Environmental Impact Study

Habitat Assessment FIWI14

This assignment is submitted in partial fulfillment of the requirements of third year leading to the diploma of Ecosystem Management Technology at Sir Sandford Fleming College.

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Environmental Impact Study

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1.0 Introduction

1.1Project Proposal:

Sir Sandford Fleming College, legal owner of the land, would like to sell the area indicated in Figure 1, to a private consortium (Development Inc.). Development Incorporated proposes to develop the site as a student town-home-subdivision and include a public docking area for boat docking on the Scugog River.(See appendix A for proposal)

The purpose of this Environmental Impact Study (EIS) is to determine the potential positive and/or negative environmental impacts that Development Inc. subdivisions and boat docking would impose on the Smith Property, located to the south west of Fleming College, and owned by Fleming college in Lindsay, Ontario. Examining the anticipated environmental effects of the proposed project will aid decision makers in their approval, disproval or alteration of a project. The purpose of this assessment is to ensure that decision makers consider the environmental impacts when deciding whether to proceed with the project proposed by development Inc. As per the zoning restrictions outlined by the City of Kawartha Lakes (City of Kawartha Lakes 2012) under conditions of the Ontario Provincial Policy Statement Under the Planning Act(Ministry of Municipal Affairs and Housing, 2014), this will include the assessment of natural heritage available for this property. Included in this report, Land Classification designations, significant wetlands, and significant wildlife habitat will be assessed on the property in question. All maps included in this study are consistent with requirements outlined in the City of Kawartha Lakes Official plan(pp182). Recommendations which follow the above summaries will include potential development options, mitigation measures, and courses of action for both Fleming College and Development Inc.

Fig. 1. The Smith Property, Fleming College; *study site area outlined in orange. (Source: Google Maps, 2017)

1.2 Qualifications of the Consultant

Christopher Vieau has completed a degree in Environmental Geography at the University of Toronto, and has interests in forest conservation and conservation biology. At the time of this project, he is a student at Fleming college, working toward an Ecosystem Management Technology diploma. Currently, Christopher retains a working knowledge of Ontario Ecological Land Classification and habitat assessment methodologies, report writing, scientific literature critique, GIS mapping, species identification, and project management.

1.3 Property Background

Lindsay is a municipality located in South Central Ontario, surrounded by Peterborough County to the east, Haliburton County to the north and the Regional Municipality of Durham to the south and west. Prior to European settlement, Lindsay was the traditional territory of the Anishinaabe Mississauga adjacent to Haudenosaunee Territory and in the territory covered by the Williams Treaty (Scugog First Nation, 2018). The first Mississauga people to settle in the basin of Lake Scugog around 1700 appreciated the resources available through forest and wetlands. The development of Lindsay began through the geological survey conducted by Duncan McDonell in 1825 following European settlement. As McDonell began to survey the land for resources, settlers immigrated into the region and by 1827, settlers situated along the Scugog River worked to create the town of present-day Lindsay. The small village developed through the building of sawmills, railways and industrial developments. The construction of the Port Hope Railway in 1857 sparked rapid development and industrial growth.

The Frost Campus, Fleming College property is in Lindsay, one of the communities in the City of Kawartha Lakes region. The Campus is located on the Southeast edge of the town of Lindsay. Prior to development, the area was occupied by farmland and uncropped fields. The site was relatively flat, with a vertical elevation of 60 feet from the west boundary to the Scugog River on eastern boundary. The Natural Resource Division determined, through site analysis, that the area most suitable for building was located on soil least desirable for nursery facilities (Master Plan for Fleming College, 1970). The Frost Campus opened in 1973 and was named after Leslie Frost, a politician that played a crucial role in the development of the Fair Employment Practices Act and Fair Accomodation Practices Act, providing penalties for racial, ethic, and gender discrimination on public property (The Canadian Encyclopedia, 2007). Some current features of the Frost campus include the Trans-Canada Trail, running straight through campus, constructed wetlands and an Arboretum. Currently, the study site under review is owned by Fleming College. Activities and current uses that take place on the campus include: heavy machinery & equipment operation, wastewater treatment, constructed wetland waste treatment and recreational sports. The campus includes a community recreation center, field house, drilling building, and arboretum. Within the study site, located east of the heavy operating equipment field, there are constructed wetlands, trails, and forests. These nature areas provide as tools for environmental students to learn and gain hands on experience within the realm of environmental science.

Fig. 2. Study Site prior to development; outlined in orange (Source: Fleming College Master Plan, 1970)

2.0 ELC Methodology

The Smith Property was initially consolidated into 5 polygons based on differences in observable topography via satellite imagery. Variation in value and texture was used in this consolidation under the premise that such features in imagery should coarsely constitute different land classes. Ground truthing was applied to the polygons established which involves field sampling and on-ground observations to confirm the accuracy of satellite determined polygons. This process further refined polygon sites, and the Smith property was revised to consist of 7 polygons in total(Figure 3). 35 randomly generated GPS locations were established among polygons in the entire Smith Property by Fleming College faculty. GPS sites were allocated to

groups in the Fleming College ecosystem Management Technology(EMX) class undertaking this project. Data and observations by the EMX groups were used to compare and discover any discrepancies within the satellite data. Evaluation of each site was taken to further define site attributes and classifications under the relevant Ontario classification systems.

3.0 Ecosite determinations

3.1 methodology

Data collected were coded and defined using datasheets with information relevant to classification of land types in the Great Lakes St Lawrence ecosite fact sheets (Wester, et al, 2015)(see appendix b for Smith property associated ecosites). Data acquired at each site included flooding patterns, substrate depth, substrate texture, vegetation communities present and topography. Photos were also taken at each plot for visual reference. Following field-studies, information at each site was used to classify each polygon with reference to the ecosite fact sheets mentioned above (Wester, et al., 2015) and subsequently categorized using the Ecological Land Classification for southern Ontario: First Approximation and its classification, field guide (MNRF,1998). The Ecological land classification process provides a standardized framework for analysis and comparison of ecosystems to ensure a consistent approach to classifying and identifying ecological units at different scales and can aid in management decisions(Sims, 1996). Importantly to this study, the classes in the MNRF(1998) guide are applicable to Ontario Ecoregional Criteria Schedules(OMNRF 2014) which define wildlife habitat and are also applicable to conditions outlined in the Kawaartha Lakes management plan(City of Kawartha Lakes, 2012) under which the Smith property is under jurisdiction.

Fig. 3. ELC map of polygons, ecosites and corresponding codes as according to field data and observations (Source, Elliot, Google Earth, 2018)

3.2 ELC Determination summary and mapping

1. Polygon 1
(Plots: 31,29,30,3,5,9,4,6,7,17,1)
Moist, Fine Meadow (S110N)
Cultural Meadow* (CUM-1)

Polygon 1 is dominated by herbaceous vegetation and has consistencies with the description of Ontario Ecological Land Classification (ELC) class S110N; defined as a Moist Fine Meadow (Wester et al, 2015). This ecosite corresponds with the Ecological Land Classification for Southern Ontario as CUM-1, defined as a Cultural Meadow (MNRF, 1998). Polygon 1 covers roughly a quarter of the study site and is located within the northeast portion of the Smith property. This polygon runs parallel to the Scogog River, between Polygon 7, and 2. Much of the

polygon is herbaceous, covered in prairie grasses and small shrubs, with a few small patches of trees. Species present include *Typhus Spp, Bromus spp., Soledago canadensis, Toxicodendron radicans, Asclepias syracia, Vicia villosa, Cirsium spp., Symphyotrichum novaeangliae, Acer negra, and Impatiens capensis*. The substrates present at this site were both mineral and calcareous, with coarse fragments. Substrates in this polygon have a moisture regime ranging from 2-3, and the substrate type varied from silty clay to clay. Depth of substrates in this ecosite varies between 42 and >120cm.

2. Polygon 2
(Plots: 8,2,6,11,13,12,10)
Mineral Meadow Marsh (S142N)
Graminoid Mineral Meadow Marsh (MAM2)

Polygon 2 is located in the western portion of the Smith property, extending parallel to the Scugog river, and towards the center of the Smith property study site. This polygon is classified as a Mineral Meadow Marsh (S142N) under the Great Lakes St. Lawrence Land Classification (Wester et al, 2015) and corresponds with the Graminoid Mineral Meadow Marsh ecosite class (MAM2') in the Ecological Land Classification for Southern Ontario (MNRF, 1998). This area is dominated by grass species occupying irregular terrain and features small waterbodies in areas of depressed terrain. Species populating this area included *Phragmites australis*, *Solidago canadensis*, *Impatiens capensis*, and *Pinus strobus*. Substrates here have a moisture regime of 6, and consequently are very moist and/or saturated. The substrates at this site were both mineral and calcareous, and the substrate types varied from sandy clay loam, to sandy clay. The depths of substrates within this ecosite varied between 36 to >120cm.

3. Polygon 3
(Plots 14,15,16)

Moist, Fine: Hemlock Cedar Conifer (S115Tt)
Coniferous Forest (FOCt)

Polygon 3 is located between the northern and southernmost portions of polygon 2 and has the smallest area of all polygons. This site is defined as a Moist, Fine: Hemlock Cedar Conifer ecosite (S115Tt) under the Great Lakes St. Lawrence Land Classification (Wester et al, 2015)

which corresponds with the Ecological Land Classification for Southern Ontario as FOCt, defined as a Coniferous Forest (MNRF,1998). This area is occupied by *Thuja occidentalis*, *Equisetum spp., Loni spp.,* and *Rhmnus cathartica*. Substrates within this ecosite are moist, with a moisture regime of 5 and are both mineral and calcareous, with textures ranging from silty fine sand to sandy clay. Depths of substrates in this polygon were under 120cm.

