



ILLINOIS
NATURAL
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SURVEY

Vascular Flora of Middle Fork Woods Nature Preserve, Vermilion County, Illinois

Richard L. Larimore, Loy R. Phillippe, and John E. Ebinger

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ABSTRACT

The vascular flora of Middle Fork Woods Nature Preserve, Vermilion County, Illinois, was studied during the growing seasons of 1999–2002. A total of 376 species were found: 12 ferns, fern-allies, and gymnosperms; 99 monocots; and 265 dicots. The three families with the largest number of species were the Poaceae (44), Asteraceae (39), and Cyperaceae (34, 29 of which were members of the genus *Carex*). The overstory and woody understory of six forest communities were surveyed: a mature second growth dry-mesic upland forest dominated by *Quercus alba* (white oak) and *Q. velutina* (black oak); an old growth, dry-mesic savanna dominated by *Q. alba* with a dense understory of *Acer saccharum* (sugar maple); SW-facing and NE-facing forested slopes of a mesic ravine, both dominated by *A. saccharum* and *Q. alba*; a southern flatwood forest/ephemeral pond community dominated by *Q. bicolor* (swamp white oak); and an immature second growth dry-mesic upland forest dominated by *Q. alba* and *Carya ovata* (shagbark hickory). Ground layer plants were surveyed in spring and fall in the dry-mesic upland forest communities, and for each species the relative cover, relative frequency, and importance values were determined. The preserve, comprised mostly of oak-hickory forest communities, was found to be in relatively good ecological condition. Mature and maturing second-growth oaks were present throughout much of the preserve. Sugar maples dominated the understory and, along with the dense overstory, were apparently limiting oak regeneration. The non-natives *Lonicera* spp. (bush honeysuckles), *Elaeagnus umbellata* (autumn olive), *Alliaria petiolata* (garlic mustard), and the native sugar maple, will continue to need to be controlled. Prescribed fire is recommended to limit populations of these species.

INTRODUCTION

The 32.4-ha Middle Fork Woods Nature Preserve (MFWNP) is located in central Vermilion County, along the eastern border of central Illinois, within the 1,153-ha Kickapoo State Park. The Middle Fork of the Vermilion River, about 27 km of which is designated as a National Scenic River, runs through the park. Approximately 2 km north of MFWNP, on the west side of the river, is the Middle Fork State Fish and Wildlife Area, encompassing 1,700 ha. North of Kickapoo Park and east of the river is the 1,214-ha Kennekuk Cove County Park. The Middle Fork of the Vermilion River forms the preserve boundary on the east, with old strip-mine land and lakes beyond the river. The land north of the preserve is logged and grazed upland forest and to the west a small creek forms the boundary, along with a county road and privately owned woods. An old-field of early successional native forest species that contains an abundance of exotic plant species lies to the south. This old-field was used as a base camp for the Civilian Conservation Corps (CCC) from 1939 to 1942 (McClain 1984, Wallace 1975).

The forest communities of MFWNP were previously studied (Wallace 1975), but the results of this investigation were not published. The MFWNP is one of nine dedicated nature preserves in Vermilion County. Of these preserves, the vegetation of only a few has been studied. Larimore et al. (1999) examined the forests at Horseshoe Bottom Nature Preserve, while Ebinger (1981) studied the glacial drift hill prairie at Windfall Prairie Nature Preserve. Though not a dedicated nature preserve, the vegetation of the Vermilion River Observatory was recently examined (Phillippe et al. 2003).

Much of the land surface within Kickapoo State Park was strip-mined and the park is currently composed of strip-mine lakes and mounds of mine spoils now covered with an abundance of successional vegetation and numerous invasive exotic species. During the strip mining operations MFWNP was not mined. Before being dedicated as a nature preserve in 1979, the area was subjected to disturbances, particularly selective timber cutting in the early 1900s, and was probably grazed until 1939 (McClain 1984). Presently the forests are recovering and the MFWNP has a high diversity of plant and animal life. The

present study was undertaken to document the vascular flora of the preserve and to determine the composition and structure of the forest communities present.

DESCRIPTION OF THE STUDY AREA

Situated within the Vermilion River Section of the Wabash Border Natural Division, the MFWNP is on the Wisconsin Till Plain about 80 km north of the terminal moraine of Wisconsin glaciation (Schwegman et al. 1973). This level region, exposed by the retreating Wisconsinan glaciation, was dissected by rapid down-cutting by post-glacial rivers, resulting in the presently entrenched Middle Fork of the Vermilion River. This area is presently characterized by rugged topography along major streams that are surrounded by relatively flat uplands. Pre-settlement vegetation was mostly wet-mesic to dry forests in ravines and on the dissected uplands, with mesic prairie, savanna, and open woodlands on flat to gently rolling uplands (Anderson 1991, Ebinger and McClain 1991).

The area now known as MFWNP was in private ownership from the early 1800s to the late 1930s (Wallace 1975). Between 1910 and 1915 the United Electric Coal Company purchased large tracts of forest along the west bank of the Middle Fork of the Vermilion River including all of the land now comprising MFWNP, and logged parts of the uplands for mine timbers. In 1939 the State of Illinois purchased the land from the United Electric Coal Company and started developing the site into Kickapoo State Park. Since 1942 the area that became the MFWNP has been relatively undisturbed though a few paths were developed, and a picnic area was maintained where the savanna community presently exists (Fig. 1). When MFWNP was dedicated in 1979, the trails and the picnic area were abandoned (McFall and Karnes 1995). A loop trail through the preserve was being maintained at the time of our study.

This 28-ha preserve, with an additional 4.4 ha of buffer, is located approximately 7.7 km west of Danville, Illinois (SE1/4 Sec 32, T20N R12W and N1/2 Sec 5, T19N R12W). The elevation varies from 167.6 m above sea level at the river to 195.0 m in the uplands. The climate of east-central Illinois is continental with cool winters, hot summers, and little or no water deficit in any season of the year (Page 1949, Fehrenbacher et al. 1967, Schwegman et

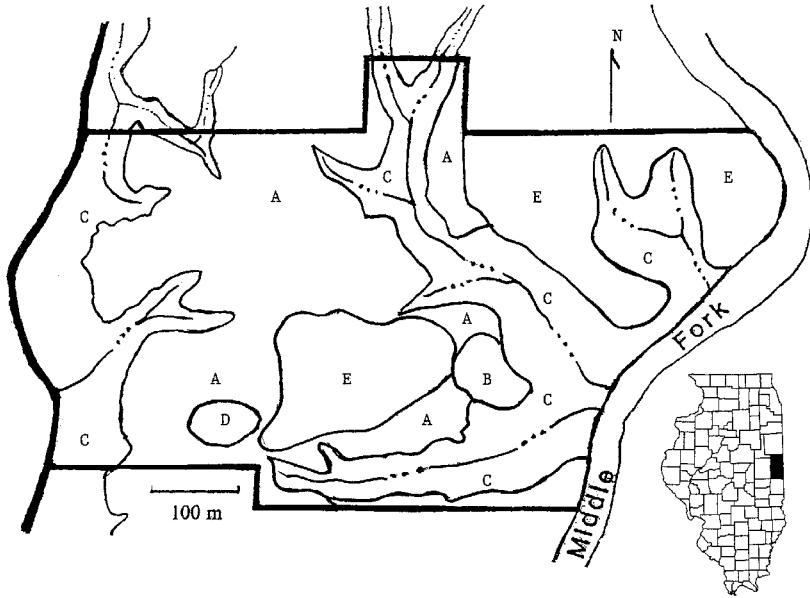


Figure 1. Forest communities within Middle Fork Woods Nature Preserve, Vermilion County, Illinois. (A) mature second growth dry-mesic upland forest, (B) old growth dry-mesic savanna, (C) mesic ravine upland forest, (D) southern flatwood forest/ephemeral pond, and (E) immature second growth dry-mesic upland forest.

al. 1973). In Danville, Illinois, average annual precipitation is 102.0 cm, with the month of July having the highest rainfall with a mean average of 11.3 cm, and January and February being the driest months, each averaging 4.8 cm of precipitation. Mean average annual temperature in Danville is 11.3°C, with the hottest month being July with a mean average of 24°C and the coldest being January with a mean average of -3.8°C. The number of frost-free days varies from 170 to 180 (Midwestern Regional Climate Center 2004).

