

Vascular Flora of Big Creek Woods Memorial Nature Preserve, Richland County, Illinois

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ABSTRACT

The vascular flora of Big Creek Woods Memorial Nature Preserve (BCWMNP), Richland County, Illinois was studied during the 1998 to 2001 growing seasons. A total of 237 vascular plant taxa representing 174 genera and 81 families was observed. Of those taxa, one was a gymnosperm, eight fern or fern allies, 51 monocots, and 177 dicots. The families with the largest number of taxa were the Asteraceae (22 taxa), Poaceae (17), Cyperaceae (14), Liliaceae (10), and Rosaceae (10). The state endangered plant *Stenanthium gramineum* (Ker) Morong (grass-leaved lily) was observed. The canopy vegetation of the upland forest was sampled in September 1998 and density (#/ha), basal area (m²/ha), relative density, relative dominance, importance value (IV = 200) and average diameter at breast height (dbh) were determined for each overstory tree species. Density (stems/ha) was determined for woody seedlings and small and large saplings. *Acer saccharum* Marsh. (sugar maple) was the dominant overstory species (IV = 76.8) accounting for nearly half of all trees encountered and 57.8% of trees less than 39.9 cm dbh. *Carya ovata* (Mill.) K. Koch (shagbark hickory) (IV = 24.2) and *Carya glabra* (Mill.) Sweet (pignut hickory) (IV = 21.9) were present in moderate numbers in the smaller diameter classes, but were absent from the larger diameter classes. *Quercus velutina* Lam. (black oak) and *Quercus alba* L. (white oak) were present in low numbers and had IV's of 18.7 and 18.5 respectively. Sugar maple accounted for 76.2% of large saplings encountered while *Asimina triloba* (L.) Dunal (pawpaw) dominated the small sapling category and *Fraxinus americana* L. (white ash) was the most frequently encountered seedling. Selective harvesting of oaks in the 1950's has shifted the composition of the forest from oak-hickory to sugar maple-hickory.

INTRODUCTION

Big Creek Woods Memorial Nature Preserve (BCWMNP) is a 16.2 ha (40 acre) nature preserve located approximately 5 km south of Olney, Richland County, Illinois. Frances A. Cline donated the area to the Nature Conservancy in April of 1967 as a memorial to George Cline and Julia Cline from their children. The area was formally dedicated as an Illinois nature preserve on June 25, 1970, and subsequently conveyed to the Board of Trustees of Eastern Illinois Community Colleges, District 529, as a gift on September 3, 1986. The study site is managed by Olney Central College, Olney, Illinois and serves as an interpretive center and outdoor education area. Prior to the present study, no quantita-

tive surveys had been undertaken in the preserve. The purpose of this study was to provide an assessment of the forest community and base line data for future studies.

DESCRIPTION OF THE WOODLOT

Big Creek Woods Memorial Nature Preserve (SW 1/4, SE 1/4, Sect. 15, T3N, R10E, 3 P.M.) is located in the Effingham Plain Section of the Southern Till Plain Natural Division of Illinois (Schwegman 1973). Richland County, Illinois has a continental climate characterized by hot summers and cold winters. Observations at Flora, Illinois, the nearest continuously-recording National Weather Service station, report January as the coldest month with an average high of 2° C and an average low of -7° C (The Weather Channel 2002). July is the hottest month with an average high of 31° C and an average low of 19° C. Average annual precipitation is 115.0 cm which falls mostly as rain from March through July. The average number of days between the last freeze in the spring until the first freeze in fall is 184 (Holhubner and Fehrenbacher 1972).

Big Creek Woods is situated in an area of gently rolling topography in the drainage basin of Big Creek that flows from west to east through the site. Elevation of the site ranges from 129 m to 149 m (425 to 475 feet) above sea level. Sandstone outcrops of the Mattoon formation of the Pennsylvanian System are present in the streambed and on a steep north-facing slope along Big Creek (Willman et al. 1975).

Mesic floodplain and terrace forest communities predominate on the north and east portions of the preserve while dry-mesic upland forest is restricted to the south-central portion. The floodplain forest is a young to mature forest that covers approximately 6.5 ha (16 acres). It is composed primarily of *Quercus palustris* Muenchh (pin oak), *Acer rubrum* L. (red maple), and *Liquidambar styraciflua* L. (sweet gum), with *Acer negundo* L. (box elder) and *Betula nigra* L. (river birch) as lesser associates. This area had been cleared and farmed until about 1940 (Big Creek Woods Memorial Committee 1971). The soil of the floodplain forest is deep, poorly drained, nearly level Belknap silt loam that is subject to frequent flooding of short duration during the wetter portions of the year (Holhubner and Fehrenbacher 1972).