4. Polygon 4
(Plots:23,20,19,24)

Mineral Thicket Swamp (S134S)

Alder Mineral Deciduous Thicket Swamp (SWT2)

Polygon 4 is located at the southern-most portion of the Smith property, adjacent to polygons 3 and the southern portion of polygon 2. The site is defined as Mineral Thicket Swamp ecosite (S134S) under the Great Lakes St. Lawrence Land Classification (Wester et al, 2015) and corresponds with the Ecological Land Classification for Southern Ontario, Alder Mineral Deciduous Thicket Swamp (SWT2) (MNRF, 1998). This ecosite is dominated by herb species with some areas covered by young trees under 10 feet. Species present include: *Crat spp., Ribe spp., Toxidendron radicans, Viburnum, Rhamnus cathartica, Fraxinus pennsyvanica*, and *Acer nigra*. Moisture regime of substrates in this location were found to range between 2 and 6, moderately to very moist and are calcareous and mineral, consisting of silty sand to clay loams. Depth of substrates were discovered to be over 120 cm, with peaty organic material accumulating from 20 to 40cm depths.

5. Polygon 5

(Plots:36,38,35)

Intolerant Hardwood Swamp (S130Tt)

Ash Mineral Deciduous Swamp (SWD2)

Polygon 5 is located at the southeast portion of the Smith property, and extends along the southern boundary, approaching the properties center. The site is defined as an Intolerant Hardwood Swamp (S130t) under the Great Lakes St. Lawrence Land Classification (Wester et

al, 2015) which corresponds with the Ecological Land Classification for Southern Ontario , Ash Mineral Deciduous Swamp (SWD2) class (MNRF, 1998). This polygon is densely populated with various tree species, which cover the area substantially. Canopy openings allow for the growth of diverse herbaceous species in the understory. *Thuja occidentalis, Acer rubrum, Picea glaucys, Populus tremuloides, Impatiens capensis, Viburnum spp., Solidago canadensis, Equisetum spp., Rhamnus alnifolia*, and *Toxidendron radicans* were found to occupy this location. Substrates in this location have a moisture regime ranging from 2 to 6 and are composed of calcareous, mineral material with textures ranging from sandy to clayey. Substrate depths range from 60 to >120cm.

6. Polygon 6

(Plot 25,27,28,26)

Fresh, Clayey: Hemlock, Cedar Conifer(S084Tt)

Fresh - White Cedar Coniferous Forest (FOC4)

Polygon 6 is located on the east side of the study site, directly beside the Scugog River at the end of the Smith property line. Polygon 6 is north of polygon 5 and south of polygon 7 and is defined as a Fresh, Clayey: Hemlock, Cedar Coniferous ecosite (S084Tt) under the Great Lakes St. Lawrence Land Classification (Wester et al, 2015) which corresponds with the Ecological Land Classification of Southern Ontario, Fresh White Cedar Coniferous Forest class (FOC4) (MNRF, 1998). Species present in this polygon include: *Thuja occidentalis, Populus balsamifera, Dryopteris carthusiana, Fraxinus nigra, Prunus nigra, Acer spp., Betula papyrifera, Acer saccharum,* and *Fraxinus pennsylvanica*. Substrates in this location are mineral calcareous, with a moisture regime ranging between 3 to 5. Textures for these substrates range from sandy to clayey, and have depths ranging from 65 to 85 cm deep.

7. Polygon7

(Plot 21,18,34,37, 39, 33, 40, 32, 33)

Moist, Fine: Elm-Ash Hardwood (S120Tt)

Fresh – Moist Lowland Deciduous Forest FOD 7

Polygon 7 is located with its northernmost portion adjacent to the Scugog river, and extends into the centre of the Smith property, next to polygon 1, 4, 5, and 6. This polygon is classified as Moist, Fine: Elm-Ash Hardwood(S120Tt) under Wester et al's(2015) criteria and corresponds with ELC(Barowsky, 1998) specifications for White Cedar – Green Ash Cultural Savanah Type (CUS1-2). Species populating this site include *Fraxinus Americana, Thuja occidentalis, Populus tremuloides, Acer nigra, Rhamnus cathartica, Cornus stolonifera, Lonicera spp, Aser Spp, Solidago canadensis, Salix spp., Ulmus spp, Dryopteris Carthusiana , Onoclea sensibilis, Carex spp., and Equisetum spp.*, Soils in this location are calcaerous, mineral and have a texture ranging from fine loam to clay with a depth ranging from 53- >120cm. The moisture regime of substrate in this polygon is moist (Moisture regime; 4-5).

4.0 Wetland Summary

4.1 Methodology

The field sampling methodologies used for delineating the wetlands 1, 2 and 3 were adapted by Barb Elliot from the Ontario Wetland Evaluation System (OWES) protocol. Prior to field observations, polygons were mapped using Google Earth to determine potential wetland boundaries. Teams surveyed and recorded different vegetational communities and corresponding UTM coordinates to map different wetland properties. This included the classification of separate plots within each wetland. To explain, Wetland 1 (located directly on Scugog River), was considered one wetland with separate vegetative communities. different data sheets and were therefore allocated accordingly to separate GPS locations. It is important to note differences in vegetative communities because these can reveal indications of different ecosystems. Different species populations depend on different vegetation, and therefore observations recorded of nearby species are used to refine confidence in determinations. Furthermore, different plots within each wetland exhibit the areas biodiversity in terms of vegetation, and animal species. Ontario Wetland Evaluation Criteria and Scoring system for determining Provincial Significance are required under the Planning Act and Provincial Policy Statement (OMNR, 2014). Wetlands have different values associated with them given their different vegetative communities. Kawartha Lakes planning use ELC defined wetlands as criteria for determining conditions for

developers(City of Kawartha Lakes, 2012). Locally significant wetlands may not experience development unless the proposed development has been demonstrated to have no negative impact on features and functions of the wetland, or that there will be a net environmental gain to the city, perhaps through biodiversity offsetting(Ibid., pp.27). If an EIS determines that the wetland can be protected, development 30m away from the site may be permitted(ibid.).

To determine the location and presence of wetlands at the Smith Property, the researchers in this study engaged in data collection, utilizing field data sheets addressing variables important to the OWES system. These data sheets are provided in appendix b and importantly address site type, Wetland type, Location, Vegetation forms, and Dominant species present.

Fig. 4. Wetlands 1, 2 and 3 are located in Polygon 2, whereas, the Green Ash Swamp is located within Polygon 7.

4.2 Green Ash Swamp Wetland Delineation

The field sampling methodologies used to delineate wetlands within the Green Ash swamp included using the 50-50 rule to determine vegetation cover of upland and wetland species. Starting from an azimuth within the site, plots were sampled along transects spacing 20 m apart each. Surveying each plot, vegetation species were recorded and analyzed to determine the dominant upland or wetland species present. Relative cover of wetland and upland was used to determine the dominant species within the plot. Boundaries were drawn when wetland species decreased, and upland species provided as the dominant vegetation cover.

The presence of Green Ash was critical in the determination of the transitioning boundary between wetland and upland species. This is because Green Ash is tolerant of occasional flooding and can often be found near wetland boundaries. Presence of Green Ash was used in this study as an indication of substrates and conditions which also constitute wetland sites, given this species requirement for growth. Sites containing Green Ash were therefore categorized accordingly.

substrate samples were acquired and analyzed using an auger in the field and this data was also used to refine spatial detail in the wetland mapping process. Mottles, and gley materials observed within substrate were used as evidence of seasonal flooding. This was not the only methodology used to delineate wetland location.

Figure 1 lists species found to be present during the evaluation of each wetland plot survey. Figure 3 provides a map of the location of each wetland on the Smith Property.

Table 1. Species list for Wetlands and Green Ash Swamp (Source: Proulx, 2018)

	Animal and Species Present	**Vegetation Present**

Wetland 1 Plot 1	*Barred Owl (Strix varia), Muskrat (Ondatra zibethicus), Common Garter Snake (Thamnophus sirtalis), Canada Goose (Branta canadensis), Snail (Gastropods)*	*Boxelder Maple (Acer negundo), Eastern White Cedar, White Elm, Red Osier Dogwood, Canadian Goldenrod, Weeping Willow, Sphagnum Moss, Marsh Horsetail, Geum Spp., Red Maple*
Wetland 1 Plot 2	*Raccoon (Procyon lotor), Grey Squirrel (Sciurus carolinensis), Blue-jay (Cyanocitta cristatat)*	*Spotted Joe-pye weed (Eutrochium maculatum), Red Osier Dogwood, Canada Goldenrod, Weeping Willow, White Elm, Geum Spp.*
Wetland 1 Plot 3	*North American River Otter (Lontra canadensis)*	*Red-Osier Dogwood (-Cornus sericea), Trumpet Lichen (Cladonia fimnriata), Balsam Poplar, Green Ash, Eastern White Cedar*
Wetland 2 Plot 1 (Surrounding Open Water)	*Banded Garden Spider (Argiope trifasciata), Mallard Duck (Anus platyrhynchos), Chickadee (Poecile atricapillus), Monarch Butterfly (Danaus plexippus)*	*Downy Willow-herb (Epilobium Strictum), Bulrush (Typha spp.), Narrowleaf Cattail (Typha angustifolia)*
Wetland 2 Plot 1a (Aquatic)	*Tadpoles, Leopard Frog (Lethobates pipiens), Green Frog (Lithobates clamitans),*	*Great Willow-herb (Epilobium hirsutum), Fringe Willow-herb (Epilobium ciliatum), Pondweed (Elodea canadensis)*
Wetland 3 Plot 1 (Surrounding Open Water)	*Blue Jay (Cyanocitta cristata), Chickadee (Poecile atricapillus), Clouded Sulphur Butterfly (Colias*	*Downy Willow-herb (Epilobium Strictum), Narrowleaf Cattail (Typha angustifolia), Common Reed*

