

THE VASCULAR FLORA
AND VEGETATIVE COMMUNITIES OF MUNSEE WOODS
IN DELAWARE COUNTY, INDIANA

A THESIS

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BY

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INTRODUCTION

Floristic inventories are surveys and collections of all the species present in a particular area of study. Floristic inventories can be used to help identify high quality natural areas, make comparisons among sites, develop long term monitoring of natural quality, monitor habitat restoration, and identify potentially sensitive communities (Swink & Wilhelm 1994). Inventories are the simplest means of documenting species diversity and are an important step in monitoring changes in species composition over time (Ruch et al. 2008_b).

Floristic Inventory and Analysis: Floristic inventories help to determine species on which to focus conservation efforts, based on their local and regional significance. This study is part of larger regional effort to document biodiversity in east-central Indiana (Rothrock et al. 1993; Rothrock 1997; Ruch et al. 1998; Ruch et al. 2002; Ruch et al. 2008_b; Ruch et al. 2010). The following paragraphs summarize selected examples of floristic inventories done in Indiana. The results of these studies are presented as an average coefficient of conservation (C_{av}), which is an average of C-values for all the species inventoried at a site. The C-value, which ranges from zero to ten, is an index of the fidelity of an individual species to undisturbed plant communities characteristic of the region before European settlement (Rothrock & Homoya 2005). For example, native but ruderal *Chamaesyce* species are given much lower C-values than *Ranunculus hispidus* var. *caricetorum*, which is restricted to only wet, undisturbed sites, and has a C-value of 10. Exotic or invasive species are assigned a value of zero. The assignment of C-values was done by a team of botanists who have observed the behavior of the over 2000 species

occurring in Indiana (Rothrock & Homoya 2005). Those sites with high natural quality might be expected to have a C_{av} of 3.5 to 4 or greater (Rothrock & Homoya 2005). Another way the results of these floristic inventories are presented below is as a floristic quality index (FQI), which is calculated by multiplying the average coefficient of conservation (C_{av}) by the square root of the total number of species at the site. The FQI considers not only species quality (fidelity to natural plant communities), given by the C values, but also species richness (Rothrock & Homoya 2005). Those sites with a FQI in excess of 45 are noteworthy remnants of the pre-settlement vegetation of a region (Swink & Wilhelm 2004; Rothrock & Homoya 2005).

Ruch et al. (2002) conducted an inventory study for the Wilbur Wright Fish and Wildlife Area (WWFWA) in Henry County, Indiana (416 ha). The inventory documented 388 native species out of the 536 total species observed. They calculated a $FQI = 77.3$ and a $C_{av} = 3.9$ for native species, and a $FQI = 65.8$ and $C_{av} = 2.8$ for the total number of species documented including exotic species. The impact of exotic species can be documented by subtracting the C_{av} values found for all species from those for only the native species. With a high number of exotics it can be assumed that the C_{av} value, and therefore the FQI, will be lower than the values for just the native species. This is due to the fact that exotic species are assigned a C -value of zero, which lowers the C_{av} value. If the C_{av} values differ by greater than or equal to 0.7 units, it can be inferred that the exotics are having a negative impact (Rothrock & Homoya 2005). This difference value was a matter of personal judgment made by Rothrock & Homoya (2005), based on the analysis of the impact of exotic species on plant communities in several Indiana study

sites. For WWFWA the C_{av} values differed by 1.1 units, therefore indicating that the exotic community is having a significant negative impact on the native floral community.

Ebinger and Bacone (1981) conducted a floristic inventory for hillside seeps at Turkey Run State Park in Parke County, Indiana (<1 ha). The inventory documented 30 native species out of the 32 total species observed. They calculated an $FQI = 29.8$ and the $C_{av} = 5.4$ for native species, and the $FQI = 28.8$ and $C_{av} = 5.1$ for the total number of species. Because of its small size and lower number of species, the FQI results are much lower than those for the Wilbur Wright study above, even though the differences in the values show that the exotics are not having a significant impact on the native flora. This is due to the fact that the Floristic Quality Index (FQI) is calculated by multiplying the mean Coefficient of Conservation (C_{av}) by the square root of the total number of species (Swink & Wilhelm 1994). As a result, the FQI is greatly affected by the number of species observed (Rothrock & Homoya 2005, Ruch et al. 2010). This shows that the FQI can only be used for comparison between sites that are similar in size and number of species (Ruch et al. 2010).

Rothrock et al. (1993) conducted a floristic inventory for Mounds State Park in Madison County, Indiana (105 ha). The inventory noted 388 native species out of the 455 total species documented. From the inventory, it was determined that the $FQI = 87.3$ and the $C_{av} = 4.5$ for native species, and the $FQI = 80.4$ and $C_{av} = 3.8$ for the total number of species documented. According to Swink and Wilhelm (1994), a site having a $C_{av} \geq 4.5$ or a $FQI \geq 45$ contains remnants of the regional natural flora. Though the results of the study show a difference of 0.7 units in the C_{av} values for Mounds State Park, it was noted

that the exotics might not be present in sufficient numbers to detract from the quality of the plant community. This was because most of the exotics were concentrated on the margins of the natural areas or in highly disturbed parts of the overall property (Rothrock & Homoya 2005). The FQI calculation does not take this spatial information into account. This review of several studies that used FQI to evaluate quality of plant communities shows some limitations of the FQI that are important to understand when working with this index.

In 2004 an unpublished checklist was made for the Upland Prairie Restoration in Grant County, Indiana (10 ha) (Rothrock & Homoya 2005). Made during the 12th year of the restoration, the list documented 46 native species out of the 67 total species. Based on the list it was determined that the $FQI = 25.1$ and the $C_{av} = 3.7$ for native species, and the $FQI = 20.8$ and $C_{av} = 2.5$ for the total number of species observed. According to Swink and Wilhelm (1994), restoration attempts rarely achieve C_{av} values higher than 3.5 or FQI values of higher than 35. The Upland Prairie restoration shows similar results. Based on this analysis, if a plant community of higher floristic value is destroyed it cannot be replaced by restoring native species to an area of equal size. This demonstrates the importance of using these methods to gauge the quality of plant communities in natural areas and to ensure conservation of high quality natural areas.

Permanent Plot Analysis: The permanent plot method used in this study will provide quantitative data to determine forest structure and composition. Permanent plot studies play a major role in ecological and management research (Sheil 1995). The establishment of permanent plots allows for continued monitoring over time. Monitoring is a direct and

accurate way to document successional changes in forest composition (Barbour et al. 1999). This method uses density, basal area, and frequency to determine the relative importance values of the various tree species in a community. Importance values can be used to analyze and classify the woody vegetation of an area.

Stonehouse et al. (2003) conducted a permanent plot analysis of Botany Glen in Grant County, Indiana. The woodlands were identified and the permanent plot method was used to determine the structure and composition of the woody plant communities. The woodlands were separated into mesic woods, floodplain forest, and successional communities. Both the overstory and understory were examined. The study found that most of the understory at Botany Glen was dominated by *Acer saccharum*. The overstory was still described as oak-hickory, although *Acer saccharum* was growing in dominance. Based on the understory growth, Botany Glen is undergoing a change from an Oak-Hickory dominated forest to a maple dominated forest. This is a trend being observed in many studies throughout forested areas of east-central Indiana (Baltzer et al. 2007; Rothrock et al. 1993).

Major Objectives of the Study: The goals of this study are to (1) inventory and voucher the vascular flora of Camp Munsee; (2) to visually estimate relative abundance and distribution of each species; (3) to determine the Floristic Quality Index (FQI) for the site; (4) to analyze the woody vegetation using plot data and to compare its species composition to other sites studied in east-central Indiana; (5) to identify any communities sensitive to disturbance or with plants of special concern; (6) to identify exotic vegetation and to describe its adverse impact, if any, on the natural flora; (7) to produce a map of the

floral communities of the site; and (8) to make recommendations for future management of the site to the Red-tail Conservancy.

STUDY SITE

Munsee Woods, formerly known as Camp Munsee, is part of a large project to determine the flora and floral communities of east-central Indiana. Munsee Woods, is an 18.4 ha (~45.5 acres) woodland, located 9.1 km (~5 ½ miles) southeast of Muncie, Indiana, and just west of the northern end of Prairie Creek Reservoir in Delaware County (UTM Zone 16T) (Figure 1). The property is bordered on the north and west by farm fields, and on the south and east by privately owned woodlands and meadows. Medford Drain, a tributary of the White River, runs north from the southeast corner along the eastern border and continues west to the northwest corner and out of the study site.

Several habitat types are found in Munsee Woods. A relatively flat, upland mesic forest occupies the southern half of the property. The largest diameter trees have low, thick branches below the cover of the overstory and pictures from the time show that the woods were much more open suggesting that the site may have been used for grazing (Graham , Wapehani Girl Scouts Camp Munsee, Pers. Commun.). Other habitats include a large ephemeral pool and open field to the west, a low moist meadow to the east and southeast along the Medford Drain, a previously farmed field to the north that has been fallow for several years, a young successional woodland dominated by exotic shrubs in the northern half of the property, many woodland edges along roads and paths, and three gravel parking areas (Figure 2).

Figure 1. – Map of Indiana (left) showing the location of Delaware County, and the location of Munsee Woods (right).