The upland forest is mature third growth forest composed primarily of *Acer saccharum* Marsh. (sugar maple), *Carya* spp. (hickory) and *Quercus* spp. (oak) and covers approximately 9.7 ha (24.0 acres). Most of the larger *Quercus alba* L. (white oak) were harvested around 1953 for use in the production of barrel staves (Big Creek Woods Memorial Committee 1971). The soil of the upland forest is well-drained Hickory loam that formed in Illinoian glacial till overlain with loess (Holhubner and Fehrenbacher 1972).

METHODS

Observations to determine the vascular flora of the site were conducted during the growing seasons of 1998 to 2001. Voucher specimens for each species were collected, identified, and deposited in the Stover-Ebinger Herbarium at Eastern Illinois University, Charleston, Illinois. Nomenclature follows Mohlenbrock (1986). Designation of introduced species follows Mohlenbrock (1986) and Gleason and Cronquist (1991).

In September 1998, three transect lines were established in an east-west orientation along compass lines at sixty meter intervals in the upland portion of the Preserve. Nested circular plots of 0.03, 0.01, 0.001, and 0.0001 ha were established at 30 meter intervals along each transect line. Four additional 0.001 and 0.0001 ha plots were established seven meters from the center of each plot in each of the cardinal compass directions. Number, diameter, and species were recorded for all trees 10 cm dbh or larger in each of the 0.03 ha plots. The number of large saplings equal to or greater than 2.5 cm but less than 10 cm dbh was recorded in each 0.01 ha plot. The number of small saplings equal to or greater than 50 cm in height but less than 2.5 cm in diameter was recorded in the 0.001 ha plot and the number of woody seedlings less than 50 cm in height was recorded in each 0.0001 ha plot. Dead-standing trees were also measured and identified. Density (trees/ha), basal area (m²/ha), relative density, relative dominance, importance value (IV = 200), and average diameter (cm) were determined for each overstory tree species. Density (stems/ha) was determined for large and small saplings and woody seedlings.

The Floristic Quality Index (FQI) was determined for the preserve using the coefficient of conservatism (C value) assigned to each species by Taft et al. (1997). The C value for each taxon in the Illinois flora was determined by assigning each an integer from 0 to 10 based on the species tolerance to disturbance and its fidelity to habitat integrity. Non-native species and native species that are most successful in damaged habitats are assigned a C value of 0. Species that are restricted to natural areas are assigned C values of 10. The average C value is determined by summing all C values and dividing that number by species richness (N) (average C value = $\sum C \text{ value}/N$). Thus, the FQI is a weighted index of the species richness (N), and is the arithmetic product of the average C value and the square root of the species richness (\sqrt{N}) of an inventory site [FQI = average C value(\sqrt{N})]. For relatively small areas that are fairly intensively studied floristically, the FQI can provide rapid means of comparison, and an indication of the floristic integrity of the site.

A nested circular plot was centered over the grass-leaved lily population to assess ground cover and associate species. Ground cover, herbaceous taxa, woody taxa less than 50 cm tall, shrubs and small saplings were sampled in a 0.01 ha plot. Large saplings and trees greater 10 cm dbh were sampled in a 0.03 ha plot.

RESULTS

Overstory and woody understory composition and structure

A total of 22 tree species was encountered during the sampling of the overstory. Of that number, *Cornus florida* L. (flowering dogwood), *Cercis canadensis* L. (redbud) and *Sassafras albidum* (Nutt.) Nees (sassafras) were understory trees that have little potential of reaching the canopy (Table 1). Overall tree density was 370.7 trees/ha and total basal area was 26.261 m²/ha. Tree density and diversity were greatest in the plots along the southernmost transect line. An average of seven tree species was encountered in each of the eleven plots. Tree density in plots located along that transect line averaged 466 trees/ha. The remaining plots located along the two transect lines near the center of the woodlot averaged only four tree species per plot with two plots containing only sugar maple. Tree density in plots along those transect lines averaged 316 trees/ha.

Sugar maple was the dominant overstory tree accounting for nearly half of all individuals encountered (Table 1). It was particularly abundant in the 10 to 29.9 cm diameter classes where it accounted for 64% of the trees encountered. Sugar maple also had the highest relative dominance (27.4) and importance value (76.8).

Carya ovata (Mill.) K. Koch (shagbark hickory) was second in importance value and relative density in the overstory trees (Table 1). It was evenly distributed in the smaller diameter classes, but was not encountered in the larger diameter classes. *Carya glabra* (Mill.) Sweet (pignut hickory) ranked third in importance value being present in low numbers in most diameter classes. *Carya tomentosa* (Poir.) Nutt. (mockernut hickory) was present in low numbers in the medium diameter classes.

Quercus velutina Lam. (black oak) and white oak ranked fourth and fifth respectively in importance value because of their larger diameters, between 40 and 50 cm. Both species were present in low numbers in the smaller diameter classes. The remaining overstory trees were present in very low numbers with densities less than 4.5 stems /ha and I.V.'s below 4.0.