The silvery salamander (*Ambystoma platinium*), a state endangered species, is found in the preserve (Herkert 1992). This unisexual polyploid species is known from scattered sites in the eastern United States. At the MFWNP the salamander uses the ephemeral ponds in a southern flatwoods community for reproduction (Morris 1974). An additional pond has been constructed in the buffer area of the preserve to ensure an adequate water supply for this species (Herkert 1992, Mui 2004).

Further information on this study, including GPS coordinates, can be found in the Illinois Nature Preserves Commission/Natural Area files

at the Illinois Natural History Survey (INHS) Library in Champaign.

MATERIALS AND METHODS

Vascular species present: During the growing seasons of 1999, 2000, and 2001, the vascular flora of MFWNP was surveyed. Voucher specimens were collected, habitats for each species determined, and the plant communities delineated. Specimens collected were identified and deposited in the herbarium of the Illinois Natural History Survey, Champaign, Illinois (ILLS). The criteria for designating non-native taxa followed Gleason and Cronquist (1991) and Mohlenbrock (2002), whereas nomenclature follows Mohlenbrock (2002). The classification of forest community types mostly followed that of White and Madany (1978).

Overstory survey: In 2000 the overstory of the mature second growth dry-mesic upland forest at MFWNP was sampled using 0.03-ha circular plots. These plots were established at 30 m intervals along two north/south transects

(50 plots total). In each plot all living and dead-standing individuals ≥ 10.0 cm dbh were identified and their diameters recorded (Tables 1 and 2). From this data, living-stem density (stems/ha), basal area (m^2/ha), relative density, relative dominance (basal area), importance value (IV), and average diameter (cm) were calculated for each species. Determination of the IV follows the procedure used by McIntosh (1957) and is the sum of the relative density and relative dominance. Density (stems/ha), basal area (m^2/ha), and average diameter (cm) were determined for dead-standing individuals.

The remaining communities were much smaller and were surveyed by dividing the majority of the area of each community into contiguous quadrats 25 m on a side, the number of quadrats being determined by the size of each area. These included: 4 quadrats in an old growth dry-mesic savanna (Table 3); 8 quadrats in a SW-facing mesic ravine forest (Table 4); 8 quadrats in a NE-facing mesic ravine forest (Table 5); 4 quadrats in a southern flatwoods forest/ephemeral pond community (Table 6), and 16 quadrats in a second growth immature dry-mesic upland forest (Table 7). The data were collected and analyzed in the same way as those for the mature second growth forest.

Woody understory survey: The woody understory composition and density (stems/ha) were determined for each forest community using nested circular plots 0.0001, 0.001, and 0.01 ha in size located at 15-meter intervals along randomly located transects within each community. Four additional 0.0001-ha circular plots were located 7 m from the center points of each plot center along cardinal compass directions. Counts were recorded of woody seedlings and shrubs (≤ 50 cm tall) in the 0.0001-ha plots, of small saplings and shrubs (> 50 cm tall and < 2.5 cm dbh) in the 0.001-ha plots, and of large saplings and shrubs (2.5–9.9 cm dbh) in the 0.01-ha plots.

Ground layer survey: The ground layers in the dry-mesic upland forest communities were surveyed in the late summer of 2001 (Tables 8 and 9) and late spring of 2002. In each community a 50 m line transect was randomly located and the ends marked with steel stakes. Along each transect 1 m^2 quadrats were spaced at 1 m intervals ($n=50/\text{transect}$), odd-numbered quadrats to the right, even-numbered to the left.

A random numbers table was used to determine the number of meters (0 to 9) the quadrat was located from the transect line. Species cover was determined using the Daubenmire cover class system (Daubenmire 1959) as modified by Bailey and Poulton (1968). Importance value (IV) for ground layer species was determined by summing relative cover and relative frequency.

RESULTS

Vascular flora: The vascular flora of MFWNP consisted of 376 species within 231 genera and 92 families. Of these species, 40 (10.6%) were not native to Illinois. Ferns, fern-allies, and gymnosperms were poorly represented at MFWNP, accounting for only 12 species (3%), whereas angiosperms accounted for the remainder. Among the angiosperms, monocots accounted for 99 species (26%) in 44 genera and 11 families, while dicots accounted for 265 species (71%) in 181 genera and 73 families. Families with the most species were: Poaceae (44 species), Asteraceae (39), Cyperaceae (34), Rosaceae (16), Brassicaceae (12), Lamiaceae (11), Apiaceae (11), Ranunculaceae (10), and Scrophulariaceae (10). These taxa are listed in Appendix I.

Mature second growth dry-mesic upland forest: Covering most of the western half of MFWNP, this community was dominated by *Quercus alba* (white oak), which accounted for more than one-third of the overstory trees (138.5 stems/ha), half of the total basal area (16.762 m^2/ha), and nearly half of the IV (90 out of 200). *Quercus velutina* (black oak) ranked second with an IV of 33.3, and *Acer saccharum* (sugar maple) was third with an IV of 22.5 (Table 1). The oaks dominated the larger diameter classes as suggested by their average diameters of 37.3 cm dbh and 42.9 cm dbh, respectively. *Acer saccharum*, in contrast, was common in the smaller diameter classes as indicated by an average dbh of 15.0 cm. *Acer saccharum* was also common in the seedling and sapling categories. Dead-standing individuals averaged 43.5 stems/ha with the oaks being well represented (Table 2). A total of 33 woody species were encountered in this community (Table 1).

The woody understory of the upland forest was dominated by numerous small seedlings of

Fraxinus americana (white ash) along with the shrubs *Lindera benzoin* (spicebush) and *Viburnum prunifolium* (black haw), while the woody vine *Parthenocissus quinquefolia* (Virginia creeper) was also common (Tables 1 and 8). During the fall survey the dominant herbaceous species of the ground layer included *Sanicula odorata* (common black snakeroot), *Viola sororia* (woolly blue violet), *Antenoron virginianum* (Virginia knotweed), and *Galium concinnum* (shining bedstraw) (Table 8). During the spring survey the dominant ground layer species were *Podophyllum peltatum* (Mayapple), *Dentaria laciniata* (toothwort), and *Circaea lutetiana* (enchanter's nightshade) along with the same dominant species documented in the fall survey.

Old growth dry-mesic savanna: Located on the flat uplands adjacent to the mesic ravine, this small savanna was less than one ha in size. The overstory was dominated by widely spaced open-grown individuals of *Quercus alba* that averaged 80 stems/ha with an average diameter of 67.1 cm dbh, an average basal area of 30.124 m²/ha, and an IV of 165.2 (Table 3). Only a few other tree species exceeded 25 cm dbh, all with only a few stems/ha. *Acer saccharum* dominated the seedling and sapling categories though many other trees and a few shrub species were common (Table 3). In contrast, *Q. alba* was poorly represented in the sapling categories with no individuals being recorded. The extensive sapling understory of *A. saccharum* has developed since the picnic area was abandoned when the preserve was dedicated in 1979.

Mesic ravine upland forest: In the eastern part of the preserve is a mesic ravine dominated by mature second growth upland forest. Oriented northwest/southeast the SW- and NE-facing slopes were dominated by *Acer saccharum*, which accounted for nearly half of the stems/ha and more than one-third of the basal area (Tables 4 and 5). *Quercus alba* was second in IV on both slopes while most of the remainder comprised mesic species commonly associated with deep ravines in east-central Illinois. *Acer saccharum* accounted for more than half of the woody seedlings and saplings in this ravine.

Southern flatwood forest/ephemeral pond: This small community located near the southwestern edge of MFWNP is less than one ha in size. *Quercus bicolor* (swamp white oak)

dominated the overstory with an IV of nearly 139 and accounted for nearly 60% of the stems/ha and 85% of the basal area in the pond. *Quercus alba* was fairly common with an IV of 24.2 (Table 6). Swamp white oak was the only tree species found in the standing water, the other species were confined to the edges of the ephemeral pond or to slightly elevated areas. Woody seedlings and saplings were nearly absent from the ephemeral pond, but some were occasionally encountered in slightly elevated areas. Herbaceous vegetation was sparse, probably due to the presence of standing water and dense shade from the overstory.

Immature second growth dry-mesic upland forest: This immature second growth forest is located near the center of the preserve and had been heavily harvested for timber 70 to 80 years ago (Wallace 1975). Tree species composition was similar to the mature second growth forest in the western part of MFWNP. Tree density averaged 436 stems/ha with the large majority of the individuals less than 35 cm dbh. *Quercus alba* was the dominant overstory species with 162 stems/ha, a basal area of 11.771 m²/ha, and an IV of 76.9 (Table 7). *Carya ovata* (shagbark hickory) was second in importance with an IV of 53.1, followed by *Quercus rubra* (red oak) and *Q. velutina* with IV's of 28.4 and 13.0, respectively. All other tree species had IVs of less than 10. Dead-standing individuals averaged 55 stems/ha with an average basal area of 1.527 m²/ha (Table 2). Tree seedlings and saplings were relatively common, but numerous shrubs dominated the woody understory with *Viburnum prunifolium* (black haw) being the most important (Table 7).

