
Appendix F

Botanical Survey Report

Survey of Plant Communities and their Rare Vascular Plants at the Elmsdale Business Park

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INTRODUCTION

The Elmsdale Business Park lies at the edge of the Nine Mile River in Hants County. The alluvial soils in the river floodplain corridor have good drainage and lend themselves to hay and grain crops in non flooding areas (Cumberland Soil Series). The upland soils in the Business Park area (Q-PH, Queens Soil Series) have slower drainage but are widely used for agriculture (mixed, hay, and grains). A large proportion of the Business Park area is wetland and has been classed in the soil series as Swamp or Poorly Drained area of the Queens Soil type (see Soil Map, Methods). The Nine Mile River affords good habitat for the flora of the “Alleghanian Element”, many of which are rare and habitat-limited. It is also an area known to support the rare black ash, *Fraxinus nigra*, a tree of cultural significance and listed as S1S2-At-Risk and GS1-At Risk by the Atlantic Canada Conservation Data Centre (see Results,, Section C). The ACCDC data for species present within a 5km radius of the Elmsdale Business Park highlight four additional candidate species (*Lilium canadense*, *Sanguinaria canadense*, *Equisetum variegatum* and *Dichantherium clandestinum*). The first two are rare Appalachian Deciduous Forest (aka: Alleghanian Element) herbs; the Canada lily is a rare, S2 listed plant that requires fertile soils and intact floodplain habitat and the bloodroot is uncommon regionally but widespread in the same rich hardwood woodland habitats. There are several other additional rare Appalachian Deciduous Forest species in this same habitat in a 10km radius, most notably, *Caulophyllum thalictroides* (S2, May Be At Risk). The S1-listed bottlebrush grass, *Elymus hystrix*, has been found within a 25km radius of the site.

Geologically, this area is part of the Windsor lowlands and its Carboniferous rock includes sandstone, limestone and gypsum (Roland, 1980); sinkhole karst topography is not well-developed at this site (NMH site observation) but a collection of plants within 20km of the study site in the ACCDC database that are known from the gypsum flora, draws attention to the possible presence of rare shrubs *Dirca palustris* (S1, Sensitive) and *Rhamnus alnifolia* (S3 Secure) and the S2-listed, ladyslipper orchids, *Cypripedium parviflorum* and *Cypripedium reginae*.

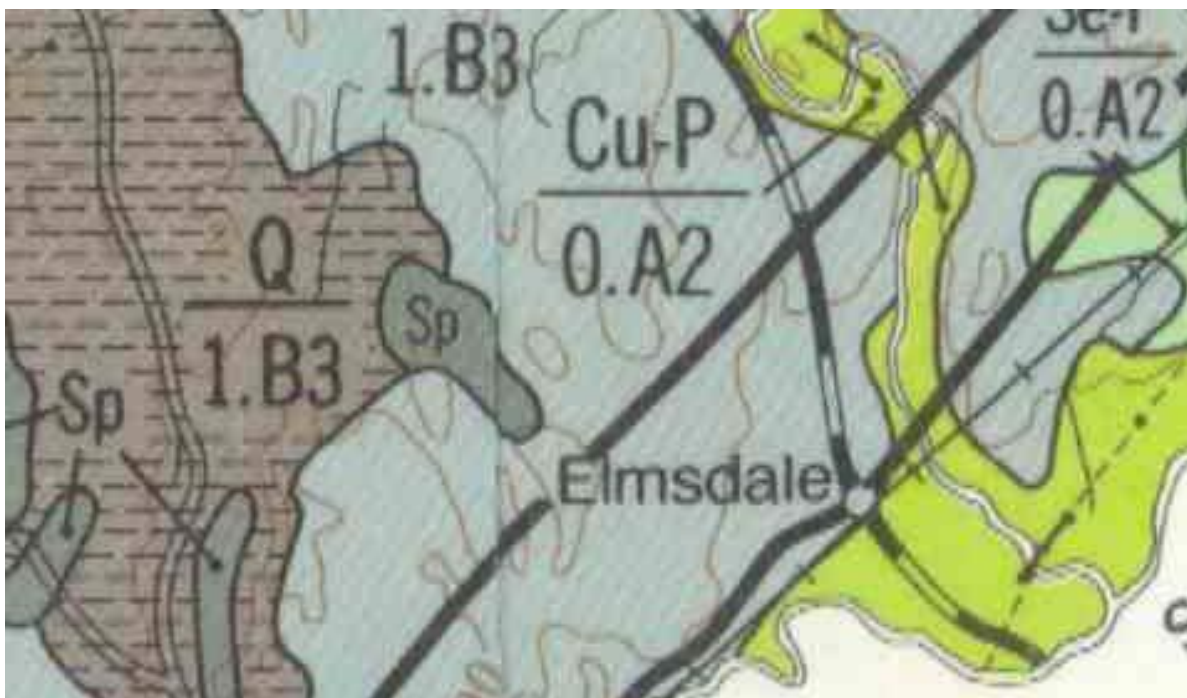
This reports on a survey of the various plant communities to determine the presence of rare vascular plants. Biodiversity and rarity (e.g. those evident in the ACCDC Elmsdale report) is most concentrated in the wetland areas at Elmsdale, a pattern generated by natural patterns of stress that prevail in wetlands which reduce competitive interactions, in concert with greater anthropogenic disturbance of uplands by forestry which disrupts old growth and simplifies those communities. The report makes clear that it is the swamp areas at Elmsdale that harbour biodiversity and rare species.