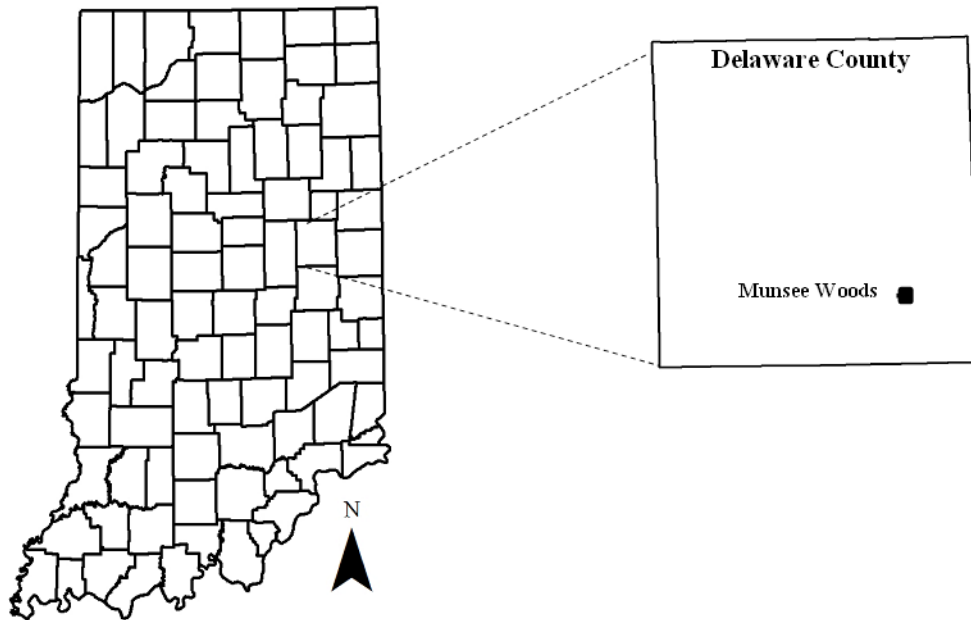
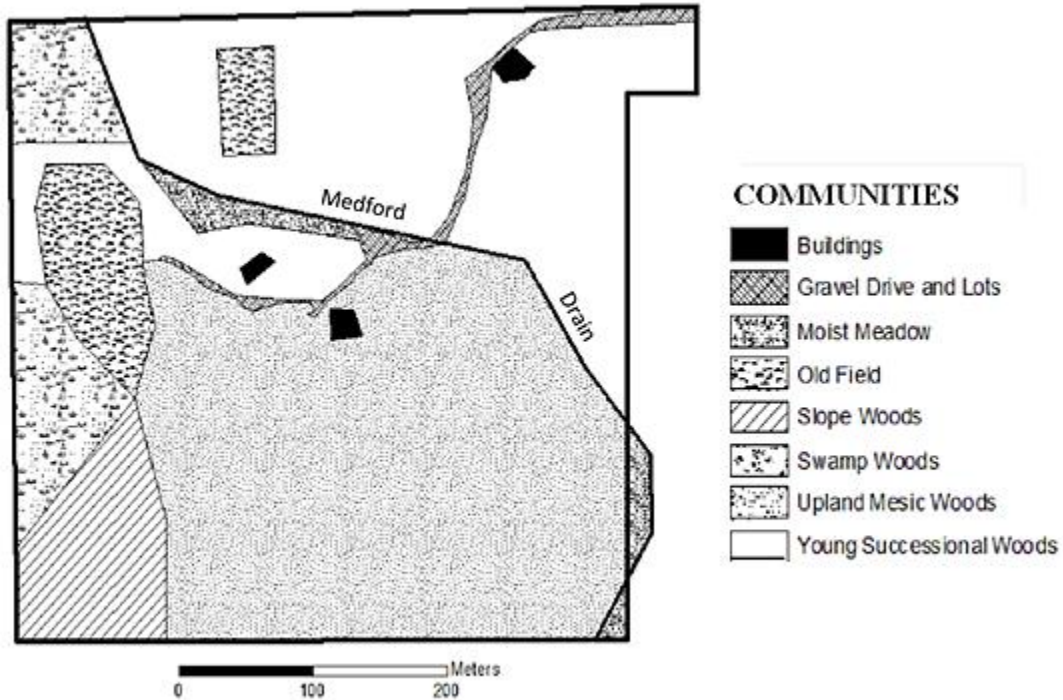


Figure 2. – Map illustrating the distribution of the major habitat types at Munsee Woods.



Munsee Woods lies within the Upper White River Watershed. Medford Drain, which cuts across the site, flows into the West Fork of the White River. The West Fork merges with the East Fork of the White River near Petersburg, Indiana. The White River then flows into the Wabash River along the Indiana-Illinois border, which then empties into the Ohio River at the intersection of the Indiana, Illinois, and Kentucky state lines. For a detailed description of the Upper White River Watershed, see E.P.A. (2011).

The soil at Munsee Woods site is comprised primarily of silt and clay loam. The central upland forest of Munsee Woods consists of both Mountpleasant silt loam, which is characterized as moderately sloping (0-12%), well-drained soil usually associated with kames and till plains and Belmore silt loam, which is characterized as moderately sloping (1-12%) and well-drained soil usually associated with outwash plains and glacial

drainage channels on till plains (Web Soil Survey 2011). The soils associated with the ephemeral pool and open field along the western border and along most of the Medford Drain are comprised of Milgrove silty clay loam and Digby-Haney silt loams. Both of these soil types are characterized as shallow sloping (0-1%), very to somewhat poorly drained soils usually associated with glacial drainage channels on till plains and outwash plains (Web Soil Survey 2011). The moist meadow running along the eastern and southeast corner of the site is comprised of Muskego muck soils, which are characterized as shallow sloping (0-1%), very poorly drained soils usually associated with depressions on till plains (Web Soil Survey 2011). The section of Munsee Woods north of the Medford Drain is comprised of several soil types that are moderately sloping (0-12%) and poorly to moderately well-drained silt loam soils (Web Soil Survey 2011). Except for the two fields, moist meadows, and gravel parking lots, all the soils at Munsee Woods are covered by woodlands (Figure 3).

Figure 3. – Map of the soil types at Munsee Woods (Web Soil Survey 2011). BdIC2 = Belmore loam, BdmB2 = Belmore silt loam, BltA = Belmore silt loam, CudA = Crosby silt loam, DdxA = Digby Haney silt loam, LshC3 = Losantville clay loam, MoeB2 = Miamian loam, MryA = Millgrove silty clay loam, MvxA = Mountpleasant silt loam, MvxB2 = Mountpleasant silt loam, MwzAU = Muskego muck, and SnIA = Southwest silt loam.



Little is known about the early history of Munsee Woods, other than its ownership has changed multiple times and its boundaries are unchanged. The land that Munsee Woods currently occupies was originally part of the Whitney farm. E. Arthur Ball purchased the land and renamed it Green Hills Farm. The land was rented to the Girl Scouts in 1936, and nine Civilian Conservation Corp (CCC) buildings were moved onto the site. In 1939, the E. Arthur Ball family deeded the Munsee Woods site to the Muncie Girl Scouts. The buildings located on the site were loaned to the Muncie Girl Scouts by the federal government. Munsee Woods was operated as a residence camp from 1937 until 1964.

In 1965 the residence camp was moved, and the site was used only as a day camp. Many of the original buildings were removed including the unit cabins and any other extra buildings. On December 2, 1970 the Great Lodge burned and was replaced by the current building. The camp experienced a steady decline in its use after that and was sold to the Red-tail Conservancy in April 2011.

MATERIALS AND METHODS

Floristic Inventory and Analysis: During the 2011 growing season one to two forays per week were made into the study site. Forays were random, but all areas of the study site were inventoried. Voucher specimens for each species observed were collected and deposited in the Ball State Herbarium (BSUH). A species list with visual estimations of relative abundance and distribution was made (Appendix 1). In addition the location of

potentially sensitive plant communities and rare and endangered species was noted.

Nomenclature follows the USDA NRCS Plants Database (USDA 2012).

The floristic quality index (FQI) for Munsee Woods was determined using the program developed by the Conservation Research Institute in conjunction with Rothrock (2004). The program not only calculates the FQI, but determines the mean Coefficient of Conservation (C_{av}) and the mean Wetland Indicator Status (W_{av}). The program also classifies both the native and exotic species into physiognomic categories.

Permanent Plot Analysis: Permanent-monitoring plots were established in the southern half of Munsee Woods within the upland forest community. Each of the 14 plots was a 15 m radius circle. The area of each circular plot is 0.0706 hectares. The center of each plot was permanently marked with an orange-tipped metal rebar.

In each plot trees were classified into one of three size classes using a plywood mold with three half-circle cutouts of radii equal to 1 cm, 5 cm, and 10 cm, e.g., 1 – 4.9 cm dbh, 5 – 9.9 cm dbh, and ≥ 10 cm dbh. Woody stems (dbh ≥ 10.0 cm) were identified working clockwise from north and their diameter at breast height (dbh) was measured. For understory stems having a dbh < 10 cm, only the species, size class, and stem count were recorded. These data were used to predict future successional trends for the site.

The data were analyzed to obtain information on the woodland structure and composition of the study site based on size-class (number of stems by dbh class), and stand tables containing the basal area (cm^2), density (stems/ha), relative density (%),

frequency, relative frequency (%), dominance (m^2/ha), relative dominance (%), and species importance value for each species.

First the total number of stems ($\text{dbh} \geq 10 \text{ cm}$) for each species and a count of the number of plots in which the species occurred were recorded. Then the basal area per tree was calculated using the equation:

$$\text{Basal area per tree} = \pi(\text{dbh}/2)^2$$

To compute the total basal area per species, the basal area per tree of all trees of a species was summed.

The density of each species was estimated by dividing the total stem count per species by the total hectares sampled and converted to stems per hectare. The relative densities are then computed by dividing the stem count for each species by the total stem count and multiplying by 100. Relative density is the percent of the measured stems that belong to a particular species.

The frequency was computed by dividing the number of plots in which a species occurred by the total number of plots sampled. The relative frequency was then computed by dividing the frequency for each species by the sum of all frequency values and multiplying by 100. Relative frequency was calculated in order to give frequency values the same range as relative density and relative dominance.

Dominance was computed by dividing the summed basal areas of each species by the number of hectares sampled. The cm^2/ha are converted to m^2/ha by dividing by the conversion factor of 10,000. Relative dominances are computed by dividing the

dominance value for each species by the sum of all dominance values and multiplying by 100. Relative dominance represents the percent of the total basal area contributed by a species.

Finally importance values (IV) were computed for each species by summing relative density, relative dominance, and relative frequency. Relative dominance was not calculated for the understory regeneration layers, only relative density and relative frequency were used. Importance values can be used to compare species distributions between stands. The relative importance value was computed by dividing the importance value of a species by three for the overstory and two for the understory.

Relative importance values were used to compare Munsee Woods to Christy Woods in Delaware County, Ginn Woods in Delaware County, and Yuhass Woods in Randolph County. Christy Woods and Yuhass Woods were chosen because they have a disturbance history similar to that of Munsee Woods. Ginn Woods was chosen to provide a comparison with an undisturbed, late successional forest. Two sample t-tests were used to compare Shannon Diversity between Munsee Woods and the two other disturbed woods, Christy Woods and Yuhass Woods. A Bonferroni adjustment was made for the multiple t-tests. A Chi-squared analysis was used to compare the species composition among the sites, and a multiple comparisons test was used to make comparisons among the sites for individual species. Multiple comparison tests were also used to compare relative abundance values between the three disturbed sites and the undisturbed, old-growth forest at Ginn Woods, for individual species and tolerance classes (shade-tolerant and shade-intolerant). Assignment of tree species to shade tolerance classes was done

using the classification of the U.S. Department of Agriculture, Forest Service (Burns & Honkola 1990). The results of these comparisons were interpreted with regards to the disturbance history of the site, age of the stand, and the stage of succession.

RESULTS

Floristic Inventory and Analysis: The catalog of the vascular flora documented at Munsee Woods is listed in Appendix 1. The vascular flora at Munsee Woods consists of 399 species and varieties representing 255 genera and 86 families. Thirty families (~35%) are represented by only one species and 19 families (~22%) are represented by only two species. The 10 families containing ~52% of the documented species (in order by number of species) were Asteraceae (46 species), Poaceae (38 species), Cyperaceae (34 species, including 30 *Carex* spp.), Rosaceae (18 species), Brassicaceae (15 species), Lamiaceae (14 species), Fabaceae (12 species), Scrophulariaceae (11 species), Polygonaceae (10 species), and Liliaceae (10 species). The plant community at Munsee Woods is dominated by herbaceous species, most notably the perennial, annual, and biennial forbs. Although grasses and sedges represent fewer total species, they are more visually abundant within the moist meadows and old fields at the site (Table 1; Appendix 1).

