FOREST VEGETATION OF BEALL WOODS NATURAL AREA, WABASH COUNTY, ILLINOIS

John E. Ebinger

Botany Department

Eastern Illinois University

Charleston, Illinois 61920

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INTRODUCTION

The Beall Woods Natural Area is located about five miles southwest of Mt. Carmel, Wabash County, Illinois (S11 T2S R13W), in the Bottomlands Section of the Wabash Border Division adjacent to the Wabash River (Schwegman 1973). The preserve is traversed by Coffee Creek and its tributary Sugar Creek, both of which are influenced by flooding of the Wabash River. A flood stages of 30 feet on the Wabash River reach the 400 foot contour in the preserve, flooding about half of the nearly 300 forested acres of Beall Woods. At that time all of the lowlands of Coffee and Sugar Creeks are covered with water, which inundates the floodplains and terraces along these stream.

The area was acquired by the Illinois Department of Conservation in 1965, and dedicated as a nature preserve on 24 January 1966. The high quality forests, both in the lowlands as well as the uplands, and the large size of many trees, some of which are of record size for Illinois, are the reason the woods was dedicated. Also, a small sandstone cliff along Coffee

Creek is of high quality. This near virgin forest has been subjected to varying degrees of disturbance over the last 200 years but only relatively few tree have been removed. According to Ashby and Ozment (1967) past use of the woods included grazing by hogs and cattle, hunting, and the removal of most black walnuts over 12 inches dbh along with a few large sweet gums, burr oaks and tulip trees. Since dedication in 1966, the woods has not been disturbed except for the construction of some trails.

During the past 35 year two scientific studied have been published concerning the preserve. Lindsey (1962) conducted a survey of the overstory of the lowland and upland forests using one-fifth aerial strips, 20 in each the lowland and upland forests. The densities, basal areas, relative values and importance values were given for the tree species present in each forest. Later Ashby and Ozment (1967) prepared a checklist of the vascular plant species present and described the eight forest cover types present. The present study was undertaken to determine the present structure and composition of the various forest communities found in the preserve, and to determine if there has been any changes in these communities since the original studies. Also, attempts were made to update the vascular plant species checklist for the preserve.

MATERIAL AND METHODS

The vegetation of the Beall Woods Natural Area was studied during the fall and winter of 1996 through early summer of 1997. The overstory was examined using line transects 100 m by 300 m (3 ha in size), with each transect divided into smaller units for ease in study (48 in each transect). The sites studied include three upland forests and three lowland forests that were designated by Ashby and Ozment (1967) as relatively large

continuous tracts of timber that had distinct tree associations. The number, size and species of all living and dead-standing trees ($\geq$10 cm dbh) were recorded for each quadrat. From this data the density (stems/ha) in broad diameter classes, the basal area (m^2/ha), relative density, relative dominance, importance value (IV) and average diameter (cm) were calculated for each species. IV determination follows the procedure outlined by McIntosh (1957) and later Boggess (1964), and is the sum of the relative values for each species.

During the late spring of 1997 the woody understory was sampled using nested circular plots 1 m^2, 10 m^2 and 100 m^2 in size randomly located along line transects throughout each of the six study areas. Two additional 1 m^2 circular plots were located 5 m to the north and south of each center. Seedlings (<50 cm tall) were tallied in the 1 m^2 plots; small saplings (>50 cm tall/ <2.5 cm dbh) were recorded in the 10 m^2 plots; while large saplings (2.6-10.0 cm dbh) were recorded in the 100 m^2 plots, and their densities (stems/ha) determined. A total of 24 nested circular plots were located within each of the study areas, with an additional 48 seedling plots.

The herbaceous species were analyzed using 1/4 m^2 quadrats spaced at one m intervals along four transects 25 m long randomly located in each of the six study areas. Along each transect the quadrats were located at 1 m intervals to the right (odd number) or to the left (even number) of the transect. The cover of each species was determined using the Daubenmire cover classes (Daubenmire 1959) as modified by Bailey and Poulton (1968): class 1 = 0-1%; class 2 = 2-5%; class 3 = 6-25%; class 4 = 26-50%; class 5 = 51-75%; class 6 = 76-95%; class 7 = 96-100%. From these data the relative frequency, relative cover and the importance value of each species was determined. The importance value is the sum of the relative frequency and

relative cover.

During the fall of 1996 and spring of 1997 the natural area was searched for vascular plant species, particularly endangered and threatened taxa (Herkert 1991). All species encountered were identified, and when identification was in doubt, voucher specimens were collected. These specimens were identified and deposited in the Stover/Ebinger Herbarium of Eastern Illinois University (EIU). Also, the literature was searched to determine what species had been reported previously for this natural area. All species encountered are listed in Appendix I at the end of this report. Nomenclature follows Mohlenbrock (1986). Throughout the text common names of all woody species will be used. For the scientific name and author citation of these taxa refer to Appendix I.

RESULTS AND DISCUSSION

Ashby and Ozment (1967) described the forest types of the Beall Woods Natural Area, reporting eight cover types based on the dominant species encountered. Of the eight forest cover types described, six were of considerable size and were sampled during the present study. Two, however, were very small, and could not be sampled using 3 ha plots. These include a very narrow, steep hillside to the west of Coffee Creek that was dominated by individuals of red oak and basswood. Many extremely large trees were present here, but the steep slope and small size of the area prevented an extensive survey. The other area not included in the present survey was the hackberry/elm lowland forest along the upper reached of Coffee Creek. This forest cover is an extension of the silver maple/pecan floodplain forest along most of Coffee Creek. Here pecan becomes less important, silver maple and the elm species continue there importance, while hackberry and

sugarberry increase slightly in importance.

During the present survey the woody overstory and understory of the six large forest cover types present in the natural area were surveyed. Three of these are located in the uplands, while the other three are associated with the floodplains and terraces along Coffee and Sugar Creeks (Figure 1). All are closed forests, the cover exceeding 90%, while the variation in species is probably a function of topography, moisture gradients, soil structure, past land uses, and the extent of past tree removal. Each of the forest cover types are discussed below.

Woody vegetation of the upland forests: The three upland forest cover types studied at Beall Woods would be classified dry-mesic to wet-mesic upland forests (White and Madany 1978). As many as 25 species entered the canopy. Open-grown trees were not common, indicating that the forest probably had a closed canopy even in presettlement times. In all of these forests sugar maple had the highest importance value with numerous associated mesophytic species being fairly common. (Tables 1, 2, 3 & 4).

Sugar Maple/Oak/Hickory Forest: Found at scattered locality throughout the natural area, this cover type is best developed on the uplands to the north of Coffee Creek (Figure 1). This relatively flat area slopes gently to the east, and standing water is not common except immediately after a rain. Twenty-four canopy and six understory trees species were encountered during the survey while tree density averaged 329.8 stems/ha and basal area averaged 26.23 m^2/ha (Table 1). The high density was the result of numerous small diameter trees with more than 185 stem/ha in the 10-19 cm diameter class. In this community sugar maple ranked highest with an IV of 46.4 out of a possible 200 (Table 1). It had the highest density with 110 stems/ha,

dominated the smaller diameter classes, and had few individuals exceeding 50 cm dbh. White oak dominated the larger diameter classes and ranked second with an IV of 42.0. Other oak species were present, swamp white oak being the most common with an IV of 6.4, the remaining oak species occurring in low densities and having large diameters. Hickories, particularly shagbark (third in IV) and mockernut (tenth in IV), were common in the study area, with bitternut hickory and pignut hickory occasionally encountered. The remaining species were those commonly associated with mesic sites, with hop hornbeam and flowering dogwood common understory species. The seedling and sapling layer was not particularly dense with 3,334 seedlings/ha, 2,417 small saplings/ha and 646 large saplings/ha (Table 4). Pawpaw and black gum, mostly as root sprouts, dominated the seedling category, pawpaw was the dominant small sapling present, and sugar maple dominated the large sapling category followed by hop hornbeam and pawpaw.

Mortality was relatively high, dead-standing individuals averaged 18 stems/ha with a basal area of 2.68 m^2/ha. White oak had the highest mortality followed by sassafras, American elm and black gum.

<u>Sugar Maple/Oak/Ash Forest</u>: Mostly located on the uplands to the south of Coffee Creek, this cover type is common on moderately dissected lands with good drainage (Figure 1). Twenty-four canopy and three understory trees species were encountered during the survey while tree density averaged 284.6 stems/ha and basal area averaged 29.51 m^2/ha (Table 2). Sugar maple was the most common species with an IV of 87.6, and a density of 182.6 stems/ha. Nearly 90% of the sugar maples were in the 10-19 and 20-29 cm diameter classes with few exceeding 50 cm. White oak dominated the larger diameter classes and ranked second with an IV of 30.6. Red oak, with an IV

of 11.0 ranked fourth in importance, black oak ranked fifth, while two other oak species, yellow chestnut oak and Shumard's oak, were rarely encountered. The oaks were common in the larger diameter classes, being absent from the seedling, sapling, and smaller diameter classes (Tables 2 & 4). Green ash was relatively common throughout the woods, being third in importance and represented in all diameter classes. Most of the species found in the sugar maple/oak/hickory cover type were also present in this community, but differed in their importance, the major difference being a decrease in the importance of hickories. Also, unlike the sugar maple/oak/hickory community, hop hornbeam and flowering dogwood were not common. Seedling averaged 7,500 stems/ha, small saplings 3,086 stems/ha, and large saplings 237 stems/ha (Table 4). Black gum, green ash and pawpaw dominated the seedling category; pawpaw, by far, dominated the small sapling category; while sugar maple was the most important large sapling present.

