constructed, and timber was cut and floated down the near-by Nine Mile River system which led down to Bedford Basin.

A review of historical maps was conducted for the properties on Giles Drive which indicated that three historic land grants were issued for the Study Area which include: Lot #1 issued to Richard Holmes in 1773 (500 Acres) (Crown Records Old Book 10 Page 243); and Lot #2 issued to Lieutenant James Morden of the 72 Regiment of Foot in 1778 (200 Acres) (Crown Records Book 10 page 359). Both lots were identified as a part of the "Windsor Road Lots" surveyed in 1833 and identified as a separate community from Hammonds Plans (CRM 2008). These lots were issued to Loyalist families during the American Revolution in the 1770s and 1780s. Even though the lots were granted, many of them were not settled. Later historic maps do not show settlement within the property lots (Church 1865) although a road is marked on the 1909 Faribault map indicating that one of the properties (#25 Giles Drive) was used for access to Sandy Lake from Hammonds Plains Road. A section of lot #1 near Sandy Lake has an adjacent property granted to John H. Mixner (122 Acres) in 1813, who was a local Bedford Basin Tanner (Crown Records Book C page 78 B). The property line follows the identified road leading to Sandy Lake (Faribault 1909) and it appears that this road was in use during the early 19th century for water access. This road could have followed an older Mi'kmaw route/trail which led down to the lake and could pre-date the settlement of Halifax in 1749. A review of aerial photographs showed the road led to a house on the south side of Hammonds Plains Road which is no longer present onsite. No other structures were observed associated with the road within the property during the early 20th century although there was evidence of use of the road and landing on Sandy Lake (NSDNR 1931, 1954).

A review of the Canadian Register of Historic Places (CRHP 2023) found three registered historic places or heritage sites located within 5 km of the Study Area. The closest registered heritage building is the Moirs Ltd. Powerhouse (1931) which is located behind Moirs pond in Mill Cove, Bedford Basin. The second is the Bedford Petroglyphs National Historic Site and is located close to Bedford Basin. The third is Fort Sackville Scott Manor House (1770) located in Bedford. No other historic places or buildings of heritage value were found near or within the Study Area during the background review.

An additional review of HRM Registered Heritage Properties (HRM 2024) found a registered heritage property approximately 5 km from the Study Area at 1608 Hammons Plains Road that consists of a church and graveyard. The church building was constructed between 1888 and 1890, when it was consecrated as St. Nicholas Anglican Church. The church replaced the little St. John's Church that was destroyed in a fire in 1888. The earliest recorded burials in the Anglican cemetery date to 1834 (Beaupre-McPhee 2022).

5.0 FIELD SURVEY RESULTS

The walkover focused on two properties along Giles Drive (#25 and #87 Giles Drive) and began with the property lot having the address #25 Giles Drive (JRK-ARCH-112; Photo 1, Appendix B) and located northeast of the road. The crew consisted of two archaeologists walking in 10 m transects throughout the subject property to watch for surface heritage resources and to assess ground conditions for archaeological potential.

The southern section of the property at #25 Giles Drive has Giles Drive as it's southern boundary. The land is steeply sloped (<35°) down to Sandy Lake. The land consists of an outcrop of granite bedrock and mixed boulder swale which was deposited during the last glaciation period (melting eskers) as well as signs that the rocks were altered and piled during previous road construction also added in the accumulation of stone along this physical characteristic in the landscape. Forest conditions encountered consisted of a mix of softwoods such as spruce and pine mixed with hardwood such as birch and maple and being semi-mature to immature growth. The forest floor encountered was very undulating, rocky, with low and wet sections with patches of sphagnum moss and having low soil development (JRK-ARCH-113; Photo 2 to 3; CKM-ARCH-040; Photo 4, Appendix B). The area was found to be low in archaeological potential and no suitable testing locations were observed.