The woody understory of the immature second growth upland forest was dominated by a few tree seedlings and shrubs with *Viburnum prunifolium*, *Fraxinus americana*, *Viburnum recognitum* (smooth arrowwood) common along with the woody vine *Parthenocissus quinquefolia* (Tables 7 and 9). During the fall survey the dominant herbaceous species of the ground layer included *Antenoron virginianum*, *Carex* spp. (sedges), *Sanicula odorata*, and *Viola sororia* (Table 9). During the spring survey the ground layer vegetation included *Podophyllum peltatum*, *Prenanthes altissima* (tall white lettuce), *Dentaria laciniata*, and

various species of *Carex* along with the same dominant species found during the fall survey.

DISCUSSION

Wallace (1975) studied the composition and structure of the forest vegetation at MFWNP during the 1970s; at that time the MFWNP had a total stand density of 477.61 stems/ha, a total basal area of 25.64 m²/ha, with 27 tree and shrub species encountered. *Quercus alba* was the dominant species, with an IV of 75.34 (total possible 300), average of 135.71 stems/ha and a basal area of 7.96 m²/ha. *Q. velutina* was second in importance (IV of 36.61), followed by *Acer saccharum* (IV of 35.47), *Q. rubra* (IV of 24.70), *Carya ovata* (IV of 23.16), and *Fraxinus americana* (IV of 21.82). Wallace (1975) also determined the average age of the trees in each community based on increment borings (at 1.37 meters) of the leading dominant species ≥ 9 cm dbh. Average tree age was the lowest in the immature second growth dry-mesic upland forest, and highest in the mesic ravine forest where some of the largest trees had 124 annual rings when surveyed in 1974. In the upland forests tree age averaged 48 annual rings in the immature upland forest and 62 annual rings in the more mature upland forest.

Mature second growth dry-mesic upland forest: In this forest type Wallace (1975) recorded 468 stems/ha with a basal area of 28.45 m²/ha of which *Quercus alba* (IV of 162.54), *Q. velutina* (IV of 31.58), and *Acer saccharum* (IV of 26.75) accounted for 74% of the total IV. In 2002 tree density averaged 353 stems/ha with a basal area of 32.995 m²/ha. The dominants remained the same as those observed by Wallace (1975) and accounted for 73% of the total IV. The general trend over the past 25 years at the MFWNP has been a decrease in stems/ha with a corresponding increase in basal area/ha, whereas the composition of the overstory changed slightly.

Old growth dry-mesic savanna: When Wallace (1975) conducted his study at MFWNP, the savanna was maintained as a picnic area. Many of the large open-grown white oaks are still present, which now average 80 stems/ha. The picnic area is no longer maintained and the major change in this community has been the explosive increase of a woody understory

dominated by *Acer saccharum*, *Fraxinus americana*, *Prunus serotina*, and *Sassafras albidum* (Table 3).

Mesic ravine upland forest: Wallace (1975) described an *Acer saccharum*-*Tilia americana* community with small inclusions of a *Quercus rubra*-*Quercus alba* community in the steep ravines on the southwestern and western edges of MFWNP. Found exclusively within these steep ravines, this community averaged 447 trees/ha with an average basal area of 24.45 m²/ha (Wallace 1975); *Acer saccharum* was the dominant species with an IV of 96.58, followed by *Tilia americana* (IV of 40.51), *Quercus alba* (IV of 33.97), and *Q. rubra* (IV of 25.68). During the present survey *A. saccharum* was the dominant species, whereas *Q. alba* was second in IV (Tables 4 and 5). *Tilia americana* and *Q. rubra* were reduced in importance, but still were common forest components. Also, *A. saccharum* continued to dominate the understory, accounting for more than half of the seedlings and saplings.

Southern flatwood forest/ephemeral pond: This community, which is restricted to a shallow depression often filled with water to 0.5 meters in depth from February to June, was dominated by *Quercus bicolor*. Two other species (*Carya ovata* and *Fraxinus americana*) were present at the edges of the depression (Wallace 1975). During the present study similar results were obtained though we recorded a few individuals of *Q. alba*, *Q. rubra*, and *Ulmus americana* in the pond that were not recorded by Wallace (1975).

Immature second growth dry-mesic upland forest: In 1974 the immature second growth dry-mesic upland forest trees averaged 525 stems/ha with a basal area of 20.68 m²/ha. *Carya ovata* ranked first in importance (IV of 65.6) followed by *Quercus imbricaria* (shingle oak) and *Q. alba* (Wallace 1975). In this forest community in 2002, tree density averaged 436 stems/ha and the basal area averaged 29.68 m²/ha. A shift in species dominance also occurred in the past 25 years; *Q. alba* became dominant, and along with *C. ovata*, accounted for 65% of the total IV (Table 7). *Quercus imbricaria* was poorly represented, having been replaced by *Q. rubra* and *Q. velutina*. A relatively long distance to a seed source at the time of logging

probably explains a lower importance of *Acer saccharum* in this community.

forest in the early 1900s and by fire suppression and the cessation of grazing 50–60 years ago.

Successional trends: Wallace (1975) did not find *Asimina triloba* (pawpaw) or *Lindera benzoin* (spicebush) at MFWNP. Both may be recent arrivals, but it was more likely that these two species were scattered and uncommon on the preserve in the early 1970s. *Asimina triloba* is fire-sensitive, and when top-killed sprouts readily, often requiring two or more burns before dying (Larimore et al. 2003). *Lindera benzoin* is also easily top-killed by fire but re-sprouts rapidly. The absence of fire since the site became a dedicated nature preserve has probably been important in the increased presence of these two species as well as *Acer saccharum* and *Viburnum prunifolium*. These fire-sensitive, shade-tolerant species will probably continue to increase in importance in the future.

The upland forests of MFWNP have been undergoing substantial changes during the past 50–60 years. We have no definite evidence that fires were used in this forest before being dedicated as a nature preserve, but burning of grazing areas was common in Illinois during the early and middle 1900s (Miller 1920). With the absence of fire, the encroachment of mesic, fire-sensitive, shade-tolerant woody species, such as *Acer saccharum* and *Fagus grandiflora*, has been increasing dramatically (Ebinger 1986, Anderson 1991, Ebinger and McClain 1991, Abrams 1992, Packard 1993, McClain and Elzinga 1994). *Acer saccharum* continues to dominate the overstory and the woody understory of the ravine forests, and is an important component of the mature second growth dry-mesic upland forest where it is third in IV and dominates the large sapling layer. Also, a few saplings of *F. grandiflora* were encountered in the upland forests. This fire-sensitive species, however, is mostly restricted to the SE-facing slope of the ravine where it ranked fourth in importance. If this trend toward more mesic conditions continues, oak regeneration will likely decrease, as will the presence of other fire-resistant, shade-intolerant species. This increase in the number of *A. saccharum* and *F. grandifolia*, and the resulting decrease of oak regeneration, probably started with the reduction in landscape fires soon after Europeans settled the area (Ebinger and McClain 1991), and was accelerated with the cutting of the

