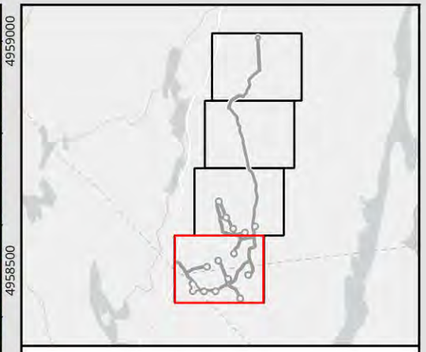

- Unregulated Wetland (<100 sq m)
- Provincially Mapped Watercourse
- Wetland Edge (CBCL 2022)
- Study Area (Phase 4)
- Property Boundaries
- Provincially Mapped Waterbody
- Delineated Wetland Area (CBCL 2022)
- Predicted Wetland Area (CBCL 2022)
- Wetland of Special Signifcance (WSS)

SAR Lichen Observations in Weland (Invoking WSS)

- Blue Felt Lichen
- Frosted Glass-whiskers Lichen

Nova Scotia POWER An Emera Company

CBCL

BEAR LAKE WIND
Vegetation & Wetlands

Wetland Assessment Results Overview (Page 4 of 4)

DATE: 2023-05-31	PROJ N°: 221266.01	FIGURE: 4-4
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

NOTES: Contour Interval = 1 m

0 135 270 540 m

SCALE: 1:13,000 @ 11 X 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter

4.2 Wetland Classification

Major wetland types are defined according to the Canadian Wetland Classification System (CWCS) prepared by the National Wetlands Working Group (1997). Several general CWCS wetland types (bog, fen, swamp) were encountered within the Study area. Two wetland types not defined under the CWCS were also documented, these were forest seep and vernal pools. As is typically the case, some wetlands encountered consisted of mosaics of several types. A general description of the base wetland types (not complexes) and ecological character, including information on vegetation, soil and hydrology indicators is provided below. A complete summary of the vegetation, soil and hydrology data recorded at each wetland sample point is presented in the plot data found in Appendix C. Descriptions of identified Vegetation Types within wetland habitats are provided in Section 5.4.

4.2.1 Swamps

Swamps are wetlands that are typically composed of at least 30% tall woody vegetation, which often results in ground cover composed of wood-rich peat. Swamps are influenced by minerotrophic groundwater, either on mineral or organic (i.e., peat) soils, and are not as wet as open bogs, fens, or marshes (National Wetlands Working Group, 1997). Both forested and shrub swamps occur within the Study Area.

The vast majority of wetlands surveyed, i.e., 79 out of 81 (98%), were classified as predominantly swamp and included the following sub-categories:

- Forested swamp (28), and
- Shrub swamp (51).

Many of the wetlands encountered were wetland complexes consisting or more than one wetland class. Swamp wetlands were noted within the study area that also included bog, fen, and disturbed marsh components.

4.2.1.1 Forested Swamps

Forested swamps are common in Nova Scotia and develop in areas with high water tables at or near the soil surface. Common deciduous tree species found in forested swamps include Red Maple, White Birch (*Betula papyrifera*), and Yellow Birch. Dominant coniferous tree species include Black Spruce, Balsam Fir (*Abies balsamea*), and Tamarack. The shrub layer is less developed in forested swamps and contain mainly regenerating tree species. The herbaceous layer often consists of a variety of graminoids and forb species that have high tolerances for saturated, poorly drained soils.

Within the Study area, 28 of the 81 wetlands assessed (35%) were classified as primarily forested swamps. Of these 28, 19 also has a shrub swamp component. Details of the wetland vegetation, hydric soils, and hydrology of these wetlands are provided in Appendix C.

Photo 4.1 Forested swamp identified within the Study Area.

4.2.1.2 Shrub Swamps

Swamps that are dominated by woody vegetation less than 20 feet in height and a diameter at breast height (dbh) less than 6 inches are classified as shrub swamps (Photo 4.2). Some common shrub species include Speckled Alder (*Alnus incana*), various species of willow (*Salix* spp.), Wild Raisin (*Viburnum cassinoides*), Canada Holly (*Ilex verticillata*), and Mountain Holly (*Ilex mucronatus*). The tree canopy is typically limited to absent, but when it exists, may contain scattered Red Maple, Balsam Fir, and Yellow Birch. The herb stratum can be very diverse and include species such as Sensitive Fern (*Onoclea sensibilis*), Soft Rush (*Juncus effusus*), Creeping Buttercup (*Ranunculus repens*), Cinnamon Fern, sedges (*Carex* spp.), and grasses such as Manna-grasses (*Glyceria* spp.) and Bluejoint (*Calamagrostis canadensis*).

Photo 4.2 Shrub swamp identified within the Study Area.

Within the Study area, 51 of the 81 wetlands assessed (63%) were classified as primarily shrub swamps. Of these 51, 14 also has a forested swamp component, while two each contained fen or bog components. Two others had disturbed marsh components, while one also had a cutover forested swamp component. Details of the wetland vegetation, hydric soils, and hydrology of these wetlands are provided in Appendix C.

4.2.2 Bogs

Bogs are peatlands characterized by their distinct hydrology, which is sourced primarily from precipitation such as snow, rain, and fog (National Wetland Working Group, 1997). Bogs perform valuable functions, such as groundwater recharge, carbon sequestration, and stormwater retention. These wetlands are virtually unaffected by surface water and groundwater, and consequently, waters associated with bogs are low in dissolved minerals and are acidic (pH 4.0-4.8 typical) (National Wetland Working Group, 1997; Rydin and Jeglum, 2006). Acidity in bogs is further enhanced by the release of organic acids during the decomposition of *Sphagnum* moss, which is the dominant substrate of these peatlands (National Wetland Working Group, 1997). The various species of *Sphagnum* mosses that

compose these wetlands have a high capacity to store water in both living and dead plant tissues; as a result of this, anaerobic conditions form, inhibiting the decomposition of the *Sphagnum*, resulting in an ever-increasing peat layer and a water table at, or slightly below, the wetland surface. This process of bog formation, known as ombrotrophication, increasingly isolates the bog flora from groundwater influence (Rydin and Jeglum, 2006).

Of the 81 wetlands assessed at Bear Lake, only one (<1%) had a strongly dominant bog component; though bog conditions were present in at least two other wetlands in smaller proportions. Details of the wetland vegetation, hydric soils, and hydrology of the wetland is provided in Appendix C.

Photo 4.3 Example of Bog Wetland observed within Bear Lake II Study Area, showing sparse tree cover, abundant ericaceous shrubs, and thick carpet of peatmosses (*Sphagnum* spp.).

4.2.3 Marshes (MR)

Marshes are defined by the Canadian Wetland Classification System (National Wetlands Working Group, 1997) as wetlands with shallow waters that fluctuate daily, seasonally, or annually due to events such as flooding, evapotranspiration, groundwater recharge, or seepage losses. Marshes receive water from many sources, including surface runoff, stream inflow, precipitation and groundwater discharge. This influx of water results in a high nutrient level in the soil (which ranges from mineral to organic) that supports a wide

variety of vegetation, predominantly emergent aquatic macrophytes (i.e., rushes, reeds, grasses and sedges).

Two of the 81 wetlands assessed (~2.5%) had a disturbed marsh component. Details of the wetland vegetation, hydric soils, and hydrology of these wetlands are provided in Appendix C. Marsh-type habitat was also noted to have developed in many disturbed areas within the Study Area, which were not considered to be natural wetlands.

4.2.4 Fens

Fens are peatlands that have a fluctuating water table rich in dissolved minerals derived from the influence of surrounding mineral soils (National Wetland Working Group, 1997). In contrast to bogs, whose hydrology is sourced from direct precipitation, fen hydrology is sourced primarily from ground or surface water. Surface flow may be directed through channels, pools, and other open water bodies. Depending on the moisture content and water chemistry in a fen, a variety of vegetation can be present. Graminoid vegetation dominates wetter fens, whereas shrubs, e.g., birch (*Betula* spp.), willow (*Salix* spp.), Tamarack, and some other tree species (usually black spruce) appear in drier sites. Fens with high mineral content tend to be dominated by sedges and brown mosses (e.g., *Drepanocladus* spp.), whereas fens which are low in dissolved minerals contain *Sphagnum* mosses and ericaceous shrubs (National Wetlands Working Group, 1997). These so-called **poor fens** often support typical bog species (Sperduto and Nichols, 2011).

On of the of the 81 wetlands assessed (~1%) was predominantly a fen. Four other wetland complexes also had fen components. Details of the wetland vegetation, hydric soils, and hydrology of these fens are provided in Appendix C.

Photo 4.4 Example of Fen Wetland observed within Study Area, showing slow moving surface water in channel and thick layer of ericaceous shrubs.

4.3 Functional Assessment Summary

WESP-AC scores for 17 major ecological functions (defined in Table 4-2) were produced for a total of 75 sites, comprising 78 of the 81 wetlands identified during delineation. For the purposes of the WESP-AC analysis, two wetland complexes were formed based on hydrological contiguity (BL-WL-061-068-072, and BL-WL-070-072). Two of the remaining three wetlands (BL-WL-006 and BL-WL-042) were well outside the Study Area and were not assessed; the one remaining wetland (BL-WL-054) was considered to be anthropogenic in origin, and is therefore not regulated, and was not assessed. These scores are summarized in Table 4-2. 'Lower', 'Moderate' and 'Higher' scores have been colour-coded to illustrate the thresholds of normalized scores used to determine each function rating. Detailed wetland functional assessment results can be found in Appendix D.