METHODS

Two field days were spent at the site: October 6th and 16th, 2015. A transect method was used following a compass bearing but once in the field, the route was governed by likely rare plant habitat. Most often the track was drawn to wetlands and as these were traversed, their various microsites were closely examined; these would include the wetland edge, their lagg zones, hummocks and hollows and pool areas. In other cases, the track made sure to assess areas of old forest (e.g. red spruce and hemlock) which could contain the rare *Goodyera pubescens* (S2 Sensitive, within 12km ACCDC report) or areas of karst which could support rare gypsum plants.

The local flora (Zinck, 1999) was consulted and plant identifications were confirmed using this and *Sedges of Maine* and the online resource “GoBotany”.

An ACCDC report of rare species occurrences, prepared on October 6, 2015 by James Churchill was consulted to inform field work.



Excerpt from Soil Survey Map from Cann et al. 1954 for Hants County showing swamp areas (Sp), and areas of poorly drained Queens Soil type (horizontal hatching) and the alluvium (mapped in green) next the Nine Mile River east of Route 247.

RESULTS

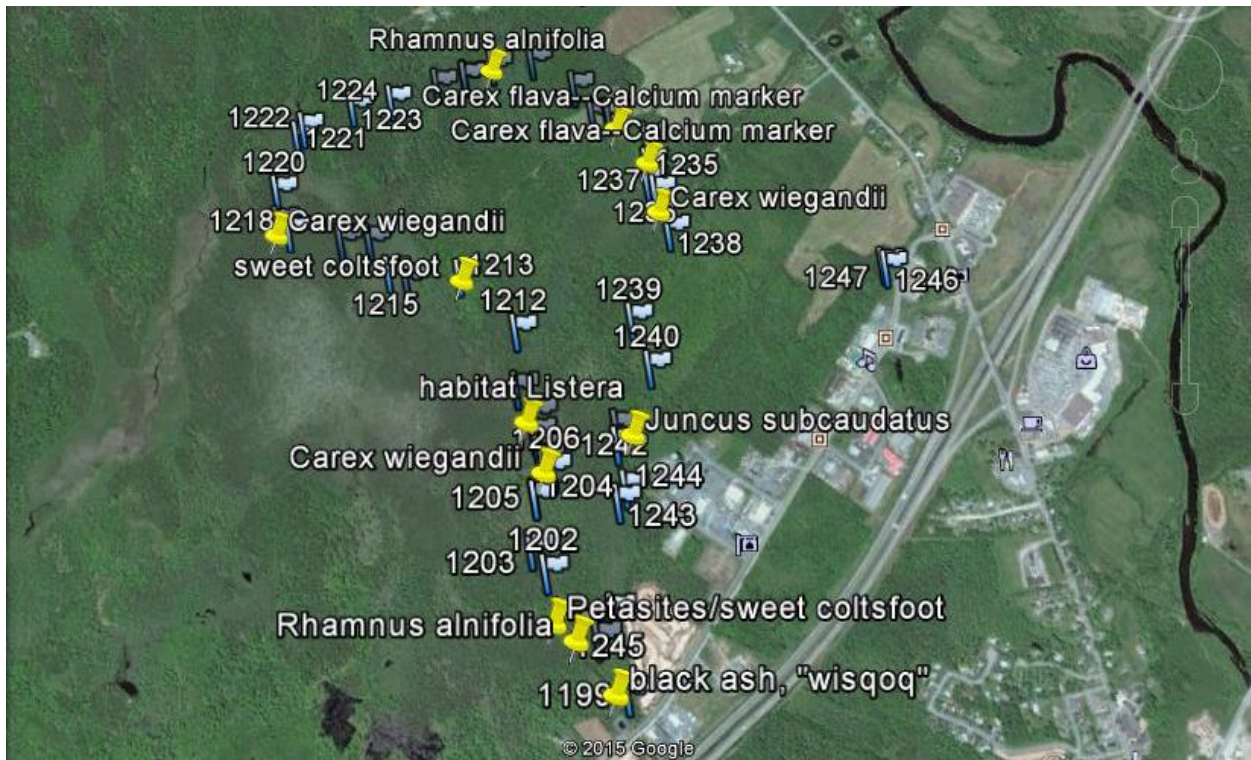
A) Findings

The rare plants are listed here according to the latest listings from Sean Blaney at ACCDC. Most of the plants have been significantly downlisted as new findings have now placed them in a S3 category. The exception is the black ash which has been uplisted to S1S2-May Be At Risk. The course of survey (see sequential waypoints, day one and day two maps) and the positions of the rare plants (yellow markers) is shown below in maps, day one and day two. On day one, in the western half of the site, three S3 rare plants were found: *Carex wiegandii* (Sensitive), *Rhamnus alnifolia* (Secure), and *Polygonum amphibium* (S3?, Undetermined). Putative habitat areas of *Listera australis* (S3 Secure) in black spruce swamp were identified. Most importantly, three individuals of *Fraxinus nigra*, (S1/S2, May Be At Risk) the black ash, were discovered. The details of these individuals and their habitat is described in a separate Species and Habitat section B below.



Day One waypoints showing locations of 3 S3 plants and 2 sites with At Risk tree, the black ash, "wisqoq".

Figure Two shows the day two survey at the eastern boundary of the property. *Carex wiegandii* had a narrow habitat, the edge of swamps. *Rhamnus alnifolia* occurred in openings within swamps and in swamp understories. The woods-rush, *Juncus subcaudatus* (S3, Sensitive) was rare in a flooded area of the swamp.