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Table 1. Size class density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the woody species in a mature second growth dry-mesic upland forest at Middle Fork Woods Nature Preserve, Vermilion County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings	Trees (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	IV	Av. Diam (cm)
<i>Quercus alba</i>	560	--	--	138.5	16.762	39.2	50.8	90.0	37.3
<i>Quercus velutina</i>	--	--	--	44.5	6.823	12.6	20.7	33.3	42.9
<i>Acer saccharum</i>	600	100	360	65.5	1.277	18.6	3.9	22.5	15.0
<i>Carya ovata</i>	1120	20	22	28.0	1.602	7.9	4.9	12.8	24.6
<i>Quercus rubra</i>	--	--	--	15.0	2.467	4.3	7.5	11.8	43.2
<i>Carya glabra</i>	200	--	--	21.0	1.573	6.0	4.8	10.8	27.7
<i>Fraxinus americana</i>	6040	160	32	12.5	1.164	3.6	3.5	7.1	33.3
<i>Tilia americana</i>	--	20	6	6.5	0.232	1.9	0.7	2.6	18.8
<i>Sassafras albidum</i>	280	40	44	5.5	0.135	1.6	0.4	2.0	16.9
<i>Ulmus americana</i>	200	20	86	5.0	0.060	1.4	0.2	1.6	12.3
<i>Quercus imbricaria</i>	40	--	--	2.0	0.256	0.6	0.8	1.4	39.9
<i>Ulmus rubra</i>	--	--	42	2.5	0.126	0.7	0.4	1.1	24.3
<i>Gleditsia triacanthos</i>	40	--	--	1.0	0.255	0.3	0.8	1.1	56.4
<i>Lindera benzoin</i>	5360	340	--	--	--	--	--	--	--
<i>Viburnum prunifolium</i>	3240	400	--	--	--	--	--	--	--
<i>Ribes missouriense</i>	440	--	--	--	--	--	--	--	--
<i>Viburnum recognitum</i>	240	100	--	--	--	--	--	--	--
<i>Zanthoxylum americanum</i>	160	120	--	--	--	--	--	--	--
<i>Lonicera maackii</i>	120	--	--	--	--	--	--	--	--
Others (14 species)	2000	20	206	5.5	0.263	1.3	0.6	1.9	--
Totals	20640	1340	798	353.0	32.995	100.0	100.0	200.0	--

Table 2. Tree density (#/ha), basal area (m²/ha), and average diameters (cm) of the dead-standing woody species in a mature second growth dry-mesic upland forest and an immature second growth dry-mesic upland forest at Middle Fork Woods Nature Preserve, Vermilion County, Illinois.

Species	Density (#/ha)	Basal Area (m ² /ha)	Average Diameter (cm)
Mature Second Growth Upland Forest			
<i>Quercus alba</i>	20.0	1.047	23.1
<i>Quercus velutina</i>	14.5	1.661	36.5
<i>Fraxinus americana</i>	2.0	0.139	26.9
<i>Quercus rubra</i>	2.0	0.133	27.1
Others	5.0	0.163	--
Totals	43.5	3.143	--
Immature Second Growth Upland Forest			
<i>Quercus alba</i>	37.0	0.914	17.5
<i>Sassafras albidum</i>	8.0	0.154	15.5
<i>Quercus rubra</i>	4.0	0.194	24.7
<i>Carya ovata</i>	4.0	0.176	21.7
Others	2.0	0.089	--
Totals	55.0	1.527	--

Table 3. Size class density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the woody species in an old growth dry-mesic savanna at Middle Fork Woods Nature Preserve, Vermilion County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings	Trees (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	IV	Av. Diam. (cm)
<i>Quercus alba</i>	750	--	--	80.0	30.124	69.1	96.1	165.2	67.1
<i>Acer saccharum</i>	40250	12250	425	12.0	0.156	10.4	0.5	10.9	12.8
<i>Fraxinus americana</i>	5750	2500	238	8.0	0.376	6.9	1.2	8.1	21.6
<i>Ulmus rubra</i>	1250	--	25	4.0	0.400	3.4	1.3	4.7	35.7
<i>Tilia americana</i>	--	--	--	4.0	0.152	3.4	0.5	3.9	22.0
<i>Juglans nigra</i>	--	--	--	4.0	0.080	3.4	0.2	3.6	16.1
<i>Ostrya virginiana</i>	1000	--	25	4.0	0.064	3.4	0.2	3.6	14.2
<i>Carya ovata</i>	2250	375	--	--	--	--	--	--	--
<i>Sassafras albidum</i>	2000	125	375	--	--	--	--	--	--
<i>Prunus serotina</i>	750	875	300	--	--	--	--	--	--
<i>Celtis occidentalis</i>	--	--	13	--	--	--	--	--	--
<i>Viburnum prunifolium</i>	6750	1125	25	--	--	--	--	--	--
<i>Viburnum recognitum</i>	500	500	75	--	--	--	--	--	--
<i>Elaeagnus umbellata</i>	250	--	25	--	--	--	--	--	--
<i>Lonicera maackii</i>	250	--	25	--	--	--	--	--	--
Totals	61750	17750	1551	116.0	31.352	100.0	100.0	200.0	--

Table 4. Size class density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the woody species in a SW-facing mesic ravine upland forest at Middle Fork Woods Nature Preserve, Vermilion County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings	Trees (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	IV	Av. Diam. (cm)
<i>Acer saccharum</i>	79600	2900	260	120.0	9.676	46.4	37.3	83.7	29.8
<i>Quercus alba</i>	2000	--	--	40.0	7.296	15.5	28.1	43.6	45.7
<i>Populus grandidentata</i>	--	--	--	30.0	1.458	11.6	5.6	17.2	24.5
<i>Fagus grandifolia</i>	600	200	20	16.0	1.938	6.2	7.5	13.7	35.9
<i>Quercus rubra</i>	200	--	--	12.0	1.722	4.7	6.6	11.3	37.9
<i>Tilia americana</i>	--	--	10	6.0	1.006	2.2	3.9	6.1	42.5
<i>Fraxinus americana</i>	8200	1000	--	4.0	0.974	1.6	3.8	5.4	49.5
<i>Juglans nigra</i>	--	--	--	6.0	0.262	2.2	1.0	3.2	23.5
<i>Quercus velutina</i>	--	--	--	4.0	0.408	1.6	1.6	3.2	35.5
<i>Carya ovata</i>	1000	--	--	4.0	0.262	1.6	1.0	2.6	28.8
<i>Quercus muhlenbergii</i>	--	--	--	2.0	0.388	0.8	1.5	2.3	49.7
<i>Ulmus rubra</i>	--	--	--	4.0	0.174	1.6	0.7	2.3	22.1
<i>Sassafras albidum</i>	1400	100	--	4.0	0.162	1.6	0.6	2.2	22.4
<i>Prunus serotina</i>	3400	--	--	2.0	0.150	0.8	0.6	1.4	30.9
<i>Ulmus americana</i>	200	--	--	2.0	0.036	0.8	0.1	0.9	15.2
<i>Ostrya virginiana</i>	2600	300	90	2.0	0.018	0.8	0.1	0.9	10.5
<i>Carya cordiformis</i>	2000	500	--	--	--	--	--	--	--
<i>Cornus florida</i>	400	--	--	--	--	--	--	--	--
<i>Viburnum recognitum</i>	1200	--	--	--	--	--	--	--	--
<i>Elaeagnus umbellata</i>	600	100	--	--	--	--	--	--	--
<i>Lindera benzoin</i>	200	100	--	--	--	--	--	--	--
<i>Morus rubra</i>	--	100	--	--	--	--	--	--	--
Totals	103600	5300	380	258.0	25.930	100.0	100.0	200.0	

Table 5. Size class density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the woody species in a NE-facing mesic ravine upland forest at Middle Fork Woods Nature Preserve, Vermilion County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings	Trees (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	IV	Av. Diam. (cm)
<i>Acer saccharum</i>	15800	2600	660	128.0	11.024	65.3	44.4	109.7	29.1
<i>Quercus alba</i>	--	--	--	12.0	5.494	6.2	22.2	28.4	76.0
<i>Juglans nigra</i>	--	--	--	12.0	2.434	6.2	9.8	16.0	48.8
<i>Ulmus rubra</i>	--	--	20	16.0	0.266	8.2	1.1	9.3	14.3
<i>Quercus muhlenbergii</i>	--	--	--	4.0	1.376	2.0	5.6	7.6	66.1
<i>Carya glabra</i>	400	--	--	4.0	1.208	2.0	4.9	6.9	62.0
<i>Carya ovata</i>	400	--	--	6.0	0.690	3.1	2.8	5.9	33.9
<i>Quercus rubra</i>	--	--	--	2.0	1.044	1.0	4.2	5.2	81.5
<i>Sassafras albidum</i>	--	--	--	4.0	0.596	2.0	2.4	4.4	43.6
<i>Carya cordiformis</i>	--	100	--	2.0	0.352	1.0	1.4	2.4	47.4
<i>Tilia americana</i>	--	--	--	2.0	0.182	1.0	0.7	1.7	34.0
<i>Fraxinus americana</i>	9000	--	--	2.0	0.102	1.0	0.4	1.4	25.4
<i>Ulmus americana</i>	200	--	--	2.0	0.020	1.0	0.1	1.1	11.1
<i>Ostrya virginiana</i>	--	--	20	--	--	--	--	--	--
<i>Celtis occidentalis</i>	--	--	10	--	--	--	--	--	--
<i>Asimina triloba</i>	2400	1300	50	--	--	--	--	--	--
<i>Ribes missouriense</i>	200	--	--	--	--	--	--	--	--
Totals	28400	4000	760	196.0	24.788	100.0	100.0	200.0	