Table 4-2 Functional Assessment Ranks of Wetlands Assessed within the Study Area

Wetland #	Water Storage (WS)	Stream Flow Support (SFS)	Water Cooling (WC)	Sediment Retention (SR)	Phosphorus Retention (PR)	Nitrate Removal (NR)	Carbon Sequestration (CS)	Organic Nutrient Export (OE)	Anadromous Fish Habitat (FA)	Resident Fish Habitat (FR)	Aquatic Invertebrate Habitat (INV)	Amphibian & Reptile Habitat (AM)	Waterbird Feeding Habitat (WBF)	Waterbird Nesting Habitat (WBN)	Songbird, Raptor & Mammal Habitat (SBM)	Pollinator Habitat (POL)	Native Plant Habitat (PH)
BL-WL-001	6.29	5.14	0.70	3.01	2.15	7.74	8.84	0.00	0.00	0.00	4.77	0.00	0.00	8.23	1.82	6.57	9.04
BL-WL-002	6.17	5.14	0.76	2.32	2.68	4.86	5.96	0.00	0.00	0.00	4.09	0.00	0.00	8.16	1.82	6.29	8.94
BL-WL-003	6.17	5.14	0.76	2.32	2.68	4.86	5.96	0.00	0.00	0.00	4.09	0.00	0.00	8.16	1.82	6.29	8.94
BL-WL-004	6.29	5.22	0.70	3.01	2.46	7.73	8.84	0.00	0.00	0.00	4.17	0.00	0.00	8.37	1.82	6.50	9.04
BL-WL-005	9.42	5.14	1.27	4.09	4.01	7.92	8.09	0.00	0.00	0.00	4.78	0.00	0.00	8.48	1.82	6.97	9.25
BL-WL-007	7.33	5.14	0.64	2.83	2.49	7.92	7.58	0.00	0.00	0.00	3.33	0.00	0.00	6.74	1.82	5.98	8.88
BL-WL-008	7.33	5.46	0.91	3.55	2.64	7.97	8.12	0.00	0.00	0.00	2.59	0.00	0.00	6.39	1.82	5.32	8.65
BL-WL-009	7.91	5.46	0.68	2.40	3.07	6.71	6.87	0.00	0.00	0.00	2.59	0.00	0.00	6.63	1.82	5.74	8.79
BL-WL-010	7.91	5.22	1.23	4.20	3.07	6.87	8.12	0.00	0.00	0.00	3.57	0.00	0.00	7.28	1.82	6.00	8.93
BL-WL-011	10.00	5.46	1.15	3.30	3.89	6.68	7.08	0.00	0.00	0.00	2.74	0.00	0.00	6.46	1.82	5.21	8.61
BL-WL-012	7.91	5.14	1.27	4.20	3.36	6.68	7.99	0.00	0.00	0.00	2.74	0.00	0.00	6.68	1.82	5.42	8.68
BL-WL-013	7.91	5.14	0.76	2.76	2.69	6.71	7.10	0.00	0.00	0.00	4.21	0.00	0.00	8.07	1.82	6.08	8.91
BL-WL-014	9.42	5.46	1.62	4.09	4.15	7.92	10.00	0.00	0.00	0.00	4.86	0.00	0.00	7.83	1.82	5.59	8.79
BL-WL-016	7.91	5.22	0.76	1.89	2.96	5.95	6.63	0.00	0.00	0.00	4.68	0.00	0.00	8.28	1.82	5.66	8.81
BL-WL-019	7.33	5.22	1.23	3.55	3.26	7.92	10.00	0.00	0.00	0.00	4.68	0.00	0.00	8.20	1.82	5.92	8.90
BL-WL-020	6.29	5.22	0.70	3.01	2.40	7.65	8.78	0.00	0.00	0.00	4.03	0.00	0.00	6.60	1.82	5.89	8.75
BL-WL-021	6.87	5.22	0.70	2.58	2.70	6.66	8.09	0.00	0.00	0.00	3.67	0.00	0.00	6.72	1.82	5.42	8.69
BL-WL-022	6.87	5.22	0.93	2.58	3.21	7.30	8.54	0.00	0.00	0.00	3.67	0.00	0.00	6.72	1.82	5.42	8.69
BL-WL-023	7.91	5.22	1.46	3.12	4.22	7.09	10.00	0.00	0.00	0.00	3.88	0.00	0.00	6.79	1.82	5.63	8.76
BL-WL-024	6.87	5.22	0.70	2.58	2.70	6.63	8.07	0.00	0.00	0.00	3.63	0.00	0.00	6.52	1.82	5.00	8.52
BL-WL-025	6.87	5.22	0.70	2.58	2.72	6.63	8.07	0.00	0.00	0.00	3.63	0.00	0.00	6.71	1.82	5.53	8.69
BL-WL-026	6.87	5.22	0.70	2.58	2.86	6.41	7.92	0.00	0.00	0.00	3.63	0.00	0.00	6.71	1.82	5.53	8.69
BL-WL-027	7.91	4.98	1.23	3.12	3.47	6.63	9.66	0.00	0.00	0.00	3.72	0.00	0.00	6.35	1.82	5.26	8.59
BL-WL-028	7.91	5.14	0.88	3.12	3.45	6.57	7.24	0.00	0.00	0.00	3.18	0.00	0.00	6.81	1.82	5.68	8.77
BL-WL-029	6.09	4.75	0.35	3.42	1.52	5.54	8.88	0.00	0.00	0.00	4.97	0.00	0.00	6.37	1.82	5.00	8.50
BL-WL-030	6.09	4.75	0.00	2.33	1.32	5.54	8.27	0.00	0.00	0.00	4.97	0.00	0.00	6.37	1.82	5.63	8.71
BL-WL-031	7.14	4.75	0.17	2.88	1.77	5.54	7.55	0.00	0.00	0.00	3.35	0.00	0.00	6.12	1.82	4.74	8.42
BL-WL-032	4.78	5.14	0.52	1.49	2.34	6.50	8.37	0.00	0.00	0.00	2.28	0.00	0.00	6.29	1.82	5.05	8.47
BL-WL-033	9.42	5.46	1.11	3.73	4.16	7.55	7.61	0.00	0.00	0.00	3.22	0.00	0.00	6.60	1.82	5.26	8.64
BL-WL-034	6.87	5.22	0.70	2.58	2.96	6.63	8.07	0.00	0.00	0.00	1.48	0.00	0.00	6.41	1.82	4.71	8.44

Wetland #	Water Storage (WS)	Stream Flow Support (SFS)	Water Cooling (WC)	Sediment Retention (SR)	Phosphorus Retention (PR)	Nitrate Removal (NR)	Carbon Sequestration (CS)	Organic Nutrient Export (OE)	Anadromous Fish Habitat (FA)	Resident Fish Habitat (FR)	Aquatic Invertebrate Habitat (INV)	Amphibian & Reptile Habitat (AM)	Waterbird Feeding Habitat (WBF)	Waterbird Nesting Habitat (WBN)	Songbird, Raptor & Mammal Habitat (SBM)	Pollinator Habitat (POL)	Native Plant Habitat (PH)
BL-WL-035	7.91	5.14	0.80	2.76	3.50	6.41	6.91	0.00	0.00	0.00	1.48	0.00	0.00	6.65	1.82	5.19	8.60
BL-WL-036	7.91	5.30	0.87	3.12	3.36	6.61	7.26	0.00	0.00	0.00	1.52	0.00	0.00	6.45	1.82	4.71	8.45
BL-WL-037	7.14	4.96	0.68	2.88	3.22	6.69	7.31	0.00	0.00	0.00	1.57	0.00	0.00	6.11	1.82	5.00	8.50
BL-WL-038	6.87	4.96	1.05	3.66	3.03	6.63	8.75	0.00	0.00	0.00	1.57	0.00	0.00	5.92	1.82	4.22	8.24
BL-WL-039	7.91	4.96	1.23	4.20	3.47	6.63	7.95	0.00	0.00	0.00	2.59	0.00	0.00	6.30	1.82	5.24	8.58
BL-WL-040	6.87	5.34	1.05	3.66	3.30	6.23	8.45	0.00	0.00	0.00	1.21	0.00	0.00	6.13	1.82	4.71	8.35
BL-WL-041	7.91	4.96	0.87	3.12	3.28	6.63	7.27	0.00	0.00	0.00	1.57	0.00	0.00	6.11	1.82	4.74	8.42
BL-WL-043	7.91	5.14	1.22	4.20	3.40	6.45	7.83	0.00	0.00	0.00	1.21	0.00	0.00	6.24	1.82	4.92	8.42
BL-WL-045	7.91	5.46	1.27	4.20	3.61	6.66	7.98	0.00	0.00	0.00	1.52	0.00	0.00	6.40	1.82	4.56	8.40
BL-WL-046	7.91	5.14	0.87	3.12	3.35	6.23	7.02	0.00	0.00	0.00	1.68	0.00	0.00	6.17	1.82	4.78	8.38
BL-WL-047	8.26	5.14	1.22	3.23	3.82	4.72	6.07	0.00	0.00	0.00	1.21	0.00	0.00	6.58	1.82	5.66	8.67
BL-WL-048	7.91	4.81	0.87	2.25	3.21	4.77	6.10	0.00	0.00	0.00	1.89	0.00	0.00	5.77	1.82	4.87	8.46
BL-WL-049	7.91	5.14	0.68	2.40	3.42	6.45	6.71	0.00	0.00	0.00	1.52	0.00	0.00	6.69	1.82	5.19	8.61
BL-WL-050	7.91	5.14	0.91	3.12	3.38	6.50	7.19	0.00	0.00	0.00	1.52	0.00	0.00	6.36	1.82	5.57	8.64
BL-WL-051	7.91	5.14	0.64	2.40	3.09	6.57	6.78	0.00	0.00	0.00	1.48	0.00	0.00	6.36	1.82	4.40	8.31
BL-WL-052	7.33	5.14	1.22	4.64	3.32	7.39	8.48	0.00	0.00	0.00	1.21	0.00	0.00	6.58	1.82	5.55	8.63
BL-WL-053	7.14	5.14	0.52	2.52	3.32	6.36	6.88	0.00	0.00	0.00	2.21	0.00	0.00	6.56	1.82	5.24	8.62
BL-WL-055	7.91	4.92	0.87	3.12	3.09	6.63	7.27	0.00	0.00	0.00	2.04	0.00	0.00	6.13	1.82	4.82	8.44
BL-WL-056	6.09	5.02	0.46	2.33	2.47	6.63	8.07	0.00	0.00	0.00	2.04	0.00	0.00	6.13	1.82	4.82	8.44
BL-WL-058	4.78	5.02	0.29	0.77	2.63	7.52	8.63	0.00	0.00	0.00	2.04	0.00	0.00	6.20	1.82	5.87	8.79
BL-WL-059	7.91	5.30	0.87	3.12	3.52	6.61	7.26	0.00	0.00	0.00	2.15	0.00	0.00	6.87	1.82	5.34	8.66
BL-WL-060	7.33	5.14	0.87	3.55	3.21	7.60	7.88	0.00	0.00	0.00	2.15	0.00	0.00	6.63	1.82	6.36	8.90
BL-WL-061-068-072	10.00	5.14	1.34	3.37	4.50	7.76	10.00	0.00	0.00	0.00	1.94	0.00	0.00	6.60	1.82	4.92	8.52
BL-WL-062	7.91	5.14	0.87	3.12	3.10	6.45	7.16	0.00	0.00	0.00	1.52	0.00	0.00	6.48	1.82	5.73	8.69
BL-WL-063	7.91	5.14	1.22	4.20	3.40	6.57	7.92	0.00	0.00	0.00	1.69	0.00	0.00	6.57	1.82	5.13	8.56
BL-WL-064	7.33	5.14	1.22	4.64	3.24	7.49	8.55	0.00	0.00	0.00	2.04	0.00	0.00	6.75	1.82	5.90	8.85
BL-WL-065	7.91	5.14	0.87	3.12	3.42	6.23	7.02	0.00	0.00	0.00	1.42	0.00	0.00	6.22	1.82	4.61	8.32
BL-WL-066	7.33	5.46	0.91	3.55	3.24	7.92	8.09	0.00	0.00	0.00	2.07	0.00	0.00	7.06	1.82	6.23	9.00
BL-WL-069	7.33	5.14	0.87	3.55	2.91	7.60	7.88	0.00	0.00	0.00	2.09	0.00	0.00	6.59	1.82	5.90	8.75