While walking along the edge of Sandy Lake on the western side of the #25 Giles Drive property, the forest conditions remained the same. Terrain was found to be low, wet in places with standing water, and being very rocky, undulating, and consisting of a typical boulder swale (JRK-ARCH-114; Photos 5 to 6, Appendix B). This area appeared to be low in potential due to poor surface conditions encountered that do not appear suitable for habitation due to their rocky and uneven condition. This was consistent further within the study area and continued to be very rocky, undulating, and moss-covered forest floor at assessment note JRK-ARCH-115 (Photos 7 to 8, Appendix B). The slope in this section is <25° down towards the lake to the northwest. A small drainage was encountered at the head of the cove (JRK-ARCH-117; Photos 9 to 10. Appendix B) and was found to be low and wet in this area. Esker scarring is very apparent in the landscape in this section having channels of granite boulders (northwest to southeast orientation) and rocks dominating the landscape. Overall, this section of the Study Area is found to have low archaeological potential and would not have been attractive for settlement and or use in the past.

On higher ground an old woods road was encountered at assessment note CMK-ARCH-045 (Photos 11 to 12), on the eastern portion of the property. The road appears to be the same road marked on the Faribault (1909) map and present in aerial photographs from the 20th century (NSDNR 1931, 1954) and was first identified during background research. A Linear Stone Feature (LSF) or a dry-stone foundation for a cellar was encountered at CKM-HSF-020 (Photos 13 to 15, Appendix B) and located on the eastern side of the old woods road. The feature appears to have been for a small camp or outbuilding that possibly once stood in this location. Some relatively modern trash at the surface was encountered in and around this feature which suggest a late 20th century date. However, this feature may be older and should be archaeologically tested if impacted through future development.

The road ended at what appears to be a boat landing or launch area where the surface had been cleared of stone, altered, landscaped, and flattened out at this location (JRK-ARCH-119; Photos 16 to 18). A medium potential polygon (JRK-POLY-015) was identified in this location because this area has elevated or raised archaeological potential for both pre-contact and or historical archaeological resources but found to be medium potential due to evidence of previous impact. A small modern trash heap was encountered to the west of the old road (JRK-ARCH-119; Photo 19, Appendix B). On the east side of the old road, the cleared stoned from the landing area was redeposited in this location (CKM-ARCH-046; Photo 20 to 21, Appendix B). The redeposited stone was added to an area full of granite rocks and boulders which formed a swale and consistent with the surface conditions during the walkover previously encountered.

Forest conditions however changed within the southeastern section of the property to a mixture of immature hardwood mixed with some softwood such as black spruce and pine trees. The terrain continued to be undulating, very rocky, and having low soil development, sphagnum moss patches. No suitable areas for testing or having elevated potential was encountered (JRK-ARCH-120; Photo 22 to 23, Appendix B). The terrain rises in this section of the property to the south <25° and forest conditions change again, showing signs of past forestry activity having thinned out sections with more mature pine trees and immature hardwood growth (CKM-ARCH-048; Photo 24; JRK-ARCH-120; Photo 25, Appendix B). The terrain is dryer in this location although still very undulating with poor soil development. The rocky granite swales and ridges run in lines parallel with the lake and curve in this section, see Figure 3 (Appendix A). Overall, this area is found to be low in potential for archaeological resources.

The southern end of the old woods road near Hammonds Plains Road was encountered at CKM-ARCH-049 (Photos 26 to 27, Appendix B). A LSF or dry-stone rock wall was encountered at JRK-HSF-010 (Photos 28 to 29; CKM-ARCH-050; Photo 30, Appendix B) and is interpreted to be a property marker due to its location close to Giles Road to the southwest. The wall terminates to the northeast at a granite swale and bedrock outcrop that skirts the road in this section. Overall, this area is found to be low in archaeological potential due to surface conditions encountered during the walkover. The LSF served as a property marker and does not appear to elevate the potential for this area.

The second property lot located at #87 Giles Drive began at assessment note JRK-ARCH-122 (Photo 31, Appendix B), immediately off Giles Drive. The property consists of a house and outbuildings with an open grassy field surrounded in the back with a wooden lot down to Sandy Lake. Forest conditions encountered consisted of semi-mature mix wood forest, having mature hardwood mixed with pines showing past signs of anthropologic activity or changing the landscape through past wood harvesting, etc. The terrain was rocky and undulating and generally sloped from the south down towards Sandy Lake at <25° then changes to the west. The area was found to be low in archaeological potential for past pre-contact occupation and or use due to conditions encountered.