Table 6. Size class density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the woody species in a southern flatwood forest/ephemeral pond community at Middle Fork Woods Nature Preserve, Vermilion County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings	Trees (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	IV	Av. Diam. (cm)
<i>Quercus bicolor</i>	--	--	--	120.0	24.196	58.8	79.9	138.7	46.7
<i>Quercus alba</i>	--	--	--	20.0	4.356	9.8	14.4	24.2	51.3
<i>Carya ovata</i>	--	--	10	28.0	0.580	13.7	1.9	15.6	15.5
<i>Ulmus americana</i>	--	100	250	28.0	0.468	13.7	1.5	15.2	14.3
<i>Quercus rubra</i>	--	--	--	4.0	0.372	2.0	1.2	3.2	34.4
<i>Fraxinus lanceolata</i>	2000	100	10	4.0	0.328	2.0	1.1	3.1	32.2
<i>Carpinus caroliniana</i>	400	100	40	--	--	--	--	--	--
<i>Crataegus pruinosa</i>	--	--	20	--	--	--	--	--	--
<i>Ulmus rubra</i>	--	--	20	--	--	--	--	--	--
<i>Viburnum prunifolium</i>	600	--	20	--	--	--	--	--	--
<i>Viburnum recognitum</i>	400	300	120	--	--	--	--	--	--
Totals	3400	600	490	204.0	30.300	100.0	100.0	200.0	--

Table 7. Size class density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the woody species in an immature second growth dry-mesic upland forest at Middle Fork Woods Nature Preserve, Vermilion County, Illinois.

Species	Seedlings	Small Saplings	Large Saplings	Trees (#/ha)	Basal Area (m ² /ha)	Rel. Den.	Rel. Dom.	IV	Av. Diam. (cm)
<i>Quercus alba</i>	--	--	--	162.0	11.771	37.2	39.7	76.9	29.7
<i>Carya ovata</i>	1800	--	20	141.0	6.162	32.3	20.8	53.1	22.5
<i>Quercus rubra</i>	200	--	--	45.0	5.368	10.3	18.1	28.4	37.6
<i>Quercus velutina</i>	--	--	--	21.0	2.445	4.8	8.2	13.0	37.3
<i>Fraxinus lanceolata</i>	9800	900	20	18.0	1.507	4.1	5.1	9.2	31.5
<i>Carya tomentosa</i>	--	--	--	9.0	0.348	2.1	1.2	3.3	21.3
<i>Quercus imbricaria</i>	--	--	--	6.0	0.562	1.4	1.9	3.3	33.6
<i>Ulmus americana</i>	--	--	100	9.0	0.178	2.1	0.6	2.7	15.3
<i>Acer saccharum</i>	200	--	80	8.0	0.080	1.8	0.3	2.1	11.2
<i>Sassafras albidum</i>	400	200	80	6.0	0.145	1.4	0.5	1.9	16.7
<i>Tilia americana</i>	--	--	--	4.0	0.332	0.9	1.0	1.9	26.1
<i>Carya glabra</i>	--	--	--	3.0	0.202	0.7	0.7	1.4	28.4
<i>Quercus bicolor</i>	--	--	--	1.0	0.369	0.2	1.2	1.4	68.5
<i>Carya cordiformis</i>	--	--	--	2.0	0.130	0.5	0.4	0.9	28.2
<i>Gleditsia triacanthos</i>	200	--	--	1.0	0.081	0.2	0.3	0.5	32.2
<i>Prunus serotina</i>	800	--	40	--	--	--	--	--	--
<i>Viburnum prunifolium</i>	21200	4400	40	--	--	--	--	--	--
<i>Viburnum recognitum</i>	800	100	--	--	--	--	--	--	--
<i>Zanthoxylum americanum</i>	800	400	--	--	--	--	--	--	--
<i>Corylus americana</i>	200	--	--	--	--	--	--	--	--
<i>Lindera benzoin</i>	200	--	--	--	--	--	--	--	--
<i>Crataegus pruinosa</i>	--	--	30	--	--	--	--	--	--
Totals	36600	6000	410	436.0	29.680	100.0	100.0	200.0	--

Table 8. Frequency (%), average cover, relative frequency, relative cover, and importance values of the ground layer species encountered in early fall in a mature second growth dry-mesic upland forest at Middle Fork Woods Nature Preserve, Vermilion County, Illinois. Only species with an importance value of ≥ 1.0 are listed.

Species	Frequen- cy%	Mean Cover	Relative Frequency	Relative Cover	IV
<i>Lindera benzoin</i>	62	5.49	14.2	55.6	69.8
<i>Sanicula odorata</i>	86	1.03	19.8	10.4	30.2
<i>Viola sororia</i>	36	0.28	8.3	2.8	11.1
<i>Fraxinus americana</i>	30	0.40	6.9	4.1	11.0
<i>Parthenocissus quinquefolia</i>	34	0.27	7.8	2.7	10.5
<i>Carya ovata</i>	22	0.51	5.1	5.2	10.3
<i>Antenoron virginianum</i>	32	0.26	7.4	2.6	10.0
<i>Galium concinnum</i>	12	0.45	2.7	4.6	7.3
<i>Ulmus</i> spp.	18	0.09	4.1	0.9	5.0
<i>Carex</i> spp.	12	0.16	2.7	1.6	4.3
<i>Viburnum prunifolium</i>	12	0.16	2.7	1.6	4.3
<i>Rubus</i> spp.	8	0.04	1.8	0.4	2.2
<i>Carya cordiformis</i>	4	0.12	0.9	1.2	2.1
<i>Phryma leptostachya</i>	6	0.03	1.4	0.3	1.7
<i>Actaea pachypoda</i>	4	0.07	0.9	0.7	1.6
<i>Lonicera maackii</i>	4	0.07	0.9	0.7	1.6
<i>Solidago ulmifolia</i>	4	0.07	0.9	0.7	1.6
<i>Dioscorea villosa</i>	4	0.02	0.9	0.2	1.1
<i>Ageratina altissima</i>	2	0.06	0.5	0.6	1.1
<i>Geum canadense</i>	4	0.02	0.9	0.2	1.1
<i>Oxalis stricta</i>	4	0.02	0.9	0.2	1.1
<i>Quercus velutina</i>	4	0.02	0.9	0.2	1.1
<i>Ribes missouriense</i>	2	0.06	0.5	0.6	1.1
<i>Scutellaria incana</i>	2	0.06	0.5	0.6	1.1
<i>Vitis</i> spp.	4	0.02	0.9	0.2	1.1
Others (11 species)		0.11	5.5	1.1	6.6
Totals		9.89	100.0	100.0	200.0
Average bare ground/litter		85.45			

Table 9. Frequency (%), average cover, relative frequency, relative cover, and importance values of the ground layer species encountered in early fall in an immature second growth dry-mesic upland forest at Middle Fork Woods Nature Preserve, Vermilion County, Illinois. Only species with an importance value of ≥ 1.0 are listed.

Species	Frequen- cy%	Mean Cover	Relative Frequency	Relative Cover	IV
<i>Viburnum prunifolium</i>	68	7.22	8.9	33.9	42.8
<i>Antenoron virginianum</i>	78	3.04	10.2	14.4	24.6
<i>Fraxinus americana</i>	70	2.70	9.1	12.8	21.9
<i>Carex</i> spp.	54	2.22	7.0	10.5	17.5
<i>Sanicula odorata</i>	68	0.99	8.9	4.8	13.7
<i>Parthenocissus quinquefolia</i>	56	0.68	7.3	3.2	10.5
<i>Carya ovata</i>	38	0.83	4.9	3.9	8.8
<i>Viola sororia</i>	44	0.27	5.7	1.3	7.0
<i>Viburnum recognitum</i>	28	0.19	3.6	0.9	4.5
<i>Sassafras albidum</i>	6	0.66	0.8	3.1	3.9
<i>Galium concinnum</i>	20	0.10	2.6	0.5	3.1
<i>Aster lanceolatus</i>	18	0.09	2.3	0.4	2.7
<i>Bromus pubescens</i>	12	0.26	1.5	1.2	2.7
<i>Solidago ulmifolia</i>	14	0.17	1.8	0.8	2.6
<i>Rubus</i> spp.	12	0.21	1.5	1.0	2.5
<i>Toxicodendron radicans</i>	16	0.08	2.0	0.4	2.4
<i>Ageratina altissima</i>	8	0.24	1.0	1.1	2.1
<i>Phlox divaricata</i>	12	0.06	1.5	0.3	1.8
<i>Prunus serotina</i>	12	0.06	1.5	0.3	1.8
<i>Stellaria longifolia</i>	6	0.13	0.8	0.6	1.4
<i>Geum canadense</i>	8	0.04	1.0	0.2	1.2
<i>Osmorhiza</i> spp.	8	0.04	1.0	0.2	1.2
<i>Quercus imbricaria</i>	8	0.04	1.0	0.2	1.2
<i>Ulmus</i> spp.	6	0.08	0.8	0.4	1.2
<i>Podophyllum peltatum</i>	4	0.12	0.5	0.6	1.1
Others (29 species)		0.77	12.8	3.0	15.8
Totals		21.29	100.0	100.0	200.0
Average bare ground/litter		79.45			

