Floristic Quality Assessment for

Orchis Fen Preserve, Emmet County, Michigan

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Abstract

The Michigan Floristic Quality Assessment (FQA) is a tool used to evaluate the natural significance and floristic quality of a given locality. We evaluated the plant community at Orchis Fen, a 35-acre preserve in Emmet County, Michigan owned by the Little Traverse Conservancy and Nature Conservancy. The purpose of our study was to use the Floristic Quality Index (FQI), Wetness Index, and the mean coefficient of conservatism (C) to provide the Little Traverse Conservancy and Nature Conservancy with information to aid in their preservation and management strategies. We set up a diagonal transect and identified plants across the site, passing through three interconnected habitats: cedar swamp, fen, and hardwood forest (Figure 1). We found that the mean C was 5.14 for native species and 4.42 when invasive species were taken into account. The FQI for native species was 53.14 and 49.60 including invasive species. The native wetness coefficient (W) was -1.96 for the entire transect and changed to -1.75 with adventives. These values indicate that Orchis Fen is a high quality natural area with an above-average representation of plant species associated with pre-settlement conditions. Our study reinforces the importance of continuing to focus on preservation efforts in this area.

Introduction

The natural areas of Michigan have been extensively altered in the past by human activity, primarily through widespread logging and farming (Herman et al. 2001). Heavy logging of pines and hemlock and subsequent disastrous fires took place in the northern Lower Peninsula during the second half of the eighteenth century (Barnes and Wagner 2004). Today extensive development in residential and industrial areas has also adversely affected the natural areas throughout the state (Herman et al. 2001). Floristic quality indicators have been used in response to concerns over human-induced changes to natural ecosystems that result in a decrease of plant diversity at a particular site (Bourdaghs et al. 2006).

The Floristic Quality Assessment (FQA) is used as a tool to assess the floristic quality and natural significance of any given area in Michigan. Part of the FQA is the Floristic Quality Index (FQI) and is based on the coefficient of conservatism (C), a number assigned to each native plant species that ranges from 1-10. The coefficient represents the likelihood that a species will be located in a landscape unaltered by human activity. For example, a plant with a low C is likely to be found in almost any landscape, but a species with a very high C is restricted to high quality, undisturbed natural areas. The coefficient of conservatism can be found for all the plants at a site and averaged to find the mean C, which is a useful variable in determining the floristic quality of the site. The FQI is calculated by using the mean C and is a predictable indicator of floristic quality for the comparison of different sites (Herman 2001).

The FQA also includes the coefficient of wetness (W) which is calculated to estimate the probability that a species will occur in a wetland. Species assigned negative numbers are likely found in wet areas, while species with positive numbers are most often found in dry sites. The mean coefficient of wetness of a site is a useful tool for distinguishing whether a site is a wetland or an upland.

The site for this study was Orchis Fen located in Emmet County, Michigan on Bellmer Road in Bear Creek Township near Petoskey. The Little Traverse Conservancy and Nature Conservancy acquired the 35-acre preserve in 1984. Though there are land disturbances around the preserve, within the boundaries of Orchis Fen are three distinct natural habitats: a cedar swamp, a fen and a hardwood forest. The topography of the site is flat and the soils are mostly composed of poorly drained organic material (United States Department of Agriculture).

The purpose of this study was to use the FQI, Wetness Index, and mean C to assess the floristic quality of Orchis Fen in order to provide the Little Traverse Conservancy with information that will aid in their preservation and management strategies.

Methods

A transect was set diagonally through Orchis Fen traversing the three different habitats: cedar swamp, fen, and hardwood forest (Fig. 1). It constructed this way to ensure that we sampled an adequate and accurate representation of biodiversity of Orchis Fen.

Figure 1. Orchis Fen Preserve in Emmet County, Michigan, showing the sampling transects line.

The transect was 569 meters long by two meters wide. On July 28, 2008 the class went out in three groups. Each group identified plants along one-third of the transect. Plants located outside of the transect were identified as we encountered them to provide a better representation of the overall floral composition in the preserve. We collected specimens that could not be identified in the field and took them back to the University of Michigan Biological Station laboratory. We keyed out these unknown plants using *Michigan Flora* Volumes I, II, and III (Voss 1979, 1985, 1996), the *Manual of Vascular Plants of Northeastern United States and Adjacent Canada* (Gleason and Cronquist 1991), the *Illustrated Companion to Gleason and Cronquist's Manual* (Holmgren et al. 1998) and the comprehensive herbarium collection located at the University of Michigan Biological Station.