Table 1. – Physiognomic analysis of the flora, both native and exotic, at Munsee Woods. W = woody; H = herbaceous; P = perennial; A = annual; B = biennial. Percent is based on the total number of species (399).

	Native species		Exotic species	
	count	(percent)	count	(percent)
Trees	33	8.3	3	0.8
Shrubs	13	3.3	10	2.5
W-Vines	9	2.3	1	0.3
H-Vines	4	1.0	0	0.0
P-Forbs	133	33.3	23	5.8
B-Forbs	10	2.5	12	3.0
A-Forbs	35	8.8	28	7.0
P-Grasses	18	4.5	13	3.3
A-Grasses	3	0.8	9	2.3
P-Sedges	35	8.8	0	0.0
A-Sedges	0	0.0	0	0.0
Ferns	7	1.8	0	0.0
Totals	300	75.2	99	24.8

The flora at Munsee Woods is predominately low fidelity (low C-value) and exotic species. Only one plant species found at Camp Munsee is classified as having the highest index of fidelity to undisturbed plant communities ($C = 10$), *Ranunculus hispidus* v. *caricetorum*. Six species have a $C = 8$ (*Anemone acutiloba*, *Aristolochia serpentaria*, *Carex amphibola*, *Deparia acrostichoides*, *Sedum ternatum*, and *Symplocarpus foetidus*), and only 11 species have a $C = 7$. In contrast, 132 species have a $C = 0$, this includes exotics and also the lowest fidelity category of native species, 29 species have a $C = 1$, and 45 species have a $C = 2$. Over 50% of the total flora at Munsee Woods is categorized with a $C \leq 2$. Based upon the Indiana Natural Heritage Data Center’s records for Delaware County, 39 species documented at Munsee Woods are reported for the first

time in the county and represent new Delaware County records (Appendix 1). Based on the list of endangered, threatened, rare and extirpated plants of Indiana compiled by the Indiana Department of Natural Resources (IDNR 2010), the vascular flora of Munsee Woods includes three species on the state watch list, i.e., (*Hydrastis canadensis*, *Spiranthes ovalis* v. *erostellata*, and *Viola pubescens*).

Although exotic species reported at Munsee Woods only account for approximately 25% of the overall flora (Table 1), they have considerably higher visual abundances than the native species (Appendix 1). Most of the native species with high visual abundances are locally abundant but limited to smaller areas; especially those species found in the moist meadows, old fields, and swamp woods habitats of Munsee Woods (Figure 2). Many of those native species are representatives of the low fidelity species categories indicating a notable history of disturbance. Some exotic shrubs, including *Lonicera maackii* and *Rosa multiflora*, grow so thickly and densely that large areas of the site hold no other ground cover. Herbaceous exotic species are found in high abundance in the many disturbed habitats on the property, including manicured lawns surrounding buildings, and the gravel driveways and parking lots (Figure 2). Exotic species, including *Alliaria petiolata*, line the many trails cutting through the woodlands, and are also highly abundant throughout site. When the exotics, which all have a Coefficient of Conservation (C) = 0, are included the C_{av} is lowered by 0.8 units (Table 2). According to Rothrock & Homoya 2005, if the C_{av} values differ by greater than or equal to 0.7 units, it can be suggested that the exotics are having a negative impact. While exotics shrubs made up only a small percentage of the total number of species (Table 1),

they had by far the highest visual abundances and largest negative impact at the site. The exotic shrub species with the highest visual abundances include, *Lonicera maackii*, *Rosa multiflora*, *Euonymus alata*, and *Ligustrum obtusifolium* (Appendix 1).

Table 2. – Floristic Quality summary for Munsee Woods - C_{av} is the mean Coefficient of Conservation, and FQI is the Floristic Quality Index.

	Count	C_{av}	FQI
Native Species	300	3.2	55.0
Total Species	399	2.4	47.7

Permanent Plot Analysis: A total of 15 tree species with $dbh \geq 10$ cm were recorded in the upland mesic woods on the southern half of the Munsee Woods property (Table 3). The five most important species, based on RIV, were *Acer saccharum* (16.6), *Quercus alba* (15.9), *Celtis occidentalis* (14.6), *Prunus serotina* (12.8), and *Ulmus Americana* (10.2). The remaining 10 species all had RIV's equal to or lower than 6.2. The high RIV of *Q. alba* was due to a small number of large diameter stems (high relative dominance), while the high RIVs of *A. saccharum*, *C. occidentalis*, and *P. serotina* were due to a higher frequency and density of smaller diameter stems.

Table 3. – Stand table for the permanent plot data at Munsee Woods (stems with dbh > 10cm). Species are listed in descending order based on relative importance value (RIV). Where BA = basal area, DEN = density, RDEN = relative density, FRE = frequency, RFRE = relative frequency, DOM = Dominance, RDOM = relative dominance, IV = importance value, and RIV = relative importance value.

Species	BA (m ²)	DEN (stems/ha)	RDEN (%)	FRE	RFRE (%)	DOM (m ² /ha)	RDOM (%)	IV	RIV (%)
<i>Acer saccharum</i>	3.2	80.8	22.7	1.0	14.4	3.3	12.9	50.1	16.7
<i>Quercus alba</i>	7.9	28.3	7.9	0.6	8.2	8.0	31.5	48.1	16.0
<i>Celtis occidentalis</i>	2.4	77.8	21.8	0.9	12.4	2.5	9.7	44.0	14.7
<i>Prunus serotina</i>	3.0	50.5	14.2	0.9	12.4	3.1	12.0	38.7	12.9
<i>Ulmus americana</i>	1.3	42.4	11.9	0.9	13.4	1.4	5.4	30.7	10.2
<i>Carya glabra</i>	1.9	17.2	4.8	0.4	6.2	1.9	7.5	18.6	6.2
<i>Fraxinus americana</i>	1.4	18.2	5.1	0.4	5.2	1.4	5.6	15.9	5.3
<i>Ulmus rubra</i>	0.7	13.1	3.7	0.5	7.2	0.7	2.9	13.8	4.6
<i>Carya ovata</i>	0.9	10.1	2.8	0.4	6.2	0.9	3.5	12.5	4.2
<i>Carya cordiformis</i>	0.9	7.1	2.0	0.3	4.1	0.9	3.6	9.7	3.2
<i>Quercus rubra</i>	0.9	3.0	0.9	0.2	3.1	0.9	3.6	7.6	2.5
<i>Juglans nigra</i>	0.1	2.0	0.6	0.1	2.1	0.1	0.4	3.1	1.0
<i>Cercis canadensis</i>	0.0	3.0	0.9	0.1	2.1	0.0	0.1	3.1	1.0
<i>Cornus florida</i>	0.0	2.0	0.6	0.1	2.1	0.0	0.1	2.7	0.9
<i>Acer negundo</i>	0.0	1.0	0.3	0.1	1.0	0.0	0.1	1.4	0.5
	25.2	356.7	100.0	6.9	100.0	25.2	100.0	300.0	100.0

A total of 20 tree and shrub species were recorded in the advanced regeneration layers at Munsee Woods. The six most important species in both regeneration layers, based on RIV, are *Acer saccharum*, *Celtis occidentalis*, *Prunus serotina*, *Ulmus Americana*, *Carya cordiformis*, and *Lonicera maackii*. The remaining species all have RIV's equal to or lower than 6.3 (Table 4 & 5). *Quercus alba*, which has the highest RDOM and second highest RIV in the overstory, is not found in either of the advanced regeneration layers. In contrast, the RIV for *Acer saccharum* in the smallest size class was double the RIV in the overstory (Table 5). Larger invasive shrub species were also recorded in the understory, including *Lonicera maackii* which was one of the most important species in each of the two understory size classes (Tables 4 & 5).

Table 4. – Stand table for permanent plot data at Munsee Woods (stems with 5 cm ≤ dbh ≤ 9.9 cm). Species are listed in descending order based on stem count. Column title abbreviations same as Table 3.

Species	Stems	DEN (stems/ha)	RDEN (%)	FRE	RFRE (%)	IV	RIV (%)
<i>Acer saccharum</i>	125	126.3	37.5	1.0	17.3	54.8	27.4
<i>Celtis occidentalis</i>	61	61.6	18.3	0.7	12.3	30.7	15.3
<i>Prunus serotina</i>	56	56.6	16.8	0.8	13.6	30.4	15.2
<i>Ulmus americana</i>	22	22.2	6.6	0.6	11.1	17.7	8.9
<i>Carya cordiformis</i>	23	23.2	6.9	0.6	9.9	16.8	8.4
<i>Lonicera maackii</i>	10	10.1	3.0	0.6	9.6	12.6	6.3
<i>Vitis</i> spp.	7	7.1	2.1	0.3	4.9	7.0	3.5
<i>Cornus florida</i>	6	6.1	1.8	0.3	4.8	6.6	3.3
<i>Carya ovata</i>	6	6.1	1.8	0.2	3.7	5.5	2.8
<i>Acer negundo</i>	5	5.1	1.5	0.2	3.7	5.2	2.6
<i>Fraxinus americana</i>	5	5.1	1.5	0.2	3.7	5.2	2.6
<i>Ulmus rubra</i>	3	3.0	0.9	0.1	2.5	3.4	1.7
<i>Quercus rubra</i>	2	2.0	0.6	0.1	2.5	3.1	1.5
<i>Carya glabra</i>	1	1.0	0.3	0.1	1.2	1.5	0.8
<i>Cercis canadensis</i>	1	1.0	0.3	0.1	1.2	1.5	0.8
<i>Crataegus mollis</i>	0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Euyonomus alatus</i>	0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Ligustrum obtusifolium</i>	0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Lindera benzoin</i>	0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Sassafras albidum</i>	0	0.0	0.0	0.0	0.0	0.0	0.0
	333	336.5	100.0	5.8	100.0	200.0	100.0