An old road or trail was encountered at assessment note JRK-ARCH-123 (Photo 32 to 33, Appendix B) which ran from the house down slope to Sandy Lake. A stone lined well was encountered while walking west-east transects through the subject property located at JRK-HSF-011 (Photo 34, Appendix B). Modern water pipes were observed at the surface in this area suggesting the house still obtains water from this well as it is close to this location. An overturned outhouse was encountered at assessment note

CKM-ARCH-051 (Photo 35, Appendix B) and was found to be relatively modern. The forest conditions change to more spruce and mix with some hardwoods, the terrain being low, wet in places, with an undulating forest floor and having large patches of sphagnum moss and having terrain characteristics which lowers the areas archaeological potential.

The old road or trail ended in a cleared area with a small landing or boat launch next to a drystone and fill pier wharf located on the shoreline of Sandy Lake at assessment note JRK-ARCH-126 (Photos 36 to 38, Appendix B). An old wooden float was also observed to the southwest of the wharf and appears to be in disuse. An old timber sill was observed at CKM-ARCH-054 (Photo 39, Appendix) which appears to have been the intended storage location for the float. A possible well (concrete and brick structure) is located next to the end of the road to the west and a recent stone lined fire pit was observed with mostly modern trash in and around it. A review of aerial photographs revealed that these features are modern, and all appear to be associated with residential and or recreational use during the late 20th century (NSDNR 1992, 2003). These features were not present on earlier aerial photos (NSDNR 1931, 1954) which lowers the potential for encountering archaeological resources from the historical period.

While completing the walkover a possible footprint for an outbuilding or garden was identified at CKM-HSF-021 (Photo 40, appendix B). Two sections of LSFs were also observed in this location and consisted of small dry-stone walls or property markers (JRK-HSF-012: Photo 41; CMK-HSF-022: Photo 42) and were located outside the property lines. Overall, this area did show some signs of use in the recent past. The house appears to date sometime between 1931 and 1954 when the house was constructed as it was not present in the 1931 aerial photograph. Overall, the property is found to be low in archaeological potential for historical and pre-contact archaeological resources and no suitable areas for testing where observed.

6.0 SUMMERY AND RECOMMENDATIONS

In general, the two properties assessed within the Study Area located along Giles Drive were found to be low in archaeological potential except for one medium potential area (JRK-POLY-015) consisting of an area identified at the end of an old woods road which ends at a boat launch area within #25 Giles Drive. The old woods road could have followed an older Mi'kmaw route/trail which led down to the lake and could pre-date the settlement of Halifax in 1749. The area, however, was found to have medium potential due to past disturbance and landscaping as well as the natural forest floor conditions encountered finding the area to be low in archaeological potential and consisting of a ridge-swamp-swale. As this location may be associated with an earlier Mi'kmaw portage route following the old woods road to the lake, a 20 m avoidance buffer is suggested along the shoreline.

LSF features identified within #25 Giles Drive include: CKM-HSF-020 being a possible late 20th century dry-stone cellar feature located close to the launch area; and JRK-HSF-010 being a possible 19th century property marker or dry-stone wall located near Hammonds Plains Road on the southern side of the property. The LSF or dry-stone rock wall is interpreted as a property marker and does not appear to raise the archaeological potential in the area. No further mitigation is recommended however, archaeological shovel testing is recommended within the area identified within JRK-POLY-015 if this location cannot be avoided by future development of this property.

LSF features identified within #87 Giles Drive include a small stone-lined well at JRK-HSF-011 as well as an outline for an outbuilding or garden CKM-HSF-021. Two additional sections of LSF, JRK-HSF-012 and CMK-HSF-022, were identified just outside of the property line to the south. No further mitigation is recommended for this property and the area was found to be low in archaeological potential for past pre-contact occupation and/or use due to surface conditions encountered during the walkover.