We compiled a list of each species found at Orchis Fen and used the Michigan Floristic Quality (FQA) (Herman et al. 2001) to determine the coefficient of conservatism. We calculated the mean C,

which is equal to the sum of all the C values divided by the total number of plant species (mean C = $\sum C/n$). We calculated the Floristic Quality Index by multiplying the mean C by the square root of the total number of species (FQI = $\sum C/n * \sqrt{n}$). We computed the mean C and the FQI with and without non-native species. The mean coefficient of wetness, which is the sum of the wetness index values divided by the number of species (mean W = $\sum W/n$), was also calculated for Orchis Fen. This mean value represents the probability that a species will occur in wetlands.

Results

Cedar Swamp

The dominant overstory species found in the cedar swamp portion of the transect were *Thuja occidentalis* and *Abies balsamea*. The dominant shrubs included *Taxus canadensis, Vaccinium myrtilloides* and *Cornus canadensis*. The groundcover included species such as *Caltha palustris, Clintonia borealis, Osmunda cinnamomea* and *Trientalis borealis.* Invasive species found in the cedar swamp included *Ranunculus acris, Plantago lanceolata* and *Solanum dulcamara*.

There were 65 native species present in the Cedar Swamp and a total of 70 species. The swamp had a C value of 4.53 for native species and 4.2 with adventives. The FQI for native species was 36.47 and with adventives was reduced to 35.14. The average wetness coefficient (W) for the total species found only in the cedar swamp portion of the transect is –1.87. The average W for the native species was -2.02.

Fen

The dominant tree species found in the fen portion of the transect was *Larix laricina*, while the dominant shrub was *Potentilla fruticosa*. Many species of the genus *Carex*, as well as other sedges made up most of the understory cover of the fen. A common fen species, *Typha latifolia*, was also found. *Utricularia intermedia, Sarracenia purpurea* and *Drosera rotundifolia* are carnivorous species found in the fen. The only invasive species found in the fen was *Cirsium palustre.*

There were 48 total species found in the fen and only one non-native species found. The total mean C for the fen was 5.67, with it increasing to 5.79 with just native species. The FQI for native species was 39.67 and 39.26 with adventives. The native average wetness coefficient in the fen was -3.48, decreasing a fraction to a W of -3.47 when adventives are added.

Hardwood Forest

The hardwood forest was largely dominated by overstory trees, which created a dense canopy. Trees present here included *Thuja occidentalis, Tsuga canadensis, Acer saccharum, Acer rubrum* and *Fagus grandifolia*. The understory of the hardwood forest includes species such as *Arisaema triphyllum, Coptis trifolia, Maianthemum canadense* and *Streptopus roseus.* The invasive species found in the hardwood forest section of the transect included *Prunella vulgaris, Veronica officinalis,* and *Silene pratensis.*

There were 80 total species found in the hardwood forest with 75 of them being native. The native mean C for the forest was 4.89 and 4.59 with adventives. The FQI for native species was 42.38 and goes down to 41.03 when invasive species are taken into account. The average wetness coefficient for the total species is -1.23 and -1.51 with only native species making it the driest habitat of the transect.

Overall Floristic Quality Assessment

There were 122 different species found along the transect including 114 native species and eight non-native species. The native species accounted for 93.44% of the total species while the invasive species only accounted for 6.56% of the total. Trees, shrubs, forbs, grasses, sedges, ferns and fern allies were the physiognomic components contributing to the flora of the site (Fig. 2). Most of the flora consisted of forbs (38%) followed by trees and shrubs (both 18%). All non-native species found were categorized as forbs.