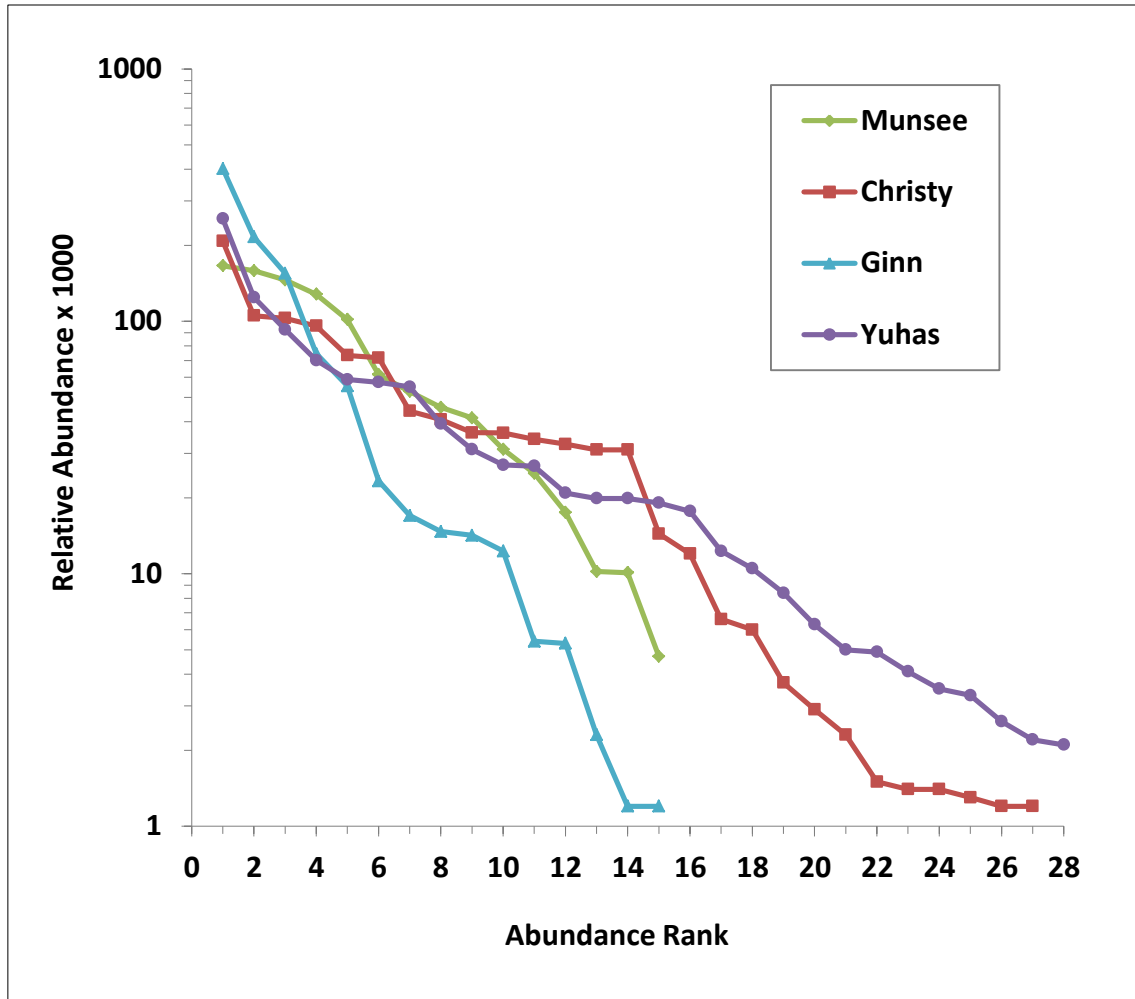
Table 5. – Stand table for permanent plot data at Munsee Woods (stems with $1 \text{ cm} \leq \text{dbh} \leq 4.9 \text{ cm}$). Species are listed in descending order based on stem count. Column title abbreviations same as Table 3.

Species	Stems	DEN (stems/ha)	RDEN (%)	FRE	RFRE (%)	IV	RIV (%)
<i>Acer saccharum</i>	727	734.6	52.7	1.0	11.6	64.3	32.1
<i>Celtis occidentalis</i>	190	192.0	13.8	0.9	9.9	23.7	11.8
<i>Carya cordiformis</i>	134	135.4	9.7	0.8	9.1	18.8	9.4
<i>Prunus serotina</i>	87	87.9	6.3	0.9	10.7	17.0	8.5
<i>Lonicera maackii</i>	71	71.8	5.1	0.9	10.4	15.5	7.8
<i>Ulmus americana</i>	54	54.6	3.9	0.9	9.9	13.8	6.9
<i>Fraxinus americana</i>	35	35.4	2.5	0.7	8.3	10.8	5.4
<i>Carya ovata</i>	23	23.2	1.7	0.6	6.6	8.3	4.1
<i>Cornus florida</i>	13	13.1	0.9	0.6	6.6	7.5	3.8
<i>Vitis spp.</i>	12	12.1	0.9	0.4	4.1	5.0	2.5
<i>Lindera benzoin</i>	13	13.1	0.9	0.3	3.3	4.2	2.1
<i>Acer negundo</i>	5	5.1	0.4	0.2	2.5	2.8	1.4
<i>Quercus rubra</i>	3	3.0	0.2	0.2	2.5	2.7	1.3
<i>Cercis canadensis</i>	2	2.0	0.1	0.1	1.7	1.8	0.9
<i>Ulmus rubra</i>	2	2.0	0.1	0.1	1.7	1.8	0.9
<i>Ligustrum obtusifolium</i>	4	4.0	0.3	0.1	0.8	1.1	0.6
<i>Euyonomus alatus</i>	2	2.0	0.1	0.1	0.8	1.0	0.5
<i>Carya glabra</i>	1	1.0	0.1	0.1	0.8	0.9	0.4
<i>Crataegus mollis</i>	1	1.0	0.1	0.1	0.8	0.9	0.4
<i>Sassafras albidum</i>	1	1.0	0.1	0.1	0.8	0.9	0.4
	1380	1394.5	100.0	8.6	100.0	200.0	100.0

Comparisons Between Munsee Woods and Other Local Woods: Shannon diversity of the tree community was similar among Munsee Woods and other disturbed woods in the vicinity, but all disturbed woods had higher Shannon diversity than an old-growth forest at Ginn Woods. The results suggest that the Shannon Diversity of the tree community at Munsee Woods ($H' = 2.355$) was lower than that of Christy Woods ($H' = 2.584$, $p = 0.038$), but the pairwise difference was not significant after a Bonferoni adjustment was made. Similarly, there was no difference in Shannon Diversity between Munsee Woods and Yuhus Woods ($H' = 2.531$, $p = 0.160$). However when Munsee Woods, Christy Woods, and Yuhus Woods, were compared to the old-growth, undisturbed forest at Ginn Woods ($H' = 1.566$), all three disturbed woods had higher Shannon Diversity ($p < 0.001$).

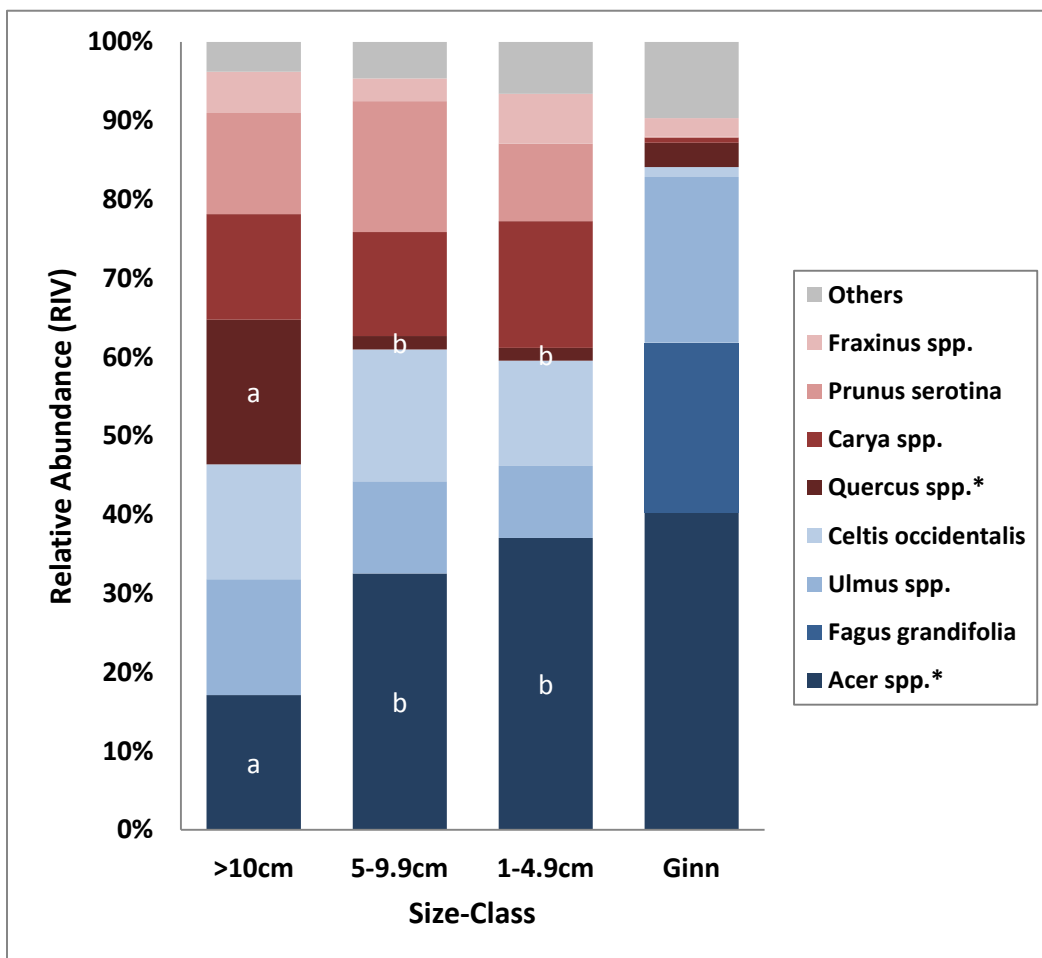
The rank abundance curves for the sites (Figure 4) illustrate the two components of Shannon Diversity index values, species richness and species evenness. Species richness is represented by the number of plot symbols on the curve, while species evenness is represented by the slope of the curve. Munsee Woods has lower species richness compared to Christy Woods and Yuhus. Even with the difference in species richness at Munsee Woods there was no difference in Shannon Diversity among the disturbed woods, because of the higher species evenness among the six most abundant species at Munsee Woods in comparison to Christy Woods and Yuhus Woods. Although the species richness at Munsee Woods was the same, species evenness was higher than that of old-growth Ginn Woods, and therefore it had a higher Shannon Diversity index value (Figure 4).

Figure 4. – Rank abundance curves for overstory tree communities at Munsee Woods, Christy Woods, Ginn Woods, and Yuhas Woods. Relative abundance = RIV converted from percentage to proportion format.