Wetland #	Water Storage (WS)	Stream Flow Support (SFS)	Water Cooling (WC)	Sediment Retention (SR)	Phosphorus Retention (PR)	Nitrate Removal (NR)	Carbon Sequestration (CS)	Organic Nutrient Export (OE)	Anadromous Fish Habitat (FA)	Resident Fish Habitat (FR)	Aquatic Invertebrate Habitat (INV)	Amphibian & Reptile Habitat (AM)	Waterbird Feeding Habitat (WBF)	Waterbird Nesting Habitat (WBN)	Songbird, Raptor & Mammal Habitat (SBM)	Pollinator Habitat (POL)	Native Plant Habitat (PH)
BL-WL-070-077	7.91	5.14	0.87	3.12	3.57	6.45	7.16	0.00	0.00	0.00	1.83	0.00	0.00	6.22	1.82	4.92	8.42
BL-WL-071	7.91	5.14	0.76	1.89	3.61	4.81	5.93	0.00	0.00	0.00	2.38	0.00	0.00	6.72	1.82	6.27	8.93
BL-WL-073	10.00	5.14	1.58	4.75	4.76	6.23	7.68	0.00	0.00	0.00	2.15	0.00	0.00	6.50	1.82	5.74	8.70
BL-WL-075	10.00	5.14	0.64	3.30	3.15	5.17	7.08	0.00	0.00	0.00	2.15	0.00	0.00	6.56	1.82	6.16	8.84
BL-WL-076	6.29	5.14	0.46	2.29	2.64	7.60	8.25	0.00	0.00	0.00	2.91	0.00	0.00	6.62	1.82	5.79	8.71
BL-WL-079	10.00	5.46	1.58	4.75	4.70	6.71	8.01	0.00	0.00	0.00	3.38	0.00	0.00	7.05	1.82	5.79	8.86
BL-WL-080	7.91	5.14	0.87	3.12	3.60	6.45	7.16	0.00	0.00	0.00	2.15	0.00	0.00	6.38	1.82	5.31	8.55
BL-WL-081	6.29	5.14	0.46	2.29	2.64	7.60	8.25	0.00	0.00	0.00	2.91	0.00	0.00	6.62	1.82	5.79	8.71
BL-WL-082	10.00	5.14	1.34	4.02	4.47	6.61	7.49	0.00	0.00	0.00	2.15	0.00	0.00	6.65	1.82	5.03	8.56
BL-WL-083	7.91	5.14	0.76	2.76	3.52	6.54	6.99	0.00	0.00	0.00	4.22	0.00	0.00	6.63	1.82	6.16	8.89
BL-WL-084	7.91	5.14	0.82	2.40	3.87	6.45	8.28	0.00	0.00	0.00	2.15	0.00	0.00	6.32	1.82	5.31	8.55
BL-WL-085	10.00	5.14	1.11	3.30	4.39	6.45	6.93	0.00	0.00	0.00	1.83	0.00	0.00	6.51	1.82	5.55	8.63
BL-WL-086	9.42	5.22	1.27	4.09	4.16	7.94	8.10	0.00	0.00	0.00	6.02	0.00	0.00	9.20	1.82	6.92	9.22
BL-WL-088	7.91	5.14	0.68	2.40	3.61	6.50	6.74	0.00	0.00	0.00	1.83	0.00	0.00	6.48	1.82	5.76	8.70
BL-WL-089	10.00	5.14	1.23	3.66	4.21	6.50	7.19	0.00	0.00	0.00	1.83	0.00	0.00	6.22	1.82	4.92	8.42
BL-WL-090	7.91	5.14	1.23	3.34	3.62	5.77	7.36	0.00	0.00	0.00	2.03	0.00	0.00	6.51	1.82	5.24	8.59

Summary of Results (# of Wetlands)

Score	WS	SFS	WC	SR	PR	NR	CS	OE	FA	FR	INV	AM	WBF	WBN	SBM	POL	PH
Lower	0	0	75	27	15	0	0	75	75	75	42	75	75	0	75	0	0
	0%	0%	100%	36%	20%	0%	0%	100%	100%	100%	56%	100%	100%	0%	100%	0%	0%
Moderate	61	75	0	48	60	47	24	0	0	0	32	0	0	65	0	64	0
	81%	100%	0%	64%	80%	63%	32%	0%	0%	0%	43%	0%	0%	87%	0%	85%	0%
Higher	14	0	0	0	0	28	51	0	0	0	1	0	0	10	0	11	75
	19%	0%	0%	0%	0%	37%	68%	0%	0%	0%	1%	0%	0%	13%	0%	15%	100%

4.4 Wetlands of Special Significance

Wetlands of Special Significance (WSS) were identified based on the confirmed presence of SAR flora (vascular plants or lichens) growing within them, or via WESP-AC identification. Flora SAR data was obtained from the present study, the AC CDC report, and the third-party lichen report (Strum, 2022). Four wetlands within the Study Area have been identified as a WSS based on the available flora SAR data, while none have been determined to be WSS based on their higher level of wetland functioning. The location of these WSS are depicted on Figure 4-1.

As CBCL does not have data on mobile SAR species within the Study Area (with the exception of a small number of incidental bird findings during non-target field surveys), the potential use of these wetlands by SAR birds or mammals cannot be assessed at this time. The potential presence of SAR turtles and fish within the Study Area is discussed within the Aquatics Technical Report prepared for this project.

Table 4-3 Known Wetlands of Special Significance (WSS) within the Study Area, as determined by the presence of flora SAR or level of wetland function.

Wetland ID	Type	Rationale
[redacted]	Shrub / Forested Swamp	Flora SAR Presence • Frosted Glass Whiskers (*Sclerophora peronella*)
[redacted]	Forested Swamp	Flora SAR Presence • Blue Felt Lichen (*Pectenia plumbea*)
[redacted]	Forested / Shrub Swamp	Flora SAR Presence • Frosted Glass Whiskers (*Sclerophora peronella*)
[redacted]	Forested / Shrub Swamp	Flora SAR Presence • Blue Felt Lichen (*Pectenia plumbea*)

5 Results: Vegetation

Results of the vegetation species and community inventory field surveys are provided in the following subsections.

5.1 Vascular Species & SoCC

During the field surveys, a total of 256 species representing 59 families of vascular flora were encountered within the Study Area. The complete inventory of vascular plant species encountered in the Study Area is presented in Appendix F. It should be noted that as all flora surveys occurred in late summer or fall due to the required project schedule, it is possible that some vascular plant species may have not been identifiable during the surveys, particularly spring ephemeral woodland species.