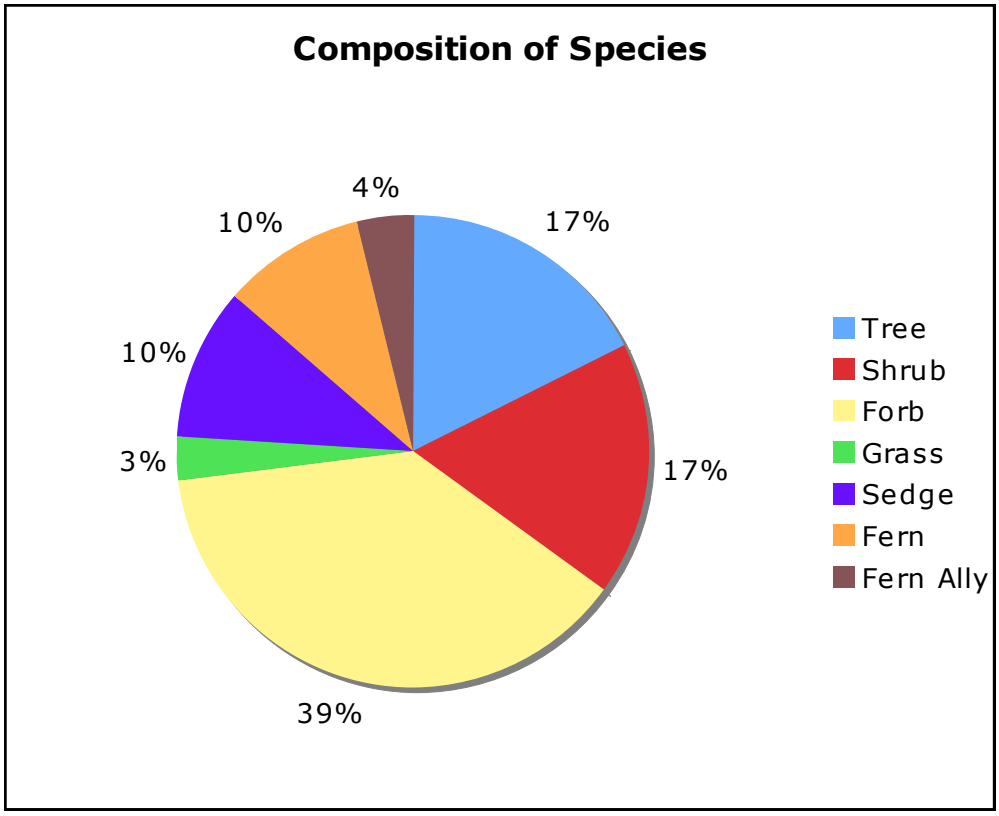

Figure 2: Composition of species found in Orchis Fen Preserve by physiognomic category and relative abundance.

We were unable to key several species due to the limited time frame of our inventory. In such instances, the genus was noted and no C value recorded. Plants in the following genera were could not be keyed down to species: *Aster*, *Hieracium*, *Rosa* and *Salix.* These unidentified species were not taken into account for any of the assessment calculations.

The mean coefficient of conservatism was 5.14 for native species and 4.42 when invasive species are taken into account. The FQI of native species found at Orchis Fen Preserve was 53.14. With the addition of the invasive species the FQI decreases to 49.60. The native wetness coefficient (W) was -1.96 for the entire transect. With adventives, the W changes to -1.75. Both of these wetness scores classify the transect as facultative (FAC+).

Discussion

Cedar Swamp

This segment of the overall transect was characterized predominantly by plant species that thrive in calcium rich soils. Various microhabitats were located within the cedar swamp between the mounds, which have slightly more acidic soil, compared to the calcium rich hollows. Species with varying soil preferences were found within the area between the different soil types. The soil of a swamp facilitates water retention, which is indicative of species that are known to thrive in wet, damp areas such as *Caltha palustris* and *Osmunda cinnamomea*.

We found five non-native species in this section, which brings the mean C of the native plants down from a 4.53 to a mean C of 4.2. This value indicates that the natural habitat is marginally preserved and contains relatively widespread plant species that could be easily found in an area undisturbed by human activity. The five adventives of total 70 species only marginally lowered the coefficient of conservatism. This means the adventives are not as drastically impacting the diversity of floral composition compared to the fen portion.

The FQI is slightly above 35 including and excluding the adventives, meaning this habitat segment possess sufficient conservatism and it is floristically important on a statewide perspective. Concerning the negative value for W at -1.87 suggests that this habitat type falls into the facultative category of wetlands, where the species are slightly more likely to occur in wetlands.

Fen

The fen segment of the transect was dominated by sedges and mounds with shrubs and trees, such as *Larix laricina*. Similar to the cedar swamp, the mounds have more alkaline conditions, while the majority of the fen is more basic and rich in calcium. Species residing within this microhabitat all prefer their roots to be in water saturated soils. The species *Typha latifolia* is a good indicator of

aerated, mineral-rich soils that often times have moving groundwater. Since fens are eutrophic there is a wide diversity of species present within due to an excess of nutrients (Crum, 1988).

Only one non-native species was found within the fen site out of a total of 48 species indicating that the principle elements of the native system are still represent the majority of the flora found in the fen. Considering the variety of species present in the fen area, the one non-native species generates a tiny decrease in the C value by 0.12. Therefore, the overall species present denote the preservation of the original natural area as partially intact with a mean C of 5.67. With the greatest C value the fen portion of the transect may be considered a higher priority for conservation in that the species found there are relatively indicative of the original system.