Four dead-standing trees were encountered. These included one *Platanus occidentalis* L. (sycamore) - 75.9 cm dbh, one *Fraxinus americana* L. (white ash) - 15.0 cm dbh, one hickory - 13.1 cm dbh and one flowering dogwood - 10.5 cm dbh.

Understory composition and structure

A total of 25 species was encountered during the sampling of the understory. Of that number, *Euonymus atropurpurea* Jacq. (wahoo), *Sambucus canadensis* L. (elderberry), *Staphylea trifolia* L. (bladdernut), *Symphoricarpos orbiculatus* Moench (coralberry) and *Viburnum prunifolium* L. (black haw) were native shrubs. *Amelanchier arborea* (Michx. f.) Fern. (serviceberry), *Asimina triloba* (L.) Dunal (pawpaw), and red bud were understory trees and *Lonicera maackii* (Rupr.) Maxim. (bush honey suckle) was a non-native shrub. Sugar maple ranked first in density in the large sapling category, accounting for over 76% of the individuals encountered (Table 2). It ranked in third in density among the small saplings. Oaks and hickories were nearly absent in the large sapling category and were present in low numbers in the small sapling category.

White ash was the most abundant species in the woody seedling category (Table 2). *Prunus serotina* Ehrh. (wild black cherry) and sugar maple were present in moderate numbers. Hickories were present in low numbers while the oaks were nearly absent.

With the exception of pawpaw and *Ulmus rubra* Muhl. (red elm), most understory tree species were not well represented. Pawpaw was present in moderate numbers in the seedling and sapling categories, but no individuals exceeded 10 cm dbh. This species, which commonly root sprouts, had a clumped distribution, being restricted to lower elevations and more mesic slopes.

Red elm in the seedling and small sapling categories was scattered throughout the forest in relatively high numbers as root sprouts from mature individuals. Few actual seedlings were encountered. Similar results have been observed in other upland forests of east-central Illinois where as many as 95% of red elm saplings were sprouts from horizontal root

systems (Davis et al. 1998). Such root sprouts are relatively short-lived, rarely exceeding nine years in age.

Flowering dogwood and redbud averaged about 1 stem/ha, had extremely low IV's, and were nearly absent from the seedling and sapling categories. Redbud and serviceberry were restricted to the edge of the woods or the more open areas near Big Creek.

In the shrub category, wahoo and bladdernut were present on the more mesic slopes. Coralberry was present in the drier, more disturbed areas in the southwest portion of the preserve.

The present study indicates that BCWMNP is a sugar maple-shagbark hickory forest which represents a dramatic shift in the composition of the forest since presettlement times. Prior to settlement, the tree density of the upland forests in neighboring Lawrence and Crawford Counties was about 150 trees/ha with the dominant trees being white oak, black oak, and hickories (Edgin 1996, Edgin and Ebinger 1997). At nearly 371 trees/ha, the average tree density at Big Creek Woods is about 2.5 times that of presettlement conditions.

The most frequent understory species in the presettlement upland forests of Lawrence and Crawford Counties were black oak, white oak, hickories, elms, and *Corylus americana* Walt. (hazelnut) (Edgin 1996, Edgin and Ebinger 1997). These species are present in low or moderate numbers in most categories at BCWMNP. The predominance of sugar maple among the smaller diameter trees and in the seedling and sapling categories combined with the relative lack of other species would indicate that the forest has shifted to a sugar maple forest. Oak and hickory species have essentially been eliminated from the sapling categories due to shading and it is highly unlikely that those individuals present in the seedling category will survive to become mature specimens. This shift from an oak-hickory forest toward a sugar maple forest is indicative of many forests in Illinois (McClain and Ebinger 1968, Newman and Ebinger 1985, Roovers and Shifley 1997, Shotola et al. 1992).

A total of 237 species and subspecific taxa in 174 families and 81 genera was encountered in the study area (Appendix I). Of that number, 22 (10.8%) were non-native taxa with bush honeysuckle and *Lonicera japonica* Thunb. (Japanese honeysuckle) being particularly abundant in the southern portion of the Preserve. Families with the largest number of individual taxa were the Asteraceae (22 taxa), Poaceae (17), Cyperaceae (14), Liliaceae (10), and Rosaceae (10). Genera with the largest number of individual taxa were *Carex* (12 taxa), *Quercus* (7) and *Polygonum* (5).

The average C value for BCWMNP was 3.47 when all species were included in the calculation and 3.82 when the calculation included only the native species. Of the species encountered, only *Stenanthium gramineum* and *Uvularia sessilifolia* L. (sessile-leaved bellwort) had C values higher than seven. The floristic integrity, as measured using the FQI, was 50.88 when the calculation included all species and 58.81 when the calculation included only native species. Areas with an FQI of 35 or higher may be regionally noteworthy while sites with an FQI of 45 or higher may be of statewide significance (Taft et al. 1997). Although the FQI for BCWMNP is relatively high, this value seems to be more

a function of species richness rather than the integrity of the habitat in which the species occur.