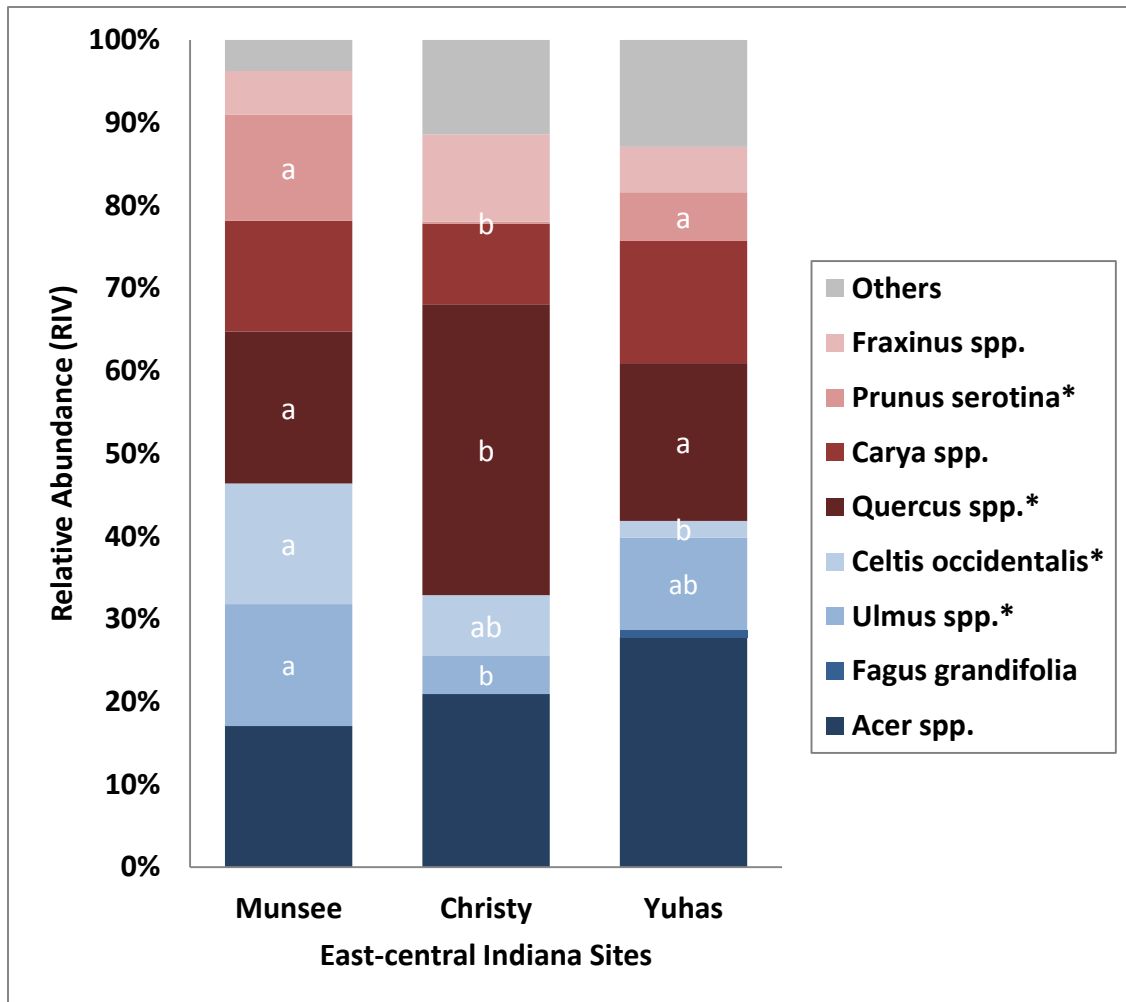
Differences in species composition were found between the overstory and advance regeneration layers within Munsee Woods ($\chi^2_{\text{test}} = 43.262$, $p < 0.0001$). The relative abundance for *Acer* spp. was significantly higher in the lower size-classes, while the relative abundance for *Quercus* spp. in the lower size classes was significantly lower than it was in the overstory (Figure 5). Understory species composition at Munsee Woods was more similar to that of the undisturbed, old-growth forest at Ginn Woods than to the overstory at Munsee Woods.

Figure 5. – Comparison of relative abundances among size classes of tree species at Munsee Woods. Ginn Woods’ overstory species composition is included as a comparison to a late successional forest. The species in blue are comprised of tree species that are more shade-tolerant, while those in red are less shade-tolerant tree species. Species classified as other, represented by the color gray in the charts, include tree species with low IVs, and those species that were excluded from the chi-squared analysis due to insufficient data. An asterisk (*) in the legend marks species for which a significant difference was found among the size classes. Bar segments that do not share a letter are significantly different.



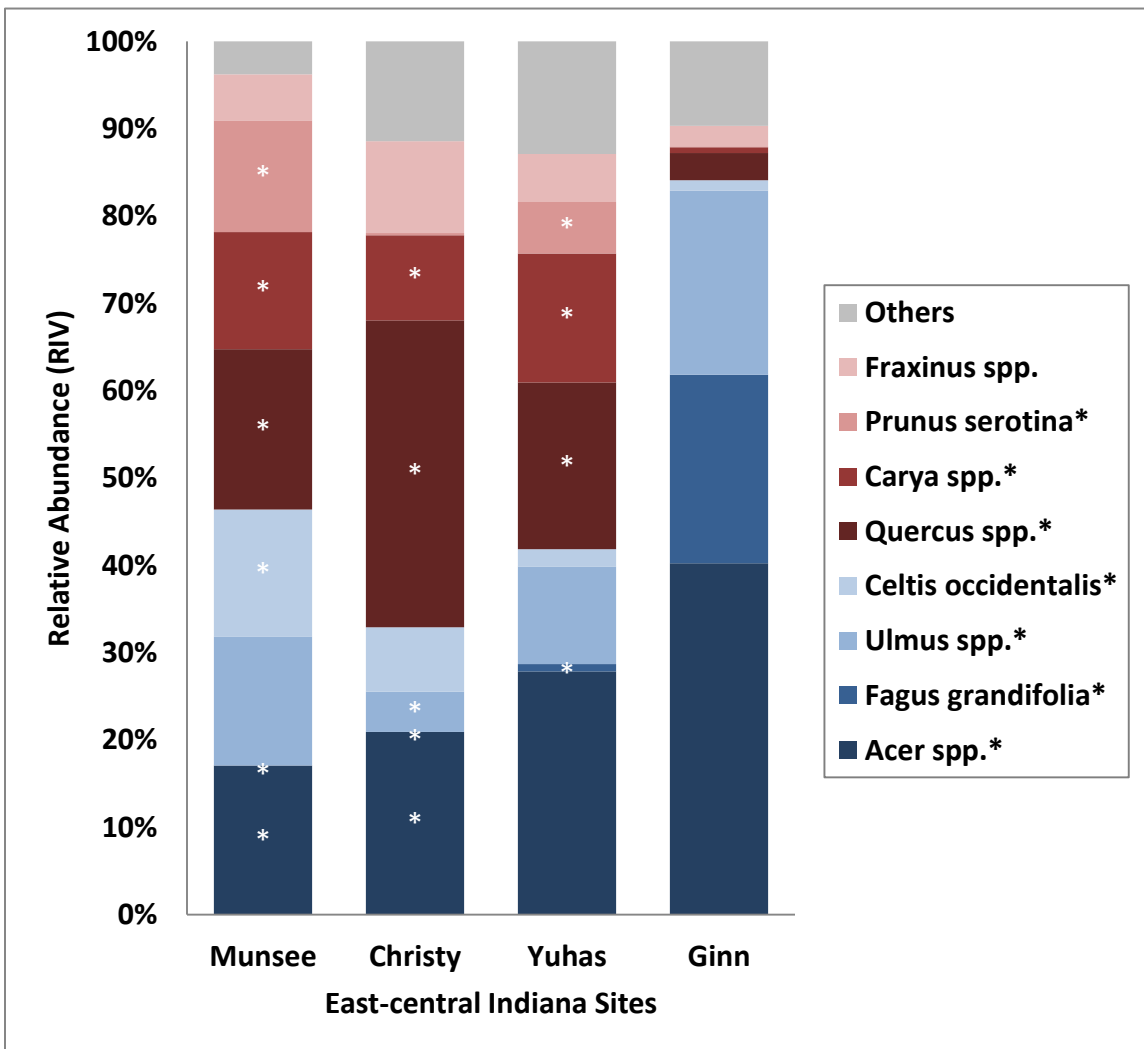
Differences of overstory species composition were also found among Munsee Woods and the other disturbed woods in east-central Indiana, including Christy Woods and Yuhus Woods ($\chi^2_{\text{test}} = 49.0, p < 0.0001$). The relative abundance of *Prunus serotina* at Christy Woods was significantly lower, while the relative abundance of *Quercus* spp. at Christy Woods was significantly greater than those at the other two sites. At Munsee Woods the relative abundance of *Celtis occidentalis* was significantly greater than that of Yuhus Woods, while the relative abundance of *Ulmus* spp. was significantly greater than that of Christy Woods. No other significant differences were observed among species at the disturbed sites (Figure 6).

Figure 6. – Comparison of overstory (stems with dbh ≥ 10 cm) tree species relative abundances among disturbed forests at Munsee Woods, Christy Woods, and Yuhas Woods. An asterisk (*) in the legend marks species for which a significant difference was found. Bar segments that do not share a letter are significantly different. Same color-coding and labeling as Figure 5.



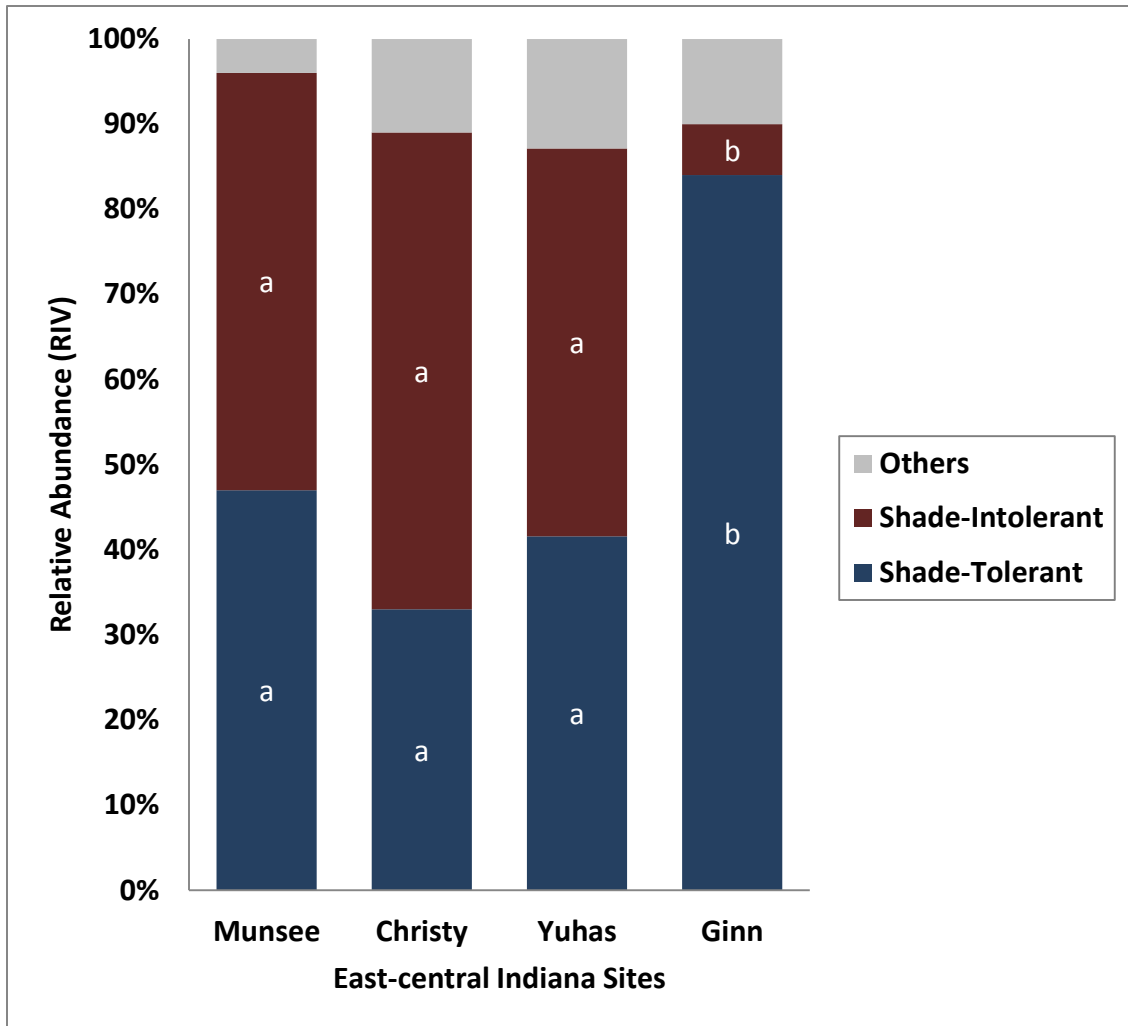
Differences were found between the overstory tree species of the three disturbed sites (Munsee Woods, Christy Woods, and Yuhas Woods), and the undisturbed, old-growth forest at Ginn Woods ($\chi^2_{\text{test}} = 180.997$, $p < 0.0001$). The differences seen between the overstory at the disturbed sites and Ginn Woods were for both the shade-tolerant species and shade-intolerant species. All of differences seen for the shade-intolerant species were significantly higher at the disturbed sites, and all of the differences, except one, for the shade-tolerant species were significantly lower. The relative abundances for *Carya* spp. and *Quercus* spp. were significantly higher at Munsee Woods, Christy Woods, and Yuhas Woods, than they are at Ginn Woods, while the relative abundance for *Prunus serotina* was significantly higher at only Munsee Woods and Yuhas Woods (Figure 7). The relative abundance for *Fagus grandifolia* was significantly lower at all of the disturbed sites compared Ginn Woods. The relative abundance for *Acer* spp. was significantly lower at Munsee Woods and Christy Woods than at Ginn Woods. The relative abundance for *Ulmus* spp. was significantly lower at Christy Woods when compared to Ginn Woods, while for *Celtis occidentalis* the relative abundance was significantly higher at Munsee Woods (Figure 7).