At an FQI of 39.67, the fen has been sufficiently conserved and and thus rich in a statewide comparison of floral importance. The FQI with and without the adventives were very similar in value, meaning that the overall species composition is largely native species found in their natural habitat. The fen is categorized as a facultative wetland at W=-3.47 where the species present are typical of wetlands, but can occasionally be observed in non-wetlands. The fen has much more saturated soil than the cedar swamp with more abundant pockets of standing water than any other part of the transect, as well as moving water in the form of a stream.

Hardwood Forest

While the hardwood forest of this field site had similar characteristic to the cedar swamp previously discussed, there were noteworthy differences in the species composition, soil features, and community interactions. Of the three microhabitats the forest was the driest area comparatively with the lowest W value, however, there was still moderate water retention, though no standing water was observed. When water becomes restricted in similar soil types there is greater aeration in hardwood forests compared to the fen and cedar swamp. This is one reason for the observed increase in the abundance of hardwood species such as *Thuja occidentalis*, *Alnus rugosa* and *Acer rubrum*, which

were all seen in this microhabitat (Barnes and Wagner 2004).

The hardwood forest portrayed the largest number of total species between the three microhabitats of the transect. The adventives comprised five out of the total 80 species found. With a mean C value of 4.89, the hardwood forests are remnant of the natural area. The minor drop 0.3 in the C value when incorporating the adventives demonstrates that this segment of the transect has species richness that is diagnostic of the original natural area.

Of the three microhabitats, the hardwood forest had the largest value for FQI of native species at 42.38. The hardwood forest habitat had the highest FQI value, which could be explained by the fact that it contained the highest number of species during the time of our survey at this period of the growing season. Many of the plants growing in the swamp and fen were done flowering and fruiting, making them difficult to recognize and identify. While the FQI is well above 35, but still a bit lower than 50, which suggests that this habitat has slightly greater conservatism concerning the floristic importance on a statewide scale. The higher value indicates that it represents a more important and notable component of Michigan's native biodiversity, but the species within are not necessarily rare.

Complete Transect

The total average coefficient for conservatism was 5.14 for native species and 4.42 with adventives, which is slightly below the value for all native flora of Michigan (6.5), it indicates an above-average representation of higher-ranked plant species. The total FQI value for Orchis Fen was 53.14 without invasive species and 49.60 with invasive species, which is indicative of a high quality natural area containing important pre-settlement native species. According to recently established standards based on repeated tests in Michigan, an FQI of 50 or more is indicative of extremely rare landscape and represent a significant component of the native floral diversity in Michigan (Herman et al. 2001). A majority of undeveloped land in Michigan has an FQI value of less than 20. This low overall FQI signifies that a majority of undeveloped land contains plants that are not restricted to pre-

settlement natural areas and may be found almost anywhere in the region. A majority of the plants at Orchis Fen are limited in their range of growth to the specific natural, pre-settlement community it represents. The large FQI and C values of Orchis Fen denote this area as having a significant component of native biodiversity and landscape in Michigan.

The negative W values for all the microhabitats were indicative of the water-retentive quality of the soils. The vegetation throughout Orchis Fen reflects the minute soil differences experienced between the microhabitats. While each habitat area does have a negative W value, the fen has the largest average wetness coefficient, then the cedar swamp, and lastly, the hardwood forest. The fen and cedar swamp have poorly draining soils, while the hardwood forest is moderately well drained (Albert et al. 1986). While progressing through the transect the differences in soil and its water-drainage capabilities could be seen in the shifting species composition through habitats. The three distinctive microhabitats examined in Orchis Fen, however, did experience some vegetative overlapping of native and invasive species. This may be a result of the transitioning soil conditions between the habitat types. In this intermediate zone, where soil and habitat characteristic merge together, a combination of species from the different microhabitats are all able reside.

One limitation of the study is the limited time frame of the inventory. In ideal conditions, the inventory would be surveyed throughout differing growing seasons in order to obtain all species at an identifiable stage of growth. The FQI would be influenced by the season during the survey because of different growing seasons; varying species would be noticeable at different times. This explains why some species were found at various stages through flowering and fruiting. Five species were unidentifiable beyond genus and were not included in calculations. A larger time frame for the survey would generate a more comprehensive and complete understanding of the floristic quality of Orchis Fen Preserve.