APPENDIX I

Vascular plant species encountered at the Middle Fork Woods Nature Preserve, Vermilion County, Illinois are listed alphabetically by family under major plant groups. All specimens were collected by R.L. Larimore and are deposited in the Illinois Natural History Survey herbarium, Champaign (ILLS). An asterisk indicates non-native (exotic) species (*). After the binomial, authority, and author's collecting number, the community number(s) where the species were collected or observed are given. (1 = mature second growth dry-mesic upland forest; 2 = dry-mesic savanna; 3 = mesic ravine forest; 4 = southern flatwood forest/ephemeral pond; 5 = immature second growth dry-mesic upland forest; 6 = east-facing bluff above river (dry upland); 7 = perennial stream; 8 = west-facing bluff above creek (dry upland).

SPHENOPHYTA

EQUISETACEAE

Equisetum arvense L., 262;3
Equisetum hyemale L., 263;3

PTERIDOPHYTA

ASPLENIACEAE

Asplenium platyneuron (L.) Oakes, 482;6

DRYOPTERIDACEAE

Athyrium filix-femina (L.) Martens, 179;1
Cystopteris protrusa (Weatherby) Blasdell, 187, 495;8
Polystichum acrostichoides (Michx.) Schott, 259, 733;2,3,5,6,8

ONOCLEACEAE

Onoclea sensibilis L., 44;1,5

OPHIOGLOSSACEAE

Botrychium virginianum (L.) Sw., 127;1,3,5
Ophioglossum vulgatum L., 741;1

PTERIDACEAE

Adiantum pedatum L., 258;3

THELYPTERIDACEAE

Phegopteris hexagonoptera (Michx.) Fee, 552, 721;1,5

CONIFEROPHYTA

CUPRESSACEAE

Juniperus virginiana L., 730;1,2,5,6,8

ANTHOPHYTA – MONOCOTYLEDONAE

ARACEAE

Arisaema dracontium (L.) Schott, 99;1,3,5
Arisaema triphyllum (L.) Schott, 102;1,3,5

COMMELINACEAE

**Commelina communis* L., 461;7
Tradescantia subaspera Ker, 253;7
Tradescantia virginiana L., 163, 184;6,8

CYPERACEAE

Carex albicans Willd., 68;6
Carex albursina Sheldon, 85;3
Carex amphibola Steud., 155;5
Carex blanda Dewey, 103;1
Carex buxbaumii Wahl., 144;4
Carex cephalophora Muhl., 75, 90;6,7
Carex conjuncta Boott, 135, 735;3,7
Carex davisii Schwein. & Torr., 77;6
Carex digitalis Willd., 86A, 112;1,3
Carex festucacea Schk., 729;3
Carex frankii Kunth, 354;7
Carex gracilescens Steud., 40, 79;4,5
Carex gracillima Schwein., 80, 743;4
Carex granularis Muhl., 151;5
Carex grisea Wahl., 78, 88;3,4
Carex hirsutella Mack., 124;1
Carex hirtifolia Mack., 76;6
Carex hitchcockiana Dewey, 125;1
Carex jamesii Schwein., 108;1
Carex laxiculmis Schwein., 88A, 154, 158;3
Carex molesta Mack., 134, 724;7
Carex normalis Mack., 744;5
Carex pennsylvanica Lam., 105;1,2,5,6,8
Carex radiata (Wahl.) Small, 82;4
Carex rosea Schk., 72, 111, 161;1,5,6,8
Carex shortiana Dewey, 145;5
Carex sparganioides Muhl., 70, 178;6
Carex squarrosa L., 149;5
Carex vulpinoidea Michx., 129;7
Cyperus odoratus L., 306;7
Cyperus squarrosus L., 299, 333;7
Cyperus strigosus L., 455;7
Eleocharis erythropoda Steud., 130;7
Hemicarpha micrantha (Vahl) Pax, 465, 526;7