	philodice), Northern Caddisflies (Limnephilidae)	*(Phragmites), Reed Canary Grass (Phalaris arundinacea)*
Wetland 3 Plot 1a (Aquatic species)	*Leopard Frog (Lethobates pipiens), Green Frog (Lithobates clamitans), Banded Garden Spider (Argiope trifasciata)*	*Pondweed (Elodea canadensis), Water Plantain (Alisma)*
Green Ash Swamp *Upland **Wetland	*Ruby-crowned Kinglet (Regulus calendula), Northeastern Wild Turkey (Meleagris gallopavo), Green Frog (Hyla cinereal), Blue Jay (Cyanocitta cristata), Hairy Woodpecker (Leuconotopicus villosus), Deer (Odocoileus virginianus)*	*Red Maple (Acer rubrum)**, White Elm (Ulmus laevis)**, Woody Nightshade (Solanum dulcamara), Sensitive Fern (Onoclea sensibilis)**, Common Buckthorn (Rhamnus)*, Marsh Fern (Thelypteris, palustris)**, Eastern White Cedar (Thuja occidentalis)**, Wrinkled Crust (Phlebia radiata), Oriental Bittersweet (Celastrus orbiculatus), Canada Goldenrod (Solidago canadensis)*, Hop Sedge (Carex lupuliformis)*, Nodding Beggarticks (Bidens cernua), Green Ash (Fraxinus pennsylvanica)**, False Nettle (Boehmeria), American Black Currant (Ribes americanum)*, Dwarf Raspberry (Rubus pubescen)**, Red Osier Dogwood*

		*(-Cornus sericea)** , Black Ash (Fraxinus nigra)***

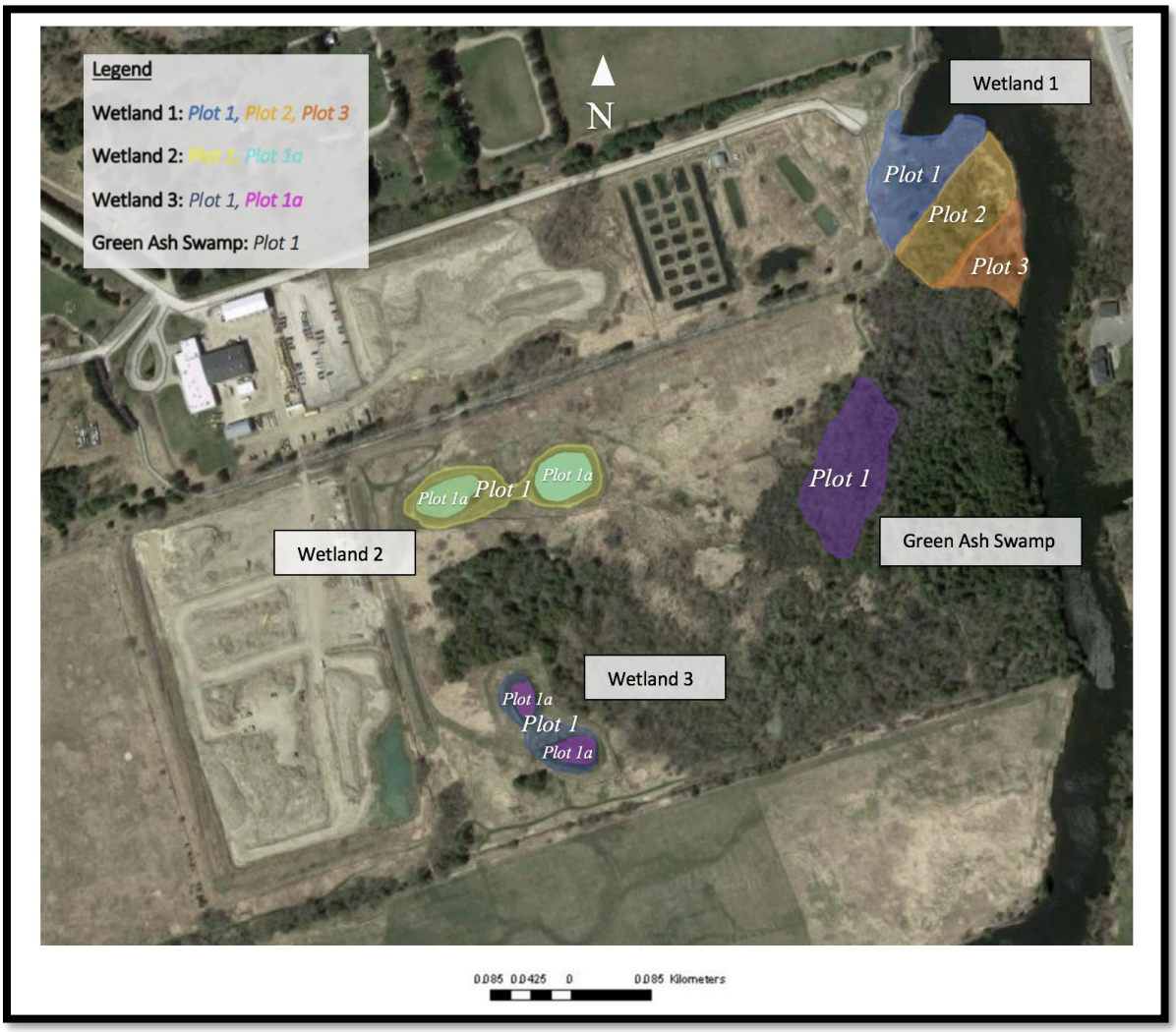

Fig. 3. Wetland Summary Map (Source: Google Earth)

5.0 Wildlife Habitat

5.1 Methodology

ELC Ecosite class per polygon studied, and wetlands at the Smith property are considered for their spatial placement with regards to their potential for meeting significant wildlife habitat criteria, with reference to the relevant Ontario Ecoregional Criteria Schedule(OMNRF 2014) as per the requirements of site definition in the Kawaartha lakes jurisdiction. Under Hills (1959)

Site regions(APPENDIX c), the Smith Property is located in region 6E of southern Ontario and therefore this study follows the Ontario significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (OMNRF, 2015). Determinations of wildlife habitat in this study are based on a combination of the spatial land classification data summarized in the above sections(3-4), and records of wildlife observed in the area, acquired by the EMX group, in addition to external sources. In 2017, a Bioblitz report was produced in association with Fleming College which surveyed species present on the Smith Property. This document is used primarily as reference for species not obtained by the 2018 EMX class at the site for this study. Other sources of information could also be used, however this document is focused on the area of interest and information in this document was recorded recently (2017). Sources taken from The Ontario significant Wildlife Habitat Criteria Schedules with relevance to potential habitat presence for Ecoregion 6E(OMNRF, 2015) are referenced to refine confidence in Wildlife habitat definitions in this study. Wildlife habitats are only addressed in this study if records of observed species and ecosite definitions(codes) per area on the Smith Property are consistent with OMNRF (2015) criteria for a wildlife habitat. Justification for the mention of wildlife habitats included in this study are given, and defining criteria of SWH's relevant to this study are provided in Table 2, adapted from the Wildlife Habitat Criteria Schedules (OMNRF, 2015). A map of candidate areas based on established polygon ecosite boundaries are provided in figure 4.

5.2 Candidate Significant Wildlife Habitat determinations

Waterfowl Stopover and Staging Areas (Terrestrial)

Polygon 1 was classified as CUM-1. In the Ontario Significant Wildlife Habitat Criteria Schedules for this area, this ELC classification may also constitute a waterfowl stopover and staging area. Criteria include the flooding of fields seasonally with sheetwater, providing invertebrate habitat, important to migrating waterfowl diets during stopovers. This may be possible at this site, given that the area is relatively planar, and that there are a diversity of vegetational type in the overall Smith Property, which could constitute increased micro habitat for invertebrate species.

A second criteria which constitutes this class of SWH, are the presence of waste grains commonly used by waterfowl. Since this location is situated over an old agricultural field, remnant species and like-species with similar properties may produce a similar food source to waste, agricultural field grains.(OMNR,2015)

Mallards have been sighted at the Smith Property(Fleming office of Sustainability, 2017) and this also supports the potential for this area being defined as an SWH, as outlined in OMNRF(2015).

Waterfowl Stopover and Staging Areas (Aquatic)

Polygon 5 was classified with site code SWD2, and Canada Geese have also been sighted on the Smith Property (Fleming Office of Sustainability, 2017). These factors make this area candidate

for the SWH status. The Smith Property also includes the presence of aquatic terrain (ponds marshes and the Scugog River), which may be used during migration for waterfowl species, furthering the merit for investigation in defining this site as an aquatic waterfowl stopover and staging area SWH. Additionally, the Smith Property may also provide abundant food supplies for waterfowl, as there are a diversity of vegetational type at this site within a small area, and small, shallow, ephemeral vegetated ponds also exist at the Smith Property site. The Shallow littoral area of the Scugog river to the east of the Smith property may also serve as habitat for an abundance of waterfowl.