Day Two survey area showing rare plant locations and indicator plants of calcium richness (e.g. sweet coltsfoot and *Carex flava*)

B) Species and Habitat

All of the rare plants found were associated with various swamp habitat. *Carex wiegandii* (S3 Sensitive) occurred always at the edge of the swamp, often right in the line of the delineation flagged line that is still evident. The sedge is distinctive in the star-like spikes (Stellulatae) that are borne on long culms, the wide leaves, and in the shape of the perigynia. *Carex atlantica* var *atlantica* was also discovered in the wetland complex on day two but it occurred in a true bog. These species differ in the shape of their perigynia.



Sweet coltsfoot (*Petasites frigidus*) was in similar swamp habitat as this sedge.



Carex wiegandii spikes and perigynia



Carex wiegandii has wide leaves and long inflorescence culms.

The sweet coltsfoot (pictured above) indicates a rich swamp and it is associated with wetlands of high pH (<https://gobotany.newenglandwild.org/species/petasites/frigidus/>). The alder-leaved buckthorn (*Rhamnus alnifolia*) was also found in the same wetlands in the study site in days one and two as the two aforementioned plants but in more open areas than the sedge (*Carex wiegandii*). This is the native buckthorn (not the invasive weed) and it is a low growing shrub restricted to calcium swamps (<https://gobotany.newenglandwild.org/species/rhamnus/alnifolia/>).



ABOVE: Alder-leaved buckthorn (S3 Secure) with swamp red currant (*Ribes triste*, S4).



ABOVE: Calcareous habitat indicator, *Carex flava*, yellow-green sedge—not rare.



LEFT: *Juncus subcaudatus*, woods-rush (S3, Sensitive)

The same S3 species were observed in swamp areas to the east of the study site. At the eastern border of this swamp system was found *Carex flava*, the yellow-green sedge, not rare but rather an indicator of calcareous conditions. Its restriction to the eastern edge on the border of farmland (see hayfields and cropland fields to the east of *Carex flava* on day two map) may be due to the naturally rich drainage from these upland areas. In addition to *Rhamnus alnifolia* and *Carex wiegandii*, in the day two eastern area surveyed, the woods-rush (*Juncus subcaudatus*) was found in a wet hollow microsite growing in association with the calcium indicators (*R. alnifolia* and *C. flava*).