A total of three vascular plant SoCC, none of which are SAR, were detected in the Study Area during the 2022 field surveys. These are listed in Table 5-1, along with their AC CDC ranks for NS. Distributions of these species are depicted on Figure 5-1 through Figure 5-4, while species descriptions are provided below. None of species listed in the AC CDC 5 km list previously stated were detected by CBCL ecologists within the Study Area.

Table 5-1 Vascular Plant Species of Conservation Concern Detected During Field Surveys

Common Name	Species	AC CDC S-Rank	# of Occurrence Locations
Lesser Brown Sedge	*Carex adusta*	S2S3	1
American Beech	*Fagus grandifolia*	S3S4	Widespread
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	S3?	3

Drawings provided directly to regulators for review to maintain confidentiality of locations of species at risk.

5.1.1 Lesser Brown Sedge

Lesser Brown Sedge (*Carex adusta*) is a tall and coarse sedge species, with culms that may reach 80 cm. It has a compact inflorescence that is erect and less than 4 cm long. It has widely elliptic perigynia that are 1.5 mm wide and 4 mm long. This species flowers and fruits from June to September, and within Nova Scotia is primarily found in dry, open forest or recent clearings on acidic, gravelly soils, most frequently after a fire. Within the Province, distribution of this species is scattered and uncommon, from Kejimkujik National Park to Cumberland counties and northern Cape Breton (Munro et al., 2014). The AC CDC ranks Lesser Brown Sedge as S3S4 in Nova Scotia. The location of this species within the Study Area is depicted on Figure 5-1. The AC CDC ranks Lesser Brown Sedge as S3S4 in Nova Scotia. Little Brown Sedge was detected at a single location within the Study Area (Figure 5-1).

Photo 5.1 Lesser Brown Sedge (*Carex adusta*) inflorescence (left) and whole plant (right). Photos are of representative material from another location (I. Bryson, CBCL).

5.1.2 American Beech

American Beech (*Fagus grandifolia*) is a large broad-leafed deciduous tree species belonging to the Beech family (Fagaceae), and the only Beech species found in Nova Scotia. American Beech is very common throughout the Northern Deciduous Region, commonly found growing alongside Sugar Maple (*Acer saccharum*). Specimens have smooth, silvery gray bark and ovate leaves, that are stiff and serrate at the ends of each leaf vein, terminating in a tooth. The fruit is a sharply angled nut that contains a single seed (Zinck, 1998; Munro et al., 2014). In Nova Scotia, American Beech trees flower in late May as the

leaves emerge (Munro et al., 2014). American Beech prefers dry-mesic to mesic soil moisture regimes and is found growing in deciduous or mixed evergreen-deciduous forests (Haines, 2011). Currently, American Beech in Nova Scotia rarely reach maturity due to Beech Canker, caused by the fungus *Nectria coccinea* which is spread by the introduced scale insect *Cryptococcus fagisuga*. Healthy, disease-free stands are limited but can occur in Kentville, along the Cornwallis River. In more recent years, American Beech populations in NS have also been threatened by the recent introduction of another insect, the Beech Leaf-Mining Weevil, *Orchestes fagi*, a European species which was discovered infesting American Beech in Nova Scotia in 2012, though it is suspected to have become established 5-10 years prior (Sweeney et al., 2020). The combined effects of these species have led to American Beech being reclassified as an S3S4 species by the AC CDC in 2022.

Photo 5.2 View of distinctive leaves of American Beech (*Fagus grandifolia*), a widespread but declining tree SoCC which is relatively common within the Study Area. Photo: B. Cameron, CBCL.

American Beech is currently fairly widespread across the Study Area, and so observed locations are not mapped.

5.1.3 Yellow Ladies'-tresses

Yellow Ladies'-tresses (*Spiranthes ochroleuca*) is a small species of orchid with noticeably fragrant yellowish or creamy-yellow flowers. It flowers from September to October. It occurs only in very dry sand barrens, roadsides, and fields, in the western half of NS, northwest to Hants County (Munro et al., 2014).

Photo 5.3 Yellow Ladies'-tresses (*Spiranthes ochroleuca*), an orchid SoCC detected within the Study Area. Photo: I. Bryson, CBCL.

The AC CDC lists this species as S3? ('Vulnerable') in Nova Scotia. Multiple specimens of this species were found at three locations within the Study Area, generally in disturbed

roadside habitat dominated by graminoids. Locations are depicted on Figure 5-1 through Figure 5-4.

5.2 Non-Vascular Species & SoCC

A total of 142 species of non-vascular flora comprising 96 lichens and 46 bryophytes (mosses or liverworts), representing 46 families, were detected within or adjacent to the Study Area by CBCL ecologists in 2022. The full inventories of lichens and bryophytes detected onsite are provided in Appendix F.

Of the 142 species, eight are considered to be SoCC, while two are also SAR. These are summarized in Table 5-2 and discussed below. Known non-vascular SAR and SoCC located within or immediately adjacent to the Study Area are summarized in Table 5-2 and discussed below. Locations of non-vascular SoCC within the Study Area are depicted on Figure 5-1 through Figure 5-4. None of species listed in the AC CDC 5 km list previously stated were detected by CBCL ecologists within the Study Area.

Table 5-2 Non-Vascular SoCC Detected in the Surveyed Area by CBCL in 2022

Common Name	Scientific Name	SARA / COSEWIC Status	NS ESA	NS S-Rank	# of Sites
Blue Felt Lichen	***Pectenia plumbea***	**SC/SC**	**V**	**S3**	2
Frosted Glass-whiskers (Atlantic population)	***Sclerophora peronella (Atlantic pop.)***	**SC/SC**	**-**	**S3S4**	2
Finger Ring Lichen	*Arctoparmelia incurva*	-	-	S3S4	1
Crumpled Bat's Wing Lichen	*Collema leptaleum*	-	-	S2S3	1
Corrugated Shingles Lichen	*Fuscopannaria ahlneri*	-	-	S3S4	3
Blistered Jellyskin Lichen	*Leptogium corticola*	-	-	S3S4	2
Appressed Jellyskin Lichen	*Scytinium subtile*	-	-	S3S4	1
Birdnest Jellyskin Lichen	*Scytinium tenuissimum*				1
Granular Soil Foam Lichen	*Stereocaulon condensatum*				1

SC= Special Concern
V= Vulnerable

5.2.1 Blue Felt Lichen

Blue Felt Lichen (*Pectenia plumbea*) is a distinctive large gray-blue foliose lichen with copper-coloured reproductive structures (apothecia) scattered over the upper surface of the thallus and a felty blue-black underside (hypothallus). Blue Felt Lichen is considered intolerant of bright sunlight and grows on mature, coarse-barked trees (particularly Red Maple, White Ash (*Fraxinus americana*) and Yellow Birch in NS) in deciduous or mixed deciduous/coniferous forests where light levels increase during winter months but where there is protective shade in summer (COSEWIC, 2010d). It is most commonly found from 50 cm above ground level up to about 2 m. It tends to be more common in low-lying areas with frequent fog or at higher elevations where there is cloud, or in areas with topographic features that help to trap moisture, such as valleys, swamps, and near watercourses (COSEWIC, 2010). It is very sensitive to acid rain as well as to changes in humidity regimes.

Globally, Blue Felt Lichen is part of the eastern North America-western European lichen species assemblage (Galloway 2008; Hinds and Hinds, 2007; Maass & Yetman 2002). Within Canada, the Blue Felt Lichen is found only in the Atlantic Provinces, and is most frequent in Nova Scotia, where 88 occurrence locations were known as of 2010 (COSEWIC, 2010). This lichen is listed as 'Special Concern' under the Federal *Species at Risk Act* (SARA), as 'Vulnerable' under the *Nova Scotia Endangered Species Act* (NS ESA) and as S3 (or 'Vulnerable') in Nova Scotia by the AC CDC.

Photo 5.4 Blue felt lichen (*Pectenia plumbea*) specimen detected within Wetland [redacted]. Photo: I. Bryson, CBCL.

CBCL ecologists detected this species on three trees in two separate locations within the Study Area during the 2022 field surveys. These locations are depicted on Figure 5-1 through Figure 5-4.

5.2.2 Frosted Glass-whiskers (Atlantic population)

Frosted glass-whiskers (*Sclerophora peronella)* is a tiny cryptic species belonging to a group of lichenized fungi known as calicioid or "stubble" lichens because of their tiny, stalked spore-bearing structures. Frosted glass-whiskers occurs on hardwoods, usually on exposed heartwood of living trunks, and more rarely on bark. It is often associated with mature and old-growth coniferous and deciduous forests, but also occurs in savannas and parklands. It seems to prefer stable humidity and small temperature fluctuations in microhabitats of intermediate light. At the time of the COSEWIC report preparation, this species was known from only from scattered locations in Europe, the USA, and three locations in Canada (British Columbia and Nova Scotia), although it has since been found at additional locations in Nova Scotia (T. Neily, pers. comm., 2018). This species is considered an indicator species of old-growth forests (COSEWIC, 2005a).

Photo 5.5 Frosted Glass Whiskers (*Sclerophora peronella*), a lichen SAR detected within wetlands [redacted] and [redacted]. Left panel shows a closeup of the tiny fruiting bodies, while the right depicts typical Red Maple heartwood habitat. Photo: I. Bryson, CBCL.

Frosted Glass Whiskers is listed as 'Special Concern' under COSEWIC and SARA and as S3S4 by AC CDC. It was detected within the Study Area by CBCL on three trees in two general locations, depicted on Figure 5-1 through Figure 5-4.