Colonially- Nesting Bird Breeding Habitat(Ground)

Polygon 1 is classified under the CUM code and Polygon 2 is classified as MAM. Ring-billed gulls have also been observed at the Smith Property. These qualities make this area candidate for the SWH class of Ground nesting bird habitat. While this is true, with consideration to the wooded area which border the Scugog river, and given that the above mentioned ecosites are inland, not directly adjacent to the river, these qualities may impact the determination of this area under this category of SWH. Polygon 1 and 2 do exhibit qualities which are similar to the candidate criteria as there are patches of open space present in the area, and while trees are dispersed among the landscape sparsely.

Deer Yarding Areas

Polygons 3 and 6 retain the FOC ELC class. This makes these sites candidate for the Deer Yarding Area SWH category. The Smith property holds some features which are relevant to deer wintering activity, such as having two stratum, including one of mixed or deciduous cover and another of browsing habitat which may include agricultural lands. OMNRF must make the determination if a site should be considered a deer yard, to which the methodology is outlined in the "Selected Wildlife and Habitat Inventory Manual". White tailed deer have been spotted at the Smith Property, which may further interest for investigation into this candidate SWH. The small size of the smith property and surrounding development may be considered in this determination.

Table 2 OMNRF, 2015 Defining criterion for confirmed SWH sites for candidate SWH sites at the Smith Property. Adapted from OMNRF, 2015 * Refer to OMNRF, 2015 for greater detail, including manuals referenced.

Candidate SWH	Defining Criteria (OMNRF,2015)
Waterfowl Stopover and Staging Areas (Terrestrial)	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"°°"i 0 Any mixed species aggregations of l00@ or more individuals

	required. 0 The flooded field ecosite habitat plus a 100-300m radius area, dependent on local site conditions and adjacent land use is the significant wildlife habitat cxlviii 0 Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). 0 SWHMiST°"“" Index #7 provides development effects and mitigation measures.
Waterfowl Stopover and Staging Areas (Aquatic)	Studies carried out and verified presence of: 0 Aggregations of l00® or more of listed species for 7 days®, results in > 700 waterfowl use days. 0 Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH “fix The combined area of the ELC ecosites and a 100m radius area is the SWH °"l"“i Wetland area and shorelines associated with sites identified within the SWHTG °X1““ Appendix K mi" are significant wildlife habitat. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”°°"i Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). SWHMiST°"“" Index #7

	provides development effects and mitigation measures.
Colonially- Nesting Bird Breeding Habitat(Ground)	Studies confirming: Presence of l or more nesting sites with 8°"“" or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. A colony identified as SWH will include a 50m radius habitat area from the peripheral nests mii Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”°°"i SWHMiST°"“" Index #4 provides development effects and mitigation measures
Deer Yarding Areas	No Studies Required: 0 Snow depth and temperature are the greatest influence on deer use of winter yards. Snow depths > 40cm for more than 60 days in a typically winter are minimum criteria for a deer yard to be Considered as SWH‘ lVi,lVii,IViii,IiX,lX ® Deer Yards are mapped by OMNRF District offices. Locations of Core or Stratum l and Stratum 2 Deer yards considered significant by OMNRF will be available at local MNRF offices or via Land Information Ontario (LIO). Field investigations that record deer tracks in winter are done to confirm use (best done from an aircraft). Preferably, this is done over a series of winters to establish the boundary of the Stratum I and Stratum II yard in

	an "average" winter. MNRF will complete these field investigations. CXW If a SWH is determined for Deer Wintering Area or if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table l.4.l of this Schedule. SWHMiST°""" Index #2 provides development effects and mitigation measures.

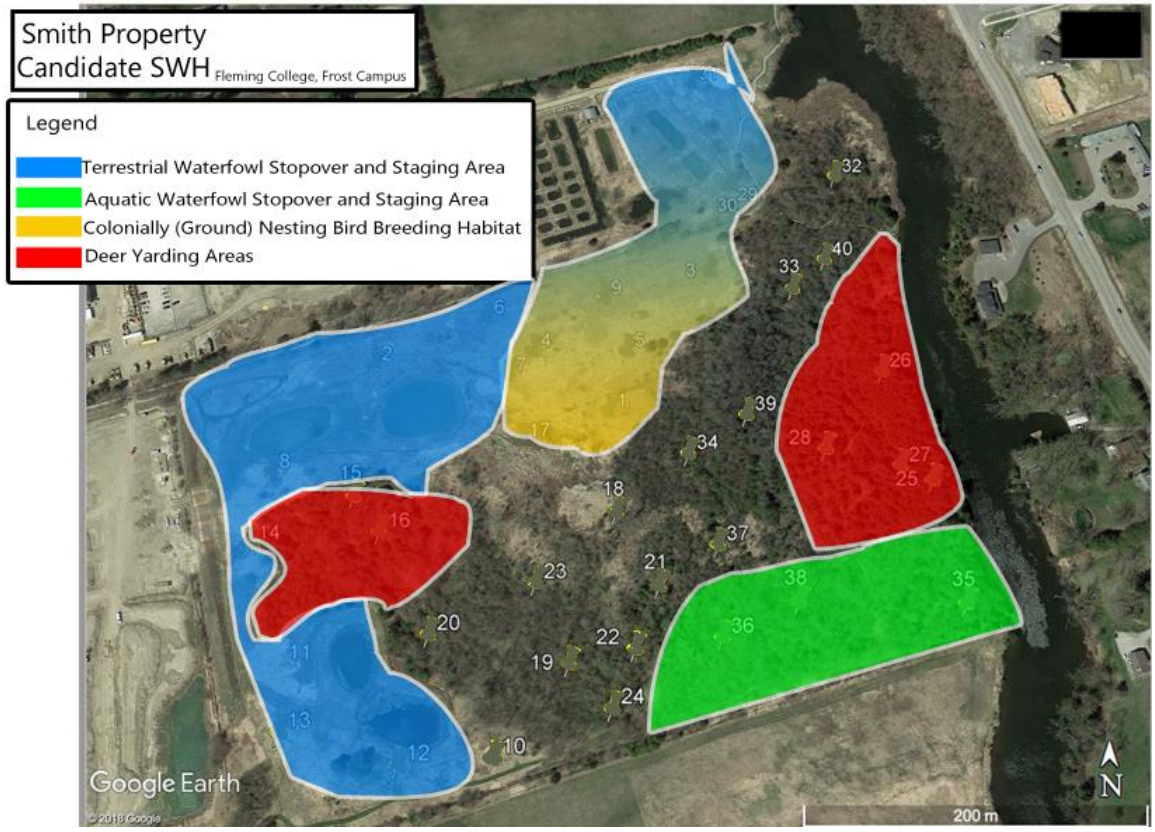

Figure 4: Smith Property Candidate SWH areas (Google Earth, 2018) *Mixed color areas denote overlapping candidate classes. Boundaries are accurate <~5m.

6.0 Conclusion/ recommendations

Several candidate SWH criteria outlined in The significant wildlife habitat criteria schedules for region 6E (OMNRF,2015) appear present at the Smith Property site. Polygons 7 and 4 did not

explicitly fit any candidate SWH criteria, however, given the proximity to other sites, it could be considered that these areas serve as transitional or unique muti-SWH sites. Where there are exceptions, analysts are advised to consult the Significant Wildlife Habitat technical Guide(OMNR, 2000, OMNRF, 2015).

It could be taken into account that The Smith property constitutes a relatively small area, especially in contrast to some criterion which justify SWH areas (eg. Some swh require >5ha, but otherwise may have been added to this list (OMRF,2015). Additionally, development (i.e. roads and infrastructure) exists in all directions ~<1km outside of each boundary of the site. These factors are not addressed in criteria for the SWH listed above however, it is suggested that these factors may impact the quality of habitat substantially. The significant Wildlife Habitat technical guide may have more information regarding the above.

with coarse qualitative evaluation it would appear that this site may not constitute a highly valuable habitat, at least not observable on dates that information was acquired for this site. No animal species mentioned above was present in a great abundance during the time of this evaluation. While species behavioural differences may explain some of this finding, it should be considered that inter-seasonal evaluation would be valuable in determining the quality of this site. Uncertainties also existed in ELC polygon definitions as seasonally temporal features per site were unobtainable with observation at one time per year in one season, which are attributable to ecosite classes listed in the manual. Kawartha lakes, 2012 (pp180) suggests that bird breeding surveys may be conducted during bird breeding season at the appropriate time of day, in appropriate weather conditions at a minimum of 2 surveys. ElC Classified vegetation may require 3 seasons to survey properly(City of Kawartha Lakes, 2012 pp. 182). More research into these matters could be valuable in refining this investigation. The SWH manual also recommends contacting locals for accounts of wildlife and characteristics attributable to the property of interest(OMNRF,2015).

Size of site and proximity to development as well as human visitation is suggested here to be considered in the determination of habitat quality, as these factors should have an impact on the quality of site. While it may be determined that SWH classification are not applicable to the site, it is certain that wildlife habitat does exist at this property. If development were to take place on this property it is therefore suggested to the developer, that infrastructure utilize and compliment the site natural features. Some solutions to this could be the creation of habitat on margins of infrastructure and vegetational planning on surfaces of infrastructure. Noise reduction measures may also be useful. Alternatively, if efforts not to disturb habitat are not possible, biodiversity offsetting measures could potentially be considered as a solution, enhancing habitat quality in other locations for habitats impacted by site development.

Development over Locally significant wetlands may not occur unless it is determined that development will not have negative impacts on the features and functions of the wetland in question, or it is determined that there will be net environmental gains to the city, as an outcome of the project in question(City of Kawartha Lakes, 2012 p.34). If the EIS determines that the development will not affect the wetland significantly, it may be permitted for the development to take place <30m away from the wetland site(ibid.) . Additionally, the 2014 Provincial Policy Statement Under the Planning Act restricts development from areas designated as significant Wildlife habitat through EIS study. The current study has developed some important information toward identifying if the site constitutes areas to be restricted from development with consideration to the above, however, more research would need to be done in order to make this decision confidently.