Mortality was relatively high in this community, dead-standing individuals averaged 13 stems/ha with a basal area of 1.49 m^2/ha. Dead oaks accounted for nearly 1.00 m^2/ha of the basal area. Most of the large canopy gaps, that are now being filled with sugar maple, were created by the death of these large veteran oaks. A number of small diameter individuals of sugar maple, green ash and sassafras accounted for most of the dead-standing individuals.

Sugar Maple/Sweet Gum/Ash Forest: Located on the flat uplands to the south of Coffee Creek, this community type was designated the white oak/tulip tree cover type by Ashby and Ozment (1967). The area is very flat, the drainage poor, and standing water is common throughout the winter and spring. Standing water is also common for a day or two after summer

rains. Twenty-five canopy and five understory trees species were encountered during the survey while the tree density average 263.2 stems/ha and basal area averaged 31.45 m/ha. Sugar maple dominated the lower diameter classes, ranked first in importance with an IV of 40.8, and had the highest density (80 stems/ha) of all species present (Table 3). Sweet gum and green ash ranked second and third in importance respectively, both species being well represented in most diameter classes, but with average diameters exceeding 40 cm. White oak was fourth in IV (20.1), and was mostly represented by individuals in the larger diameter classes. This species averaged 14 stems/ha, and had an average diameter of 62.6 cm. Other oak species were not common, red oak had an IV of 2.6, ranging 14th in importance, while a few large Spanish, Shumard's, and black oaks were rarely encountered. Hickory species were uncommon, bitternut ranked 15th in importance, with shagbark and mockernut being extremely rare. The presence of numerous mesophytic species indicate the wet nature of this community. The understory was relatively dense with 4,584 seedlings/ha, 5,251 small saplings/ha and 495 large saplings/ha (Table 4). Pawpaw and spicebush dominated the seedling and small sapling categories, while pawpaw was also the most important large sapling followed by sugar maple and American elm.

Mortality was relatively high, dead-standing individuals averaged 17 stems/ha with a basal area of 3.59 m/ha. A few large oaks and green ashes were responsible for the high basal area, the canopy gaps being filled with sugar maple, sweet gum, ash, and tulip tree.

Similarity of the upland forests of the preserve with previous studies: Lindsey (1962) studied Beall Woods upland forest using one-fifth acre strips scattered throughout the upland forest of the preserve. He found white oak

to be the leading dominant, and oaks in general accounted for 70% of the basal area. Sugar maple ranked second mostly due to the many small diameter individuals, while the hickories as a group, ranked third in importance. The remaining species encountered are the same as those reported in the present study.

The results reported by Lindsey (1962) are similar to those found in the sugar maple/oak/hickory cover type during the present study, except sugar maple has replaced oak as first in importance. The increase in sugar maple is to be expected as it has increased dramatically is most Illinois forests during the past 30 years (Ebinger 1986). Actually, this shade-tolerant, fire-sensitive species has been increasing in importance since early settlement times due to reduced fire frequency and a corresponding increase in canopy cover, creating more mesic condition in the forest interior. Similar results have been reported for many nature preserve forests throughout central Illinois.

Woody vegetation of the lowland forests: The three lowland forest cover types studied at Beall Woods would be classified as wet floodplain forest to mesic floodplain forest depending upon the extent and duration of flooding (White and Madany 1978). In these forests species diversity is determine by flooding, fewer species entering the canopy and a sparse woody understory were flooding is extensive. At slightly higher elevation, usually on terraces, where flooding is of a shorter duration, the number of species increases, and the woody understory becomes dense (Table 5, 6, 7 & 8).

Silver Maple/Pecan Forest: This forest cover type is common along both sides of Coffee Creek (Figure 1). Located on a relatively flat area it

contains occasional depressions that remain filled with water well into the summer. Commonly flooding will last for three weeks to a month in early spring, and occasionally floods of a week or more may occur throughout the growing season. Only 11 tree species were encountered during the survey while tree density averaged 209.3 stems/ha and the basal area averaged 36.71 m^2/ha (Table 5). In this community silver maple was the most important species with an IV of 146. It had the highest density (149.4 stems/ha), the largest basal area (27.41 m^2/ha), was common in all diameter classes, and some individuals exceeded 125 cm dbh. Pecan and American elm were second and third in importance, pecan being present in the larger diameter classes, while the American elms were common in the smaller diameter classes. The remaining species were uncommon, averaged less than 9 stems/ha, and accounted for less than 1% of the basal area. Understory trees were not common, though sugarberry, which is usually a relatively small diameter tree, averaged 7 stems/ha. The understory was very open, few saplings were found, though silver maple and green ash seedlings were common (Table 8).

Mortality was relatively high in this community, dead-standing individuals averaged 15 stems/ha with a basal area of 2.08 m^2/ha. As expected, silver maple accounted for over 80% of the dead stems and basal area. Though no living river birch were present in the study area, a few dead-standing stems of this species were encountered.

Hackberry/Sweet Gum/Kingnut Hickory Forest: Situated on a very flat low terrace about 1.5 m above the floodplain, this forest community is restricted to an area east of Coffee Creek, and just south of Sugar Creek (Figure 1). At this slightly higher elevation it does not flood as often as the floodplain and consequently has a higher species diversity than the

silver maple/pecan forest community. Fifteen canopy and three understory tree species were encountered during the survey while tree density averaged 282.5 stems/ha and the basal area averaged 29.13 m^2/ha. Hackberry was the most common species encountered with 102.6 stems/ha and an IV of 52.1 (Table 6). More than half of the hackberries were in the 10-19 cm diameter class, though occasional individuals exceeded 80 cm dbh. In contrast, sweet gum, which ranked second in importance (IV of 29.0), had most individuals in the larger diameter classes. Kingnut hickory ranked third in importance (IV of 25.9), with the majority of the individuals in the intermediate diameter classes. Silver maple and American elm were also common forest components, both with IV's exceeding 20. The remaining species, all flood tolerant, were found in relatively low numbers. Few understory trees were found, though pawpaw, redbud and red haw were occasionally present as small trees (Table 6). Few woody understory plant were encountered, seedlings averaged 834 stems/ha, small saplings 208 stems/ha, and large saplings averaged only 66 stems/ha, hackberry and Kentucky coffee tree being the most common (Table 8).

Mortality was high in this community, dead-standing individuals averaged 25 stems/ha and the basal area exceeded 3.01 m^2/ha. Individuals of hackberry and American elm accounted for more than 75% of the dead-standing individuals, though a few oaks and silver maple accounted for most of the dead-standing basal area.

Elm/Sweet Gum/Oak Forest: Common on terraces along Coffee Creek, this plant community occurs about 1 m above the low terrace on which the hackberry/sweet gum/kingnut hickory community is situated (Figure 1). The terrain is very flat, sloping only slightly toward Coffee Creek, and due to

its slightly higher position, floods are of relatively short duration and less frequent. Sixteen canopy and three understory trees were found during the survey while tree density averaged 299.8 stems/ha and basal area averaged 29.00 m^2/ha (Table 7). American elm was the most important species with an IV of 39.3. It dominated the lower diameter classes, had the highest density (88.3 stems/ha), and averaged only 18.5 cm dbh. Though extremely common, it was overshadowed by the sweet gums, oaks, and kingnut hickories, which ranked second through fourth in importance. These species had much higher average diameters, and were well represented in the larger diameter classes. Three oak species, Shumard's, bur and swamp white, occurred only in the 40+ cm diameter classes. Many of the remaining species were well represented in the lower diameter classes, particularly box elder, sugarberry, and pawpaw. The woody understory was not very dense, seedlings averaged 833 stems/ha, small saplings 1,000 stems/ha, and large saplings 284 stems/ha with pawpaw dominating all categories (Table 8).

Mortality was relatively high in this cover type, dead-standing individuals averaged 21.3 stems/ha with a basal area of 4.10 m^2/ha. The oaks, particularly Shumard's and bur, accounted for more than 80% of the basal area, but American elm accounted for 55% of the individuals. Also, many large dead oaks were on the ground, the canopy gaps being filled with American elm, hackberry, sugarberry and pawpaw.

<u>Similarity of the lowland forests of the preserve with previous studies</u>: Lindsey (1962) in a study of Beall Woods lowland forests used one-fifth acre plots, scattered throughout the floodplain and terraces of Coffee and Sugar Creeks. He listed American elm as having the highest importance value followed by Shumard's oak, sweet gum, bur oak and kingnut hickory,

referring to the area as a oak/gum/elm/hickory forest. Shumard's oak and sweet gum accounted for 40 % of the basal area, and along with bur oak and American elm exceeded 60%. Silver maple, which was confined to the low spots, ranked fifth in his study, while he reported few pecans.

The results reported by Lindsey (1962) are similar to those found in the present study for the elm/sweet gum/oak terrace forest (Table 7). In both studies American elm had the highest IV, while sweet gum and oak species (Shumard's and bur) were also common, followed by kingnut hickory. It is very possible that most of the plots used by Lindsey (1962) were located in this cover type, particularly since his tree density for this forest was 281.7, nearly identical with that found during the present study.