5.2.3 Finger Ring Lichen

Finger Ring Lichen (*Arctoparmelia incurva*) is a sorediate ring lichen with large (up to 4 mm), globose soralia growing from the tips of interior lobes. The lower surface of the thallus is darker tan to brown in colour. It is uncommon along the northeast Atlantic coast and is normally found on acidic rocks (Hinds and Hinds, 2007). It is known to be tolerant of cold, dry conditions, and can survive in areas with a high level of exposure to sunlight (Brodo et al., 2001).

Photo 5.6 Specimen of Finger Ring Lichen (*Arctoparmelia incurva*), a lichen SoCC occurring on a granite boulder within the Study Area. Photo: I. Bryson, CBCL.

Finger Ring Lichen is ranked as S3S4 ('Vulnerable' to 'Apparently Secure') in Nova Scotia by the AC CDC. Finger Ring Lichen was found a single location within the Study Area, depicted on Figure 5-1 through Figure 5-4.

5.2.4 Crumpled Bat's Wing Lichen

Crumpled Bat's Wing Lichen (*Collema leptaleum*) is a small to medium- sized foliose lichen which reaches a maximum thallus width of about 5 cm (Hinds and Hinds, 2007). The thallus consists of small pale to dark olive-green lobes which form an anastomosing network, resulting in a thallus with a 'crumpled' appearance. The thallus lobes often have swollen margins and the entire thallus may appear cushion-like. Round coin-like reproductive structures (apothecia) are usually present on the upper surface. Crumpled Bat's Wing Lichen has a wide global distribution, occurring throughout the Americas, as well as Africa, Australia and New Zealand, and parts of Asia. This species grows on bark substrates, generally on hardwood species (Hinds and Hinds, 2007).

Crumpled Bat's Wing Lichen is ranked as S2S3 (or 'Imperilled' to 'Vulnerable') by the AC CDC in Nova Scotia. Crumpled Bat's Wing Lichen was found at one location within the Study

Area, growing on the trunk of a mature red maple. Known locations within the Study Area are depicted on Figure 5-1 through Figure 5-4.

Photo 5.7 Crumpled Bat's Wing Lichen (*Collema leptaleum*), a lichen SoCC detected on within the Study Area. Left: Whole thallus on bark. Right: Closeup showing apothecia. Photos: I. Bryson, CBCL.

5.2.5 Corrugated Shingles Lichen

A member of the family Pannariacaeae, Corrugated Shingles Lichen (*Fuscopannaria ahlneri*) is a small foliose lichen which forms rosette shaped thalli up to 2 cm wide. The lobes are narrow and convex, with a pale browning upper surface and marginal granular soredia. The hypothallus is well-developed and bluish black, not usually extending beyond the thallus (Hinds and Hinds, 2007). It occurs in humid boreal forest sites in Europe and in eastern North America and Asia, where it usually grows on conifers, but is occasionally found on rock. Selva (1999) considered this species to be an indicator of old-growth forest habitat. Corrugated Shingles Lichen is ranked as S3 (or 'Vulnerable') in Nova Scotia by the AC CDC. The three locations discovered by CBCL within the Study Area are depicted on Figure 5-1 through Figure 5-4.

Photo 5.8 Corrugated Shingles Lichen (*Fuscopannaria ahlneri*), a lichen SoCC detected within the Study Area. Photo: I. Bryson, CBCL.

5.2.6 Blistered Jellyskin Lichen

Blistered Jellyskin Lichen (*Leptogium corticola*) is a foliose lichen with broad rounded lobes which may reach up to 8 cm in diameter (Nash et al., 2004). Typically, it has a distinctly wrinkled surface and puffy, blister-like bumps with no isidia or lobules (Brodo et al., 2001). Blistered Jellyskin Lichen is found growing on hardwoods within the Atlantic Canada region (notably on Red Maple in this Study Area) or occasionally on White Cedar (*Thuja occidentalis*) or on mossy rocks. Blistered Jellyskin Lichen is ranked as S3S4 in Nova Scotia by the AC CDC. It was detected by CBCL on three trees in two general locations within the Study Area, as depicted on Figure 5-1 through Figure 5-4.

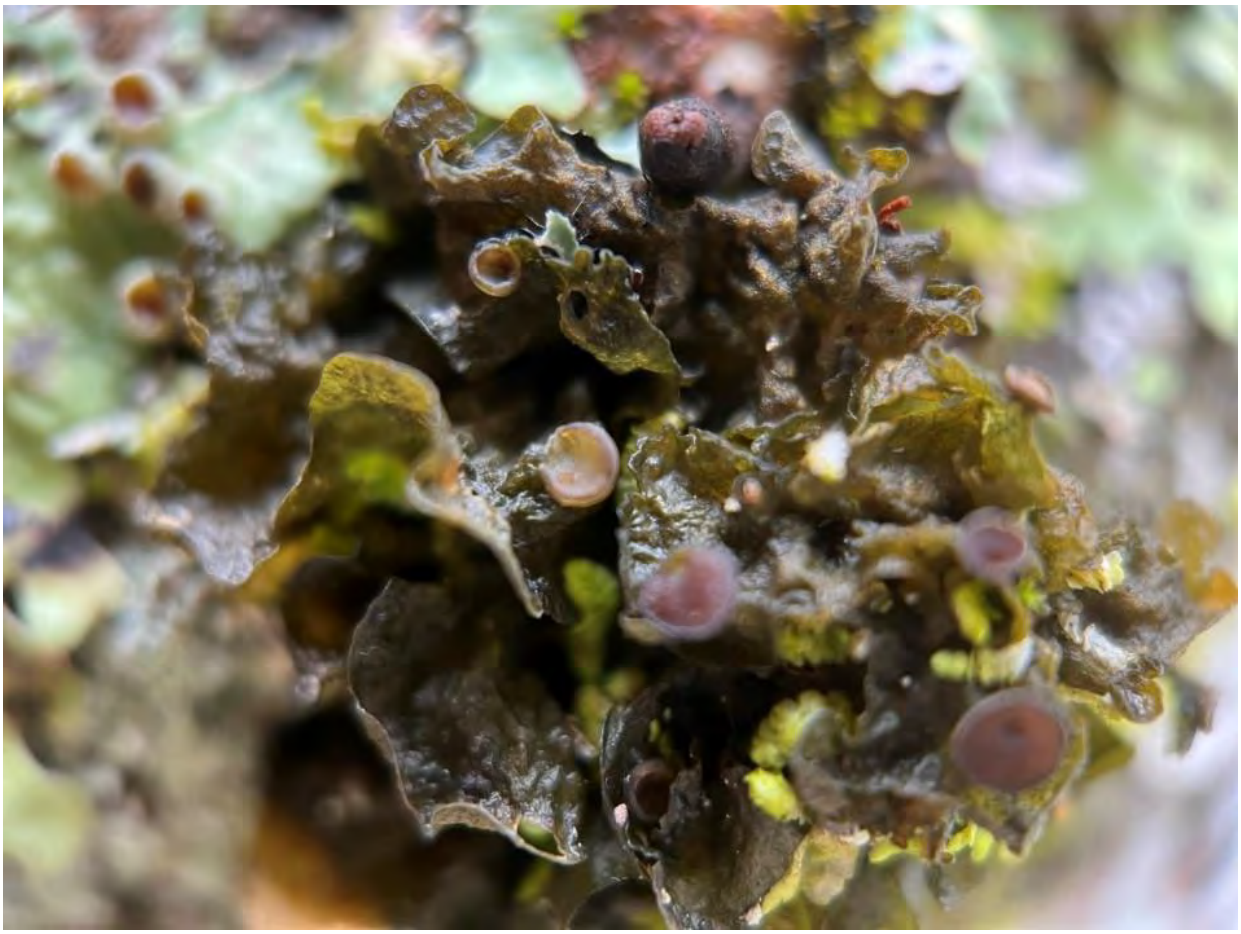

Photo 5.9 Blistered Jellyskin Lichen (*Leptogium corticola*), a lichen SoCC detected within the Study Area. Photo: I. Bryson, CBCL.

5.2.7 Appressed Jellyskin Lichen

Appressed Jellyskin Lichen (*Scytinium subtile)* grows on rotting bark, wood or detritus at intermediate elevations (*Consortium of North American Lichen Herbaria*, online). It is a small jelly lichen with minutely foliose lobes which tends to form a crust-like cushion shape. Orange-brown to almost black apothecia are commonly present (Nash et al., 2004). Appressed Jellyskin Lichen occurs throughout temperate Europe and occasionally in North America, extending to the Arctic. Appressed Jellyskin Lichen is ranked as S3 ('Vulnerable') in Nova Scotia by the AC CDC. The known location within the Study Area is depicted on Figure 5-1 through Figure 5-4.

Photo 5.10 Appressed Jellyskin Lichen (*Scytinium subtile)*, a lichen SoCC detected within the Study Area. Photo: I. Bryson, CBCL.

5.2.8 Birdnest Jellyskin Lichen

Birdsnest Jellyskin Lichen (*Scytinium tenuissimum*) is a small foliose jelly lichen with irregular and flattened lobes which tends to develop int a crust-like cushion shape (Nash et al., 2004). The thallus is usually medium gray to brownish gray or black in colour, often with light brown to dark apothecia (coin-like reproductive structures) on the upper surface (Nash et al., 2004). This species typically occurs on sandy soil, often among mosses, but sometimes also on bark or sandstone (Hinds and Hinds, 2007). Nash et al., (2004) state it occurs among mosses on calcareous soil. This species was originally known as *Leptogium tenuissimum*. Birdsnest Jellyskin Lichen is ranked as S2S3 (or 'Imperiled' to 'Vulnerable') in Nova Scotia by the AC CDC. Known locations within the Study Area are depicted on Figure 5-1 through Figure 5-4.