Stenanthium gramineum

The population of grass-leaved lily consisted of 106 plants. One flowering plant was observed during the growing season of 2000 and four flowering plants were observed in 2001. Twelve of the plants were rather small, possessing one to three basal leaves that were less than 30 cm in length, and may be seedlings.

The population appears to be stable, but is confined to an area about 3 m wide and 4 m long near the crest of a north-facing slope. Ground cover consisted of leaf litter (95%), bare soil (4%) and sandstone (1%). The soil in the vicinity of the plants was somewhat sandy in texture with fragments of sandstone bedrock just below the surface, but did not appear to be subject to erosion. Soil disturbance and invasion by non-native species are perhaps the greatest threats to this population.

Tree density in the plot centered over *Stenanthium* population averaged 275 trees /ha and included white oak, black oak, *Quercus rubra* L. (red oak), shagbark hickory, pignut hickory, sugar maple, and *Fraxinus pennsylvanica* Marsh. (green ash). Large sapling density was 325 stems/ha with flowering dogwood and sugar maple being the only species encountered. Small sapling density was 1400 stems/ha with pawpaw, sugar maple, red elm, white ash, and wild black cherry being encountered.

Associated herbaceous and woody taxa less than 50 cm tall included sugar maple, bush honeysuckle, *Asarum canadense* L. var. *reflexum* (Bickn.) Robbins (wild ginger), *Carex* spp., *Cystopteris protrusa* (Weatherby) Blasd. (fragile fern), *Galium circaezans* Michx. (wild licorice), *Impatiens capensis* Meerb. (spotted touch-me-not), *Osmorhiza longistylis* (Torr.) DC var. *villicailis* Fern. (sweet cicely), *Parthenocissus quinquefolia* (L.) Planch. (Virginia creeper), *Phryma leptostachya* L. (lopseed), wild black cherry, *Sanicula* spp. (snakeroot), *Smilacina racemosa* (L.) Desf. (false Solomon's seal) and *Smilax* spp. (cat-briar).

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Table 1. Density (#/ha) by diameter class (cm), total density (#/ha), basal area (m²/ha), relative values, importance value, and average diameter (cm) of tree species encountered during sampling at Big Creek Woods Memorial Nature Preserve, Richland County, Illinois.

Species	Diameter classes (cm)							Total Density (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	I.V.	Avg. Diam. (cm)
	10.0-19.9	20.0-29.9	30.0-39.9	40.0-49.9	50.0-59.9	69.9	70+						
<i>Acer saccharum</i>	113.4	40.0	19.9	8.9	1.1	--	--	183.3	7.216	49.4	27.4	76.8	20.3
<i>Carya ovata</i>	15.5	8.9	12.3	8.9	--	--	--	45.6	3.128	12.2	12.0	24.2	27.4
<i>Carya glabra</i>	9.9	9.9	11.3	1.1	5.6	--	--	37.8	3.056	10.2	11.7	21.9	29.5
<i>Quercus velutina</i>	--	1.1	2.2	5.6	5.6	1.1	2.2	17.8	3.645	4.8	13.9	18.7	49.4
<i>Quercus alba</i>	4.4	1.1	2.2	7.9	2.2	2.2	1.1	21.1	3.371	5.7	12.8	18.5	41.7
<i>Fraxinus americana</i>	6.8	1.1	3.3	3.3	2.2	1.1	--	17.8	2.113	4.8	8.0	12.8	33.4
<i>Carya tomentosa</i>	--	1.1	1.1	1.1	2.2	--	--	5.5	0.802	1.5	3.1	4.6	41.7
<i>Platanus occidentalis</i>	--	--	2.2	1.1	1.1	--	--	4.4	0.693	1.2	2.6	3.8	3.9
<i>Nyssa sylvatica</i>	--	1.1	1.1	1.1	1.1	--	--	4.4	0.600	1.2	2.3	3.5	40.1
<i>Acer rubrum</i>	--	1.1	--	3.3	--	--	--	4.4	0.579	1.2	2.2	3.4	39.9
<i>Ulmus americana</i>	3.3	1.1	1.1	--	--	--	--	5.5	0.217	1.5	0.8	2.3	21.3
<i>Celtis occidentalis</i>	4.4	1.1	--	--	--	--	--	5.5	0.122	1.5	0.5	2.0	15.9
<i>Prunus serotina</i>	2.2	1.1	--	--	--	--	--	3.3	0.104	0.9	0.4	1.3	18.5
<i>Ulmus rubra</i>	2.2	1.1	--	--	--	--	--	3.3	0.087	0.9	0.3	1.2	17.5
<i>Acer negundo</i>	1.1	--	1.1	--	--	--	--	2.2	0.133	0.6	0.5	1.1	26.4
<i>Quercus rubra</i>	--	2.2	--	--	--	--	--	2.2	0.106	0.6	0.4	1.0	24.6
<i>Juglans nigra</i>	--	--	1.1	--	--	--	--	1.1	0.136	0.3	0.5	0.8	39.5
<i>Liriodendron tulipifera</i>	--	--	1.1	--	--	--	--	1.1	0.087	0.3	0.3	0.6	31.5
<i>Cornus florida</i>	1.1	--	--	--	--	--	--	1.1	0.014	0.3	0.1	0.4	12.7
<i>Cercis canadensis</i>	1.1	--	--	--	--	--	--	1.1	0.014	0.3	0.1	0.4	12.6
<i>Acer saccharinum</i>	1.1	--	--	--	--	--	--	1.1	0.026	0.3	0.1	0.4	17.3
<i>Sassafras albidum</i>	1.1	--	--	--	--	--	--	1.1	0.012	0.3	<0.1	0.3	11.7
Totals	167.6	72.0	60.0	42.3	21.1	4.4	3.3	370.7	26.261	100.0	100.0	200.0	