The results obtained during the present study for the silver maple/pecan forest are similar to those reported by Lindsey et al. (1961) and Phillippe and Ebinger (1973). The floodplains and frontal flats of the Wabash are dominated by silver maple, with the remaining species present determined by the extent of flooding and standing water. In swampy areas *Taxodium distichum* (L.) Rich. (bald cypress) was important, while area that generally lack standing water for most of the year have a more diverse forest overstory with silver maple and pecan along with a few other associated species.

Herbaceous vegetation of the forest communities: More than 350 vascular plant species have been reported from the Beall Woods Nature Preserve. An extensive study of the site was conducted by Ashby and Ozment (1967), while other species were recorded during the Natural Areas Inventory (White 1978). From these sources, herbarium records, and personal observations by the author and some of his students, a list of the species occurring in the

nature preserve was compiled (Appendix I). Some taxa on this list were not observed during the present study, and since some of the records have not been vouchered with herbarium specimens it is not possible to verify their existence on the site. Most of the species listed, however, were observed during the present study.

Ground cover of the upland forests: The ground cover vegetation of the three upland forest communities was similar, most of the species being the same at each site, but differing in importance (Table 9). In the sugar maple/oak/hickory community *Pilea pumila* and *Impatiens capensis* were the dominant herbaceous species along with the woody vines poison ivy and Virginia creeper, and ash seedlings. Twenty-one other species were recorded in the plots, all in low numbers and usually not accounting for much of the cover. Overall, few species accounted for more than 25% cover, and nearly all plots bare ground and leaf litter exceeded 50%.

In the sugar maple/oak/ash community the ground cover was more divers than the sugar maple/oak/hickory community with 30 species encountered (Table 9). Ash seedlings had the highest importance value, with *Podophyllum peltatum*, *Pilea pumila*, *Polygonum virginianum*, *Leersia virginica* and *Impatiens capensis* being the common herbaceous species. Virginia creeper and poison ivy were also common understory taxa, ranking fourth and seventh in importance. Few of the remaining species accounted for much of the herbaceous cover, though *Phytolacca americana* was important in canopy gaps. Again most plots bare ground and leaf letter exceeded 50%.

In the sugar maple/sweet gum/ash community 29 ground cover species were found in the plots. Of these *Pilea pumila* had the highest IV followed by *Asarum canadense*, *Polygonum virginianum*, *Circaea lutetiana*, seedlings of ash, poison ivy, and *Leersia virginica* (Table 9). Except for *Asarum*

canadense, all of these taxa were found in the other upland forest communities. The wet conditions of this forest communities was probably responsible for the increase in IV of some species, however, in most plots bare ground and leaf litter exceeded 50%.

Overall, the ground cover of the upland forests was not very diverse in early summer. Relatively few species were encountered, and bare ground and litter accounted for more than 50% of the cover. Earlier in the year, spring ephemerals were common, but again, bare ground and litter appeared to be the most common. Though many species have been reported from the preserve, many are not common, and others have a very restricted distribution, or are only associated with disturbances. Within the forest communities, with canopy cover exceeding 90%, many herbaceous species will not survive except in canopy gaps.

Ground cover of the lowland forests: The ground cover of the lowland forest communities were not surveyed during the present study. When the survey was to be completed, Coffee Creek flooded, the ground cover vegetation being underwater for the first two weeks of June. If possible, the ground cover vegetation will be surveyed in mid July.

Endangered and threatened plant species in the preserve: During the present study the only endangered or threatened plant species encountered was Iresine rhizomatosa Standl. (bloodleaf). This taxon, which is listed as endangered in Illinois (Herkert 1991) is extremely common in the floodplain forest (silver maple/pecan) and to a lesser extent in the terrace forests (hackberry/sweet gum/kingnut hickory and the elm/sweet gum/oak) along Coffee and Sugar Creeks. Usually several thousand individuals can be see flowering in late summer.

Exotic plant species within the preserve: Within the forest communities exotic species were rarely encountered. These natural communities, with their dense canopy cover, are usually not extremely vulnerable to exotic species invasion. In disturbed sites, such as canopy gaps created by windthrows and death, exotic species can occasionally be a problem. Overall, few exotic plant species were observed, except along paths, where disturbance by hikers and occasional vehicular traffic allow for the introduction of an some native weedy and exotic species. As can be seen from the species list (Appendix I), few non-native species were found.

A few woody exotics do have the potential of creating problems in the preserve. *Elaeagnus umbellata* Thunb. (autumn olive), has become a major invasive exotic since being introduced into Illinois. This species is the dominant woody understory taxon in the forest plantations and disturbed forests surrounding the preserve. Occasionally individuals are found in the preserve. They are usually small, found in canopy gaps or near the forest margins, usually not being found in the forest interior. With this tremendous seed source, it is possible that this species could become more of a problem in the future. The removal of this seed source is recommended.

Other woody exotic species that have the potential of becoming a problem in the preserve are *Euonymus alatus* (Thunb.) Sieb. (winged wahoo) and *Lonicera japonica* Thunb. (Japanese honeysuckle). Japanese honeysuckle is occasionally found in the disturbed forests and plantations surrounding the preserve, and occasionally at the preserve margins. It will probably become more common, particularly in marginal areas where shading is not too extensive. Winged wahoo is potentially of much greater concern. Presently only a few individuals have been observed in the preserve. This species,

however, grows well in shade. In other forest communities in the area (Robeson Hills Nature Preserve) it is becoming a major component of the understory. As the seed source increase there will probably be a population explosion of this taxon within the forest communities. Ebinger (1983) found that winged wahoo is common in some forest communities in Illinois, particularly if there is a seed source in the area. Though presently not common in the preserve, as the population slowly increase, a point will be reached when an explosive increase will occur. The removal of the few small populations is recommended. This can best be accomplished in late fall of the year when the bright red foliage of this species is obvious.

Problems with exotic animals in the preserve: Presently deer populations appear to be extremely high. As a result, the vegetation is showing signs of being over browsed. Woody seedlings and saplings of some species, particularly black gum, are being cut back and in some cases killed. Some herbaceous species are also being grazed, particularly *Trillium recurvatum* (red trillium) and *Podophyllum peltatum* (mayapple). This year only a few red trillium were observed fruiting, most stems being grazed. As population pressure increases, the deer will continue to have a negative impact on the vegetation. It is recommended that some method be used to control the deer population in and surrounding the preserve.

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Table 1. Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in the sugar maple/oak/hickory upland forest at Beall Woods Natural Area, Wabash County, Illinois.

Species	Diameter Classes (cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-80	80+	Total #/ha	Basal Area m^2/ha	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Sugar Maple	76.0	25.7	5.3	2.0	0.7	0.3	--	--	110.0	3.42	33.4	13.0	46.4	18.1
White Oak	1.0	--	0.7	1.7	2.7	4.0	6.3	6.3	22.7	9.20	6.9	35.1	42.0	69.1
Shagbark	2.7	3.7	10.0	8.0	4.7	1.3	0.7	--	31.1	4.24	9.4	16.2	25.6	39.6
Hop Hornbeam	35.7	--	--	--	--	--	--	--	35.7	0.44	10.8	1.7	12.5	12.8
Green Ash	7.3	4.0	1.7	0.3	0.7	1.7	0.7	0.3	16.7	1.71	5.1	6.5	11.6	29.8
Sweet Gum	3.7	4.0	4.7	2.7	1.0	0.3	0.3	--	16.7	1.60	5.1	6.1	11.2	32.4
American Elm	19.0	4.0	--	--	--	--	--	--	23.0	0.49	7.0	1.9	8.9	15.9
Black Gum	2.3	3.0	2.3	1.3	1.0	--	--	0.3	10.2	1.04	3.1	4.0	7.1	32.1
Swamp White Oak	--	--	0.3	0.7	0.7	1.3	1.0	0.3	4.3	1.33	1.3	5.1	6.4	60.9
Mockernut	6.7	3.0	1.7	0.7	0.3	0.3	--	--	12.7	0.67	3.8	2.5	6.3	22.7
Sassafras	4.7	3.7	1.0	0.7	--	--	--	--	10.1	0.47	3.0	1.8	4.8	22.8
Red Maple	6.0	1.0	--	0.7	--	--	--	--	7.7	0.26	2.3	1.0	3.3	14.0
Fl. Dogwood	7.3	--	--	--	--	--	--	--	7.3	0.09	2.2	0.3	2.5	12.5
Others[1]	13.3	4.7	1.3	0.7	0.3	0.3	1.0	--	21.6	1.27	6.6	4.8	11.4	--
Totals	185.7	56.8	29.0	19.5	12.1	9.5	10.0	7.2	329.8	26.23	100.0	100.0	200.0	

1. Others include Acer negundo L. (box elder), Carya cordiformis (Wang.) K. Koch, (bitternut hickory), C. glabra (Mill.) Sweet (pignut hickory), Celtis laevigata Willd. (sugarberry), C. occidentalis L. (hackberry), Cercis canadensis L. (redbud), Crataegus mollis (Torr. & Gray) Scheele (red haw), Diospyros virginiana L. (persimmon), Juglans nigra L. (black walnut), Morus rubra L. (red mulberry), Prunus serotina Ehrh. (black cherry), Quercus imbricaria Michx. (shingle oak), Q. macrocarpa Michx. (bur oak), Q. rubra L. (red oak), Q. velutina Lam. (black oak), Tilia americana L. (basswood) and Ulmus rubra Muhl. (slippery elm).