Nonetheless, the results from this study clearly show that Orchis Fen, though mostly surrounded

by development, has maintained high floristic quality through its protection by the Little Traverse Conservancy and Nature Conservancy. Development in the natural area of Orchis Fen is not an issue because the site is preserved and protected. Disturbance is more prevalent on the boundaries of the site and surrounding development may potentially introduce more invasive species to the preserve. The presence of invasive species such as *Ranunculus acris, Solanum dulcamara, Cirsium palustre* and *Prunella vulgaris* is further reason to extend protective measures by discouraging development of surrounding areas. As the preserve is protected from disturbance, the habitat will become less suitable for these invasive species and more suitable for high quality native species, retaining the desired diversity of pre-settlement times.

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APPENDIX A: Orchis Fen Plant Species List

ACRONYM	C	SCIENTIFIC NAME	W	WET	PHYS	COMMON NAME	Habitat
ABIBAL	3	*Abies balsamea*	-3	FACW	Nt Tree	BALSAM FIR	C,H
ACERUB	1	*Acer rubrum*	0	FAC	Nt Tree	RED MAPLE	C,H,F
ACESAU	5	*Acer saccharum*	3	FACU	Nt Tree	SUGAR MAPLE	H
ALNRUG	5	*Alnus rugosa*	-5	OBL	Nt Shrub	TAG ALDER	C,H
AMEARB	4	*Amelanchier arborea*	3	FACU	Nt Tree	JUNEBERRY	C
AMELAE	4	*Amelanchier laevis*	5	[UPL]	Nt Tree	SMOOTH SHADBUSH	H
ANDGLA	10	*Andromeda glaucophylla*	-5	OBL	Nt Shrub	BOG ROSEMARY	H,F
ARANUD	5	*Aralia nudicaulis*	3	FACU	Nt P-Forb	WILD SARSAPARILLA	C,H,F
ARITRI	5	*Arisaema triphyllum*	-2	FACW-	Nt P-Forb	JACK-IN-THE-PULPIT	H
AROPRU	5	*Aronia prunifolia*	-3	FACW	Nt Shrub	BLACK CHOKEBERRY	C,H
		Aster spp.					
ASCINC	6	*Asclepias incarnata*	-5	OBL	Nt P-Forb	SWAMP MILKWEED	F
AHFIL	4	*Athyrium filix-femina*	0	FAC	Nt Fern	LADY FERN	H
BETPAP	2	*Betula papyrifera*	2	FACU+	Nt Tree	PAPER BIRCH	C
BETALL	7	*Betula alleghaniensis*	0	FAC	Nt Tree	YELLOW BIRCH	C
BROCIL	6	*Bromus ciliatus*	-3	FACW	Nt P-Grass	FRINGED BROME	C,F
CARPEN	1	*Cadamine pensylvanica*	-4	FACW+	Nt B-Forb	PENNSYLVANIA BITTER CRESS	C
CALCAN	3	*Calamagrostis canadensis*	-5	OBL	Nt P-Grass	BLUE-JOINT GRASS	H,F
CALTPA	6	*Caltha palustris*	-5	OBL	Nt P-Forb	MARSH-MARIGOLD	C,H
CAMAPR	7	*Campanula aparinoides*	-5	OBL	Nt P-Forb	MARSH BELLFLOWRER	F
CXCOMO	5	*Carex comosa*	-5	OBL	Nt P-Sedge	SEDGE	H
CXFLAV	4	*Carex flava*	-5	OBL	Nt P-Sedge	SEDGE	C,F
CXGARB	8	*Carex garberi*	-3	FACW	Nt P-Sedge	SEDGE	C,F
CXHYST	2	*Carex hystericina*	-5	OBL	Nt P-Sedge	SEDGE	C
CXINTE	3	*Carex interior*	-5	OBL	Nt P-Sedge	SEDGE	C,F
CXINTU	3	*Carex intumescens*	-4	FACW+	Nt P-Sedge	SEDGE	C,H
CXLEPO	3	*Carex leptonervia*	0	FAC	Nt P-Sedge	SEDGE	C,H
CXLEPA	5	*Carex leptalea*	-5	OBL	Nt P-Sedge	SEDGE	F
CXOLIS	10	*Carex oligosperma*	-5	OBL	Nt P-Sedge	SEDGE	F
CXTRIS	9	*Carex trisperma*	-5	OBL	Nt P-Sedge	SEDGE	H
CHACAL	8	*Chamaedaphne calyculata*	-5	OBL	Nt Shrub	LEATHERLEAF	H,F
CIRMUT	6	*Cirsium muticum*	-5	OBL	Nt B-Forb	SWAMP-THISTLE	H,F
CIRPAL	*	*CIRSIUM PALUSTRE*	-4	[FACW+]	Ad B-Forb	MARSH-THISTLE	F
CLAMAR	10	*Cladium mariscoides*	-5	OBL	Nt P-Sedge	TWIG-RUSH	H,F
CLIVUL	3	*Clinopodium vulgare*	5	[UPL]	Nt P-Forb	WILD BASIL	H