Figure 7. – Comparison of overstory (stems with dbh \geq 10 cm) tree species relative abundances between disturbed forests at Munsee Woods, Christy Woods, and Yuhus Woods and the undisturbed, late successional forest at Ginn Woods. An asterisk (*) in the legend marks species for which a significant difference was found. Bar segments with an asterisk (*) indicate species for which a significant difference was found between the disturbed woods and Ginn Woods. Same color-coding as Figure 5.



Relative abundance of overstory trees by tolerance class differed among the three disturbed sites (Munsee Woods, Christy Woods, and Yuhus Woods) and the undisturbed, old-growth forest at Ginn Woods ($\chi^2_{\text{test}} = 73.069$, $p < 0.0001$). The relative abundance of shade-tolerant species at Ginn Woods was significantly higher than at the three disturbed sites, while the relative abundance of shade-intolerant species was significantly lower at Ginn Woods (Figure 8).

Figure 8. - Comparison of tolerance classes in the overstory (stems with dbh \geq 10 cm) tree species relative abundances between disturbed forests at Munsee Woods, Christy Woods, and Yuhas Woods and the undisturbed, late successional forest at Ginn Woods. Labeling is the same as in Figure 5.



DISCUSSION

Floristic Inventory and Analysis: The FQI = 55.0 suggests that the site contains remnants of the regions natural flora (Swink & Wilhelm 1994). The FQI at Munsee Woods compares favorably with several other natural areas, including Barker Woods Nature Preserve in La Porte County (FQI = 60.7), Bendix Woods Nature Preserve in St. Joseph County (FQI = 49.3), Fogwell Forest Nature Preserve in Allen County (FQI = 59.3) (Rothrock & Homoya 2005). Rothrock & Homoya (2005) indicated that the best quality central Indiana sites had C_{av} ranging from 3.8 – 4.1. The $C_{av} = 3.2$ for Munsee Woods falls shy of this range. The lower C_{av} at the site is likely because sampling included many disturbed areas of the property (campsites, clear trails, mowed fields, gravel drives and parking lots, and manicured lawns adjacent to buildings). Also, the majority of the northern half of the site was agricultural field until about 15 years ago, and has since been covered by the young successional forest now present (Graham , Wapehani Girl Scouts Camp Munsee, Pers. Commun.). In addition to containing 99 exotic species, the site also includes a large number of native plants with low C-values. Rothrock & Homoya (2005) noted that central Indiana natural areas have limited number of species in the highest fidelity categories of C-values, but gave no specific reason for this observation. Ruch et al. (2008_a) suggested the large number of low fidelity species is due to the anthropogenic impact associated with large amounts of agriculture and construction. The most noticeable disturbance was clearing of the northern half of the site for agricultural use when it was still farm property, but trees were also cleared later for the buildings, drive ways, trails, and campsites associated with the old girl scout camp. The presence of low branches among the larger, older stems and apparent absence of species common in the

area, such as *Asarum canadense*, in the southern half of Munsee Woods suggests that the site was once more open and may have been used for grazing when it was part of Whitney Farm or Green Hills Farm. The flora from Munsee Woods contained only 18 species that had C-values ≥ 7 , just 4.5% of all species recorded.

The FQI for all species is 7.3 units lower and the C_{av} is 0.8 units lower than the FQI and C_{av} for native species alone. Rothrock & Homoya (2005) suggested that the quality of a plant community is degraded when including exotic species lowers the C_{av} by more than 0.7 units. From these numbers it can be suggested that the exotic flora is having a negative impact on the native plant community at Munsee Woods and this is readily observed as a number of exotic species dominate various parts of this site. Sites, such as Fall Creek Gorge in Warren County (Tonkovich & Sargent 1993), have shown a difference of 0.7 units or more in the C_{av} with limited negative impact on the community. This was in large part due to the highest diversity of exotic species being located on the margins and failing to penetrate the interior of natural areas. However at Munsee Woods many of the exotic species, including many invasive shrubs, were found in the highly disturbed northern half of the site, and were spreading into the south woods along the Medford Drain and the many paths throughout the site. *Lonicera maackii* dominated the northern half of the site, and was growing so thickly that almost no other plants could grow in certain parts of the area. Furthermore, around the gravel drive and parking lots, herbaceous exotic species grew more heavily in the disturbed edges and were moving into the areas that were not already being dominated by *Lonicera maackii* and other exotic shrubs. A similar situation was seen at Wilbur Wright Fish and Wildlife Area,

where exotics dominated some areas of the site and were a problem in even the most intact areas. The result was a difference in C_{av} of 1.1 units between natives and all species (Ruch et al. 2002). A study that uses plot analysis to quantify frequency, density, and percent cover of exotic species, especially the shrubs, would be needed to better quantify the abundance and impact of exotic species on the plant community at Munsee Woods.

Permanent Plot Analysis: The high dominance of *Quercus* spp. is due to a small number of larger overstory trees, while *Acer saccharum* dominates the understory with a high density of smaller trees. This suggests the future replacement of oaks in the overstory by higher density maples. One reason for the current dominance of oak spp. in the overstory at these sites may be heavy use of the area by Native Americans (Abrams 1992). This resulted in periodic surface fire prior to European settlement, which favors *Quercus* spp. because of their sprouting ability and resistance to rot after scarring, relative to later successional species like maples and beech (Lorimer 1985). Due to fire suppression in oak-hickory forests, which are considered to be an early to mid-stage of succession, *A. saccharum* and other shade-tolerant, fire sensitive trees began replacing oaks, by out competing *Quercus* spp. in gaps and openings in the canopy due to windfall or logging (Parker & Sherwood 1986).

Although understory species composition does not directly translate to future overstory composition, the high relative importance values of the *Acer* spp. suggests a likely change to maple dominated forest in later successional stages. This change is seen in the comparison of tree species composition among Munsee Woods, Christy Woods, Yuhas Woods, and Ginn Woods. Ginn Woods is a largely undisturbed site, and is

occupied by an old-growth forest in a later stage of succession than Munsee Woods or the other sites (Badger et al. 1998). This forest is dominated by shade-tolerant species (the three most dominant species, *Acer saccharum*, *Fagus gradifolia*, and *Tilia americana*, accounting for more than 65% of the total RIV at the site) and a low abundance of shade intolerant species, such as oaks (Badger et al. 1998). The larger diameter stems of *Acer* spp. at Munsee Woods were more commonly associated with the plots that had the highest abundance of maples in the understory. If those *Acer* spp. prevalent in the understory at Munsee Woods continue to replace *Quercus* spp. in the overstory, the result will be a species distribution similar to that seen at Ginn Woods.

Comparisons among the various woods in the east-central Indiana region suggest a relationship between the age of the stand and tree species richness. Stands in later stages of succession, like Ginn Woods, typically have lower tree species richness than stands in the early to mid-stages of succession (Goebel & Hix 1996). According to Clebsch & Busing (1989) this is because species richness peaks at mid-succession with the coexistence of shade-intolerant colonizers in the overstory and shade-tolerants in the understory. Species richness begins to decrease when the shade-tolerant species replace the shade-intolerant species in the overstory. This pattern is consistent with the dominance of shade-intolerant species in the overstory of Munsee Woods and the high density of shade-tolerant species in the understory.

Some management suggestions include:

1. Reduce or eradicate populations of invasive exotic species.
 - a. Continued removal and maintenance of invasive shrubs.

- b. Spray *Ailanthus altissima* (Tree of Heaven) at the base of uncut stems with Garlon4 to eradicate this invasive tree species before it becomes abundant.
 - c. Control of invasive herbaceous species, such as *Alliaria petiolata*, within the many disturbed habitats at the site.
2. Facilitate re-establishment of populations of native species typical of the habitat types present at Munsee Woods.
- a. Transplanting species with higher C-values to reestablish populations within the varying habitats.

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APPENDIX 1

CATALOG OF VASCULAR FLORA AT MUNSEE WOODS, DELAWARE COUNTY,
INDIANA

(Arranged in alphabetical order by family)

Listed are voucher specimens for all floral species documented at Munsee Woods. Nomenclature follows the USDA Plants Database (USDA 2010). Each species report contains the following information: (1) current scientific name based on the USDA Plants Database; (2) current taxonomic synonyms, if appropriate; (3) common name(s), based primarily on Gleason & Cronquist (1991), Swink & Wilhelm (1994), and Yatskievych (2000); (4) typical habitat(s) within the study site; (5) a visual estimate of its relative abundance; (6) its coefficient of conservatism (C-value) for Indiana (Rothrock 2004); and (7) the Ball State University Herbarium (BSUH) number(s).