Photo 5.11 Birdnest Jellyskin Lichen (*Scytinium tenuissimum*) a lichen SoCC detected within the Study Area. Photo: I. Bryson, CBCL.

5.2.9 Granular Soil Foam Lichen

A member of the Stereocaulaceae family of lichens, Granular Soil Foam Lichen (*Stereocaulon condensatum*) is a low-growing fruticose lichen. The upright thallus is whitish, and supports numerous black reproductive structures on stalks. Globally, it occurs in Arctic and boreal regions of the Northern hemisphere and in South America. It generally grows on sandy and occasionally gravelly soils, in exposed situations. Granular Soil Foam Lichen is ranked as S2S3 (or 'Imperiled' to 'Vulnerable') in Nova Scotia by the AC CDC. The known location within the Study Area is depicted on Figure 5-1 through Figure 5-4.

Photo 5.12 Granular Soil Foam Lichen (*Stereocaulon condensatum*), a lichen SoCC detected within the Study Area. Photo: I. Bryson, CBCL.

5.3 Invasive Species

Many vascular plant species not native to Nova Scotia were detected within the Study Area, however the vast majority of these are considered naturalized and are not currently considered a threat to native ecosystems. One species of some invasive concern was noted and is described in the following subsection. Locations are depicted on Figure 5-1.

5.3.1 Multiflora Rose

Multiflora Rose (*Rosa multiflora)* is a large sprawling species, with has long arching stems forming dense impenetrable thickets. Originally native to Asia, this species is now a problem in many parts of the world, primarily due to the horticultural trade. The long canes are armed with strong recurved spines, while the leaves contain five to eleven ovate, serrated leaflets. Blooms are simple white and pink roses, occurring in clusters from June to July. The resulting red rose hips are readily eaten by birds, which can disperse them over long distances. Multiflora Rose will also root along its long arching stems where they touch the ground. Multiflora Rose prefers sunny sites with well drained soils and aggressively colonizes old fields, open woodlands and forest edges. While it provides dense cover for

wildlife, it is capable of aggressive growth, often climbing over and outcompeting native plants and trees for light and nutrients (Warne, 2018).

Multiflora Rose is widespread within Nova Scotia where it is difficult to eradicate and considered a serious threat to native habitats (Munro et al., 2014). A small specimen was identified at a single location, at the edge of a wooded area. This location is depicted on Figure 5-1 through Figure 5-4.

Photo 5.13 Multiflora Rose (*Rosa multiflora*), an invasive vascular plant detected within the Study Area. Photo: B. Cameron, CBCL.

5.4 Community Classification

A total of 15 (with marshes) vegetation community groups and 34 vegetation types (VTs) were identified within the Study Area in 2022. These are listed in Table 5-3.

Table 5-3 Summary of Vegetation Groups and Vegetation Types Identified in the Study Area during the CBCL Vegetation Field Program in 2022

Community Type	Vegetation Groups	Vegetation Types (VTs)	Source of Category
Upland Communities	Intolerant Hardwood Forest Group	• IH6 – White Birch - Red Maple / Sarsaparilla / Bracken • IH7 - Red Maple / Hay-Scented Fern - Wood Sorrel	Neily et al., 2010
	Mixedwood Forest Group	• MW1 - Red Spruce - Yellow Birch / Evergreen Wood Fern • MW2 Red Spruce - Red Maple - White Birch / Goldthread • MW4 Balsam Fir - Red Maple / Wood Sorrel - Goldthread • MW5 White Birch - Balsam Fir / Starflower	
	Spruce-Hemlock Forest Group	• SH3 - Red Spruce - Hemlock / Wild Lily-Of-The-Valley • SH4 - Red Spruce - White Pine / Lambkill / Bracken • SH5 - Red Spruce - Balsam Fir / Schreber's Moss • SH6 - Red Spruce - Balsam Fir / Stair-Step Moss - Sphagnum • SH9 - Balsam Fir - Black Spruce / Blueberry	Neily et al., 2010
	Spruce-Pine Forest Group	• SP8 - Black Spruce – Aspen / Bracken – Sarsaparilla	
	Tolerant Hardwood Forest Group	• TH1a – Sugar Maple / Hay-scented Fern • TH1b – Yellow Birch / Hay-scented Fern • TH7 - Yellow Birch - White Birch / Evergreen Wood Fern	Neily et al., 2010
	Barrens - Shrubland	• DS1- Black Huckleberry Heath • DS5- Sheep Laurel Inland Heath	Porter et al., 2020
	Barrens – Rock Barrens	• Rock Barren (Disturbed Habitat)	N/A

Community Type	Vegetation Groups	Vegetation Types (VTs)	Source of Category
Wetland Communities	Wet Coniferous Forest Group	• WC1 – Black Spruce / Cinnamon Fern / Sphagnum • WC5 - Red Spruce - Balsam Fir / Cinnamon Fern / Sphagnum • WC6 – Balsam Fir / Cinnamon Fern / Three-Seeded Sedge / Sphagnum	Neily et al., 2010
	Wet Deciduous Forest Group	• WD2 – Red Maple / Cinnamon Fern / Sphagnum • WD6 - Red Maple - Balsam Fir / Wood Aster / Sphagnum	Neily et al., 2010
	Shrub Swamps	• SS1 – Early Successional Cutover Swamp • SS2 – Alder Seepage Thicket	CBCL NCNH
	Bogs	• BG3 - Leatherleaf – Sheep Laurel - Black Spruce Bog	Adapted from NCNH
	Fens	• FE1 - Sweet Gale Mixed Shrub Fen • FE2 – Tall Shrub Fen	Adapted from NCNH
	Marshes	• MR1 - Tall graminoid meadow marsh • MR2 – Meadow Marsh / Cutover Swamp	Adapted from NCNH CBCL

Five upland forest groups per NS DNRR FEC were identified within the Study Area; "Intolerant Hardwood (IH)', 'Mixedwood (MW)', 'Spruce-Hemlock' (MW), 'Spruce-Pine' (SP), and 'Tolerant Hardwood' (TH) (Table 5-3). The 'Wet Coniferous' and 'Wet Deciduous' forest groups were also identified as present within the study area, but are discussed in the context of the wetland communities, where they are encountered primarily. One barrens vegetation group per the NS DNRR BENS (Porter et al., 2020) was also identified: 'Shrubland' (S). Within these upland groups, a number of VTs were present, and are described below.

General wetland types were introduced and described in Section 4.2. The current section describes different VTs present within the larger wetland classes. Two forested wetland habitats per the NS DNRR FEC were identified within the Study Area, these were 'Wet Coniferous' and 'Wet Deciduous' groups. 'Forested Swamp' habitat, as defined by the NCNH was also identified as present. All three of these wetland types also fit within the "Forested Swamp" category of the Canadian Wetland Classification System (CNCS) (National Wetlands Working Group, 1997). Four non-forested CNCS wetland types were also present, and included 'Shrub Swamps', 'Bogs', 'Marshes', and 'Fens'. Within these wetland groups, a number of VTs were present, and are described below.

5.4.1 'Intolerant Hardwood' Forest Group (NS DNRR FEC)

Intolerant hardwoods are an early to mid-successional group comprising predominantly even-aged, short-lived species such as Red Maple, Aspen (*Populus* spp.), Gray Birch (*Betula populifolia)* and White Birch. The origin of these stands is primarily from stand-level disturbances over relatively large areas, such as forest fire or clearcut harvesting.

5.4.1.1 IH6 – White Birch – Red maple / Sarsaparilla – Bracken

The White Birch – Red Maple / Sarsaparilla – Bracken VT is typically associated with dry to moist sites, with a variable nutrient content. In this VT, White Birch and Red Maple are the most common overstory trees, with Occasional Balsam Fir, Red and White Spruce (*Picea glauca*), White Pine and Yellow Birch. The typically well-developed shrub layer often comprises Wild Raisin, Serviceberry (*Amelanchier* spp.), Sheep Laurel, Blueberry (*Vaccinium* spp.), Striped Maple and various species of regenerating trees. Herbaceous layer components commonly include Bracken Fern, woodferns (*Dryopteris* spp.), Sarsaparilla, Starflower, and Bunchberry, and minor amounts of bryophytes such as Schreber's moss and *Hypnum* species.

Photo 5.14 Example of IH6 – White Birch - Red Maple / Sarsaparilla – Bracken VT. Photo: I. Bryson, CBCL.

5.4.1.2 IH7 Red Maple / Hay-Scented Fern – Wood Sorrel

The IH7 Red maple / Hay-scented Fern - Wood Sorrel VT is associated with fresh to moist, nutrient medium to rich soils of variable texture. It is dominated by red maple and lesser amounts of several shade-tolerant trees, such as Sugar Maple, Yellow Birch and/or Red Spruce. The shrub layer is moderately developed and includes regenerating trees (including Balsam Fir), Canada Fly-Honeysuckle (*Lonicera canadensis*) and Striped Maple. It also supports a diverse herb layer, which is indicative of mesic Nova Scotia hardwood forests. Herbaceous vegetation is dominated by ferns, most notably Hay-scented Fern which can be an aggressive competitor in open, disturbed sites. Other common species include New York Fern (*Parathelypteris noveboracensis*), Evergreen Wood Fern (*Dryopteris intermedia*), Rose Twisted Stalk (*Streptopus lanceolatus*), Indian Cucumber Root (*Medeola virginiana*), Wood Aster (*Oclemena acuminata*), Wood Sorrel (*Oxalis montana*), Bristly and Shining Club-moss (*Spinulum annotinum* and *Huperzia lucidula*), and various violet (*Viola*) species. The bryophyte layer is poorly developed. This VT occurs throughout NS but is particularly common on upper slope positions within the Nova Scotia Uplands ecoregion.