Table 2. Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in the sugar maple/oak/ash upland forest at Beall Woods Natural Area, Wabash County, Illinois.

Species	Diameter Classes (cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-80	80+	Total #/ha	Basal Area m^2/ha	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Sugar Maple	96.3	66.0	17.0	3.0	--	0.3	--	--	182.6	6.91	64.2	23.4	87.6	20.6
White Oak	--	--	1.3	2.3	2.3	4.0	4.3	4.3	18.5	7.12	6.5	24.1	30.6	67.2
Green Ash	2.0	0.3	0.3	0.3	1.7	1.7	2.0	2.3	10.6	3.46	3.7	11.7	15.4	58.8
Red Oak	--	--	0.3	--	1.7	0.7	1.7	1.3	5.7	2.65	2.0	9.0	11.0	73.5
Black Oak	--	--	0.3	0.7	0.3	0.3	0.7	3.0	5.3	2.59	1.9	8.8	10.7	76.1
Black Gum	2.0	0.3	2.7	3.0	3.3	0.7	--	--	12.0	1.81	4.2	6.2	10.4	41.3
Mockernut	2.7	3.0	1.3	1.3	1.0	0.7	--	--	10.0	0.97	3.5	3.3	6.8	31.4
Sweet Gum	1.3	1.3	1.7	2.0	1.0	0.3	--	--	7.6	0.93	2.7	3.2	5.9	36.6
Tulip Tree	0.7	0.7	--	--	0.3	--	0.3	1.0	3.0	1.04	1.1	3.5	4.6	55.3
Shargbark	1.3	0.7	1.7	1.0	0.7	--	--	--	5.4	0.52	1.9	1.8	3.7	33.0
Others[1]	14.0	3.3	3.0	2.7	0.3	0.3	--	0.3	23.9	1.51	8.3	5.0	13.3	--
Totals	120.3	75.6	29.6	16.3	12.6	9.0	9.0	12.2	284.6	29.51	100.0	100.0	200.0	

1. Others include Carpinus caroliniana Walt. (blue beech), Carya cordiformis (Wang.) K. Koch, (bitternut hickory), C. glabra (Mill.) Sweet. (pignut hickory), Celtis occidentalis L. (hackberry), Cornus florida L. (flowering dogwood), Diospyros virginiana L. (persimmon), Juglans nigra L. (black walnut), Gleditsia triacanthos L. (honey locust), Gymnocladus dioicus (L.) K. Koch (Kentucky coffee tree), Ostrya virginiana (Mill.) K. Koch. (hop hornbeam), Prunus serotina Ehrh. (wild black cherry), Quercus prinoides Willd. (yellow chestnut oak), Q. shumardii Buckley (Shumard's oak), Sassafras albidum (Nutt.) Nees. (sassafras), Ulmus americana L. (American elm), and U. rubra Muhl. (slippery elm).

Table 3. Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in the sugar maple/sweet gum/green ash upland forest at Beall Woods Natural Area, Wabash County, Illinois.

Species	Diameter Classes (cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-80	80+	Total #/ha	Basal Area m^2/ha	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Sugar Maple	40.7	26.0	11.3	1.7	0.3	--	--	--	80.0	3.27	30.4	10.4	40.8	21.2
Sweet Gum	5.7	8.3	4.3	3.0	2.0	3.0	4.3	1.3	31.9	5.58	12.2	17.7	29.9	41.5
Green Ash	4.7	2.7	1.0	1.7	1.7	1.7	3.0	5.3	21.8	6.56	8.2	20.9	29.1	53.9
White Oak	--	1.0	1.3	0.7	2.7	3.3	3.0	2.0	14.0	4.66	5.3	14.8	20.1	62.6
Tulip Tree	4.7	0.3	1.3	0.7	2.3	2.7	2.0	2.3	16.3	4.25	6.2	13.5	19.7	50.5
Black Gum	4.7	2.0	2.7	1.0	1.3	0.3	--	--	12.0	1.04	4.6	3.3	7.9	29.5
Sassafras	3.0	3.7	2.3	1.3	0.7	--	--	--	11.0	0.81	4.2	2.6	6.8	28.2
Fl. Dogwood	13.7	0.3	--	--	--	--	--	--	14.0	0.21	5.3	0.7	6.0	13.5
American Elm	6.0	3.0	1.0	0.3	--	--	--	--	10.3	0.36	3.9	1.1	5.0	19.4
Red Maple	1.3	0.3	1.3	--	0.7	0.7	--	0.7	5.0	0.96	1.9	3.1	5.0	41.7
Hackberry	7.0	2.7	0.3	0.3	--	--	--	--	10.3	0.28	3.9	0.9	4.8	17.1
Redbud	9.0	0.3	--	--	--	--	--	--	9.3	0.13	3.5	0.4	3.9	13.1
Slippery Elm	8.0	0.3	--	--	--	--	--	--	8.3	0.15	3.2	0.5	3.7	14.3
Red Oak	--	--	--	--	--	--	0.3	0.7	1.0	0.68	0.4	2.2	2.6	92.3
Bitternut	1.3	0.7	0.7	0.7	--	0.3	--	--	3.7	0.34	1.4	1.1	2.5	30.1
Others[1]	6.0	2.0	0.7	2.0	1.3	0.3	0.7	1.3	14.3	2.17	5.4	6.8	12.2	--
Totals	115.8	53.6	28.2	13.4	13.0	12.3	13.3	13.6	263.2	31.45	100.0	100.0	200.0	

1. Others include Acer negundo L. (box elder), Asimina triloba (L.) Dunal. (pawpaw), Carpinus caroliniana Walt. (blue beech), Carya ovata (Mill.) K. Koch, (shagbark hiskory), C. tomentosa (Poir.) Nutt. (mockernut hickory), Celtis laevigata Willd. (sugarberry), Diospyros virginiana L. (persimmon), Juglans nigra L. (black walnut), Gymnocladus dioicus (L.) K. Koch (Kentucky coffee tree), Morus rubra L. (red mulberry), Platanus occidentalis L. (sycamore), Quercus falcata Michx. (Spanish oak), Q. shumardii Buckley (Shumard's oak), Q. velutina Lam. (black oak), and Tilia americana L. (basswood).

Table 4. Densities (stems/ha) of the woody seedlings (<50 cm tall), small saplings (>50 cm tall <2.5 cm dbh), and large saplings (2.6-9.9 cm dbh) in the upland forests at Beall Woods Natural Area, Wabash County, Illinois.

	Sugar Maple/Oak/Hickory Forest			Sugar Maple/Oak/Ash Forest			Sugar Maple/Sweet Gum/Ash Forest		
Species	Seedlings	Small Saplings	Large Saplings	Seedlings	Small Saplings	Large Saplings	Seedlings	Small Saplings	Large Saplings
Pawpaw	1389	2208	100	972	2500	29	1250	4042	196
Black Gum	1111	--	4	4583	292	4	--	--	4
Bitternut Hickory	417	--	4	--	--	--	--	--	4
Sassafras	278	--	--	--	--	--	--	--	--
Hop Hornbeam	--	125	133	--	42	13	--	--	4
Sugar Maple	--	42	238	417	42	121	--	42	125
Hackberry	--	42	17	139	42	4	139	--	21
Flowering Dogwood	--	--	88	--	--	33	--	--	54
American Elm	--	--	17	--	--	--	--	--	--
Green Ash	--	--	17	1111	42	8	278	--	8
Shagbark Hickory	--	--	8	139	--	--	--	--	--
Mockernut Hickory	--	--	4	--	--	--	--	--	--
Redbud	--	--	4	--	--	8	--	--	13
Box Elder	--	--	4	--	--	--	--	--	8
Red Haw	--	--	4	--	--	--	--	--	--
Black Cherry	--	--	4	--	--	--	--	--	--
Slippery Elm	--	--	--	139	42	17	--	--	29
Red Maple	--	--	--	--	--	--	--	--	17
Red Mulberry	--	--	--	--	--	--	--	--	4
Silver Maple	--	--	--	--	--	--	--	--	4
Ky. Coffee Tree	--	--	--	--	--	--	--	--	4
Spicebush	139	--	--	--	42	--	2917	1167	--
Autumn Olive	--	--	--	--	42	--	--	--	--
Totals	3334	2417	646	7500	3086	237	4584	5251	495

Table 5. Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in the silver maple/pecan floodplain forest at Beall Woods Natural Area, Wabash County, Illinois.