C) Black ash, *Fraxinus nigra* or “wisqoq” (Mi’kmaq name)

Wisqoq is the Mi’kmaq name for this species. It has cultural significance and its S1S2 “May Be At Risk” status is due to the lack of reproductive success of the trees at most sites. It also reflects the unhealthy condition of most of the adult trees in Nova Scotia. Two sites were found in lower swamp drainage areas (waypoints 1160, 1191 and 1192). The trees were flagged with pink tape. At the first site (WP 1160), a healthy black ash, 9cm DBH and approximately 12 metres in height, was a subordinate subcanopy tree in a red maple swamp with an upland woods dominated by hemlock. This ecosystem is prone to flooding as evidenced by nearby occurrence of golden saxifrage and American water pennywort and sensitive fern (*Chrysosplenium americanum*, *Hydrocotyle americana*, *Onoclea sensibilis*).

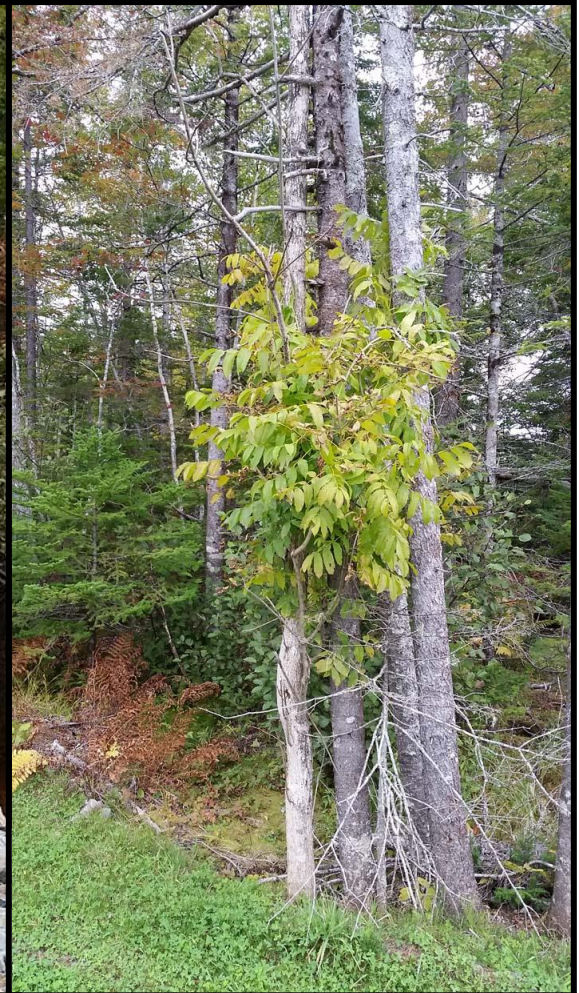


Black ash at Site One is a subcanopy tree in a red maple swamp beside a stream.

The second site is topographically similar to the first. Black ash occur where a large swamp's drainage narrows and results in a small central stream. The wooded swamp land margin where black ash grows at Site Two has been cut and the ash is at the exposed development edge. A juvenile black ash (see Left photo below) occurs in a red maple/fir swamp with royal fern (OBL wetland plant) and a pile of sawn logs. A small adult (not fruiting) is near the first and is more exposed to edge as is evident in photo at Right below; there is a clover lawn at the base of the tree on one side and woods on the other. This tree has damage to its trunk and has obvious die back of upper branches.



Juvenile black ash, waypoint 1191, in royal fern; note brush pile to left and tree's exposed aspect.



Small adult black ash, waypoint 1192, at disturbed edge (clover lawn in foreground).

d) Plant Communities

A total of 192 native plants were tallied over the two day survey at Elmsdale Business Park. Twelve of these were rare (S3 or rarer) or uncommon (S4 or S4S5). Only ten exotic species were recorded and this proportion of exotics is low ($10/(191+10) = 5\%$).

All of these rare or uncommon plants were recorded in wetland or at the edge of wetland (e.g. *Uvularia sessilifolia*). Swamp was the most common wetland type and it graded from black spruce dominated systems with the potential to support the S3 *Listera australis* to wetter swamps with much tamarack present, to richer mixed wood swamps supporting red maple, white ash and big toothed poplar. Black ash was found in the latter swamp type. In the mid zones of swamps, trees gave way to shrub dominance by either Canada holly or speckled alder. Swamps had more graminoid cover in these midzones and there various low shrub communities developed in the higher light availability. Here were the patches of *Rhamnus alnifolia* and the occasional swamp red currant (*Ribes triste*). Swamp complexes drained toward Park Road and with increasing watershed area and change in slope, the swamps became more linear and had definite stream channels. The two black ash, "wisqoq", sites occurred in these pinch points where seasonal water level fluctuations may be larger than in the middle of these large swamps.