Photo 5.15 Example of IH7 Red maple / Hay-scented fern - Wood sorrel VT. Photo: B. Cameron, CBCL.

5.4.2 'Mixedwood' Forest Group (NS DNRR FEC)

The Mixedwood Forest Group is an early to late successional group with the predominant tree species varying according to successional stages. Earlier successional stages are dominated by Red Maple, White Birch and Balsam Fir, but they usually contain residuals from past stand-level disturbances. Late successional stages contain Yellow Birch along with Red Spruce or Hemlock. Early and mid-successional stages are usually even-aged whereas late successional stages can develop uneven-aged characteristics due to the longevity of the dominant species.

5.4.2.1 MW1 – Red Spruce – Yellow Birch / Evergreen Wood Fern

The MW1: Red Spruce - Yellow Birch / Evergreen Wood Fern VT is a late successional community with an overstory co-dominated by Red Spruce and Yellow Birch, with lesser and varying amounts of mostly shade-tolerant trees such as Sugar Maple, Hemlock, Beech, Balsam Fir, Red Maple, White Pine and White Ash. MW1 is mainly associated with fresh to fresh-moist, nutrient medium to rich soils of variable texture. Red Spruce – Yellow Birch / Evergreen wood fern is a climax Acadian mixedwood VT that can be found throughout mainland Nova Scotia but is most common in central and eastern sections of the province and along the Bay of Fundy shore. In eastern Nova Scotia, Balsam Fir can take the place of Red Spruce in this VT. The longevity and shade tolerance of the dominant overstory tree species aids in the development of old forest characteristics, maintained by gap disturbances. The shrub layer is moderately developed and includes mainly regenerating trees, Striped Maple and Canada Fly Honeysuckle. Several fern species are common in the well-developed herb layer including Evergreen Wood Fern, New York Fern and Hay-Scented Fern. Wood Sorrel, Wood Aster, Rosy Twisted-stalk, Indian Cucumber Root and some Club-mosses (*Lycopodium* spp., *Dendrolycopodium* spp., etc.) are also common. Bryophyte development varies, with Schreber's moss and Stairstep Moss being the main species. Bazzania can also be common where coarse woody debris has accumulated on the forest floor.

Photo 5.16 Example of MW1 - Red Spruce - Yellow Birch / Evergreen Wood Fern VT.

5.4.2.2 MW2 – Red Spruce – Red Maple – White Birch / Goldthread

The MW2 Red Spruce - Red Maple - White Birch / Goldthread VT is typically associated with fresh to fresh-moist sites, with medium nutrient content. This mid-successional VT is defined by Red Spruce and Red Maple in the upper canopy with sporadic occurrences of shade tolerant species such as Sugar Maple, Beech, White Pine, and Eastern Hemlock. The moderately developed shrub layer is composed of regenerating tree species, Striped Maple, and Canada Fly Honeysuckle. The herb layer contains species similar to other mixedwood VTs, However Bracken Fern, Bunchberry, and Goldthread (*Coptis trifolia*) are more common in MW2 (Neily et al., 2013).

Photo 5.17 Example of MW2 Red Spruce - Red Maple - White Birch / Goldthread VT.

Photo 5.18 Example of MW2 Red Spruce - Red Maple - White Birch / Goldthread VT.

5.4.2.3 MW4 – Balsam Fir – Red Maple / Wood Sorrel – Goldthread

MW4 Balsam Fir - Red Maple / Wood Sorrel - Goldthread is an early to mid-successional VT, commonly arising from disturbances such as clearcut harvesting or windthrow. There is a dominance of red maple and balsam fir in the overstorey, although other associates are present in lesser quantities, i.e., Red Spruce, and White Spruce (*Picea glauca*), Yellow and White Birch, and Aspen (*Populus* spp.). Understory shrubs are typically Red Maple and Balsam Fir, and herbaceous vegetation includes Wild Lily-Of-The-Valley (*Maianthemum canadense*), bluebead lily (*Clintonia borealis*), Goldthread, Starflower, and Wood Sorrel. Presence of various fern species is indicative of site moisture levels, with Cinnamon Fern (*Osmundastrum cinnamomea*) (hydric sites), Hay-scented Fern (mesic sites), and Bracken Fern (xeric sites) being most common (Neily et al., 2013).

Photo 5.19 Example of MW4 Balsam fir - Red maple / Wood sorrel - Goldthread VT.

5.4.2.4 MW5 – White Birch – Balsam Fir / Starflower

The MW5 White birch - Balsam fir / Starflower VT has White Birch and Balsam Fir as dominant overstory trees, with lesser Red Spruce, Yellow Birch, White Spruce and/or Red Maple. Minor amounts of Black Spruce, Hemlock and White Pine can also occur. The shrub layer is moderately developed and dominated by regenerating trees (especially Balsam Fir and Red Maple). The herb layer is represented by typical forest flora including Wild Lily-Of-The-Valley, Starflower, Bluebead Lily, Goldthread and Wood Sorrel. Bracken, Hay-Scented Fern and Cinnamon Fern may also occur, with their presence and relative abundance indicative of moisture levels. Bryophyte development varies; its coverage directly related to softwood overstory abundance. Schreber's moss, stair-step moss and broom moss are the main species. Bazzania can also be common where coarse woody debris has accumulated on the forest floor. MW5 is mainly associated with fresh to moist, nutrient-medium soils of variable texture. It is an even-aged VT that usually follows stand-level disturbances such as windthrow and harvesting and is common in eastern Nova Scotia.

5.4.3 'Spruce-Hemlock' Forest Group (NS DNRR FEC)

The Spruce-Hemlock Forest Group is a mid to late successional group comprising predominantly of Red Spruce, Eastern Hemlock (*Tsuga canadensis*) and White Pine (*Pinus strobus*). Mid-successional stages are typically even-aged and develop into uneven-aged structure as they develops into late successional stages. Within the well-developed canopies, the mid-successional stages usually have a significant Balsam Fir along with Eastern Hemlock, Red Spruce, and White Pine in the overstory, changing to late successional stands of Eastern Hemlock and Red Spruce due to these species' longevity.

5.4.3.1 SH3 – Red Spruce – Hemlock / Wild Lily-of-the-Valley

SH3 — Red Spruce - Hemlock / Wild Lily-of-the-valley: This VT is typically associated with fresh to moist sites, with medium nutrient content. This late successional VT's overstory is dominated by shade-tolerant red spruce, which may be codominant with hemlock. The shrub layer is primarily composed of regenerating overstory species, chiefly Eastern Hemlock, Balsam Fir, Red Spruce and Red Maple. The density of the herbaceous layer is typically low, although species diversity can be high. Species observed within the herb layer may include Wild Lily-Of-The-Valley, Bluebead Lily, Partridge-Berry (*Mitchella repens*), Starflower, and Painted Trillium (*Trillium undulatum*). Dominate bryophyte species include Schreber's moss and Stair-step Moss (*Hylocomium splendens*); Bazzania (can also be abundant where coarse woody debris has accumulated.

5.4.3.2 SH4 – Red Spruce – White Pine / Sheep Laurel / Bracken

SH4 - Red spruce - White pine / Lambkill / Bracken is a late successional VT is typically associated with dry to fresh sites, with poor to medium nutrient content. This VT has an abundance of Red Spruce and White Pine with partial coverage of Red Maple, White Birch, Black Spruce and Balsam Fir. Commonly notably absent from this VT overstory is Eastern Hemlock. The shrub layer is primarily composed of regenerating overstory species, such as balsam fir and Red Spruce, along with ericaceous species such as Sheep Laurel and blueberries. The density of the herb layer is low, with Bracken Fern being most prevalent. Dominate bryophyte species include Bazzania and Schreber's moss with Reindeer Mosses (*Cladonia* spp.) in drier sites.

Photo 5.20 Example of SH4 - Red spruce - White pine / Lambkill / Bracken VT.

5.4.3.3 SH5 – Red Spruce – Balsam Fir / Schreber's Moss

SH5 Red Spruce - Balsam Fir / Schreber's Moss is a mid-successional VT with abundant Red Spruce and varying amounts of Balsam Fir. The presence of minor amounts of Red Maple and White Birch usually indicate recent disturbance events, whereas Yellow Birch, White Pine and Eastern Hemlock indicate development toward a later successional stage. SH5 is mainly associated with dry to fresh, nutrient poor to medium soils of glacial origin, which are generally medium to coarse textured and often stony. Red Spruce – Balsam Fir / Schreber's Moss is a typical Acadian softwood VT found on zonal sites throughout mainland Nova Scotia and parts of Cape Breton. Red Spruce is usually the dominant overstory tree, although Balsam Fir may be abundant in some stands. Both species are often well represented as regeneration in the shrub layer. Hybrid (Red/Black) Spruce can also be found on more marginal sites. Low light availability often reduces the abundance of common woodland flora such as Wild Lily-of-the Valley, Goldthread, and Bunchberry. A needle carpet is common under many stands, but coverage by Schreber's Moss, Stair-step Moss, and Bazzania can be extensive in some.

Photo 5.21 Example of SH5 Red Spruce - Balsam Fir / Schreber's Moss VT.

Photo 5.22 Example of SH5 Red Spruce - Balsam Fir / Schreber's Moss VT Observed within Study Area.