CLIBOR	5	*Clintonia borealis*	-1	FAC+	Nt P-Forb	BLUEBEAD-LILY; CORN-LILY	C,H
COPTRI	5	*Coptis trifolia*	-3	FACW	Nt P-Forb	GOLDTHREAD	H
CORCAA	6	*Cornus canadensis*	0	FAC	Nt Shrub	BUNCHBERRY	C,H,F
CORSTO	2	*Cornus stolonifera*	-3	FACW	Nt Shrub	RED-OSIER DOGWOOD	C,H,F
CYPREG	9	*Cypripedium reginae*	-4	FACW+	Nt P-Forb	SHOWY LADY-SLIPPER	F
DROROT	6	*Drosera rotundifolia*	-5	OBL	Nt P-Forb	ENGLISH SUNDEW	F
DRYCRI	6	*Dryopteris cristata*	-5	OBL	Nt Fern	CRESTED SHIELD FERN	C,H
EPICIL	3	*Epilobium ciliatum*	3	FACU	Nt P-Forb	WILLOW-HERB	H
EPIHEL	*	*EPIPACTIS HELLEORINE*	5	[UPL]	Ad P-Forb	HELLEBORINE	C,H
EQUARV	0	*Equisetum arvense*	0	FAC	Nt Fern Ally	COMMON HORSETAIL	C,H,F
EQULAE	2	*Equisetum laevigatum*	-3	FACW	Nt Fern Ally	SMOOTH SCOURING RUSH	C
EQUSCI	7	*Equisetum scirpoides*	-1	FAC+	Nt Fern Ally	DWARF SCOURING RUSH	C,F
EUPMAM	4	*Eupatorium maculatum*	-5	[OBL]	Nt P-Forb	JOE-PYE WEED	F
EUPPER	4	*Eupatorium perfoliatum*	-4	FACW+	Nt P-Forb	COMMON BONESET	C,H
EUTGRA	3	*Euthamia graminifolia*	-2	FACW-	Nt P-Forb	GRASS-LEAVED GOLDENROD	F
FAGGRA	6	*Fagus grandifolia*	3	FACU	Nt Tree	AMERICAN BEECH	H
FRAVIR	2	*Fragaria virginiana*	1	FAC-	Nt P-Forb	WILD STRAWBERRY	C,F
FRAAME	5	*Fraxinus americana*	3	FACU	Nt Tree	WHITE ASH	H
FRANIG	6	*Fraxinus nigra*	-4	FACW+	Nt Tree	BLACK ASH	C
GALTRR	4	*Galium triflorum*	2	FACU+	Nt P-Forb	FRAGRANT BEDSTRAW	C,H,F
GAUHIS	8	*Gaultheria hispidula*	-3	FACW	Nt Shrub	CREEPING SNOWBERRY	C,H,F
GAUPRO	5	*Gaultheria procumbens*	3	FACU	Nt Shrub	WINTERGREEN	H,F
GAYBAC	7	*Gaylussacia baccata*	3	FACU	Nt Shrub	HUCKLEBERRY	H
GEURIV	7	*Geum rivale*	-5	OBL	Nt P-Forb	PURPLE AVENS	C,H,F
GLYSTR	4	*Glyceria striata*	-5	OBL	Nt P-Grass	FOWL MANNA GRASS	C,F
GYMDRY	5	*Gymnocarpium dryopteris*	0	FAC	Nt Fern	OAK FERN	C
		Hieracium sp.					
ILEVER	5	*Ilex verticillata*	-4	FACW+	Nt Shrub	MICHIGAN HOLLY	H
JUNBRE	8	*Juncus brevicaudatus*	-5	OBL	Nt P-Forb	RUSH	C,F
LARLAR	5	*Larix larcina*	-3	FACW	Nt Tree	TAMARACK	H,F
LINBOR	6	*Linnaea borealis*	0	FAC	Nt P-Forb	TWINFLOWER	C,H,F
LOBKAL	10	*Lobelia kalmii*	-5	OBL	Nt P-Forb	BOG LOBELIA	H,F
LONOBL	8	*Lonicera oblongifolia*	-5	OBL	Nt Shrub	SWAMP FLY HONEYSUCKLE	H
LYCANN	5	*Lycopodium annotinum*	0	FAC	Nt Fern Ally	STIFF CLUBMOSS	H
LYCDEN	5	*Lycopodium dendroideum*	0	FAC	Nt Fern Ally	TREE CLUBMOSS	H
LYCUNI	2	*Lycopus uniflorus*	-5	OBL	Nt P-Forb	NORTHERN BUGLE WEED	C,H
MAICAC	4	*Maianthemum canadense*	0	FAC	Nt P-Forb	CANADA MAYFLOWER	H
MATSTR	3	*Matteuccia struthiopteris*	-3	FACW	Nt Fern	OSTRICH FERN	C,H