The area of the PDA associated with the Sandy Lake Expansion Area was previously assessed by CRM Group Ltd. in 2008 and again in 2022, and no further archaeological mitigation was recommended. However, high potential areas to be avoided were established within that section of the PDA. If any future development will happen within these identified areas and can't be avoided, then further archaeological mitigation will be required.

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. A2023NS154 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.

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APPENDIX A

Figures

Legend

- Study Area
- PDA

Utilities

- Transmission Line
- Pipeline

Transportation

- Trail
- Highway
- Other Road

Other Features

- Waterways
- Waterbodies
- Wetland
- NS Significant Habitat
- Property Boundary
- Buildings

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

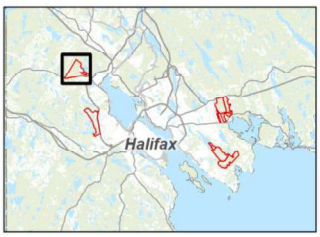
Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_006

Figure No.
1

Title
Sandy Lake

HRM FCM 2022.aprx Revised: 2023-11-21 By: acuff



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
- Study Area
- High Potential Areas for Avoidance Identified by CRM Group Ltd.
- Area of Low Archaeological Potential - Previously Assessed Area by CRM Group Ltd., No Further Assessment Required
- Historical Locations Tested by CRM Group Ltd.

Utilities
- Transmission Line
- Pipeline

Transportation
- Trail
- Highway
- Other Road

Other Features
- Waterways
- Waterbodies
- NS Significant Habitat
- Field Delineated Wetlands
- Property Boundary

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality,
Nova Scotia

Prepared by lPodrug on 2023-11-16

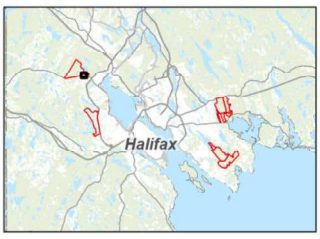
Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_014

Figure No.
2a

Title
Sandy Lake Archaeological Survey - Previously Assessed

HPM FCM 2022.aprx Revised: 2023-12-04 By: lpodrug



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

- Historically Significant Features
- Archaeological Assessment Note
- Study Area

Archaeological Potential Area

- Medium Potential Area

Transportation

- Highway
- Other Road

Other Features

- Waterways
- Waterbodies
- Field Delineated Wetlands
- Property Boundary

0 50 100 Metres

(At original document size of 8.5x11)
1:4,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IPodrug on 2023-11-16