7.0 References

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8.0 Appendices;

Appendix A

Fall 2018 – Ecosystem Management Technology - Habitat Assessment Course

Instructor: Barb Elliot – barb.elliot@flemingcollege.ca; Room 256, Frost Campus

Environmental Impact Study (EIS) Project:

As a team of environmental consultants, you have been hired to complete a preliminary Natural Heritage Assessment for a portion of property located on the Frost Campus of Sir Sandford Fleming College in Lindsay, Ontario (Fig. 1). The College, which is the legal owner of the land, would like to sell the area indicated in Figure 1 (now referred to as "the site") to a private consortium (Development Inc.). Development Inc. wants to develop the site as a student town-home sub-division and include a public area for boat docking on the Scugog River. However, prior to the sale, the College wants to ensure that no significant natural features exist on this site; or, if such features DO exist, the College requires specific recommendations regarding what measures should be taken to mitigate the effects of development.

You have been hired by the College and Development Inc. to complete a preliminary Environmental Impact Study (EIS) for the site, which must be completed prior to the sale of the property. There is no existing information on natural heritage available for this property. Your consulting firm is expected to provide an **unbiased and neutral assessment** of this property as related to natural heritage and the implications of any potential development.

The Environmental Impact Study will include:

- A complete description and background/history of the Frost Campus property;
- Ecological Land Classification (ELC) mapping and ecosite descriptions of the property;
- Delineation of all wetlands on the site (natural and otherwise) and supporting documentation, including substrate and wetland/upland vegetation community data
- Assessment of Significant Wildlife Habitat;
- Assessment of the Significant Habitat for Endangered and Threatened Species; and
- Recommendations related to developing a sub-division, streets and a docking area for boats on this property, which will include outlines of where development could possibly exist on the property, mitigation measures for natural heritage, and recommended options for development of the property.

EIS Project Assessment (44% of your final mark in the course) – There are three formal assessments for this project, as listed below. Instructor feedback from the draft EIS report is expected to be used to improve the final project submission. Failure to upgrade/edit previously assessed aspects of the project will affect the mark awarded for the final assessment.

Week 7 – Submission of ELC mapping and ecosite determination, field data sheets, and wetland polygon boundaries – (12%)
Week 12 – Submission of Draft EIS project – (12%)
Week 14 – Submission of Completed EIS project – (20%)

THIS PROJECT IS TO BE COMPLETED IN A TEAM OF 2 TO NOT MORE THAN 3 PERSONS PER TEAM. NO PEER EVALUATION WILL OCCUR. YOU WILL BE CONSIDERED BY THE INSTRUCTOR AS A CONSULTING FIRM AND EXPECTED TO RESOLVE ISSUES WITHIN YOUR TEAM ACCORDINGLY. This means that the final mark for the project will be shared amongst the team (i.e. each member will receive the same mark).

Appendix B.

Ecosite Fact Sheets Corresponding to Polygons established on the Smith Property

Polygon 1

Moist, Fine: Meadow

G110N

Profile/Slope Sequence

Not Available

Approximately 250m

Ecosite Description

Herbaceous (forb and/or graminoid) vegetation community. Trees and shrubs generally absent. Ground surface mostly herbaceous litter and mineral material. Substrate silty to fine loamy to clayey. Mostly > 15 cm deep and moist (MR = 4 or 5).

Substrate Description

Substrate Series	S2 M7 M11 MD7 MD11 MD15 D7 D9 D11 D15																							
Mode of Deposition	RO		CO		MO		GF		FL		LA		GL		EO		OR		GW		WA		CX	AN
Family	Sandy			Coarse Loamy				Silty			Fine Loamy			Clayey				Peat				Folic		
Humus Form	Mull				Moder				Fibrimor				Humimor				Peatymor					Anmoor		
Moisture Regime	Θ	0		1		2		3	4		5	6		7		8		9	x		h		s	
Moisture	d			f					m			v		w					x		h		s	
Depth	R			VS					S			M				MD				D				
Chemistry	k								n							z								

Vegetation Description

Herbaceous dominated community. Scattered small, open-grown trees and shrubs may be present, however neither exceed 10% absolute cover. Species composition variable dependant on time since abandonment. Tree and shrub species when present include trembling aspen, white birch, *Rubus* species, and speckled alder. Herbaceous species may include Canada bluejoint grass, spotted jewel-weed, and asters. Non-vascular species may include haircap mosses and fire moss.

Trees	*Populus tremuloides, Betula papyrifera, Thuja occidentalis, Populus balsamifera*
Shrubs	*Rubus* spp., *Alnus incana* ssp. *rugosa, Cornus stolonifera, Salix* spp., *Rosa acicularis* ssp. *sayi*
Vascular Herbaceous	*Calamagrostis canadensis* var. *canadensis, Impatiens capensis, Erigeron* spp., *Symphyotrichum* spp., *Trifolium* spp., *Phleum pratense* ssp. *pratense, Cirsium arvense, Carex* spp., *Chamerion angustifolium* ssp. *angustifolium, Solidago* spp., *Elymus repens, Ranunculus acris, Leucanthemum vulgare, Onoclea sensibilis,*
Non-vascular	*Polytrichum* spp., *Ceratodon purpureus* var. *purpureus, Pleurozium schreberi*

G110N Moist, Fine: Meadow

Ecology

Substrate is nutrient rich and has good moisture holding capacity required for plant growth. Limitations to growth result from vegetative competition. May originate from agriculture (e.g., crop or pasture) abandonment, silvicultural practices, fire, or selective removal of woody material (e.g., hydro or gas corridors). Depending on time from abandonment the characteristic species may be a mix of native and introduced species (early abandonment) or predominately native species (later abandonment). Grass species that typically dominate newly abandoned fields are replaced by forb species as the meadow ages. A distinctive plow layer (Ap) may be present. Maintenance of structure and composition associated with low to moderate disturbance (e.g., fire, grazing, periodic flooding, vegetation control). Dense grass and sedge thatch may inhibit woody growth. In the absence of disturbance this ecosite will succeed to a sparse shrub (G111).

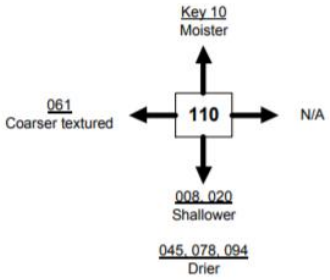
Ecoregional Variability

Limited across Great Lakes-St. Lawrence range due to infrequency of fine textured materials. Ecosite also limited and uncommon due to clearing of land for agriculture. Occurs in 4E-5, 5E-1, 5E-3, 5E-4, 5E-5, and 5E-8. Generally on flat to undulating glaciolacustrine deposits, glaciofluvial material in large river valleys, and flat to rolling fine textured morainal materials throughout the range. Rugged bedrock controlled topography occurs in 5E-1, 5E-3, and 5E-5. Typically non-calcareous, where calcareous increased diversity and vigour of the understory may occur. Little bluestem may occur on the southern edge of the shield.

Edaphic Variability

Typically uniform in nutrient availability with variable moisture due to inconsistency of substrate depth over bedrock. Mostly on middle or lower slopes or in depressions. Black spruce, speckled alder, and peat substrates more abundant in depressions on moderately deep substrates.

Related Ecosites

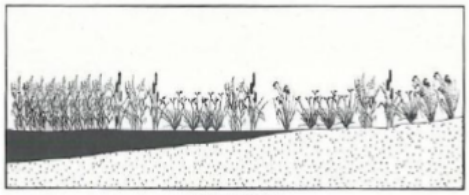


Polygon 2

Mineral Meadow Marsh

G142N

Profile/Slope Sequence



approximately 50m

Ecosite Description

Graminoid or less frequently forb communities. Dominated by sedges and grasses. Ground surface mostly sedge litter. Substrate mineral. Mostly deep and very moist (MR=8) or saturated.

Substrate Description

Substrate Series	VS1 VS2 S1 S2 M8 M9 M10 M11 MD12 MD13 MD14 MD15 D12 D13 D14 D15													
Mode of Deposition	RO	CO	MO	GF	FL	LA	GL	EO	OR	GW	WA	CX	AN	
Family	Sandy		Coarse Loamy		Silty		Fine Loamy		Clayey		Peat		Folic	
Humus Form	Mull		Moder		Fibrimor		Humimor		Peatymor		Anmoor			
Moisture Regime	0	0	1	2	3	4	5	6	7	8	9	x	h	s
Moisture	d		f			m		v		w		x	h	s
Depth	R		VS		S		M		MD		D			
Chemistry	k				n				z					

Vegetation Description

Graminoid or forb dominated system. Herbaceous cover > 50% and anchored to the surface. Trees if present may include black spruce, tamarack, and red maple but does not exceed 10% cover. Tall shrub cover ≤ 25%. Ecosite may be dominated by one specie or have a variable composition. Shrub species include pussy willow and red-osier dogwood. Herbaceous species include lake-bank sedge, tussock sedge, Canada blue-joint grass, and reed canary grass. Trace occurrence of non-vascular cover restricted to the edges of tussocks.