MENTRI	8	*Menyanthes trifoliata*	-5	OBL	Nt P-Forb	BUCKBEAN	C,H,F
MITREP	5	*Mitchella repens*	2	[FACU+]	Nt P-Forb	PARTRIDGE BERRY	C,H
MYRGAL	6	*Myrica gale*	-5	OBL	Nt Shrub	SWEET GALE	H,F
ONOSEN	2	*Onoclea sensibilis*	-3	FACW	Nt Fern	SENSITIVE FERN	C,H
OSMCIN	5	*Osmunda cinnamomea*	-3	FACW	Nt Fern	CINNAMON FERN	C,H
OSMREG	5	*Osmunda regalis*	-5	OBL	Nt Fern	ROYAL FERN	C,H
PICGLA	3	*Picea glauca*	3	FACU	Nt Tree	WHITE SPRUCE	C,H
PICMAR	6	*Picea mariana*	-3	FACW	Nt Tree	BLACK SPRUCE	F
PINSTR	3	*Pinus strobus*	3	FACU	Nt Tree	WHITE PINE	C,H
PLALAN	*	*PLANTAGO LANCEOLATA*	0	FAC	Ad P-Forb	ENGLISH PLANTAIN	C,H
PLAHYP	5	*Platanthera hyperborea*	-4	FACW+	Nt P-Forb	TALL NORTHERN BOG ORCHID	C,F
POAPAS	3	*Poa palustris*	-4	FACW+	Nt P-Grass	FOWL MEADOW GRASS	H,C
POPBAL	2	*Populus balsamifera*	-3	FACW	Nt Tree	BALSAM POPLAR	C
POPGRA	4	*Populus grandidentata*	3	FACU	Nt Tree	BIG-TOOTHED ASPEN	H
POPTRE	1	*Populus tremuloides*	0	FAC	Nt Tree	QUAKING ASPEN	C,H
POTFRU	10	*Potentilla fruticosa*	-3	FACW	Nt Shrub	SHRUBBY CINQUEFOIL	C,F
PRUVUL	*	*PRUNELLA VULGARIS*	0	FAC	Ad P-Forb	LAWN PRUNELLA	H
PRUSER	2	*Prunus serotina*	3	FACU	Nt Tree	WILD BLACK CHERRY	H
PRUVIR	2	*Prunus virginiana*	1	FAC-	Nt Shrub	CHOKE BERRY	C,H
PTEAQU	0	*Pteridium aquilinum*	3	FACU	Nt Fern	BRACKEN FERN	C,H,
PYRROT	7	*Pyrola rotundifolia*	1	FAC-	Nt P-Forb	ROUND-LEAVED PYROLA	H
QUERUB	5	*Quercus rubra*	3	FACU	Nt Tree	RED OAK	C
RANAMB	*	*RANUNCULUS ACRIS*	-2	FACW-	Ad P-Forb	TALL BUTTERCUP	C
RHAALN	8	*Rhanmus alnifolia*	-5	OBL	Nt Shrub	ALDER-LEAVED BUCKTHORN	C,F
RHYALB	6	*Rhynchospora alba*	-5	OBL	Nt P-Sedge	BEAK-RUSH	H,F
RIBLAC	6	*Ribes lacustre*	-3	FACW	Nt Shrub	SWAMP BLACK CURRANT	C
		Rosa sp.					
ROSPAL	5	*Rosa palustris*	-5	OBL	Nt Shrub	SWAMP ROSE	H
RUBPUB	4	*Rubus pubescens*	-4	FACW+	Nt P-Forb	DWARF RASPBERRY	H
		Salix spp					
SARPUR	10	*Sarracenia purpurea*	-5	OBL	Nt P-Forb	PITCHER-PLANT	F
SCIHUD	10	*Scirpus hudsonianus*	-5	[OBL]	Nt P-Sedge	BULRUSH	C
SILPRA	*	*SILENE PRATENSIS*	5	[UPL]	Ad A-Forb	WHITE CATCHFLY	H
SMIRAC	5	*Smilacina racemosa*	3	FACU	Nt P-Forb	FALSE SPIKENARD	H
SMITRI	10	*Smilacina trifolia*	-5	OBL	Nt P-Forb	FALSE MAYFLOWER	C,H,F
SOLDUL	*	*SOLANUM DULCAMARA*	0	FAC	Ad P-Forb	BITTERSWEET NIGHTSHADE	C
SOLRUG	3	*Solidago rugosa*	-1	FAC+	Nt P-Forb	ROUGH GOLDENROD	C,F
SOLULI	4	*Solidago uliginosa*	-5	OBL	Nt P-Forb	BOG GOLDENROD	C,F
SORAME	4	*Sorbus americana*	-1	FAC+	Nt Tree	AMERICAN MOUNTAIN-ASH	H
STRROS	5	*Streptopus roseus*	0	FAC	Nt P-Forb	ROSE TWISTED-STALK	H