5.4.3.4 SH6 – Red Spruce – Balsam Fir / Stair-step Moss – Sphagnum

SH6 Red Spruce - Balsam Fir / Stair-step Moss - Sphagnum is a mid-successional VT very similar to SH5 (Red Spruce – Balsam Fir / Schreber's moss) that occurs on moister sites. Tree cover is mainly Red Spruce with varying amounts of Balsam Fir. Typically, minor amounts of Red Maple and White Birch indicate recent disturbance events, whereas Yellow Birch, White Pine and Eastern Hemlock indicate development toward a later successional stage. SH6 is mainly associated with fresh-moist to moist, nutrient medium soils of glacial origin, which are generally medium to coarse textured and often stony. This VT is found throughout mainland Nova Scotia and parts of Cape Breton. Red Spruce - Balsam Fir / Stair-step moss – Sphagnum is a typical Acadian softwood VT found on moist, zonal sites in Nova Scotia. Red Spruce is usually the dominant overstory tree, although Balsam Fir may be abundant in some stands. Both species are usually well represented as regeneration in the shrub layer. Hybrid (Red/Black) spruce can also be found on more marginal sites. Low light availability often reduces the abundance of woodland flora, but moist soils associated with this VT generally support a higher diversity of species than drier Red Spruce types. In more moist sites, herbs like Cinnamon Fern, Creeping Snowberry (*Gaultheria hispidula*), New York Fern (*Parathelypteris noveboracensis*), Interrupted Fern (*Osmunda claytoniana*) and

Three-Seeded Sedge (*Carex trisperma*) will be present. The bryophyte layer is characterized by extensive coverage of mainly Stair-step Moss and Schreber's moss, with Sphagnum mosses present in wetter parts of the stand.

Photo 5.23 Example SH6 Red Spruce - Balsam Fir / Stair-step Moss - Sphagnum VT.

5.4.3.5 SH9 – Balsam Fir – Black Spruce / Blueberry

The SH9 Balsam Fir - Black Spruce / Blueberry VT usually develops after a disturbance such as windthrow or insect infestation. Balsam Fir is the predominant species, found in both the overstorey and understory (regeneration) with varying amounts of Black Spruce. In the absence of disturbance, Black Spruce can become the more dominant species due to a greater life expectancy. The shrub layer is not species rich, with Balsam Fir regeneration being the most common element; however, Sheep Laurel and Velvet-Leaf Blueberry may be present. The herb layer consists of various mosses, Bracken Fern, and Bunchberry (Neily et al., 2013).

5.4.4 'Spruce-Pine' Forest Group (NS DNRR FEC)

The spruce-pine vegetation types, which consist mainly of Black Spruce, Eastern White Pine, Red Pine (*Pinus resinosa)*, and Jack Pine *(Pinus banksiana)*, are dependent on wildfire disturbances. All of these tree species, besides Eastern White Pine, have either semi-

serotinous or serotinous cones which require heat to open and disperse seeds for regeneration. Due to the acidic nature of the soils, the shrub and ground vegetation layers are dominated by ericaceous species. These vegetation types are typically early to mid-successional and can be even aged or uneven aged depending on the severity of fire disturbances.

5.4.4.1 SP8 – Black Spruce – Aspen / Bracken – Sarsaparilla

SP8 - Black Spruce – Aspen / Bracken – Sarsaparilla supports a mixedwood canopy of black spruce and pioneer hardwoods. Black Spruce, Large-Tooth Aspen (*Populus grandidentata*) and Trembling Aspen (*Populus tremuloides*) are the dominant overstory trees in this VT, along with White and Grey Birch, Red Maple and Red Oak. Residual trees such as large Eastern White Pine and Red Oak are often present. The shrub layer is dominated by Sheep Laurel, Velvet-Leaf Blueberry, and Wild Raisin. Black Spruce, White Pine, Balsam Fir and Red Maple regeneration can also be extensive. The herb layer consists primarily of Sarsaparilla, Bracken, Bunchberry and Wild Lily-Of-The-Valley. Schreber's Moss and Wavy Dicranum are the dominant bryophytes. This VT is an early successional form which usually follows stand-replacing disturbance events such as fire, windthrow or harvesting, and is widespread and common in NS. It is generally associated with dry to fresh-moist, nutrient poor soils.

5.4.5 'Tolerant Hardwood' Forest Group (NS DNRR FEC)

This vegetation type consists of mid to late successional hardwood species like Sugar Maple, Yellow Birch, American Beech, Red Maple, Ironwood (*Ostrya virginiana*), and White Ash. There is a variety of fern species in the understory along with a diverse shrub layer. Large scale disturbances are a rarity, and as a result these VTs can eventually transform into uneven-aged, old growth forests. The nutrient rich soils promote the growth of many rare plant species in Nova Scotia.

5.4.5.1 TH7 – Yellow Birch – White Birch / Evergreen Wood Fern

TH7 - Yellow Birch - White Birch / Evergreen Wood Fern is a mid-successional VT with an overstory dominated by Yellow Birch with a strong component of White Birch. Balsam Fir is also common in both the overstory and understory – its dominance in either layer reflects the time elapsed since the last major insect disturbance (spruce budworm or tussock moth). TH7 is mainly associated with fresh, nutrient medium soils of glacial origin. This VT is primarily found in eastern Nova Scotia and Cape Breton, but is possible to occur elsewhere. Yellow Birch and White Birch are the dominant overstory trees, with lesser amounts of Balsam Fir, Red Maple and White Spruce. Scattered Sugar Maple, Red Spruce and American Beech are also typical. Balsam Fir is prominent in the shrub layer, with Red Maple also common in some stands. The herb layer has extensive fern cover including Wood Ferns, Hay-Scented Fern, Northern Beech Fern, Bracken and New York Fern. Other common plants include Wild Lily Of-The-Valley, Bunchberry, Wood Sorrel, Sarsaparilla and Gold Thread. The bryophyte later is discontinuous and species-poor, especially where the forest floor is characterized by leaf litter and/or where the softwood component is low.

Photo 5.24 Example of TH7 - Yellow Birch - White Birch / Evergreen Wood Fern VT.

5.4.6 Barrens – Shrubland (BENS)

Barrens are a type of ecosystem which develop in areas with harsh climactic or soil conditions and low shrub-dominated vegetation communities (Porter et al., 2020). Many barrens in NS have been classified according to the *Barrens Ecosystems in Nova Scotia: Classification of Heathlands and Related Plant Communities* (Porter et al., 2020), referred to in this document as the BENS. These vegetation communities mainly consist of species belonging to the heath (Ericaceae) or heath-like crowberry (Empetraceae) families, which are often referred to as ericaceous shrubs. Common ericaceous shrub species of dry barren habitats in NS include Sheep Laurel, Late Lowbush Blueberry, Black Huckleberry (*Gaylussacia baccata*), and Rhodora (*Rhododendron canadense*).

Two barren VTs were encountered within the Study Area, both shrubland types, these were:

- S1. Black Huckleberry Heath (BENS)
- S5. Sheep Laurel Inland Heath (BENS)

Each of these VTs are described below.

5.4.6.1 S5 – Sheep Laurel Inland Heath (BENS)

This vegetation type is a type of shrub barren which is dominated by Sheep Laurel on inland barrens occurring over surficial deposits of glacial till or sand. Indicator species include Sheep Laurel, Bracken Fern, Eastern Teaberry, and Inkberry (*Ilex glabra*), Lesser amounts of Rhodora and Wild Raisin frequently occur. The dwarf shrubs Eastern Teaberry and Lowbush Blueberry are also frequently present, as are the taller Bristly Dewberry *(Rubus hispidus)* and Black Chokeberry (*Aronia melanocarpa*). Black Spruce and Eastern White Pine are the most common tree species encountered within the association, (though not likely to be tree-sized). Bracken Fern is frequent and abundant. Grey Reindeer Lichen (*Cladonia rangiferina*) and Reindeer Lichen (*Cladonia arbuscula* ssp*. squarrosa*) both commonly occur, but do not generally provide more than 5% cover (Porter et al., 2020).

Photo 5.25 Typical Vegetation of Sheep Laurel Inland Heath (BENS) Shrub Barren VT.

5.4.6.2 S1 – Black Huckleberry Heath (BENS)

The Black Huckleberry Heath VT, as described in the BENS (Porter et al., 2020), is a type of shrubland occurring widely throughout NS. This VT is dominated by Black Huckleberry, with Lowbush Blueberry and Eastern Teaberry occurring frequently. This VT usually occurs on sites with nutrient poor and acidic humus over coarse-grained mineral soils. These soils are

typically shallow but may occasionally be deep enough to support small trees, mainly Red Maple, Balsam Fir, Black Spruce, White Spruce and Tamarack. Bunchberry and Wild Lily-of-the-Valley frequently occur, as does Starflower. Bracken Fern is frequently present in sheltered microsites. On low elevation sites, Grey Reindeer Lichen and Reindeer Lichen are the most common lichen species. This VT rarely reaches an average vegetation height of more than 1.5 m.

Photo 5.26 Typical Vegetation of Black Huckleberry Heath (BENS) Shrub Barren VT.

5.4.7 'Wet Coniferous' Forest Group (NS DNRR FEC)

The VT's associated with the 'Wet Coniferous' forest group develop in areas with very high water tables, or with surface water present. Black Spruce, Tamarack, and Balsam Fir are the most common tree species in these vegetation types. Vegetation in the shrub and herb layer is often ericaceous species with high tolerances with water and poor soils. These VT's may arise from various types of disturbances such as fluctuating water levels, windthrow, insects, and disease.

5.4.7.1 WC5 – Red Spruce – Balsam Fir / Cinnamon Fern / Sphagnum

The Red Spruce – Balsam Fir/ Cinnamon Fern / Sphagnum VT is found on soils with reduced rooting potential and relatively low nutrient availability, but sites are generally more