Trees	*Picea mariana, Larix laricina, Acer rubrum, Betula papyrifera, Fraxinus pennsylvanica, Ulmus americana*
Shrubs	*Salix discolor, Cornus stolonifera, Spiraea alba* var. *alba, Alnus viridis* ssp. *crispa*
Vascular Herbaceous	*Carex lacustris, C. stricta, Calamagrostis canadensis, Phalaris arundinacea, Impatiens capensis, Agrostis gigantea, Scirpus cyperinus, Polygonum* spp., *Juncus nodosus, Juncus alpinoarticulatus, Carex viridula* var. *viridula*

G142N Mineral Meadow Marsh

Ecology

Substrate has variable nutrient availability due to substrate texture and mineralogy. Secondary enrichment of site may occur if in contact with lake or stream water. Rooting zone in contact with minerotrophic groundwater. Limitation to plant growth due to excess moisture. Subjected to seasonal water fluctuations through seasonal flooding and near shore wave action. Vascular plant cover and diversity variable, predominantly hydrophytic. Trees when present scattered and stunted. Fire does not have a large impact due to the wetness of the site, but can help maintain the ecosite through the reduction of woody species. Stable unless moisture levels change. The ecosite may convert to a shrub thicket when water levels decrease. Open conditions maintained by seasonal flooding and beaver activity.

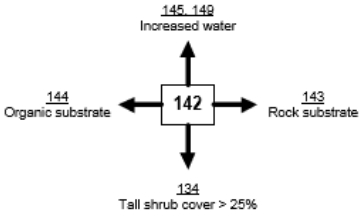
Ecoregional Variability

Widespread across Great Lakes-St.Lawrence range occurring in wetland basins, along streams and drainage ways, in drained beaver ponds, in shallow bays. Generally morainal, glaciolacustrine and glaciofluvial deposits. Atlantic coast plain species may occur along the shores of lakes in Parry Sound and Muskoka. These species may include Virginia meadow-beauty, Eaton's panic grass, Carolina yellow-eyed-grass, Carey's knotweed, bayonet rush, and golden hedge-hyssops. Typically non-calcareous, where calcareous increased plant diversity and vigour may occur.

Edaphic Variability

Hydric. Nutrient and moisture availability uniform. Mineral or peaty phase substrates likely. Generally on lower or level slopes adjacent to small streams, lakeshores, beaver meadows, ditches and occasionally in isolated basins. The ecosite often forms a mosaic of shrub and herb dominated areas, some open pools of water may be present. May be adjacent to a marsh or thicket. Microtopography variable ranging from uniformly level to mounds and hollows. Changes in peat elevation within the site result in better drained conditions supporting localized communities of low ericaceous shrubs and scattered black spruce and tamarack, wetter hollows dominated by graminoids, and open pools of water dominated by floating-leaved or emergent vegetation.

Related Ecosites



Polygon 3

Moist, Fine: Hemlock - Cedar Conifer

G115T6/T1

Profile/Slope Sequence

Not Available

Approximately 250m

Ecosite Description

Conifer canopy consisting mostly of eastern white cedar and/or eastern hemlock. May contain balsam fir, white birch, trembling aspen, balsam poplar, yellow birch, and red maple. Understory tree species consisting of moderate levels of balsam fir, white spruce, and red maple. Shrub and herb moderately rich. Ground surface mostly conifer and broadleaf litter. Substrate silty to fine loamy to clayey. Mostly > 15 cm deep and moist (MR = 4 or 5).

Substrate Description

Substrate Series	S2 M7 M11 MD7 MD9 MD11 MD15 D7 D9 D11 D15												
Mode of Deposition	RO	CO	MO	GF	FL	LA	GL	EO	OR	GW	WA	CX	AN
Family	Sandy		Coarse Loamy		Silty		Fine Loamy		Clayey		Peat		Folic
Humus Form	Mull		Moder		Fibrimor		Humimor		Peatymor		Anmoor		
Moisture Regime	⊖	0	1	2	3	4	5	6	7	8	9	x	h	s
Moisture	d		f			m		v		w		x	h	s
Depth	R		VS		S		M		MD		D		
Chemistry	k				n			z					

Vegetation Description

Tall treed (> 10 m) and low treed (≤ 10 m) ecosites common. Canopy closure variable. Low treed condition often consisting of dense, younger trees. Eastern white cedar and eastern hemlock compose >50% of the tree species in the main canopy. Common understory vegetation includes mountain maple, fly honeysuckle, beaked hazel, striped maple, spinulose wood fern, wild sarsaparilla, twinflower, fragrant bedstraw, and powder horn lichen. Often contains Central v-types V9 and V18; NE v-type V16.

Trees	*Thuja occidentalis, (Tsuga canadensis), Abies balsamea, Betula papyrifera, Populus tremuloides, P. balsamifera, Betula alleghaniensis, Acer rubrum*
Shrubs	*Acer spicatum, Lonicera canadensis, Corylus cornuta* ssp. *cornuta, Acer pensylvanicum, Ribes glandulosum, Linnaea borealis* ssp. *longiflora, Viburnum nudum* var. *cassinoides*
Vascular Herbaceous	*Dryopteris carthusiana, Aralia nudicaulis, Trientalis borealis* ssp. *borealis, Galium triflorum, Maianthemum canadense* ssp. *canadense, Cornus canadensis*
Non-vascular	*Cladonia coniocraea*

G115TtTl Moist, Fine: Hemlock - Cedar Conifer

Ecology

Substrate is nutrient rich and has good moisture holding capacity required for plant growth. Limitations to tree growth result from vegetative competition. Conifer litter and feathermoss abundance increases with canopy closure. Species diversity increases as canopy becomes more open. This ecosite generally represents a late seral stage. Cedar and hemlock are susceptible to fire disturbance. Without the influence of fire, the vegetation will not likely succeed to another ecosite. Ecosite will persist due to shade tolerance of seedlings.

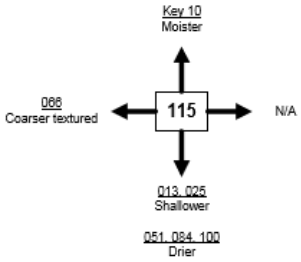
Ecoregional Variability

Limited across Great Lakes-St. Lawrence range due to infrequency of fine textured materials. Ecosite also limited and uncommon due to clearing of land for agriculture. Occurs in 4E-5, 5E-1, 5E-3, 5E-4, 5E-5, and 5E-8. Generally on flat to undulating glaciolacustrine deposits, glaciofluvial material in large river valleys, and flat to rolling fine textured morainal materials throughout the range. Rugged bedrock controlled topography occurs in 5E-1, 5E-3, and 5E-5. Typically non-calcareous, where calcareous increased diversity and vigour of the understory may occur. The ecosite transitions from eastern white cedar dominated stands in the northern portion (4E) of the Great Lakes-St. Lawrence range to eastern white cedar / eastern hemlock stands in the south (5E). Pure eastern hemlock conditions often limited to cool moist slopes. Eastern red cedar may occur in 5E-7. Common tree associates in 4E include white birch, eastern white pine, and balsam fir. Yellow birch and sugar maple are more common tree associates with eastern hemlock in 5E and transitioning into 6E.

Edaphic Variability

Typically uniform in nutrient availability with variable moisture due to inconsistency of substrate depth over bedrock. Mostly on middle or lower slopes or in depressions. Black spruce, speckled alder, and peat substrates more abundant in depressions on moderately deep substrates.

Related Ecosites

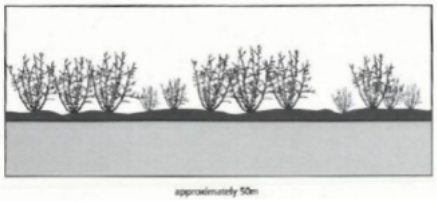


Polygon 4

Mineral Thicket Swamp

G1345

Profile/Slope Sequence



Ecosite Description

Tall shrub community. Tree poor. Herb moderately rich. Ground surface mostly broadleaf litter, dead wood, and mineral material. Evidence of vernal pools or presence of standing water common. Substrate mineral or peaty phase. Mostly moderately deep to deep mineral material and very moist (MR = 6).

Substrate Description

Substrate Series	VB1 VB2 B1 B2 M8 M9 M10 M11 MD12 MD13 MD14 MD15 D12 D13 D14 D15													
Mode of Deposition	RO	CO	MO	GF	FL	LA	GL	EO	OR	GW	WA	CX	AN	
Family	Sandy		Coarse Loamy		Silty		Fine Loamy		Clayey		Peat		Folic	
Humus Form	Mull		Moder		Fibrimor		Humimor		Peatymor		Anmoor			
Moisture Regime	0		1	2	3	4	5	6	7	8	9	x	h	s
Moisture	d		f			m		v	w			x	h	s
Depth	R		VS		S		M		MD		D			
Chemistry	k				n			z						

Vegetation Description

Tall deciduous shrub cover > 25%, tree cover ≤ 10%. Canopy closure variable. Ecosite variable from stands dominated by one tall shrub specie to a variable mix of tall and short shrub species. When present common tree species may include black ash, black spruce, and red maple. Shrub species commonly found include speckled alder, willows, mountain-holly, dwarf birch, and red-osier dogwood. Herbaceous understory vegetation may include blue-joint grass, sedges, and spotted jewel-weed. *Sphagnum* and *Mnium* species are the dominant mosses.

Trees	*Fraxinus nigra, Picea mariana, Acer rubrum, Ulmus americana, Thuja occidentalis, Fraxinus pensylvanica, Acer saccharinum, Larix laricina*
Shrubs	*Alnus incana* ssp. *rugosa, Salix* spp., *Ilex mucronata, Betula pumila* var. *pumila, Cornus stolonifera, Ilex verticillata, Spiraea alba* var. *alba, Myrica gale, Rhamnus alnifolia, Cephalanthus occidentalis*
Vascular Herbaceous	*Calamagrostis canadensis* var. *canadensis, Carex* spp., *Impatiens capensis, Onoclea sensibilis, Scutellaria galericulata* var. *pubescens, Aster lanceolatus, Dulichium arundinaceum var. arundinaceum, Osmunda cinnamomea*
Non-vascular	*Sphagnum* spp., *Mnium* spp.