Species	Diameter Classes (cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-80	80+	Total #/ha	Basal Area m^2/ha	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Silver Maple	10.0	29.7	26.0	31.7	20.0	17.0	8.7	6.3	149.4	27.41	71.3	74.7	146.0	44.5
Pecan	--	--	--	0.7	2.7	2.0	3.0	2.7	11.1	4.59	5.3	12.5	17.8	71.1
American Elm	15.7	6.0	2.7	1.3	--	--	0.3	--	26.0	1.19	12.4	3.2	15.6	21.6
Slippery Elm	2.3	1.7	2.0	1.3	1.0	--	0.3	--	8.6	0.85	4.1	2.3	6.4	31.8
Sycamore	--	--	--	--	--	0.3	0.3	1.7	2.3	1.73	1.1	4.7	5.8	94.9
Sugarberry	6.0	0.7	0.3	--	--	--	--	--	7.0	0.16	3.3	0.4	3.7	16.3
Green Ash	0.7	0.7	0.3	0.3	--	0.3	--	0.7	3.0	0.61	1.4	1.7	3.1	43.2
Others[1]	1.0	0.3	0.3	--	--	0.3	--	--	1.9	0.17	1.1	0.5	1.6	--
Totals	35.7	39.1	31.6	35.3	23.7	19.9	12.6	11.4	209.3	36.71	100.0	100.0	200.0	

1. Others include Acer negundo L. (box elder), Carya laciniosa (Michx.) Loud., (kingnut hickory), Celtis occidentalis L. (hackberry), Quercus shumardii Buckley (Shumard's oak).

Table 6. Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in the hackberry/sweet gum/kingnut hickory terrace forest at Beall Woods Natural Area, Wabash County, Illinois.

Species	Diameter Classes (cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-80	80+	Total #/ha	Basal Area m^2/ha	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Hackberry	55.0	33.7	10.0	2.3	0.3	0.3	0.7	0.3	102.6	4.60	36.3	15.8	52.1	21.5
Sweet Gum	--	0.3	0.3	1.7	2.7	3.0	3.7	5.0	16.7	6.73	5.9	23.1	29.0	69.5
Kingnut Hickory	1.3	3.0	6.7	8.3	4.0	2.0	1.0	0.7	27.0	4.76	9.6	16.3	25.9	44.5
Silver Maple	5.7	3.3	4.3	4.0	4.0	2.3	0.7	0.7	25.0	3.60	8.8	12.3	21.1	38.5
American Elm	30.3	10.0	2.0	1.0	0.7	--	--	--	44.0	1.48	15.6	5.1	20.7	18.9
Box Elder	13.3	7.0	5.0	1.0	--	--	--	--	26.3	1.24	9.3	4.3	13.6	22.5
Ky. Coffee Tree	4.7	2.0	1.7	1.3	1.3	--	0.3	--	11.3	1.02	4.0	3.5	7.5	29.6
Bur Oak	--	--	--	--	0.3	--	--	1.7	2.0	1.49	0.7	5.1	5.8	95.5
Bitternut	1.3	1.0	1.7	2.0	0.7	0.7	--	--	7.4	0.92	2.6	3.2	5.8	37.0
Sugarberry	9.0	1.7	--	0.3	--	0.3	--	--	11.3	0.40	4.0	1.4	5.4	18.4
Sycamore	--	--	--	0.3	--	--	0.3	0.7	1.3	1.00	0.5	3.4	3.9	91.9
Black Walnut	--	0.3	0.7	0.7	1.3	--	--	--	3.0	0.55	1.1	1.9	3.0	47.3
Others[1]	2.3	0.7	--	--	0.3	--	0.3	1.0	4.6	1.33	1.6	4.6	6.2	--
Totals	122.9	63.0	32.4	22.9	15.6	8.6	7.0	10.1	282.5	29.12	100.0	100.0	200.0	

1. Others include Asimina triloba (L.) Dunal (pawpaw), Cercis canadensis L. (redbud), Crataegus mollis (Torr. & Gray) Scheele (red haw), Fraxinus pennsylvanica Marsh. (green ash), Quercus shumardii Buckley (Shumard's Oak), and Ulmus rubra Muhl. (slippery elm).

Table 7. Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in the elm/sweet gum/oak terrace forest at Beall Woods Natural Area, Wabash County, Illinois.

Species	Diameter Classes (cm) 10-19	20-29	30-39	40-49	50-59	60-69	70-80	80+	Total #/ha	Basal Area m^2/ha	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
American Elm	61.0	20.7	3.3	3.0	0.3	--	--	--	88.3	2.82	29.6	9.7	39.3	18.5
Sweet Gum	2.7	3.3	4.0	4.0	2.3	4.7	2.3	3.7	27.0	6.87	9.0	23.7	32.7	51.5
Shumard's Oak	--	--	--	0.3	1.0	--	0.7	5.3	7.3	6.06	2.4	20.9	23.3	98.5
Kingnut Hickory	1.0	5.3	5.3	5.3	3.7	2.7	--	--	23.3	3.37	7.8	11.6	19.4	40.7
Hackberry	29.3	8.3	1.7	--	--	--	--	--	39.3	1.00	13.1	3.4	16.5	16.6
Box Elder	18.7	6.0	3.0	0.3	--	--	--	--	28.0	0.93	9.3	3.2	12.5	18.9
Bur Oak	--	--	--	--	--	0.7	0.7	2.7	4.1	2.82	1.3	9.7	11.0	92.6
Sugarberry	16.0	3.3	1.3	--	--	--	--	--	20.6	0.48	6.9	1.7	8.6	16.2
Silver Maple	6.0	4.3	0.3	1.0	0.3	0.7	--	--	12.6	0.84	4.2	2.9	7.1	25.9
Green Ash	1.7	1.7	--	--	--	0.3	--	2.0	5.7	1.49	1.9	5.1	7.0	46.7
Pawpaw	18.0	--	--	--	--	--	--	--	18.0	0.20	6.0	0.7	6.7	12.0
Bitternut	5.0	2.3	1.7	0.3	--	--	--	--	9.3	0.38	3.1	1.3	4.4	20.5
Black Walnut	--	0.7	1.7	0.3	0.7	1.0	--	--	4.4	0.79	1.4	2.7	4.1	45.7
Redbud	6.0	0.7	--	--	--	--	--	--	6.7	0.12	2.2	0.4	2.6	14.7
Swamp White Oak	--	--	--	0.3	0.7	--	--	0.3	1.3	0.59	0.5	2.0	2.5	68.8
Others[1]	3.3	0.3	--	--	--	--	--	0.3	3.9	0.24	1.3	1.0	2.3	--
Totals	168.7	56.9	22.3	14.8	9.0	10.1	3.7	14.3	299.8	29.00	100.0	100.0	200.0	

1. Others include Crataegus mollis (Torr. & Gray) Scheele (red haw), Gymnocladus dioicus (L.) K. Koch (Kentucky coffee-tree), Platanus occidentalis L. (sycamore) and Ulmus rubra Muhl. (slippery elm).

Table 8. Densities (stems/ha) of the woody seedlings (<50 cm tall), small saplings (>50 cm tall <2.5 cm dbh), and large saplings (2.6-9.9 cm dbh) in the floodplain and terrace forests at Beall Woods Natural Area, Wabash County, Illinois.

	Silver Maple/Pecan Forest			Hackberry/Gum/Kingnut Forest			Elm/Gum/Oak Forest		
Species	Seedlings	Small Saplings	Large Saplings	Seedlings	Small Saplings	Large Saplings	Seedlings	Small Saplings	Large Saplings
Silver Maple	1528	--	--	--	--	4	--	--	--
Green Ash	556	417	4	139	83	4	--	--	4
Sugarberry	139	--	--	--	--	8	--	--	13
Pawpaw	139	--	--	--	125	13	694	875	117
Hackberry	--	--	--	278	--	25	--	83	46
Ky. Coffee Tree	--	--	--	278	--	--	--	--	--
Bur Oak	--	--	--	139	--	--	--	--	--
American Elm	--	--	--	--	--	4	--	--	71
Bitternut	--	--	--	--	--	4	--	--	8
Box Elder	--	--	--	--	--	4	139	--	8
Sweet Gum	--	--	--	--	--	--	--	42	--
Redbud	--	--	--	--	--	--	--	--	13
Kingnut Hickory	--	--	--	--	--	--	--	--	4
Totals	2362	417	4	834	208	66	833	1000	284

Table 9. Relative frequencies, relative covers and importance values of the ground cover species in the three upland forest cover types at Beall Woods Natural Area, Wabash County, Illinois.