DIOSCOREACEAE

Dioscorea villosa L., 505;5

IRIDACEAE

Sisyrinchium angustifolium Mill., 152;5

JUNCACEAE

Juncus tenuis Willd., 324;6,8

LILIACEAE

Allium burdickii (Hanes) A.G. Jones,

178a;1,2,3,5,6,8

Allium canadense L., 81;1,2,3,5,6,8

Polygonatum commutatum (Schult.) A. Dietr., 739;8

Smilacina racemosa (L.) Desf., 727;3

Trillium flexipes Raf., 34;3

Trillium recurvatum Beck., 45;1,2,3,5,6,8

Uvularia grandiflora Sm., 69;3

ORCHIDACEAE

Corallorhiza odororhiza (Willd.) Nutt., 484;5

Liparis liliifolia (L.) Rich., 169, 323;6

POACEAE

Agrostis gigantea Roth, 277;7

Agrostis perennans (Walt.) Tuckerm., 316, 550;1,2,3,5,6,8

Brachyelytrum erectum (Roth) P. Beauv., 185;3

Bromus latiglumis (Shear) Hitchc., 284;7

Bromus pubescens Muhl., 174;1,2,5,6,8

Chasmanthium latifolium (Michx.) Yates, 283;7

Cinna arundinacea L., 363;1,2,3,4,5,6,7,8

**Dactylis glomerata* L., 146;5

Danthonia spicata (L.) Roem. & Schultes, 269;6,7

Diarrhena obovata (Gl.) Brandenburg, 260;3,7

Dichantherium acuminatum (Sw.) Gould & Clark, 121, 270, 181;1,5,6

Dichantherium clandestinum (L.) Gould, 137, 177;3,7

Digitaria filiformis (L.) Koel., 463;7

**Digitaria sanguinalis* (L.) Scop., 527;7

**Echinochloa crus-galli* (L.) P. Beauv., 295;7

Elymus canadensis L., 346;7

Elymus hystrix L., 173;1,2,3,4,5,6,7,8

Elymus villosus Muhl., 172;5

Elymus virginicus L., 138;3,7

Eragrostis frankii C.A. Meyer, 489, 533;7

Eragrostis hypnoides (Lam.) BSP., 339;7

Eragrostis pectinacea (Michx.) Nees, 464, 490;7

**Festuca arundinacea* Schreb., 140;7

Festuca subverticillata (Pers.) E.B. Alexeev, 147;1,2,5,6,8

Glyceria striata (Lam.) Hitchc., 150;1,4,5

Leersia oryzoides (L.) Swartz, 508;7

Leersia virginica Willd., 366;1,3,4,5,

Leptochloa fascicularis (Lam.) Gray, 509;7

Muhlenbergia frondosa (Poir.) Fern., 454, 486;7

Muhlenbergia sobolifera (Muhl.) Trin., 443;3

Muhlenbergia tenuiflora (Willd.) BSP., 485;7

Panicum capillare L., 528;7

Panicum dichotomiflorum Michx., 294;7

Panicum virgatum L., 349;7

Phalaris arundinacea L., 132;7

**Phleum pratense* L., 275;7

**Poa compressa* L., 122, 180;6

**Poa pratensis* L., 63;6

Poa sylvestris A. Gray, 87;3

**Setaria faberi* R.A.W. Herrm., 488;7

**Setaria glauca* (L.) P. Beauv., 342;7

**Setaria viridis* (L.) P. Beauv., 293;7

Sorghastrum nutans (L.) Nash, 467;7

Sphenopholis obtusata (Michx.) Scribn., 148;5

POTAMOGETONACEAE

**Potamogeton crispus* L., 535;7

SMILACACEAE

Smilax ecirrhata Kunth, 723;1,3,5,6,8

Smilax lasioneuron Hook., 732;6

Smilax tamnoides L., 445;1,2,3,4,5,6,7,8

ANTHOPHYTA – DICOTYLEDONAE

ACANTHACEAE

Justicia americana (L.) Vahl, 521;7

Ruellia strepens L., 460;7

ACERACEAE

Acer negundo L., 13;3,7

Acer nigrum Michx. f., 497;3

Acer saccharinum L., 297;7

Acer saccharum Marsh., 483, 538;1,2,3,4,5,6,8

AMARANTHACEAE

Amaranthus tuberculatus (Moq.) Sauer, 512, 513;7

ANACARDIACEAE

Rhus glabra L., 291, 352, 524;7

Toxicodendron radicans (L.) Kuntze, 115;1,2,3,4,5,6,7,8

ANNONACEAE

Asimina triloba (L.) Dunal, 33;3

APIACEAE

Chaerophyllum procumbens (L.) Crantz, 92;3,7

Cryptotaenia canadensis (L.) DC., 126;3,7

**Daucus carota* L., 278;7

Erigenia bulbosa (Michx.) Nutt., 1;3,6

Osmorhiza claytonii (Michx.) C.B. Clarke,
73;1,3,5,7

Osmorhiza longistylis (Torr.) DC., 740;3

Oxypolis rigidior (L.) Raf., 504;5

Sanicula canadensis L., 255;1,2,3,5,6,7,8

Sanicula odorata (Raf.) Pryer & Phillippe, 100,
238;1,2,3,5,6,7,8

Sanicula trifoliata Bickn., 265;3

Thaspium barbinode (Michx.) Nutt., 450;3

APOCYNACEAE

Apocynum cannabinum L., 353;7

ARALIACEAE

Panax quinquefolius L., 266;1,3,5

ARISTOLOCHIACEAE

Aristolochia serpentaria L., 186;3,6,8

Asarum canadense L., 53, 98;1,3,5,6,8

ASCLEPIADACEAE

Asclepias exaltata L., 395;3

Asclepias syriaca L., 726;7

ASTERACEAE

Ageratina altissima (L.) R.M. King & H. Rob.,
330;1,2,3,4,5,6,7,8

Ambrosia artemisiifolia L., 308;7

Ambrosia trifida L., 309;7

Antennaria plantaginifolia (L.) Hook., 64;6,8

Aster cordifolius L., 543, 546;3,5,6,8

Aster lanceolatus Willd., 331, 530;7

Aster lateriflorus (L.) Britt., 502,549;3,5

Aster shortii Lindl., 328;6

Bidens cernua L., 337;7

Bidens connata Muhl., 534;7

Bidens frondosa L., 547;3

Bidens vulgata Greene, 369;1,5

Conyza canadensis (L.) Cronq., 469;7

Eclipta prostrata (L.) L., 313;7

Erechtites hieracifolia (L.) Raf., 478;4

Erigeron annuus (L.) Pers., 118, 251;6,7

Erigeron philadelphicus L., 93;7

Eupatoriadelphus purpureus (L.) R. M. King &
H. Rob., 296;7

Eupatorium perfoliatum L., 545; 3

Eupatorium serotinum Michx., 357;7

Helenium autumnale L., 289, 332;7

Heliopsis helianthoides (L.) Sweet, 247;7

Lactuca floridana (L.) Gaertn., 452;3

Polymnia canadensis L., 517;7

Prenanthes altissima L., 493;1,5

Rudbeckia laciniata L., 358;7

Rudbeckia triloba L., 356;7

Senecio glabellus Poir., 91;7

Senecio obovatus Muhl., 110, 580;8

Silphium perfoliatum L., 336;7

Solidago caesia L., 506;1,3,5,6,7,8

Solidago canadensis L., 503;5

Solidago flexicaulis L., 541;3,6,8

Solidago gigantea Ait., 286, 338;7

Solidago ulmifolia Muhl., 329, 499;5,6,8

**Taraxacum officinale* Weber, 10;7

Verbesina alternifolia (L.) Britt., 285, 458;7

Vernonia gigantea (Walt.) Trel., 314;5

Xanthium strumarium L. 312;7

BALSAMINACEAE

Impatiens capensis Meerb., 448;1,3,4,5,7,8

BERBERIDACEAE

Caulophyllum thalictroides (L.) Michx., 84;3

Podophyllum peltatum L., 97;1,2,3,5,6,8

BIGNONIACEAE

**Catalpa bignonioides* Walt., 143;7

BORAGINACEAE

Mertensia virginica (L.) Pers., 11;3,7

Myosotis macrosperma Engelm., 120;6

BRASSICACEAE

**Alliaria petiolata* (Bieb.) Cavara & Grande,
48;1,2,3,5,6,7,8

Arabis canadensis L., 731;3

Arabis laevigata (Willd.) Poir., 162;8

Arabis shortii (Fern.) Gl., 83;3

**Barbarea vulgaris* R. Br. 36;7

**Brassica nigra* (L.) Koch, 355;7

Cardamine douglassii (Torr.) Britt., 2;1,4,5

Cardamine parviflora L., 74, 722;1,4,5

Dentaria laciniata Muhl., 3;1,2,3,4,5,6,7,8

Iodanthus pinnatifidus (Michx.) Steud., 139,
456;7

Rorippa palustris (L.) Besser, 274;7

**Rorippa sylvestris* (L.) Besser, 246;7

CAESALPINIACEAE

Cercis canadensis L., 47, 304;2,5,6,7,8

Gleditsia triacanthos L., 300;7

CAMPANULACEAE

Campanulastrum americanum (L.) Small,
280;3,5,6,7,8

Lobelia inflata L., 361;5

Lobelia siphilitica L., 290;7
Triodanis perfoliata (L.) Nieuwl., 119;6,7,8

CAPRIFOLIACEAE

**Lonicera japonica* Thunb., 368;1,3,5
 **Lonicera maackii* (Rupr.) Maxim., 62, 248;6
 **Lonicera morrowii* Gray, 71, 240;6
Lonicera reticulata Raf., 268;1,3,5,6,8
Sambucus canadensis L., 518;1,3,5,6,7,8
Symphoricarpos orbiculatus Moench, 439;1,5
Triosteum aurantiacum Bickn., 261, 327, 738;3
Viburnum prunifolium L., 39;1,2,5,6,8
Viburnum recognitum Fern., 165;1,4,5

CARYOPHYLLACEAE

**Cerastium fontanum* Baum, 117;6
Moehringia lateriflora (L.) Fenzl., 56;5
Silene stellata (L.) Ait. f., 236;3
Silene virginica L., 273;8
Stellaria longifolia Muhl., 55;5

CHENOPODIACEAE

**Atriplex patula* L., 514;7
 **Chenopodium album* L., 519;7

CONVOLVULACEAE

Calystegia sepium (L.) R. Br., 359;7

CORNACEAE

Cornus drummondii C.A. Mey., 157, 321;3,5
Cornus florida L., 106;1,6,8

CORYLACEAE

Carpinus caroliniana Walt., 264;1,2,3,4,5,6,7,8
Corylus americana Walt., 347;5,7
Ostrya virginiana (Mill.) K. Koch, 440;1,2,3,5,6,8

CRASSULACEAE

Sedum ternatum Michx., 554;7

ELAEAGNACEAE

**Elaeagnus umbellata* Thunb., 66;5,6

EUPHORBIACEAE

Acalypha deamii (Weatherby) Ahles, 525;7
Acalypha rhomboidea Raf., 350, 472;7
Acalypha virginica L., 481;1,2,5,6,8
Chamaesyce maculata (L.) Small, 473;7
Chamaesyce nutans (Lag.) Small, 292;7

FABACEAE

Amorpha fruticosa L., 141;7
Desmodium glutinosum (Muhl.) A. Wood, 183;6

Desmodium nudiflorum (L.) DC., 272;8

**Melilotus albus* Medic., 250;7

**Robinia pseudoacacia* L., 745;5

**Securigera varia* (L.) Lassen, 462;7

FAGACEAE

Fagus grandifolia Ehrh., 401;1,2,3,5
Quercus alba L., 319;1,2,5,6,8
Quercus bicolor Willd., 325;4
Quercus imbricaria Michx., 320, 544;5
Quercus X leana Nutt., 317, 492, 501;5
Quercus macrocarpa Michx., 322;6,7
Quercus muhlenbergii Engelm., 396, 453, 496;3,6,8
Quercus rubra L., 480, 494;3,5,6,8
Quercus velutina Lam., 399, 498;1,5,6,8