The rare swamp plants occur in swamp where there are many indicators of calcium enrichment. These indicator plants include: *Carex flava*, *Lonicera villosa*, *Petasites frigidum*, and *Cosmarum palustre*.

There were smaller and more discrete areas of open fen and bog. Fen often occurred between an upper swamp area and a retaining upland barrier. These low biomass and low competition areas were scrutinized for the possible presence of rare plants. The lagg fens included a range of slow growing small plants: *Mainthemum triflorum*, *Rhynchospora alba*, cottongrasses (*Eriophorum angustifolium* and *E. virginicum*), bog laurel, small cranberry, and leatherleaf (*Chamaedaphne calyculata*). The bogs included a variety of depressed heath plants and bog sedges (*Carex atlantica* ssp. *atlantica*, and *Carex pauciflora*), the dragon's mouth orchid (*Arethusa bulbosa*) and small heaths (*Empetrum nigrum*, *Vaccinium oxycoccos* and *Kalmia polifolia*). Treed bog vegetation was more closed in with higher shrubs; here black spruce thicket developed and open areas included tussocks of the tussock cottongrass (*Eriophorum vaginatum*), Billing's sedge (*Carex billingsii*) and narrow leaved cottongrass (*Eriophorum angustifolium*) in a matrix of knee-high heath (*Chamaedaphne calyculata*, *Ledum groenlandicum*, *Rhododendron canadense* and *Kalmia angustifolia*).

Upland forest communities ranged from white pine forest, to hemlock to oak. Successional upland communities had regrown in trembling aspen (*Populus tremuloides*), wire birch (*Betula populifolia*) red maple and fir and had an understory of *Vaccinium myrtilloides*. This may be an old field that has become wooded in the past century. The pine woods had greater integrity and the understory included large leaf aster (*Eurybia macrophylla*), bracken fern, and two *Danthonia* grass species (*D. compressa* and *D. spicata*). Oak woods may be fire communities; these uplands had a tree layer of red oak, big-toothed poplar (*Populus grandidentata*) and black spruce and a ground layer of bracken fern, lambkill (*Kalmia angustifolia*), bunchberry (*Cornus canadensis*) and teaberry (*Gaultheria procumbens*). Minor amounts of eastern hemlock woodland occurs in north-facing aspects where Christmas fern (*Polystichum acrostichoides*) occurs as ground cover.

CONCLUSIONS

1. Four wetland rare plants identified by ACCDC report as with 10km were confirmed for the study area (black ash, *Rhamnus alnifolia*, *Polygonum amphibium*, *Juncus subcaudatus*).
2. Five very rare wetland plants listed in the ACCDC report within this radius were not found (Canada lily, blue cohosh, leatherwood, *Boehmeria cylindrica*, silky willow); each of these plants are fairly large and would be evident from remains at the time of survey.
3. All rare plants were in or at the edge of wetland areas.
4. Upland areas had lower ecological integrity, the result of logging, old fires, or agriculture.
5. There were no signs of a gypsum plant community as would support the rare lady slipper orchids (viz. *Cypripedium parviflorum* and *C. arietinum*)
6. The wetland plant community contains several indicators of calcareous conditions.
7. The high species richness (192 species) of native plants suggests this is a high value ecosystem.
8. The survey time of year means that an early flowering guild may have been overlooked although no remains of such a guild were observed as would be if this had substantial presence.
9. Two sites of black ash were found in similar topographic positions (pinch points of large swamp areas).
10. It is likely that black ash, “wisqoq”, at Site Two will be eradicated unless active restoration measures are taken prior to the next growing season. Such mitigation would involve the identification of a buffer area and its restoration using dead wood, removal of any imported soils, planting of native wetland trees (red maple, yellow birch, white ash) and alders (see Photo Below).



RESTORATION OPPORTUNITY: Swamp corridor immediately below Site Two showing removal of canopy trees and consequent regrowth of weedy vegetation. To avoid this at black ash Site Two, a buffer zone could be planted with whips of red maple, white ash and yellow birch.

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