Table 2. Density (#/ha) of seedlings, small saplings, and large saplings encountered at Big Creek Woods Memorial Nature Preserve, Richland County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings
<i>Fraxinus americana</i>	16200	73	23
<i>Prunus serotina</i>	7666	60	--
<i>Ulmus rubra</i>	5800	906	40
<i>Acer saccharum</i>	4133	393	270
<i>Asimina triloba</i>	1866	806	6
<i>Euonymus atropurpurea</i>	1266	--	--
<i>Carya</i> spp.	933	--	--
<i>Celtis occidentalis</i>	866	46	--
<i>Carya cordiformis</i>	533	13	--
<i>Symphoricarpos orbiculatus</i>	400	60	--
<i>Liriodendron tulipifera</i>	266	--	--
<i>Lonicera maackii</i>	266	6	--
<i>Staphylea trifolia</i>	133	66	--
<i>Nyssa sylvatica</i>	133	13	--
<i>Amelanchier arborea</i>	133	--	--
<i>Sambucus canadensis</i>	133	--	--
<i>Quercus rubra</i>	133	--	--
<i>Quercus alba</i>	133	--	3
<i>Cercis canadensis</i>	66	20	6
<i>Gleditsia triacanthos</i>	66	--	--
<i>Quercus velutina</i>	66	--	--
<i>Carya ovata</i>	--	13	3
<i>Morus rubra</i>	--	6	--
<i>Viburnum prunifolium</i>	--	6	--
<i>Carya glabra</i>	--	--	3
Totals	41191	2487	354

APPENDIX I

The vascular flora of Big Creek Woods Memorial Nature Preserve, Richland County, Illinois is arranged alphabetically within each taxonomic group. Introduced species are indicated by an asterisk (*). Endangered species are indicated by a plus sign (+). After the binomial and author citation, the community in which the taxon was observed (1=upland forest, 2=floodplain forest, 3=sandstone outcropping) and collection number is given.