G134S	Mineral Thicket Swamp	

Ecology

Substrate has moderate nutrient and good moisture conditions for shrub and herbaceous growth, generally too wet for trees to become established. Vegetation predominately hydrophytic. Subjected to periodic flooding or ground water movement enriching the site with mineral and organic material. The extent and frequency of flooding limits the accumulation of organic matter. Rooting zone in contact with minerotrophic groundwater. Dense, nearly continuous shrub canopy favours shade-tolerant species in the ground layer and a decrease in moss coverage. Origin of the ecosite may occur following disturbances (e.g., logging, fire, windthrow or temporary changes in hydrology due to beaver activity) that eliminate trees in a forested swamp. Relative stable ecosite but may succeed to a forested mineral swamp with a stable water table. Fire does not have a large impact due to the wetness of the site.

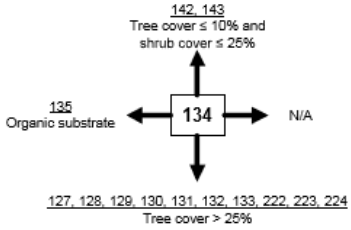
Ecoregional Variability

Widespread across Great Lakes-St.Lawrence range in bedrock depressions, open water margins along peatlands and upland borders, or associated with large peatland systems or riparian areas such as flood plains adjacent to lakes, streams, or rivers. Generally level to undulating glaciolacustrine and glaciofluvial deposits. Typically non-calcareous, where calcareous increased plant diversity and vigour may occur. Thickets containing mountain-holly, alder-leaved buckthorn, or buttonbush occur east of Lake Superior. Thickets dominated by these species may occur along the southern edge of 5E. Speckled alder and dwarf birch more common in 4E.

Edaphic Variability

Hydric. Nutrient and moisture availability uniform. Very shallow to deep materials. Generally on lower or level slopes, or in depressions. Often located adjacent to or as patches within forested rich swamp communities, or part of a complex associated with treed or shrub fens or treed bogs. Microtopography variable from uniformly level to mounds and hollows, resulting in better drained conditions supporting localized communities of swamp forest herbs and mosses such as dwarf raspberry, Canada mayflower, and starflower.

Related Ecosites



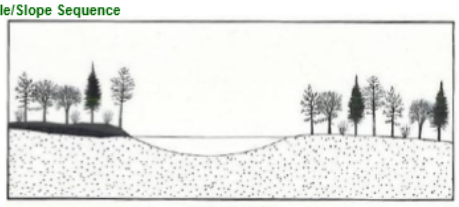
Polygon 5

Intolerant Hardwood Swamp

G130TWTI

L W H

Profile/Slope Sequence



approximately 250m

Ecosite Description

Hardwood canopy consisting mostly of black ash, green ash, trembling aspen, and/or balsam poplar. May contain balsam fir, white birch, eastern white cedar, white spruce, and red maple. Understory tree species consisting of moderate levels of balsam fir, black ash, trembling aspen, red maple, and white spruce. Shrub and herb rich. Ground surface mostly conifer litter and broadleaf litter with occurrences of feathermoss and sphagnum. Evidence of vernal pools or presence of standing water common. Substrate organic or mineral. Mostly deep and very moist to wet (MR = 6, 7, 8, or 9) or saturated.

Substrate Description

Subetrate Series	VS1 VS2 S1 S2 M8 M9 M10 M11 **MD12 MD13** MD14 MD15 D12 D13 D14 D15 O2 O4 O5 O8													
Mode of Deposition	RO	CO	MO	GF	FL	LA	GL	ED	OR	GW	WA	CX	AN	
Family	Sandy		Coarse Loamy		Silty		Fine Loamy		Clayey		Peat		Folic	
Humus Form	Mull		Moder		Fibrimor		Humimor		Peatymor		Anmoor			
Moisture Regime	0	0	1	2	3	4	5	6	7	8	9	x	h	s
Moisture	d		f			m		v		w		x	h	s
Depth	R		VS		S		M		MD		D			
Chemistry	k					n			z					

Vegetation Description

Tall treed (> 10 m) and low treed (≤ 10 m) ecosites common. Canopy closure variable. Low treed condition often indicative of younger trees. Black ash, green ash, trembling aspen and/or large-tooth aspen species compose > 50% of the hardwood tree species in the main canopy. Ecosite variable from dominant stands of aspen and/or ash to mixed conditions. Common understory vegetation includes mountain maple, beaked hazel, fly honeysuckle, swamp black currant, northern wild raisin, wild sarsaparilla, large-leaved aster, wild lily-of-the-valley, naked mitrewort, sensitive fern, Schreber's moss, and common green peat moss. Often contains Central v-types V7-9, V20, and V22.

Trees	*Populus tremuloides, Fraxinus nigra, Populus balsamifera, (Fraxinus pennsylvanica) Abies balsamea, Betula papyrifera, Thuja occidentalis, Picea glauca, Acer rubrum*
Shrubs	*Acer spicatum, Corylus cornuta* ssp. *cornuta, Lonicera canadensis, Ribes lacustre, Viburnum nudum* var. *cassinoides, Prunus virginiana* var. *virginiana, Linnaea borealis* ssp. *longiflora, Alnus incana* ssp. *rugosa*
Vascular Herbaceous	*Aralia nudicaulis, Eurybia macrophyllus, Maianthemum canadense* ssp. *canadense, Mitella nuda, Galium triflorum, Clintonia borealis, Cornus canadensis, Onoclea sensibilis, Carex vaginata*
Non-vascular	*Pleurozium schreberi, Calliciadium haldanianum, Brachythecium salebrosum* var. *salebrosum, Cladonia coniocraea, Plagiothecium laetum, Sphagnum girgensohnii*

G130T/TI Intolerant Hardwood Swamp

Ecology

Substrate has good nutrient and moisture conditions for plant growth. Subjected to periodic flooding or ground water movement enriching the site with mineral and organic material. Moisture content high. Hardwood swamps are the richest of hydric ecosites leading to abundant herbaceous cover including graminoids, ferns, and herbs and vigorous tree and shrub growth. Limitations to tree growth are the result of high levels of moisture. Fire frequency low due to the wetness of site. Stable unless moisture levels change. Successional trends result in an uneven-aged stand.

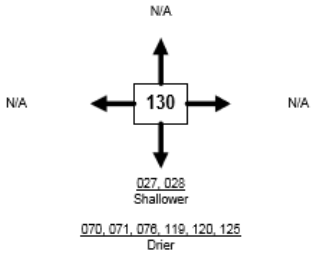
Ecoregional Variability

Widespread across Great Lakes-St. Lawrence range. Confined to depressions, or riparian areas such as floodplains along lakes, streams, or rivers. Generally level to undulating glaciolacustrine and glaciofluvial deposits. Typically non-calcareous, where calcareous increased diversity and vigour of the understory may occur. Wide variety of associated vegetation including eastern white cedar, red maple, and white elm in 4E and northern 5E. Yellow birch becomes more likely as you move south.

Edaphic Variability

Hydric. Nutrient and moisture availability uniform. Mineral, peaty phase, or deep organic substrates likely. Generally on lower or level slopes, in depressions, or adjacent to flowing water, lakes, or peatlands. Changes in microtopography within the site result in better drained conditions supporting localized communities of feathermosses and tree species reflective of drier conditions. Seasonal and persistent water filled depressions are common and can support unique communities of bryophytes, sedges, and assorted shrubs. Xeric vegetation such as eastern white pine, white-grained mountain-rice, as well as decreased shrub and herb diversity and abundance likely on occasional exposures of bedrock or very shallow substrates.

Related Ecosites



Polygon 6

Fresh, Clayey: Hemlock - Cedar Conifer

G084TbTl

Profile/Slope Sequence

approximately 250m

Ecosite Description

Conifer canopy consisting mostly of eastern white cedar and/or eastern hemlock. May contain yellow birch, balsam fir, red maple, white birch, sugar maple, and white spruce. Understory tree species consisting of moderate levels of balsam fir, yellow birch, sugar maple, and red maple. Shrub and herb moderately rich. Ground surface mostly conifer and broadleaf litter. Substrate clayey. Mostly > 15 cm deep and fresh (MR ≤ 3).

Substrate Description

Substrate Series	S2 M5 MD10 D10													
Mode of Deposition	RO	CO	MO	GF	FL	LA	GL	EO	OR	GW	WA	CX	AN	
Family	Sandy		Coarse Loamy		Silty		Fine Loamy		Clayey		Peat		Folic	
Humus Form	Mull		Moder		Fibrimor		Humimor		Peatymor		Anmoor			
Moisture Regime	0		1	2	3	4	5	6	7	8	9	x	h	s
Moisture	d		f			m		v		w		x	h	s
Depth	R		VB		B		M		MD		D			
Chemistry	k				n			z						

Vegetation Description

Tall treed (> 10 m) and low treed (≤ 10 m) ecosites common. Canopy closure variable. Low treed condition often consisting of dense, younger trees. Eastern white cedar and eastern hemlock compose > 50% of the tree species in the main canopy. Common understory vegetation includes striped maple, fly honeysuckle, red-berried elderberry, mountain maple, spinulose wood fern, wild lily-of-the-valley, bluebead-lily, rose twisted-stalk, and three-lobed bazzania. Often contains Central v-types V17 and V18; NE v-types V1, V14, and V16.