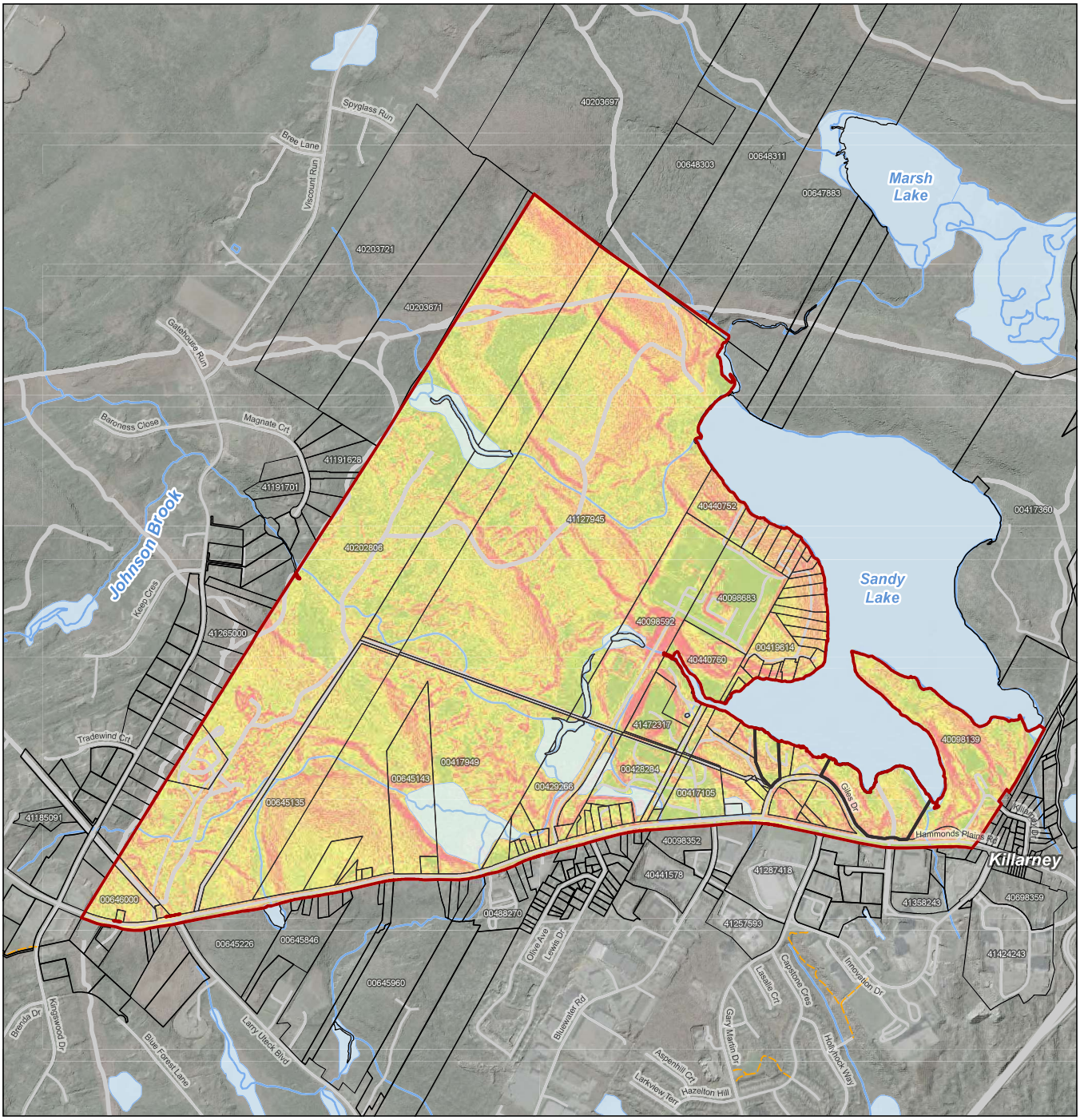
Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

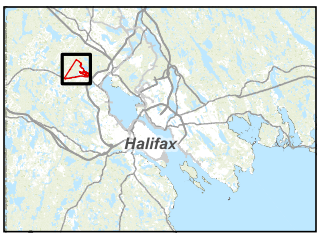
Fig ID: 160410459_014

Figure No.
2b

Title
Sandy Lake Archaeological Survey Results

HPM FCM 2022.aprx Revised: 2024-04-08 By: ipodrug





Legend

- Study Area
- PDA

Transportation

- Trail
- Highway

Slope Analysis (Percent Rise)