PTERIDOPHYTA

ASPLENIACEAE

Asplenium platyneuron (L.) Oakes; 1, 3;
E3437

Cystopteris protrusa (Weatherby) Blasd.; 1,
2, 3; E3436

Onoclea sensibilis L.; 2; E3595

Polystichum acrostichoides (Michx.) Schott;
1, 3; E3427

EQUISETACEAE

Equisetum arvense L.; 2; E3461

OPHIOGLOSSACEAE

Botrychium dissectum Spreng. var. *obliquum*
(Muhl.) Clute; 1, 2; E5205

Botrychium virginianum (L.) Sw.; 1, 2;
E3307

Ophioglossum vulgatum L. var.
pycnostichum Fern.; 2; E3313

GYMNOSPERMAE

CUPRESSACEAE

Juniperus virginiana L.; 1; E3299

MONOCOTYLEDONAE

ARACEAE

Arisaema dracontium (L.) Schott; 1, 2;
E5464

Arisaema triphvllum (L.) Schott; 1, 2; E3300

CYPERACEAE

Carex blanda Dewey; 1, 2; E3316

Carex davisii Schwein. & Torr.; 2; E3468

Carex frankii Kunth.; 2; E3656

Carex glaucoidea Tuckerm.; 1; E5189

Carex grayi Carey; 2; E3473

Carex grisea Wahlenb.; 1; E3593

Carex hirsutella Mack.; 2; E3466

Carex hirtifolia Mack.; 2; E3442

Carex jamesii Schwein.; 2; E3470

Carex lupulina Willd.; 2; E5170

Carex projecta Mack.; 2; E3472

Carex rosea Willd.; 2; E5465

Carex squarrosa L.; 2; E3469

Scirpus atrovirens Willd.; 2; E5466

COMMELINACEAE

Tradescantia subaspera Ker.; 2; E3677

Tradescantia virginiana L.; 1; E3455

DIOSCOREACEAE

**Dioscorea batatas* Dcne.; 3; E3452

Dioscorea quaternata Walt.; 1; E3447

IRIDACEAE

Iris shrevei Small; 2; E5171

JUNCACEAE

Juncus tenuis Willd.; 1; E3480

LILIACEAE

Allium canadense L.; 1, 2; E5467

Erythronium albidum Nutt.; 1, 2; E3208

Erythronium americanum Ker.; 2; E3207

Lilium michiganense Farw.; 2; E3432

**Ornithogalum umbellatum* L.; 2; E5468

Polygonatum commutatum (Schult.) A.

Dietr.; 1, 2; E5468a

Smilacina racemosa (L.) Desf.; 1, 2; E3428

+*Stenanthium gramineum* (Ker) Morong; 1;
E3592

Trillium recurvatum Beck.; 1, 2; E3197

Uvularia sessilifolia L.; 2; E3310

POACEAE

Agrostis hyemalis (Walt.) BSP; 1; E3682

**Bromus commutatus* Schrad.; 1; E3479
Chasmanthium latifolium (Michx.) Yates; 2;
 E3674
Cinna arundinacea L.; 2; E3679
Danthonia spicata (L.) Roem. & Schultes;
 1; E3471
 **Eleusine indica* (L.) Gaertn.; 2; E5202
Elymus canadensis L.; 2; E3672
Elymus villosus Muhl.; 2; E5208
Elymus virginicus L.; 2; E3474
Festuca obtusa Biehler; 2; E3478
Glyceria striata (Lam.) Hitchcock; 2; E3477
Leersia virginica Willd.; 2; E5186
Muhlenberia frondosa (Poir.) Fern.; 1;
 E5459
Panicum lanuginosum Ell.; 1; E3476
Panicum latifolium L.; 2; E3600, E3475
Paspalum pubiflorum Rupr. var. *glabrum*
 Vasey; 2; E3795
 **Setaria faberi* Herrm.; 2; E5213

SMILACACEAE

Smilax hispida Muhl.; 2; E3667
Smilax pulverulenta Michx.; 1; E3443

DICOTYLEDONAE

ACANTHACEAE

Ruellia strepens L.; 2; E3459

ACERACEAE

Acer negundo L.; 2; E5191
Acer rubrum L.; 2; E5168
Acer saccharinum L.; 2; E5469
Acer saccharum Marsh.; 1; E5174

AMARANTHACEAE

Amaranthus hybridus L.; 2; E5174

ANACARDIACEAE

Toxicodendron radicans (L.) Kuntze; 1, 2;
 E5470

ANNONACEAE

Asimina triloba (L.) Dunal; 1, 2; E3305

APIACEAE

Chaerophyllum procumbens (L.) Crantz.; 2;
 E3216
Cryptotaenia canadensis (L.) DC; 2; E3460
Erigenia bulbosa (Michx.) Nutt.; 2; E3212
Osmorhiza claytonii (Michx.) Clark; 1;
 E3202
Osmorhiza longistylis (Torr.) DC var.
villicaulis Fern.; 1, 2; E3302
Sanicula canadensis L.; 1, 2; E3429
Zizia aurea (L.) Koch; 2; E3306

APOCYNACEAE

Apocynum cannabinum L.; 1; E3657

ARALIACEAE

Panax quinquefolius L.; 1; E3434

ARISTOLOCHIACEAE

Aristolochia sepentaria L.; 2; E5184
Asarum canadense L. var. *reflexum* (Bickn.)
 Robbins; 2; E3312

ASTERACEAE

Ambrosia artemisiifolia L.; 2; E5160
Antennaria plantaginifolia (L.) Richards; 1;
 E5209
Aster lateriflorus (L.) Britt.; 2; E5471
Aster x sagittifolius Wedem; 1; E5452
Cacalia atriplicifolia L.; 2; E5175
Eclipta prostrata (L.) L.; 2; E5215
Erigeron annuus (L.) Pers.; 2; E3458
Erigeron philadelphicus L.; 2; E3315
Eupatorium purpureum L.; 2; E3675
Eupatorium rugosum Houtt.; 1; E3604
Eupatorium serotinum Michx.; 1; E5164
Helianthus divaricatus L.; 1; E3602
Heliopsis helianthoides (L.) Sweet; 1;
 E5176
Lactuca floridana (L.) Gaertn.; 1, 2; E5201
Rudbeckia hirta L.; 1; E5472
Rudbeckia laciniata L.; 2; E5148
Senecio glabellus Poir.; 2; E5473
Silphium perfoliatum L.; 2; E5474
Solidago canadensis L.; 1; E5451
Solidago gigantea Ait.; 1; E3804
Solidago ulmifolia Muhl.; 1; E3609
Verbesina alternifolia (L.) Britt.; 2; E5475