Species	Sugar Maple/Oak/Hickory Forest			Sugar Maple/Oak/Ash Forest			Sugar Maple/Sweet Gum/Ash Forest		
	Relative Frequency	Relative Cover	IV	Relative Frequency	Relative Cover	IV	Relative Frequency	Relative Cover	IV
Pilea pumila	14.4	23.6	38.0	8.4	13.0	21.4	16.8	23.1	39.9
Toxicodendron radicans	12.7	22.2	34.9	6.5	6.3	12.8	5.4	6.4	11.8
Fraxinus spp.	21.0	7.6	28.6	18.9	10.0	28.9	11.1	2.9	14.0
Impatiens capensis	11.8	12.8	24.6	5.7	6.3	12.0	4.7	4.0	8.7
Partenocissus quinquifolia	11.8	10.3	22.1	10.3	9.7	20.0	1.8	0.7	2.5
Podophyllum peltatum	2.6	6.4	9.0	6.9	16.8	23.7	1.3	2.2	3.5
Polygonum virginianum	3.9	4.6	8.5	6.5	8.1	14.6	10.4	13.8	24.2
Carex jamesii	4.8	1.1	5.9	1.5	0.7	2.2	2.2	0.8	3.0
Arisaema dracontium	1.7	2.8	4.5	1.5	2.2	3.7	1.3	1.6	2.9
Carex blanda	2.2	1.0	3.2	0.8	0.3	1.1	0.4	0.1	0.5
Circaea lutetiana	1.4	1.0	2.4	5.7	3.0	8.7	7.9	8.1	16.0
Vitis spp.	1.7	0.3	2.0	1.5	0.4	1.9	0.4	0.1	0.5
Sanicula gregaria	1.4	0.5	1.9	4.2	2.2	6.4	3.2	1.8	5.0
Geum canadense	1.4	0.5	1.9	0.4	0.2	0.6	--	--	--
Galium aparine	1.4	0.2	1.6	--	--	--	--	--	--
Galium triflorum	0.4	0.7	1.1	2.3	1.8	4.1	--	--	--
Acer saccharum	0.4	0.1	0.5	0.8	0.4	1.2	--	--	--
Phytolacca americana	0.4	0.1	0.5	2.7	3.8	6.5	--	--	--
Arisaema triphyllum	0.4	0.1	0.5	1.5	0.6	2.1	3.9	2.6	6.5
Leersia virginica	--	--	--	5.7	8.3	14.0	6.1	5.2	11.3
Hackelia virginiana	--	--	--	1.5	2.2	3.7	1.1	1.5	2.6
Viola pratincola	--	--	--	2.3	0.6	2.9	4.3	2.2	6.5
Laportea canadensis	--	--	--	0.4	0.9	1.3	1.8	2.9	4.7
Asarum canadense	--	--	--	--	--	--	9.3	17.8	27.1
Viola pubescens	--	--	--	--	--	--	2.5	1.0	3.5
Poa sylvestris	--	--	--	--	--	--	1.3	0.5	1.8
Others (7 species)	4.2	4.1	8.3	4.0	2.2	6.2	2.8	0.7	3.5
Total	100.0	100.0	200.0	100.0	100.0	200.0	100.0	100.0	200.0

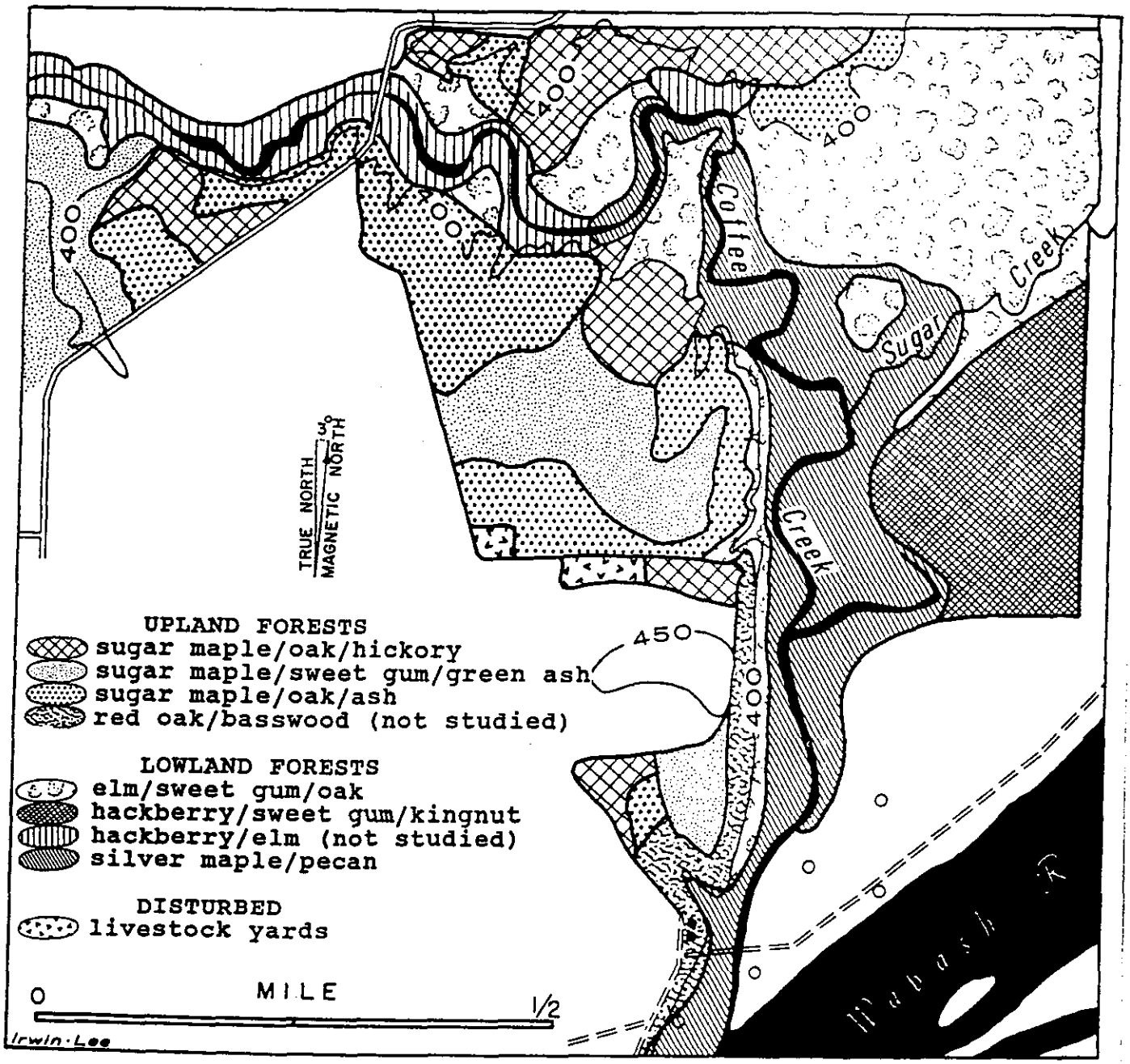

FIGURE 1. Forest cover types of Beall Woods Natural Area, Wabash County, Illinois. Modified from Ashby and Ozment (1967).

APPENDIX I -- Vascular plant species observed and previously reported to occur at the Beall Woods Nature Preserve, Wabash County, Illinois.

ACANTHACEAE
Ruellia strepens L. Smooth Ruellia

ACERACEAE
Acer negundo L. Box Elder
Acer nigrum Michx. f. Black Maple
Acer rubrum L. Red Maple
Acer saccharinum L. Silver Maple
Acer saccharum Marsh. Sugar Maple

AMARANTHACEAE
Amaranthus hybridus L. Green Amaranth
Iresine rhizomatosa Standl. Bloodleaf

ANACARDIACEAE
Rhus glabra L. Smooth Sumac
Toxicodendron radicans (L.) Kuntze Poison Ivy

ANNONACEAE
Asimina triloba (L.) Dunal. Pawpaw

APIACEAE
Chaerophyllum tainturieri Hook. Wild Chervil
Cryptotaenia canadensis (L.) DC. Honewort
Erigenia bulbosa (Michx.) Nutt. Harbinger-of-Spring
Osmorhiza claytonii (Michx.) Clarke Sweet Cicely
Sanicula canadensis L. Canadian Black Snakeroot
Sanicula gregaria Bickn. Common Snakeroot

AQUIFOLIACEAE
Ilex decidua Walt. Swamp Holly

ARACEAE
Arisaema dracontium (L.) Schott Green Dragon
Arisaema triphyllum (L.) Schott Jack-in-the-Pulpit

ARALIACEAE
Panax quinquefolius L. Ginseng

ARISTOLOCHIACEAE
Aristolochia serpentaria L. Virginia Snakeroot
Asarum canadense L. var. reflexum (Bickn.) Robins. Wild Ginger

ASCLEPIADACEAE
Asclepias exaltata L. Poke Milkweed
Asclepias perennis Walt. White Milkweed

ASPLENIACEAE
Cystopteris protrusa (Weatherby) Blasd. Fragile Fern
Polystichum acrostichoides (Michx.) Schott. Christmas Fern

ASTERACEAE
Achillea millefolium L. Common Yarrow
Ambrosia artemisiifolia L. Common Ragweed
Ambrosia trifida L. Giant Ragweed
Arctium minus Bernh. Common Burdock
Artemisia annua L. Annual Wormwood
Aster ericoides L. Heath Aster
Aster lateriflorus (L.) Britt. Side-flowered Aster
Aster ontarionis Wieg. Ontario Aster
Aster pilosus Willd. Hairy Aster
Aster simplex Willd. Panicled Aster
Bidens aristosa (Michx.) Britt. Swamp Marigold
Bidens bipinnata L. Spanish Needles
Bidens frondosa L. Common Beggar-ticks
Bidens vulgata Greene Tall Beggar-ticks
Conyza canadensis (L.) Cronq. Horseweed
Eclipta prostrata (L.) L. Yerba de Tajo
Elephantopus carolinianus Raeusch. Elephant's-foot
Erigeron annuus (L.) Pers. Daisy Fleabane
Erigeron philadelphicus L. Marsh Fleabane
Eupatorium coelestinum L. Mistflower
Eupatorium purpureum L. Purple Joe-Pye-Weed
Eupatorium rugosum Houtt. White Snakeroot
Eupatorium serotinum Michx. Late Boneset
Lactuca canadensis L. Wild Lettuce
Lactuca floridana (L.) Gaertn. Woodland Lettuce
Prenanthes altissima L. Tall White Lettuce
Rudbeckia laciniata L. Goldenglow
Rudbeckia subtomentosa Pursh Fragrant Coneflower
Rudbeckia triloba L. Brown-eyed Susan
Senecio aureus L. Golden Ragwort
Senecio glabellus Poir. Butterweed
Solidago caesia L. Woodland Goldenrod
Solidago canadensis L. Tall Goldenrod
Solidago gigantea Ait. Late Goldenrod
Solidago ulmifolia Muhl. Elm-leaved Goldenrod
Taraxacum officinale Weber Common Dandelion
Verbesina alternifolia (L.) Britt. Yellow Ironweed
Vernonia gigantea (Walt.) Trel. Tall Ironweed
Vernonia missurica Raf. Missouri Ironweed
Xanthium strumarium L. Common Cocklebur