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

Other Features

- Waterways
- Waterbodies
- Property Boundary

0 250 500 Metres

(At original document size of 8.5x11)
1:21,000

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 lPodrug on 2023-11-09

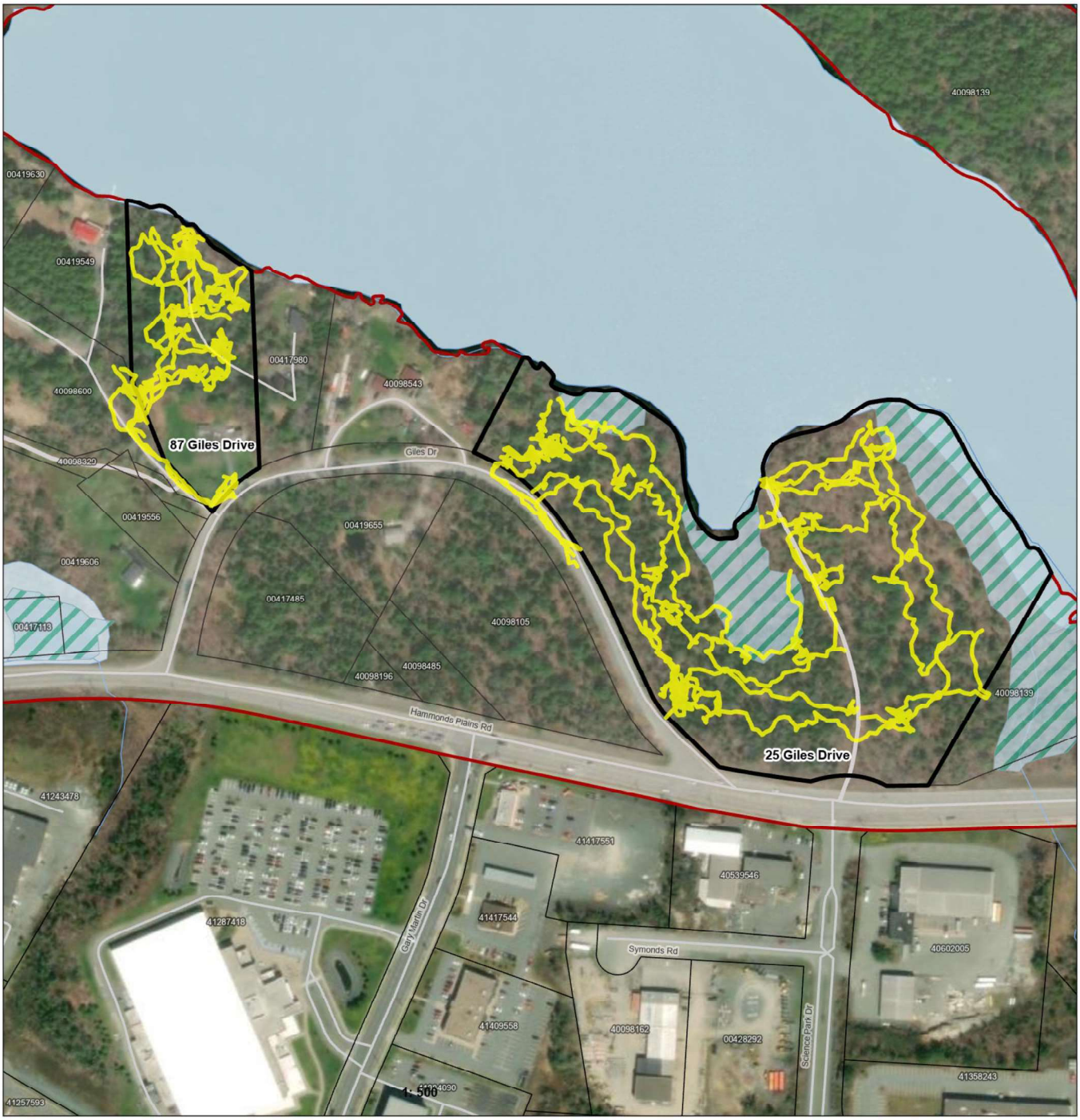
Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

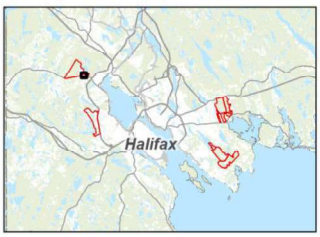
Fig ID: 160410459_013

Figure No.
3

Title
Slope Inventory: Sandy Lake

HRM FCM 2022.aprx Revised: 2023-11-21 By: acuff





Legend

- Study Area
- Property Boundary
- Archaeological Tracklog

Transportation

- Highway
- Other Road

Other Features

- Waterways
- Waterbodies
- Field Delineated Wetlands
- Property Boundary

0 50 100 Metres

(At original document size of 8.5x11)
1:4,000

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 IPodrug on 2023-11-16

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_014

Figure No.
4

Title
Sandy Lake Archaeological Survey Track Logs

HPM FCM 2022.aprx Revised: 2023-12-04 By: ipodrug

APPENDIX B

Photographs

HRP A2023NS154	
	
Photo 1 View facing northwest form the road at #25 Giles Drive	**Photo 2** View northeast showing steep slope & forest conditions
	