BALSAMINACEAE,

Impatiens capensis Meerb.; 2; E3422a,
E3658

BERBERIDACEAE

**Berberis thunbergii* DC; 1; E3213
Podophyllum peltatum L.; 1, 2; E3297

BETULACEAE

Betula nigra L.; 2; E5204

BIGNONIACEAE

Campsis radicans (L.) Seem.; 1, 2; E3591
Catalpa speciosa (Warder) Englem.; 2;
E3668

BORAGINACEAE

Cynoglossum virginianum L.; 2; E3430
Mertensia virginica (L.) Pers.; 1, 2; E3210

BRASSICACEAE

Cardamine bulbosa (Schreb.) BSP; 2;
E3308
**Cardamine hirsuta* L.; 2; E3215

CAESALPINIACEAE

Cercis canadensis L.; 1, 2; E3665
Gleditsia triacanthos L.; 2; E3445

CAPRIFOLIACEAE

**Lonicera japonica* Thunb.; 1, 2; E5153
**Lonicera maackii* (Rupr.) Maxim.; 1, 2, 3;
E5195
Sambucus canadensis L.; 1, 2; E5446
Symphoricarpos orbiculatus Moench; 1, 2;
E3211
Viburnum prunifolium L.; 1, 2; E3655

CARYOPHYLLACEAE

Silene stellata (L.) Ait. f.; 1; E3605
**Stellaria media* (L.) Vill.; 2; E3201

CELASTRACEAE

Celastrus scandens L.; 3; E5151
**Euonymus alata* (Thunb.) Sieb.; 1; E3309
Euonymus atropurpurea Jacq.; 1, 2; E3670
**Euonymus europaea* L.; 2; E5447

CONVOLVULACEAE

Calystegia sepium (L.) R.Br. spp. *americana*
(Sims) Brummitt; 2; E3601

CORNACEAE

Cornus drummondii C.A. Mey.; 2; E5476
Cornus florida L.; 1; E3298

CORYLACEAE

Carpinus caroliniana Walt.; 1, 3; E3448,
E5200
Corylus americana Walt.; 1; E5150
Ostrya virginiana (Mill.) K. Koch; 1;
E5476a

CUSCUTACEAE

Cuscuta polygonorum Engelm.; 2; E5214

EBENACEAE

Diospyros virginiana L.; 1; E5181

ELAEAGNACEAE

**Elaeagnus umbellata* Thunb.; 1; E5477

EUPHORBIACEAE

Acalypha rhomboidea Raf.; 2; E5450

FABACEAE

Amorpha fruticosa L.; 2; E5152
Apios americana Medic.; 2; E5478

FAGACEAE

Quercus alba L.; 1, 2; E5192
Quercus bicolor Willd.; 2; E5168
Quercus imbricaria Michx.; 1; E5197
Quercus macrocarpa Michx.; 2; E3433
Quercus palustris Muenchh.; 2; E5177
Quercus rubra L.; 1, 2; E5218
Quercus velutina Lam.; 1; E5272

GERANIACEAE

Geranium maculatum L.; 1; E5479

HAMAMELIDACEAE

Liquidambar styraciflua L.; 2; E3433

HYDRANGEACEAE

Hydrangea arborescens L.; 3; E3465

HYDROPHYLLACEAE

Hydrophyllum macrophyllum Nutt.; 2;
E3456

HYPERICACEAE

Hypericum punctatum Lam.; 2; E3663
Hypericum prolificum L.; 1, 2; E5206

JUGLANDACEAE

Carya cordiformis (Wang.) K. Koch; 1;
E3454
Carya glabra (Mill.) Sweet; 1; E5193
Carya ovata (Mill.) K. Koch; 1, 2; E5480
Carya tomentosa (Poir.) Nutt.; 1; E5173
Juglans nigra L.; 1, 2; E5165

LAMIACEAE

Agastache nepetoides (L.) Ktze.; 1; E5481
**Glechoma hederacea* L. var. *micranthra*
Moricand; 2; E3214
**Lamium purpureum* L.; 1, 2; E3202
Monarda bradburiana Beck.; 1; E5161
**Prunella vulgaris* L.; 2; E5155
Pycnanthemum tenuifolium Schrad.; 1;
E3660
Scutellaria incana Biehler; 1; E3608
Stachys tenuifolia Willd. var. *hispida*
(Pursh) Fern.; 2; E3681
Teucrium canadense L. var. *virginicum* (L.)
Eat.; 2; E3659