BALSAMINACEAE
Impatiens capensis Meerb. Spotted Touch-me-not
Impatiens pallida Nutt. Pale Touch-me-not

BERBERIDACEAE
Podophyllum peltatum L. Mayapple

BETULACEAE
Betula nigra L. River Birch

BIGNONIACEAE
Bignonia capreolata L. Cross-vine

Campsis radicans (L.) Seem. Trumpet Creeper
Catalpa speciosa (Warder) Engelm. Southern Catalpa

BRASSICACEAE
Arabis laevigata (Muhl.) Poir. Smooth Rock Cress
Barbarea vulgaris R. Br. Yellow Rocket
Cardamine bulbosa (Schreb.) BSP. Spring Cress
Dentaria laciniata Muhl. Toothwort
Iodanthus pinnatifidus (Michx.) Steud. Purple Rocket

BORAGINACEAE
Hackelia virginiana (L.) I. M. Johnston Stickseed

CAESALPINIACEAE
Cercis canadensis L. Redbud
Gleditsia triacanthos L. Honey Locust
Gymnocladus dioicus (L.) K. Koch Kentucky Coffee-tree

CAMPANULACEAE
Campanula americana L. American Bellflower
Lobelia inflata L. Indian Tobacco
Triodanis perfoliata (L.) Nieuwl. Venus' Looking-glass

CAPRIFOLIACEAE
Lonicera japonica Thunb. Japanese Honeysuckle
Lonicera prolifera (Kirchn.) Rehd. Grape Honeysuckle
Sambucus canadensis L. Elderberry
Symphoricarpos orbiculatus Moench. Coralberry

CARYOPHYLLACEAE
Paronychia canadensis (L.) Wood Forked Chickweed
Paronychia fastigiata (Raf.) Fern. Forked Chickweed
Silene stellata (L.) Ait.f. Starry Campion
Stellaria longifolia Muhl. Chickweed

CELASTRACEAE
Celastrus scandens L. Bittersweet
Euonymus alata (Thunb.) Sieb. Winged Euonymus
Euonymus atropurpurea Jacq. Wahoo

CHENOPODIACEAE
Atriplex patula L. Spear Scale
Chenopodium album L. Lamb's Quarters
Chenopodium standleyanum Aellen Goosefoot

COMMELINACEAE
Commelina diffusa Burm.f. Day Flower
Commelina virginica L. Day Flower
Tradescantia subaspera Ker. Spiderwort

CONVOLVULACEAE
Ipomoea lacunosa L. Small White Morning-glory

CORNACEAE
Cornus drummondii C. A. Mey. Rough-leaved Dogwood
Cornus florida L. Flowering Dogwood

CORYLACEAE
Carpinus caroliniana Walt. Blue Beech, Ironwood
Corylus americana Walt. Hazelnut
Ostrya virginiana (Mill.) K. Koch Hop Hornbeam

CRASSULACEAE
Sedum ternatum Michx. Three-leaved Stonecrop

CUCURBITACEAE
Sicyos angulatus L. Bur Cucumber

CUPRESSACEAE
Juniperus virginiana L. Red Cedar

CUSCUTACEAE
Cuscuta coryli Engelm. Dodder
Cuscuta polygonorum Engelm. Dodder

CYPERACEAE
Carex bushii Mack. Sedge
Carex cephalophora Willd. Sedge
Carex cristatella Britt. Sedge
Carex gravi Carey Sedge
Carex hitchcockiana Dewey Sedge
Carex jamesii Schwein. Sedge
Carex laxiflora Lam. Sedge
Carex louisianica Bailey Sedge
Carex muhlenbergii Willd. Sedge
Carex muskingumensis Schwein. Sedge
Carex nigrmarginata Schwein. Sedge
Carex normalis Mack. Sedge
Carex oligocarpa Willd. Sedge
Carex rosea Willd. Sedge
Carex scoparia Willd. Sedge
Carex shortiana Dewey Sedge
Carex sparganioides Willd. Sedge
Carex squarrosa L. Sedge
Carex tetanica Schk. Sedge
Carex umbellata Schk. Sedge
Eleocharis obtusa (Willd.) Schult. Spike Rush
Scirpus atrovirens Willd. Bulrush
Scirpus pendulus Muhl. Bulrush

DIOSCOREACEAE
Dioscorea villosa L. Wild Yam

EBENACEAE
Diospyros virginiana L. Common Persimmon

ELAEAGNACEAE
Elaeagnus umbellata Thunb. Autumn Olive

EQUISETACEAE
Equisetum hyemale L. Smooth Scouring Rush

EUPHORDIACEAE
Acalypha rhomboidea Raf. Three-seeded Mercury
Acalypha virginica L. Tree-seeded Mercury
Chamaesyce humistrata (Engelm.) Small Milk Spurge
Chamaesyce maculata (L.) Small Nodding Spurge
Chamaesyce supina (Raf.) Moldenke. Milk Spurge

FABACEAE
Amorpha fruticosa L. False Indigo
Desmodium glabellum (Michx.) DC. Tick Trefoil
Desmodium nudiflorum (L.) DC. Bare-stemmed Tick Trefoil
Desmodium pauciflorum (Nutt.) DC. White-flowered Tick Trefoil
Lespedeza hirta (L.) Hornem. Hairy Bush Clover
Lespedeza violacea (L.) Pers. Violet Bush Clover
Lespedeza virginica (L.) Britt. Slender Bush Clover

FAGACEAE
Fagus grandiflora Ehrh. American Beech
Quercus alba L. White Oak
Quercus bicolor Willd. Swamp White Oak
Quercus falcata Michx. Spanish Oak
Quercus imbricaria Michx. Shingle Oak
Quercus lyrata Walt. Overcup Oak
Quercus macrocarpa Michx. Bur Oak
Quercus michauxii Nutt. Basket Oak
Quercus pagoda Raf. Cherry-bark Oak
Quercus palustris Muenchh. Pin Oak
Quercus prinoides Willd. Yellow Chestnut Oak
Quercus rubra L. Red Oak
Quercus shumardii Buckley Shumard's Oak
Quercus stellata Wangh. Post Oak
Quercus velutina Lam. Black Oak

GERANIACEAE
Geranium carolinianum L. Wild Cranesbill

HAMAMELIDACEAE
Liquidambar styraciflua L. Sweetgum

HYDRANGEACEAE
Hydrangea arborescens L. Wild Hybrangea

HYDROPHYLLACEAE
Hydrophyllum appendiculatum Michx. Great Waterleaf

HYPERICACEAE
Hypericum hypericoides (L.) Crantz St. Andrew's Cross
Hypericum punctatum Lam. Spotted St. John's-wort

Triadenum tubulosum (Walt.) Gl. Marsh St. John's-wort

JUGLANDACEAE
Carya cordiformis (Wang.) K. Koch Bitternut Hickory
Carya glabra (Mill.) Sweet. Pignut Hickory
Carya illinoensis (Wang.) K. Koch Pecan
Carya laciniosa (Michx.) Loud. Kingnut Hickory
Carya ovalis (Wang.) Sarg. Sweet Pignut Hickory
Carya ovata (Mill.) K. Koch Shagbark Hickory
Carya tomentosa (Poir.) Nutt. Mockernut Hickory
Juglans cinerea L. Butternut
Juglans nigra L. Black Walnut

JUNCACEAE
Juncus tenuis Willd. Path Rush
Luzula multiflora (Retz.) Legeune. Wood Rush

LAMIACEAE
Agastache nepetoides (L.) Ktze. Yellow Giant Hyssop
Blephilia hirsuta (Pursh) Benth. Pagoda Plant
Hedeoma pulegioides (L.) Pers. American Pennyroyal
Lycopus rubellus Moench. Stalked Water Horehound
Prunella vulgaris L. Self-heal
Pycnanthemum tenuifolium Schrad. Slender Mountain Mint
Scutellaria lateriflora L. Mad-dog Skullcap
Scutellaria nervosa Pursh Veiny Skullcap
Scutellaria ovata Hill Heart-leaved Skullcap
Stachys tenuifolia Willd. Smooth Hedge Nettle
Teucrium canadense L. American Germander

LAURACEAE
Lindera benzoin (L.) Blume Spicebush
Sassafras albidum (Nutt.) Nees Sassafras