Photo 3 View east showing an undulating forest floor with granite rocks; ground conditions are low and wet with sphagnum moss patches	**Photo 4** View southwest of a steep granite bedrock ridge and boulder swale

HRP A2023NS154	
	
Photo 5 View east at the edge of Sandy Lake at assessment note JRK-ARCH-114	Photo 6 View south along the edge of Sandy Lake, found to be low and wet and very rocky with undulating terrain
	
Photo 7 View west of a section of a low wet area with considerable amount of granite rock	Photo 8 View south showing the undulating surface conditions

HRP A2023NS154	
	
Photo 9 View Southwest showing the slop encountered down to the small drainage at JRK-ARCH-117	**Photo 10** View north showing the low surface conditions encountered at the head of the cove and facing a small drainage
	
Photo 11 View facing south and looking upslope at the road encountered	**Photo 12** View facing north and looking downslope at the road encountered

HRP A2023NS154	
	
Photo 13 View west of a LSF or dry-stone foundation feature encountered, possibly from camp or shed	Photo 14 View northwest of the same foundation feature
	
Photo 15 View north of the foundation feature and the old road to the west and on the left side of the photo	Photo 16 View southwest from JRK-ARCH-118 the end of the old road in the boat launch area

HRP A2023NS154	
	
Photo 17 View north at the boat launch area at the end of the old road	**Photo 18** View north at of the medium potential area identified (JRK-POLY-015)
	
Photo 19 View west at a small 20th century trash heap next to the end of the old road near Sandy Lake	**Photo 20** View east at redeposited stone cleared from the landing area located at the end of the old road and mixed with a larger stone swale

HRP A2023NS154	
	
Photo 21 View northwest of wet area with granite cobbles at CKM-ARCH-046	**Photo 22** View west showing conditions encountered at JKR-ARCH-120
	
Photo 23 View east showing conditions encountered at JKR-ARCH-120	**Photo 24** View west of dryer conditions encountered evidence of past forest harvesting was noted in the southeastern section

HRP A2023NS154	
	
Photo 25 View south of conditions encountered at JKR-ARCH-121	Photo 26 View north of the old road at CKM-ARCH-049
	
Photo 27 View south towards Hammonds Plans Road at CKM-ARCH-049	Photo 28 View northeast taken of the LSF encountered at JRK-HSF-010

HRP A2023NS154	
	
Photo 29 View southwest of the LSF encountered at JRK-HSF-010	Photo 30 View northeast of the LSF or dry-stone wall taken from CKM-ARCH-050 and interpreted as a property marker
	
Photo 31 View northwest of #87 Giles Drive taken at JKR-ARCH-122	Photo 32 View north of a trail that runs between the house at #87 Giles Drive and Sandy Lake

HRP A2023NS154	
	
Photo 33 View south of the trail that led down to Sandy Lake	Photo 34 View northwest of a stone lined ground water well encountered at JRK-HSF-011
	
Photo 35 View northeast of an abandoned outhouse at CKM-ARCH-051	Photo 36 View south of the cleared area at the end of the trail at JRK-ARCH-126

HRP A2023NS154	
	
Photo 37 View east of a drystone and fill wharf and boat launch JRK-ARCH-127	**Photo 38** View southeast of the wharf and launch, an old float is located behind the bushes
	
Photo 39 View west of a timber sill for a wharf float CKM-ARCH-054	**Photo 40** View southwest of a possible outbuild or garden footprint at CKM-HSF-021

HRP A2023NS154	
	
Photo 41 View west of a LSF or property marker JRK-HSF-012	**Photo 42** View southwest of a LSF encountered at CKM-HSF-022

APPENDIX E

Old Growth Forest Types – Nova Scotia

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