TAXCAN	5	*Taxus canadensis*	3	FACU	Nt Shrub	CANADIAN YEW	C
THUOCC	4	*Thuja occidentalis*	-3	FACW	Nt Tree	ARBOR VITAE	C,H
THENOV	5	*Thelypteris noveboracensis*	-1	FAC+	Nt Fern	NEW YORK FERN	C,H
THEPAL	2	*Thelypteris palustris*	-4	[FACW+]	Nt Fern	MARSH FERN	H,F
TRIBOR	5	*Trientalis borealis*	-1	FAC+	Nt P-Forb	STARFLOWER	C,H
TSUCAN	5	*Tsuga canadensis*	3	FACU	Nt Tree	HEMLOCK	C,H
TYPLAT	1	*Typha latifolia*	-5	OBL	Nt P-Forb	BROAD-LEAVED CAT-TAIL	C,F
UTRINT	10	*Utricularia intermedia*	-5	OBL	Nt P-Forb	FLAT-LEAVED BLADDERWORT	C,F
VACANG	4	*Vaccinium angustifolium*	3	FACU	Nt Shrub	BLUEBERRY	H
VACOXY	8	*Vaccinium oxycoccos*	-5	OBL	Nt Shrub	SMALL CRANBERRY	H,F
VACMYR	4	*Vaccinium myrtilloides*	-2	FACW-	Nt Shrub	CANADA BLUEBERRY	C,H
VEROFF	*	*VERONICA OFFICINALIS*	5	[UPL]	Ad P-Forb	COMMON SPEEDWELL	H
VIBCAS	6	*Viburnum cassinoides*	-3	FACW	Nt Shrub	NORTHERN HAW	H,C

- Denotes non-native species.

Floristic Quality Data		**Native**		**Adventive (bold)**		**Totals**
Total Native Species	114	Tree	18.03%	Tree	####	18.03%
Total Species with Adventives	122	Shrub	18.03%	Shrub	####	18.03%
Native Mean C	5.0263	Forb	31.15%	Forb	####	37.70%
Mean C with Adventives	4.6967	Grass	3.28%	Grass	####	3.28%
Native FQI	53.666	Sedge	10.66%	Sedge	####	10.66%
FQI with Adventives	51.877	Fern	8.20%	Fern	####	8.20%
Native Mean W	-1.9561	Fern Ally	4.10%	Fern Ally	####	4.10%
Mean W with Adventives	-1.7541	**Total**	**93.44%**	**Total**	**####**	**100.00%**
Average Wetland Classification	FAC+					

Cedar Swamp		**Fen**		**Hardwood Forest**	
Floristic Quality Data		**Floristic Quality Data**		**Floristic Quality Data**	
Native Species	65	Native Species	47	Native Species	75
Total Species	70	Total Species	48	Total Species	80
Native Mean C	4.53	Native Mean C	5.79	Native Mean C	4.89
Total Mean C	4.2	Total Mean C	5.67	Total Mean C	4.59
Native FQI	36.47	Native FQI	39.67	Native FQI	42.38
Total FQI	35.14	Total FQI	39.26	Total FQI	41.03
Native Mean W	-2.02	Native Mean W	-3.48	Native Mean W	-1.51
Total Mean W	-1.87	Total Mean W	-3.47	Total Mean W	-1.23

Wetland Status	FAC+	Wetland Status	FACW	Wetland Status	FAC+