Trees	*Tsuga canadensis, Thuja occidentalis, Betula alleghaniensis, Abies balsamea, Acer rubrum, Betula papyrifera, Acer saccharum* var. *saccharum, Populus tremuloides, Picea glauca*
Shrubs	*Acer pensylvanicum, Lonicera canadensis, Sambucus racemosa* ssp. *pubens, Acer spicatum, Corylus cornuta* ssp. *cornuta, Viburnum lantanoides*
Vascular Herbaceous	*Dryopteris carthusiana, Maianthemum canadense* ssp. *canadense, Clintonia borealis, Streptopus lanceolatus* ssp. *lanceolatus, Trientalis borealis* ssp. *borealis*
Non-vascular	*Bazzania trilobata* var. *trilobata, Cladonia coniocraea, Pleurozium schreberi*

G084T1/T1 Fresh, Clayey: Hemlock - Cedar Conifer

Ecology

Substrate is nutrient rich and has good moisture holding capacity required for plant growth. Limitations to tree growth result from vegetative competition. Understory diversity and abundance decreases, and feathermoss abundance increases as the canopy becomes more closed. This ecosite generally represents a late seral stage. Cedar and hemlock are susceptible to fire disturbance. Without the influence of fire, the vegetation will not likely succeed to another ecosite. Ecosite will persist due to shade tolerance of seedlings.

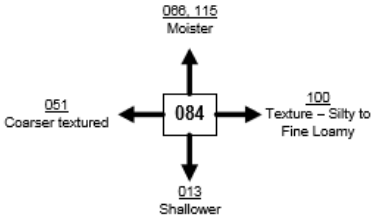
Ecoregional Variability

Limited across Great Lakes-St. Lawrence range due to infrequency of fine textured materials. Ecosite also limited and uncommon due to clearing of land for agriculture. Occurs in 4E-5, 5E-1, 5E-3, 5E-4, 5E-5, and 5E-8. Generally flat to rolling glaciolacustrine, glaciofluvial, lacustrine, alluvial, and fine texture morainal deposits throughout the range. Rugged bedrock controlled topography occurs in 5E-1, 5E-3, and 5E-5. Typically non-calcareous, where calcareous increased diversity and vigour of the understory may occur. The ecosite transitions from eastern white cedar dominated stands in the northern portion (4E) of the Great Lakes-St. Lawrence range to eastern white cedar / eastern hemlock stands in the south (5E). Pure eastern hemlock conditions often limited to cool moist slopes. Eastern red cedar may occur in 5E-7. Common tree associates in 4E include white birch, eastern white pine, and balsam fir. Yellow birch and sugar maple are more common tree associates with eastern hemlock in 5E and transitioning into 6E.

Edaphic Variability

Typically uniform in nutrient and moisture availability. Moderately deep to deep materials. Mostly on level, lower, or toe slopes or in depressions. Xeric vegetation such as pines, white-grained mountain-rice, as well as decreased shrub and herb diversity and abundance likely on occasional exposures of bedrock or very shallow substrates. Occasional moist inclusions may contain speckled alder, *Sphagnum* species, sedges, and conifer species reflecting hydric conditions.

Related Ecosites



Polygon 7

G120T/TI Moist, Fine: Elm - Ash Hardwood

Ecology

Substrate is nutrient rich and has good moisture holding capacity required for plant growth. Typically abundant and diverse fern cover. Limitations to tree growth result from vegetative competition. Shrub and herb poor under a closed canopy. Species diversity increases as canopy become more open. Elm and ash are much reduced from historical abundance and range due to pathogens and/or human exploitation. Maintenance of structure and composition associated with low to moderate intensity fire. In the absence of fire this ecosite will likely succeed to a mixedwood.

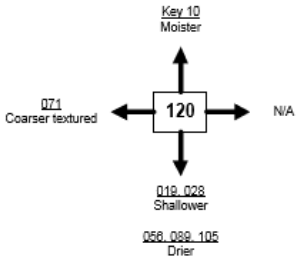
Ecoregional Variability

Limited across Great Lakes-St. Lawrence range due to infrequency of fine textured materials. Ecosite also limited and uncommon due to clearing of land for agriculture. Occurs in 4E-5, 5E-1, 5E-3, 5E-4, 5E-5, and 5E-8. Generally on flat to undulating glaciolacustrine deposits, glaciofluvial material in large river valleys, and flat to rolling fine textured morainal materials throughout the range. Rugged bedrock controlled topography occurs in 5E-1, 5E-3, and 5E-5. Typically non-calcareous, where calcareous increased diversity and vigour of the understory may occur. Black ash and white elm found throughout the range. White ash and green ash limited to 5E. Sugar maple, yellow birch, and ironwood are more frequent in 5E. Boreal hardwoods, trembling aspen and white birch, more common in the northern portion of 4E.

Edaphic Variability

Typically uniform in nutrient availability with variable moisture due to inconsistency of substrate depth over bedrock. Mostly on middle or lower slopes or in depressions. Black spruce, speckled alder, and peat substrates more abundant in depressions on moderately deep substrates.

Related Ecosites



Moist, Fine: Elm - Ash Hardwood

G120T1/T1

Profile/Slope Sequence

Not Available

Approximately 250m

Ecosite Description

Hardwood canopy consisting mostly of elm and/or ash. Black ash and white elm typically present in the main canopy, but may contain white ash and green ash. May contain white spruce, trembling aspen, sugar maple, and red maple, yellow birch. Understory consisting of moderate levels of black ash, balsam fir, sugar maple, and red maple. Shrub and herb rich. Ground surface mostly broadleaf litter. Substrate silty to fine loamy to clayey. Mostly > 15 cm deep and moist (MR = 4 or 5).

Substrate Description

Substrate Series	S2 M7 M11 MD7 MD9 MD11 MD15 D7 D9 D11 D15												
Mode of Deposition	RO	CO	MO	GF	FL	LA	GL	EO	OR	GW	WA	CX	AN
Family	Sandy		Coarse Loamy		Silty		Fine Loamy		Clayey		Peat		Folic
Humus Form	Mull		Moder		Fibrimor		Humimor		Peatymor		Anmoor		
Moisture Regime	0		1	2	3	4	5	6	7	8	9	x	h	s
Moisture	d		f			m		v		w		x	h	s
Depth	R		VS		S		M		MD		D		
Chemistry	k				n			z					

Vegetation Description

Tall treed (> 10 m) and low treed (≤ 10 m) ecosites common. Canopy closure variable. Low treed condition often indicative of younger trees. Elm and/or ash species compose > 50% of the hardwood tree species in the main canopy. Common understory vegetation includes beaked hazel, choke cherry, mountain maple, fly honeysuckle, spinulose wood fern, wild sarsaparilla, starflower, sensitive fern, wild lily-of-the-valley, and beautiful branch moss. Often contains Central v-type V7; NE v-types V9 and V14.

Trees	*Fraxinus nigra, (F. pennsylvanica, F. americana), Ulmus americana, Picea glauca, Populus tremuloides, Acer saccharum* var. *saccharum, A. rubrum, Betula alleghaniensis, Tilia americana, Populus balsamifera*
Shrubs	*Corylus cornuta* ssp. *cornuta, Prunus virginiana* var. *virginiana, Acer spicatum, Lonicera canadensis, Rubus idaeus* ssp. *strigosus, Ribes lacustre, Cornus alternifolia*
Vascular Herbaceous	*Dryopteris carthusiana, Aralia nudicaulis, Trientalis borealis* ssp. *borealis, Onoclea sensibilis, Maianthemum canadense* ssp. *canadense, Clintonia borealis*
Non-vascular	*Calliciadium haldanianum, Brachythecium reflexum* var. *reflexum, Cladonia coniocraea*

Appendix c

Hills Site Regions (Adapted from OMNR, 2012)

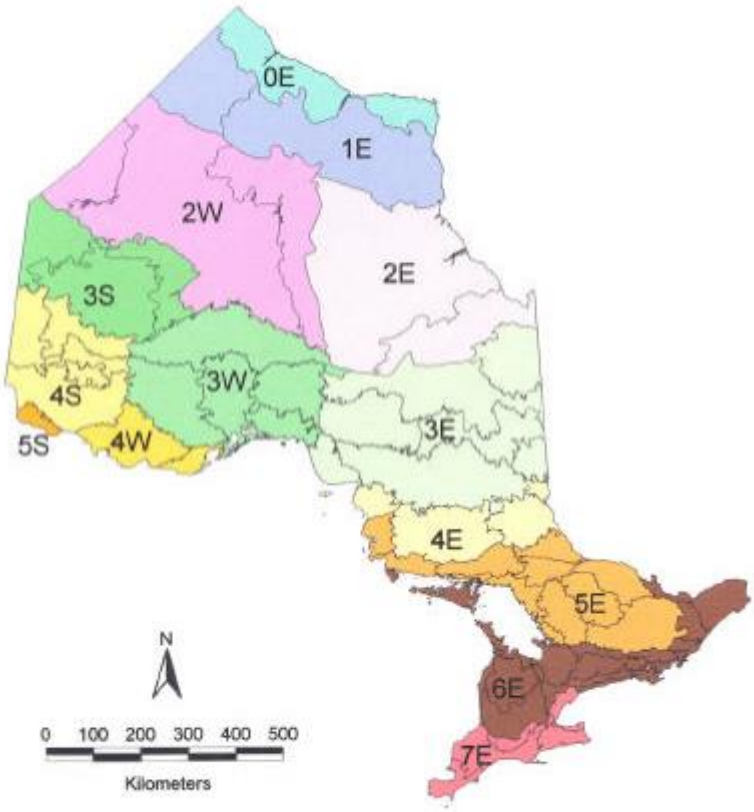


Figure 2-1. Hill's Site Regions (modified) in Ontario.