LAURACEAE

Lindera benzoin (L.) Blume; 2; E5482
Sassafras albidum (Nutt.) Nees; 1; E5207

MAGNOLIACEAE

Liriodendron tulipifera L.; 1, 2; E3446

MENISPERMACEAE

Menispermum canadense L.; 1, 2; E3662

MORACEAE

**Maclura pomifera* (Raf.) Schneider; 1, 2;
E3673
**Morus alba* L.; 1; E5187

NYSSACEAE

Nyssa sylvatica Marsh.; 1; E5483

OLEACEAE

Fraxinus americana L.; 1, 2; E5162
Fraxinus pennsylvanica Marsh.; 1, 2; E3671

ONAGRACEAE

Circaea lutetiana Aschers. and Magnus spp.
canadensis (L.) Aschers. and Magnus; 1,
2; E3599

OXALIDACEAE

Oxalis stricta L.; 1; E3435
Oxalis violacea L.; 1; E5484

PAPAVERACEAE

Dicentra cucullaria (L.) Bernh.; 1, 2; E3200
Sanguinaria canadensis L.; 1, 2; E3198

PASSIFLORACEAE

Passiflora lutea L. var. *glabriflora* Fern.; 2;
E5163

PHYTOLACCACEAE

Phytolacca americana L.; 1; E3596

PHRYMACEAE

Phryma leptostachya L.; 1; E3603

PLATANACEAE

Platanus occidentalis L.; 2; E3666

POLEMONIACEAE

Phlox divaricata L. spp. *laphamii* (Wood)
Wherry; 1, 2; E3209
Phlox paniculata L.; 2; E3669
Polemonium reptans L.; 2; E3303

POLYGONACEAE

**Polygonum cespitosum* Blum. var.
longisetum (Debruyn) Stewart; 2; E3453,
E3716
Polygonum hydropiperoides Michx.; 2;
E5203
**Polygonum persicaria* L.; 2; E5448
Polygonum punctatum Ell.; 2; E3803
Polygonum virginianum L.; 1, 2; E3661
**Rumex crispus* L.; 2; E3451

PORTULACACEAE

Claytonia virginica L.; 1, 2; E3206

PRIMULACEAE

**Lysimachia nummularia* L.; 2; E3440

RANUNCULACEAE

Anemone virginiana L.; 1; E3606

Actaea pachypoda Ell.; 1; E3589

Clematis virginiana L.; 2; E5156

Delphinium tricorne Michx.; 1; E3304

Hydrastis canadensis L.; 1; Not collected

Isopyrum biternatum (Raf.) Torr. & Gray; 2;
E3204

Ranunculus abortivus L.; 2; E2203

Ranunculus septentrionalis Poir.; 2; E3462,
E3317

ROSACEAE

Agrimonia rostellata Wallr.; 1; E3606,
E5154

Amelanchier arborea (Michx. f.) Fern.; 2;
E5485

Aruncus dioicus (Walt.) Fern.; 2; E3464

Geum canadense Jacq.; 1; E5159

Geum vernum (Raf.) Torr. & Gray; 1; E5486

Prunus serotina Ehrh.; 1, 2; E5198

**Rosa multiflora* Thunb.; 1, 2; E5180

Rosa palustris Marsh.; 2; E5487

Rosa setigera Michx.; 2; E3590

Rubus occidentalis L.; 1; E5488

RUBIACEAE

Cephalanthus occidentalis L.; 2; E3449

Galium aparine L.; 2; E3437

Galium circaeazans Michx.; 1; E3438

Galium concinnum Torr. & Gray; 2; E3441

SALICACEAE

Populus deltoides Marsh.; 2; E5489

Salix nigra Marsh.; 2; E5490

SAURURACEAE

Saururus cernuus L.; 2; E5185

SAXIFRAGACEAE

Penthorum sedoides L.; 2; E5210

SCROPHULARIACEAE

Penstemon digitalis Nutt.; 1; E3463

Scrophularia marilandica L.; 2; E5188

SOLANACEAE

Physalis heterophylla Nees; 2; E5217

Solanum ptycanthum Dunal; 2; E5216

STAPHYLEACEAE

Staphylea trifolia L.; 1; E5182

ULMACEAE

Celtis occidentalis L.; 1, 2; E5190

Ulmus americana L.; 1, 2; E5199

Ulmus rubra Muhl.; 1, 2; E5179

URTICACEAE

Boehmeria cylindrica (L.) Sw.; 2; E3678

Laportea canadensis (L.) Wedd.; 2; E3678

Parietaria pensylvanica Muhl.; 1; E3599

Pilea pumila (L.) Gray; 1, 2; E5149

VERBENACEAE

Verbena urticifolia L.; 2; E3664

VIOLACEAE

Hybanthus concolor (T. F. Forst.) Spreng.;
1; E5183

Viola pubescens Ait. var. *eriocarpa*
(Schwein.) Russell; 1, 2; E3311

Viola striata Ait.; 2; E3314

Viola sororia Willd.; 1, 2; E3205

VITACEAE

Parthenocissus quinquefolia (L.) Planch.; 1,
2; E5158

Vitis aestivalis Michx.; 1, 2; E3444