LILIACEAE
Allium canadense L. Wild Onion
Erythronium albidum Nutt. White Dog-tooth Violet
Hypoxis hirsuta (L.) Coville Yellow Star Grass
Polygonatum commutatum (Schult.) A. Dietr. Solomon's Seal
Smilacina racemosa (L.) Desf. False Solomon's Seal
Trillium flexipes Raf. White Trillium
Trillium recurvatum Beck. Red Trillium

LYTHRACEAE
Ammannia coccinea Rottb. Long-leaved Ammannia
Cuphea viscosissima Jacq. Clammy Cuphea
Rotala ramosior (L.) Koehne. Tooth-cup

MAGNOLIACEAE
Liriodendron tulipifera L. Tulip Tree

MENISPERMACEAE
Menispermum canadense L. Moonseed

MORACEAE
Maclura pomifera (Raf.) Schneider Osage Orange
Morus alba L. White Mulberry
Morus rubra L. Red Mulberry

NYSSACEAE
Nyssa sylvatica Marsh. Sour Gum

OLEACEAE
Fraxinus americana L. White Ash
Fraxinus pennsylvanica Marsh. Green Ash, Red Ash

ONAGRACEAE
Circaea lutetiana Aschers. & Magnus Enchanter's Nightshade
Oenothera biennis L. Evening Primrose

OPHIOGLOSSACEAE
Botrychium virginianum (L.) Sw. Rattlesnake Fern

ORCHIDACEAE
Corallorhiza wisteriana Conrad Wister's Coral-root
Liparis liliifolia (L.) Rich. Twayblade

OXALIDACEAE
Oxalis dillenii Jacq. Yellow Wood Sorrel
Oxalis stricta L. Yellow Wood Sorrel
Oxalis violacea L. Purple Oxalis

PAPAVERACEAE
Corydalis flavula (Raf.) DC. Pale Corydalis
Dicentra cucullaria (L.) Bernh. Dutchman's-breeches
Sanguinaria canadensis L. Bloodroot

PASSIFLORACEAE
Passiflora lutea L. Small Passion-flower

PHRYMACEAE
Phryma leptostachya L. Lopseed

PHYTOLACCACEAE
Phytolacca americana L. Pokeweed

PLANTAGINACEAE
Plantago rugelii Dcne. Rugel's Plantain

PLATANACEAE
Platanus occidentalis L. Sycamore

POACEAE
Agrostis hyemalis (Walt.) BSP. Tickle Grass
Andropogon virginicus L. Broom Sedge
Bromus racemosus L. Chess
Cinna arundinacea L. Stout Wood Reed
Danthonia spicata (L.) Roem. & Schultes Curly Oat Grass

Dichanthelium acuminatum (Sw.) Gould & Clark Panic Grass
Dichanthelium nitidum (Lam.) Mohlenbr. Panic Grass
Dichanthelium oligosanthes (Schult.) Gould Panic Grass
Digitaria sanguinalis (L.) Scop. Crab Grass
Echinochloa crus-galli (L.) Beauv. Barnyard Grass
Echinochloa walteri (Pursh) Heller Barnyard Grass
Elymus canadensis L. Nodding Wild Rye
Elymus virginicus L. Virginia Wild Rye
Festuca obtusa Biehler Nodding Fescue
Hordeum pusillum Nutt. Little Barley
Leersia virginica Willd. White Grass
Muhlenbergia frondosa (Poir.) Fern. Muhly
Panicum capillare L. Witch Grass
Panicum dichotomiflorum Michx. Fall Panicum
Paspalum pubiflorum Rupr. var. glabrum Vasey Bead Grass
Phleum pratense L. Timothy
Poa compressa L. Canadian Bluegrass
Poa pratensis L. Kentucky Bluegrass
Poa sylvestris Gray Woodland Bluegrass
Setaria viridis (L.) Beauv. Green Foxtail
Sphenopholis obtusata (Michx.) Scribn. Wedge Grass
Sphenopholis nitida (Biehler) Scribn. Shining Wedge Grass

POLEMONIACEAE
Phlox divaricata L. Common Phlox
Phlox paniculata L. Garden Phlox
Polemonium reptans L. Jacob's-ladder

POLYGONACEAE
Polygonum convolvulus L. Black Bindweed
Polygonum hydropiper L. Smartweed
Polygonum pensylvanicum L. Common Smartweed
Polygonum punctatum Ell. Smartweed
Polygonum scandens L. False Buckwheat
Polygonum virginianum L. Virginia Knotweed
Rumex altissimus Wood Pale Dock
Rumex obtusifolius L. Bitter Dock

PORTULACACEAE
Claytonia virginica L. Spring Beauty

PRIMULACEAE
Anagallis arvensis L. Scarlet Pimpernel
Lysimachia lanceolata Walt. Loosestrife
Lysimachia nummularia L. Moneywort
Samolus valerandii L. Brookweed

RANUNCULACEAE
Clematis virginiana L. Virgin's Bower
Delphinium tricorne Michx. Dwarf Larkspur
Hydrastis canadensis L. Goldenseal
Myosurus minimus L. Mousetail
Ranunculus abortivus L. Small-flowered Crowfoot
Ranunculus recurvatus Poir. Buttercup

Ranunculus septentrionalis Poir. Swamp Buttercup
Thalictrum dioicum L. Early Meadow Rue

ROSACEAE
Agrimonia pubescens Wallr. Soft Agrimony
Agrimonia rostellata Wallr. Woodland Agrimony
Arunus dioicus (Walt.) Fern. Goat's-beard
Crataegus crus-galli L. Cock-spur Thorn
Crataegus mollis (Torr. & Gray) Scheele Red Haw
Geum canadense Jacq. White Avens
Geum vernum (Raf.) Torr. & Gray Spring Avens
Geum virginianum L. Pale Avens
Malus angustifolia (Ait.) Michx. Narrow-leaved Crab Apple
Malus ioensis (Wood) Britt. Iowa Crab Apple
Prunus americana Marsh. var. lanata Sudw. Wild Plum
Prunus persica (L.) Batsch. Peach
Prunus serotina Ehrh. Wild Black Cherry
Rosa multiflora Thunb. Multiflora Rose
Rosa setigera Michx. Prairie Rose
Rubus allegheniensis Porter Common Blackberry
Rubus alumnus Bailey Blackberry
Rubus occidentalis L. Black Raspberry

RUBIACEAE
Cephalanthus occidentalis L. Buttonbush
Diodia teres Walt. Rough Buttonweed
Galium aparine L. Goosegrass
Galium circaezans Michx. Wild Licorice
Galium concinnum Torr. & Gray Shining Bedstraw
Galium obtusum Bigel. Wild Madder
Galium triflorum Michx. Sweet-scented Bedstraw
Hedyotis purpurea (L.) Torr. & Gray Broad-leaved Bluets
Spermacoce glabra Michx. Smooth Buttonweed

SALICACEAE
Populus deltoides Marsh. Cottonwood
Salix lucida Muhl. Shining Willow
Salix nigra Marsh. Black Willow

SAURURACEAE
Saururus cernuus L. Lizard's-tail

SCROPHULARIACEAE
Agalinis tenuifolia (Vahl) Raf. Slender False Foxglove
Aureolaria flava (L.) Farw. Smooth False Foxglove
Chelone obliqua L. Pink Turtlehead
Dasistoma macrophylla (Nutt.) Raf. Mullein Foxglove
Grationa neglecta Torr. Clammy Hedge Hyssop
Mimulus alatus Ait. Winged Monkey-flower
Penstemon digitalis Nutt. Foxglove Beardstongue
Scrophularia marilandica L. Late Figwort
Verbascum blattaria L. Moth Mullein
Verbascum thapsus L. Woolly Mullein

SIMAROUBACEAE
Ailanthus altissima (Mill.) Swingle Tree-of-Heaven

SMILACACEAE
Smilax hispida Muhl. Bristly Catbrier
Smilax lasioneuron Hook. Carrion Flower
Smilax pulverulenta Michx. Carrion Flower
Smilax rotundifolia L. Catbrier

SOLANACEAE
Physalis pubescens L. Annual Ground Cherry
Physalis subglabrata Mack. & Bush. Smooth Ground Cherry

STAPHYLEACEAE
Staphylea trifolia L. Bladdernut

THELYPTERIDACEAE
Phegopteris hexagonoptera (Michx.) Fee Broad Beech Fern

TILIACEAE
Tilia americana L. American Basswood

ULMACEAE
Celtis laevigata Willd. Sugarberry
Celtis occidentalis L. Hackberry
Ulmus americana L. American Elm
Ulmus rubra Muhl. Slippery Elm

URTICACEAE
Boehmeria cylindrica (L.) Sw. False Nettle
Laportea canadensis (L.) Wedd. Wood Nettle
Parietaria pensylvanica Muhl. Pellitory
Pilea pumila (L.) Gray Clearweed

VERBENACEAE
Verbena urticifolia L. White Vervain

VIOLACEAE
Viola pratincola Greene Common Blue Violet
Viola pubescens Ait. var. eriocarpa (Schwein.) Russell Smooth Yellow Violet
Viola rafinesquii Greene Johnny-jump-up

VITACEAE
Ampelopsis cordata Michx. Raccoon Grape
Parthenocissus quinquefolia (L.) Planch. Virginia Creeper
Vitis aestivalis Michx. Summer Grape
Vitis cinerea Engelm. Winter Grape
Vitis riparia Michx. Riverbank Grape
Vitis vulpina L. Frost Grape