The relative abundance for species is defined as follows; rare = < 5 sites although a species may be abundant at one site; infrequent = occasional, not widespread throughout its potential habitats, but may be locally abundant at a site; common = frequent throughout its potential habitats and may be locally abundant at one or more sites; and abundant = common and numerous throughout its potential habitats.

All naturalized, non-native (exotic) species are in capital letters. [Exotics that were planted and have not naturalized are also listed in capital letters.] Potential Delaware County records are indicated by a pound-symbol (#) in parentheses immediately preceding a species. Species were deemed unreported for Delaware County (and hence considered a county record) if they did not appear in the computer database of

Keller et al. (1984), Overlease & Overlease (2007), Ruch et al. (1998, 2004), or the UDSA Plant Database (UDSA 2012). (The database of plants developed by Keller et al. (1984) contains the same plant list for Madison County as does the Indiana Natural Heritage Data Center, IDNR.). There are 39 Delaware County records. Lastly, the status of certain species in brackets (e.g. [Endangered], [Rare], [Threatened], and [Watch List]) is from the list compiled by the Indiana Department of Natural Resources (IDNR 2010).

DIVISION EQUISETOPHYTA

Horsetails and Scouring Rushes

Equisetaceae (Horsetail Family)

Equisetum arvense L.; Common or Field Horsetail; East side creek and meadow in the wet area; Infrequent, but widespread; C = 1; BSUH 17822.

DIVISION POLYPODIOPHYTA

Ferns

Aspleniaceae (Spleenwort Family)

Asplenium platyneuron (L.) Oakes; Ebony Spleenwort; Woodland path west of vernal pool and north of east side creek; Rare, but locally abundant; C = 3; BSUH 17798.

Cystopteris protrusa (Weath.) Blasdell; Lowland Bladder Fern; Hillside woods along northern creek; Common; C = 4; BSUH 17805.

Dryopteridaceae (Wood Fern Family)

Deparia acrostichoides (Sw.) M. Kato; SYN: *Athyrium thelypteroides* (Michx.) Desv.;
Diplazium acrostichoides (Sw.) Butters; Silver False Spleenwort, Silvery Glade Fern, Silvery Spleenwort; Upland mesic woods; Rare, one plant; C = 8; Observed but not collected.

Onocleaceae (Sensitive Fern Family)

Onoclea sensibilis L.; Sensitive Fern; South eastern creek bank and meadow; Rare, but locally frequent; C = 4; BSUH 17783.

Ophioglossaceae (Adder's Tongue Family)

Botrychium dissectum Spreng. var. *obliquum* (Muhl. ex Willd.) Clute; Lace-Frond or Cutleaf Grapefern; Upland mesic woods; Rare; C = 3; BSUH 17826.

Botrychium virginianum (L.) Sw.; Rattlesnake Fern, Virginia Grapefern; Hillside woods along northern creek; Abundant and widespread; C = 4; BSUH 17757.

DIVISION CONIFEROPHYTA

Gymnosperms or Conifers

Cupressaceae (Cypress Family)

(#) *Juniperus virginiana* L.; Eastern Red Cedar; Young successional mesic woods,
Happy Hollow Campsite; Rare; C = 2; BSUH 17964.

Pinaceae (Pine Family)

PICEA ABIES (L.) Karst.; Norway Spruce; West side of parking lot; One tree, planted
not naturalized; BSUH 17988.

Pinus strobus L.; Eastern White Pine; Road near maintenance building; Rare, one tree,
planted; C = 5; BSUH 17947. [Rare]

DIVISION MAGNOLIOPHYTA

Angiosperms

Acanthaceae (Acanthus Family)

Ruellia strepens L.; Smooth Ruellia, [Limestone] Wild Petunia; Entrance road and field
around gravel parking lot; Infrequent, but widespread; C = 4; BSUH 18059.

Aceraceae (Maple Family)

Acer negundo L.; Boxelder, Ash-Leaved Maple; Young successional woods around
Happy Hollow camp site and permanent plots; Abundant and widespread; C = 1;
BSUH 17311.

Acer saccharinum L.; Silver Maple; Vernal pool; Common, and locally abundant; C = 1;
BSUH 17846.

Acer saccharum Marsh. var. *saccharum*; Sugar Maple; Woods; Abundant and
widespread; C = 4; BSUH 17758.

Alismataceae (Water Plantain Family)

Alisma subcordatum Raf.; Small-Flowered or American Water-Plantain; Northern moist
meadow; Rare; BSUH 18022.

(#) *Sagittaria latifolia* Willd.; Common or Broadleaf Arrowhead; Southern moist
meadow; Rare; BSUH 18039.

Amaranthaceae (Amaranth Family)

(#) *AMARANTHUS RETROFLEXUS* L.; Rough Green Amaranth, Redroot; Along edge
of vernal pool towards the open field; Infrequent; C = 0; BSUH 17290.

Anacardiaceae (Cashew Family)

Rhus glabra L.; Smooth Sumac; Woodland edge along south end of northern field; Rare,
but locally abundant; C = 1; BSUH 17940.

Toxicodendron radicans (L.) Kuntze ssp. *negundo* (Greene) Gillis; Eastern Poison Ivy;
Abundant and widespread; C = 1; BSUH 17738.

Apiaceae (Carrot Family) [9]

Chaerophyllum procumbens (L.) Crantz var. *procumbens*; Wild or Spreading Chervil;
Young successional woods along creek; Abundant and widespread; C = 2; BSUH
17867.

Cicuta maculata L. var. *maculata*; [Spotted] Water Hemlock; Path by northern wet
meadow; Infrequent, but widespread; C = 6; BSUH 18036.

CONIUM MACULATUM L.; Poison Hemlock; Entrance road near maintenance building;
Rare; C = 0; BSUH 17745.

Cryptotaenia canadensis (L.) DC.; [Canada] Honewort; Woods along northern edge of
northern old field; Abundant and widespread; C = 3; BSUH 17955.

DAUCUS CAROTA L.; Queen Anne's-Lace, Wild Carrot; Gravel parking lot; Common,
and widespread; C = 0; BSUH 17972.

Osmorhiza longistylis (Torr.) DC.; Aniseroot, Longstyle Sweetroot; Young successional
woods; Abundant and widespread; C = 3; BSUH 17812.

PASTINACA SATIVA L.; Wild Parsnip; Gravel parking lot; Rare; C = 0; BSUH 17742.

Sanicula canadensis L. var. *canadensis*; Canada Sanicle, Canada Black-Snakeroot;
Flagpole field; Infrequent but widespread; BSUH 17975.

Sanicula odorata (Raf.) K.M. Pryer & L.R. Philippe; SYN: *Sanicula gregaria* E.P.
Bicknell; Clustered [Black-] Snakeroot; Along creek east of the entrance road;
Abundant and widespread; C = 2; BSUH 17794.

Apocynaceae (Dogbane Family)

Apocynum cannabinum L.; Dogbane, American Indian Hemp; Northern old-field;
Infrequent; C = 2; BSUH 18020.

Araceae (Arum Family)

Arisaema dracontium (L.) Schott; Green Dragon; Path along moist meadow to the
southeast; Rare, but locally common; C = 5; BSUH 18010.

Arisaema triphyllum (L.) Schott var. *triphyllum*; Jack-in-the-Pulpit; Hillside woods along
northern moist meadow; Abundant and widespread; C = 4; BSUH 17814.

Symplocarpus foetidus (L.) Salib. ex Nutt.; Skunk Cabbage; Moist meadows; Common,
and locally abundant; C = 8; BSUH 17843.

Aristolochiaceae (Birthwort Family)

Aristolochia serpentaria L.; Virginia Snakeroot; Successional woods near lodge;
Infrequent; C = 8; BSUH 17778.

Asclepiadaceae (Milkweed Family)

Asclepias incarnata L. ssp. *incarnata*; Swamp Milkweed; Eastern moist meadow;
Infrequent; C = 4; BSUH 18054.

Asclepias syriaca L.; Common Milkweed; Gravel lot and associated field; Rare; C = 1;
BSUH 18006.

Asteraceae (Aster Family) [46]

Achillea millefolium L.; Common Yarrow; Western old field; Infrequent but widespread;
C = 0; BSUH 17316.

Ageratina altissima (L.) King & H. Rob. var. *altissima*; SYN: *Eupatorium rugosum*
Houtt.; White Snakeroot; Paths in young successional woods; Abundant and
widespread; C = 2; BSUH 17907.

Ambrosia artemisiifolia L. var. *elatior* Descourt.; SYN: *Ambrosia elatior* L.; Common
Ragweed; Northern old field; Abundant and widespread; C = 0; BSUH 17903.

Ambrosia trifida L. var. *trifida*; Great or Giant Ragweed; Field associated with gravel lot;
Common and widespread; C = 0; BSUH 17895.

ARCTIUM MINUS (Hill) Bernh.; Common or Lesser Burdock; Border of western old
field; Infrequent but widespread; C = 0; BSUH 18021.

Bidens cernua L.; Nodding Bur-Marigold, Nodding Beggartick; Creek bank north of
western old field; Common and widespread; C = 2; BSUH 17292.

Bidens frondosa L.; Common Beggar's-Ticks, Devil's-Beggartick; Happy Hollow camp
site; Abundant and widespread; C = 1; BSUH 17873.

(#) *Bidens tripartita* L.; SYN: *Bidens comosa* (A. Gray) Wiegand; Three-Parted or Three-
Lobed Beggar's-Ticks; Path along northern moist meadow; Common; C = 2;
BSUH 17922.

Bidens vulgata Greene; Tall Beggar's-Ticks, Big Devil's-Beggartick; Northern old field;
Infrequent but locally abundant; C = 0; BSUH 17904.

CICHORIUM INTYBUS L.; Chicory; Gravel lot; Rare; C = 0; BSUH 17932.

CIRSIUM ARVENSE (L.) Scop.; Canada Thistle; Gravel lot and associated field;
Infrequent; C = 0; BSUH 18012.

Cirsium discolor (Muhl. ex Willd.) Spreng.; Field or Pasteur Thistle; Gravel lot and old-
fields; Infrequent but widespread; C = 3; BSUH 17871.

CIRSIUM VULGARE (Savi) Ten.; Bull Thistle; Gravel lot and adjacent field; Rare; C =
0; BSUH 18023.

Conyza canadensis (L.) Cronquist var. *canadensis*; [Canadian] Horseweed; Gravel lot
and associated field; Common and widespread; C = 0; BSUH 18034.

Erechtites hieraciifolia (L.) Raf. ex DC. var. *hieraciifolia*; White Fireweed; Path to
western old field; Rare; C = 2; BSUH 17890.

Erigeron annuus (L.) Pers.; Eastern Daisy or Annual Fleabane, Whitetop; Northern old
field; Abundant and widespread; C = 0; BSUH 17740.

Erigeron philadelphicus L. var. *philadelphicus*; Philadelphia Daisy or Fleabane; Edge of
parking lot; Infrequent, but widespread; C = 3; BSUH 17809.