FUMARIACEAE

Dicentra cucullaria (L.) Bernh., 5;3

GERANIACEAE

Geranium maculatum L., 41, 167;3,5,6,8

GROSSULARIACEAE

Ribes missouriense Nutt., 65;1,2,3,4,5,6,7,8

HIPPOCASTANACEAE

Aesculus glabra Willd., 449;1,3,5,6,7,8

HYDRANGEACEAE

Hydrangea arborescens L., 267;1,3,5,6,7,8

HYDROPHYLLACEAE

Ellisia nyctelea L., 61;3,6
Hydrophyllum appendiculatum Michx., 89;1,3,5
Hydrophyllum virginianum L., 742;1,5

JUGLANDACEAE

Carya cordiformis (Wangenh.) K. Koch, 474;1,2,3,4,5,6,7,8
Carya glabra (Mill.) Sweet, 441;1,5,6,8
Carya laciniosa (Michx.) Loud., 326;5
Carya ovata (Mill.) K. Koch, 315;1,2,4,5,6,8
Juglans nigra L., 479;3,5,6,7,8

LAMIACEAE

Blephilia hirsuta (Pursh) Bernh., 539;3
 **Glechoma hederacea* L., 107;1,2,5,6,7,8
Lycopus americanus Muhl., 470;7
Lycopus virginicus L., 515;7
 **Mentha arvensis* L., 548;3
 **Prunella vulgaris* L., 364;5
Scutellaria incana Biehler, 241;5

Scutellaria lateriflora L., 471;7
Scutellaria ovata Hill, 182;5
Stachys tenuifolia Willd., 360;7
Teucrium canadense L., 244;7

LAURACEAE

Lindera benzoin (L.) Blume, 15;1,3,4,5
Sassafras albidum (Nutt.) Nees, 52,
 303;1,2,5,6,8

LYTHRACEAE

Ammannia coccinea Rottb., 307;7

MAGNOLIACEAE

Liriodendron tulipifera L., 477;5

MENISPERMACEAE

Menispermum canadense L., 451;1,3,4,5,6,7,8

MOLLUGINACEAE

**Mollugo verticillata* L., 348;7

MONOTROPACEAE

Monotropa hypopithys L., 442;5

MORACEAE

**Maclura pomifera* (Raf.) Schneider, 457;3,7
 **Morus alba* L., 511;7
Morus rubra L., 537;3

OLEACEAE

Fraxinus americana L., 318;1,5,6,8
Fraxinus lanceolata Borkh., 343;3,7

ONAGRACEAE

Circaea lutetiana L., 171;1,2,3,4,5,6,7,8

OROBANCHACEAE

Conopholus americana (L.) Wallr., 187,
 495;1,2,3,5,6,8

OXALIDACEAE

Oxalis fontana Bunge, 170;5
Oxalis stricta L., 128;1,3
Oxalis violacea L., 109;6

PAPAVERACEAE

Sanguinaria canadensis L., 6;3,5,6,8

PASSIFLORACEAE

Passiflora lutea L., 507;7

PHRYMACEAE

Phryma leptostachya L., 254;1,3,5,6,8

PLANTAGINACEAE

Plantago rugelii Decne., 252;7

PLATANACEAE

Platanus occidentalis L., 305;3,7

POLEMONIACEAE

Phlox divaricata L., 38;1,2,3,4,5,6,7,8
Phlox paniculata L., 281;7

POLYGALACEAE

Polygala senega L., 116;6

POLYGONACEAE

Antenoron virginianum (L.) Roberty & Vautier,
 365;1,2,3,4,5,6,7,8
Fallopia scandens (L.) Holub, 446, 523;3,5
Persicaria cespitosa (Blume) Nakai, 301;7
Persicaria lapathifolia (L.) S. F. Gray, 311;7
Persicaria pensylvanica (L.) Small, 310;7
Persicaria punctata (Ell.) Small, 367, 529;3,4,7
 **Persicaria vulgaris* Webb & Moq., 282;7
Rumex altissimus Wood, 142;7
 **Rumex crispus* L., 136;7

PORTULACEAE

Claytonia virginica L., 4;1,2,3,4,5,6,7,8

PRIMULACEAE

Dodecatheon meadia L., 35;8
Lysimachia lanceolata Walt., 904;5
 **Lysimachia nummularia* L., 468;7
Samolus parviflorus Raf., 520;7

RANUNCULACEAE

Actaea pachypoda Ell., 104;1,3,5
Anemone virginiana L., 239;3,6
Enemion biternatum Raf., 7;3,5,6,7,8
Hepatica americana (DC.) Ker, 14;3,6,8
Hydrastis canadensis L., 95, 734;1,2,5
Ranunculus abortivus L., 49;2,5,7
Ranunculus recurvatus Poir., 96;1,5
Ranunculus sceleratus L., 522;7
Ranunculus septentrionalis Poir., 37, 43;5,7
Thalictrum dasycarpum Fisch. & Lall, 447;3

ROSACEAE

Agrimonia parviflora Sol., 475;3,4,5
Agrimonia pubescens Wallr., 362;1,5,6,8
Agrimonia rostellata Wallr., 271;1,5,6,8
Amelanchier arborea (Michx. f.) Fern., 176;5
Crataegus crus-galli L., 491;1,5
Crataegus pruinosa (Wendl.) K. Koch, 58;1,5
Geum canadense Jacq., 237;1,2,3,4,5,6,7,8

Geum vernum (Raf.) Torr. & Gray,
46;1,2,3,4,5,6,7,8
Malus coronaria (L.) Mill., 59;5
Potentilla simplex Michx., 168;1,2,3,5,6,8
Prunus serotina Ehrh., 57;1,2,5,6,8
**Rosa multiflora* Thunb., 131;1,2,3,5,6,7,8
Rosa setigera Michx., 487;7
Rubus flagellaris Willd., 166;1,5
Rubus occidentalis L., 476;1,3,4,5,6,7
Rubus pensilvanicus Poir., 133;1,3,4,5,6,7

RUBIACEAE

Cephalanthus occidentalis L., 725;7
Galium aparine L., 50, 51, 160;1,2,3,4,5,6,7,8
Galium circaeans Michx., 123,
242;1,2,3,5,6,7,8
Galium concinnum Torr. & Gray,
60;1,2,3,4,5,6,8
Galium obtusum Bigel., 164, 257;1,3,4,5,6,7,8
Galium triflorum Michx., 243;1,2,3,5,6,7,8

RUTACEAE

Zanthoxylum americanum Mill., 175;1,2,5

SALICACEAE

Populus deltoides Marsh., 302;7
Populus grandidentata Michx., 398;5
Salix amygdaloides Anderss., 288;7
Salix nigra Marsh., 444, 532;3,7

SAXIFRAGACEAE

Penthorum sedoides L., 287;7

SCROPHULARIACEAE

Dasistoma macrophylla (Nutt.) Raf., 279;7
Gratiola neglecta Torr., 256;4
Leucospora multifida (Michx.) Nutt., 341;7
Lindernia dubia (L.) Pennell, 466;7
Mimulus alatus Sol., 542;3
Mimulus ringens L., 340;7
Penstemon pallidus Small, 551;3
Scrophularia marilandica L., 459;7
**Verbascum thapsus* L., 334;7
Veronica peregrina L., 94;7

SOLANACEAE

Physalis subglabrata Mack. & Bush, 531;7
Solanum carolinense L., 276;
Solanum ptychanthum Dunal, 298, 351;7

STAPHYLEACEAE

Staphylea trifolia L., 159;3,7

TILIACEAE

Tilia americana L., 400;3,5,6,8

ULMACEAE

Celtis occidentalis L., 736;3
Ulmus americana L., 12;1,3,4,5,7
Ulmus rubra Muhl., 482a;1,3,5

URTICACEAE

Boehmeria cylindrica (L.) Sw., 510;3,7
Laportea canadensis (L.) Wedd., 536;3
Pilea pumila (L.) Gray, 516, 540;3,7
Urtica gracilis Ait., 737;3

VERBENACEAE

Phyla lanceolata (Michx.) Greene, 245;7
Verbena urticifolia L., 249;7

VIOLACEAE

Viola pubescens Ait., 9, 101;1,3,4,5,7
Viola sororia Willd., 8, 42;1,2,3,4,5,6,7,8
Viola striata Ait., 156;3,4,5,7

VITACEAE

Parthenocissus quinquefolia (L.) Planch.,
344;1,3,4,5,6,7,8
Vitis aestivalis Michx., 397, 553;1,2,5
Vitis riparia Michx., 345;3,7

Notes

Illinois Natural History Survey
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