(#) *Eupatorium altissimum* L.; Tall Boneset, Tall Thoroughwort; Gravel lot and
associated field; Infrequent; C = 1; BSUH 17295.

Eupatorium perfoliatum L. var. *perfoliatum*; Common Boneset; Moist meadows;
Common and widespread; C = 4; BSUH 18025.

Eupatorium purpureum L. var. *purpureum*; Purple-Node, Green-Stemmed or Sweet-Scented Joe-Pye-Weed; Gravel lot and associated field; Abundant and widespread; C = 5; BSUH 18016.

Euthamia graminifolia (L.) Nutt. ex Cass. var. *graminifolia*; Common Flat-Topped Goldenrod; Northern old field; Infrequent but locally common; C = 3 BSUH 17889.

(#) *GALINSOGA QUADRIRADIATA* Cav.; Common Quickweed, Peruvian Daisy, Shaggy Soldier; Gravel lot; Rare; C = 0; BSUH 17288.

Helenium autumnale L. var. *autumnale*; Common Sneezeweed; Creek bank near east moist meadow; Rare; C = 3; BSUH 17925.

Helianthus grosseserratus M. Martens; Sawtooth Sunflower; Creek bank north of western old field; Infrequent; C = 3; BSUH 17285.

Helianthus tuberosus L.; Jerusalem-Artichoke; Gravel lot and edge of western old field; Infrequent but locally abundant; C = 2; BSUH 17878.

Heliopsis helianthoides (L.) Sweet var. *helianthoides*; False Sunflower, Smooth Oxeye; Along creek; Common and widespread; C = 4; BSUH 17980.

(#) *HYPOCHAERIS RADICATA* L.; (Hairy) Cat's-Ear; Western old-field; Infrequent but locally common; C = 0; BSUH 17779.

Lactuca biennis (Moench) Fernald; Tall Blue Lettuce; Eastern moist meadow; Infrequent but widespread; C = 2; BSUH 17882.

Lactuca canadensis L.; Wild or Canada Lettuce; Northern old-field; Infrequent; C =2;
BSUH 18051.

Lactuca floridana (L.) Gaertn. var. *floridana*; Woodland or Blue Lettuce; Gravel lot and
old-fields; Abundant and widespread; C = 5; BSUH 17870.

MATRICARIA DISCOIDEA DC.; SYN: *Matricaria matricarioides* auct. non (Less.)
Porter; Pineapple-Weed, Disc Mayweed; Gravel lot and associated field; Rare; C
= 0; BSUH 17324.

Packera glabella (Poir.) C. Jeffrey; SYN: *Senecio glabellus* Poir.; Butterweed,
Yellowtop; Young successional woods; Infrequent but widespread; C = 0; BSUH
17852.

Packera obovata (Muhl. ex Willd.) W.A. Weber & A. Löve; SYN: *Senecio obovatus*
Muhl. ex Willd.; Round-Leaved Golden Ragwort; Upland woods; Infrequent but
locally common; C = 7; BSUH 17850.

Prenanthes altissima L.; Tall Rattlesnake-Root, Tall White Lettuce; Upland woods;
Common; C = 5; BSUH 17879.

Ratibida pinnata (Vent.) Barnhart; Gray-Headed or Pinnate-Prairie Coneflower; Flagpole
hill and path; Rare; C = 5; BSUH 17931.

Rudbeckia hirta L. var. *pulcherrima* Farw.; Black-Eyed Susan; Creek bank in southeast
corner; Rare; C = 2; BSUH 17912.

Rudbeckia laciniata L. var. *laciniata*; Cut-Leaved Coneflower; Along creek north of old field; Common and widespread; C = 3; BSUH 18035.

(#) *Solidago altissima* L.; SYN: *Solidago canadensis* L. var. *scabra* Torr. & A. Gray; Tall or Canada Goldenrod; Gravel lot and associated fields; Abundant and widespread; C = 0; BSUH 17920.

Solidago caesia L. var. *caesia*; Blue-Stemmed Goldenrod, Wreath Goldenrod; Southern upland woods along paths; Infrequent but locally common; C = 7; BSUH 17299.

SONCHUS ASPER (L.) Hill; Spiny Sow-Thistle; Gravel lot and associated field; Rare; C = 0; BSUH 17951.

Symphyotrichum cordifolium (L.) G.L. Nesom; SYN: *Aster cordifolius* L. var. *cordifolius*; *Aster sagittifolius* Wedem. ex Willd.; *Symphyotrichum sagittifolium* (Wedem. ex. Willd.) G.L. Nesom; Common Blue Wood Aster, Blue Heart-Leaved Aster; Field associated with gravel lot; Common and widespread; C = 5; BSUH 17302.

Symphyotrichum lanceolatum (Willd.) G.L. Nesom ssp. *lanceolatum* var. *lanceolatum*; SYN: *Aster simplex* Willd.; *Aster lanceolatus* Willd. ssp. *simplex* (Willd.) A.G. Jones; White Panicked Aster; Northern moist meadow; Common and widespread; C = 3; BSUH 17301.

Symphyotrichum lateriflorum (L.) Á. Löve & D. Löve var. *lateriflorum*; SYN: *Aster lateriflorus* (L.) Britton; Calico, Goblet, or Side-Flowering Aster; Gravel lot and associated fields; Abundant and widespread; C = 3; BSUH 17294.

Symphyotrichum novae-angliae (L.) G.L. Nesom; SYN: *Aster novae-angliae* L.; New England Aster; Gravel lot and associated field; Rare; C = 3; BSUH 17289.

Symphyotrichum pilosum (Willd.) G.L. Nesom var. *pilosum*; SYN: *Aster pilosus* Willd.; Hairy White Old-Field Aster, Heath Aster, Goodbye Meadow; Flagpole hill; Common and widespread; C = 0; BSUH 17303.

(#) *Symphyotrichum puniceum* (L.) Á. Löve & D. Löve var. *puniceum*; SYN: *Aster firmus* Nees.; *Symphyotrichum firmum* (Nees) G.L. Nesom; Purple-Stem Aster; Southeast moist meadow; Rare but locally common; C = 4; BSUH 17300.

TARAXACUM OFFICINALE F.H. Wigg. ssp. *OFFICINALE*; Common Dandelion; Along gravel drives and in old fields; Common and widespread; C = 0; BSUH 17840.

TRAGOPOGON LAMOTTEI Rouy; SYN: *Tragopogon pratensis* L. ssp. *pratensis*; Common Goat's-Beard, Jack-Go-to-Bed-at-Noon; Western old-field; Rare; C = 0; BSUH 18056.

Verbesina alternifolia (L.) Britton ex Kearney; SYN: *Actinomeris alternifolia* (L.) DC.; Wingstem; Path along eastern creek; Common; C = 3; BSUH 17908.

Vernonia gigantea (Walter) Trel. ssp. *gigantea*; Tall or Giant Ironweed; Northern old-field; Common and widespread; C = 2; BSUH 17905.

Xanthium strumarium L. var. *glabratum* (DC.) Cronquist; Rough Cocklebur; Dry vernal pool; Rare but locally abundant; C = 0; BSUH 17917.

Balsaminaceae (Touch-Me-Not Family)

Impatiens capensis Meerb.; Orange Jewelweed, Spotted Touch-Me-Not; Northern old-field; Abundant and widespread; C = 2; BSUH 17978.

Impatiens pallida Nutt.; Yellow Jewelweed, Pale Touch-Me-Not; Edge of parking lot and along entrance drive; Rare; C = 4; BSUH 18027.

Berberidaceae (Barberry Family)

(#) *BERBERIS THUNBERGII* DC.; Japanese Barberry; Northern edge of upland mesic woods; Rare; C = 0; BSUH 17785.

Podophyllum peltatum L.; May-Apple; Woodlands; Abundant and widespread; C = 3; BSUH 17835.

Bignoniaceae (Trumpet-Creeper Family)

Campsis radicans (L.) Seem. ex Bureau; Trumpet Creeper; Western old-field; Locally abundant; C = 1; BSUH 17983.

Catalpa speciosa Warder; Northern Catalpa; Gravel lot and woods along northern creek; Infrequent but locally common; C = 0; BSUH 17753.

Boraginaceae (Borage Family)

Hackelia virginiana (L.) I.M. Johnst.; Stickseed, Beggars-Lice; Northern end of upland mesic woods; Abundant and widespread; C = 0; BSUH 18042.

Mertensia virginica (L.) Pers. ex Link; Virginia Bluebells; Northern edge of upland mesic woods; Rare but locally abundant; C = 6; BSUH 17839.

Brassicaceae (Mustard Family) [15]

ALLIARIA PETIOLATA (M. Bieb.) Cavara & Grande; SYN: *Alliaria officinalis* Andrz. ex

M. Bieb.; Garlic Mustard; Northern creek and moist meadow; Abundant and widespread; C = 0; BSUH 17823.

Arabis hirsuta (L.) Scop. var. *pyncocarpa* (M. Hopkins) Rollins; SYN: *Arabis hirsuta*

(L.) Scop. var. *adpressipilis* (M. Hopkins) Rollins; Hairy Rockcress; Northern end of upland mesic woods; Rare but locally common; C = 5; BSUH 17804.

BARBAREA VULGARIS W.T. Aiton; [Garden] Yellow Rocket, Bitter Winter Cress;

Gravel lot; Common; C = 0; BSUH 17863.

BRASSICA NIGRA (L.) W.D.J. Koch; Black Mustard; Gravel lot and associated field;

Rare but locally common; C = 0; BSUH 18014.

CAPSELLA BURSA-PASTORIS (L.) Medik.; Shepherd's Purse; Gravel lot and associated

field; Infrequent; C = 0; BSUH 17807.

Cardamine bulbosa (Schreb. ex Muhl.) Britton, Sterns & Poggenb.; SYN: *Cardamine*

rhomboidea (Pers.) DC.; White Spring Cress, Bulbous Bittercress; Northern creek and moist meadow; Infrequent but locally abundant; C = 4; BSUH 17824.

Cardamine concatenata (Michx.) Sw.; SYN: *Dentaria laciniata* Muhl. ex Willd.; Cut-

Leaved Toothwort; Woodlands; Abundant and widespread; C = 4; BSUH 17836.

Cardamine douglassii Britton; Purple Spring Cress, Limestone Bittercress; Edge of

western old-field; Common and widespread; C = 5; BSUH 17845.

(#) *CARDAMINE HIRSUTA* L.; Hairy Bittercress; Building lawns; Infrequent but locally abundant; C = 0; BSUH 17837.

Cardamine pensylvanica Muhl. ex Willd.; Pennsylvania Bittercress; Along the creek in young successional woods; Infrequent; C = 2; BSUH 17851.

(#) *DRABA VERNA* L.; Early Whitlow-Grass, Spring Draba; Gravel drive and lawns; Infrequent but locally abundant; C = 0; BSUH 17830.

Lepidium virginicum L. var. *virginicum*; Common Peppergrass, Poor Man's-Pepper, Virginia Pepperweed; Gravel lot and associated fields; Infrequent; C = 0; BSUH 17962.

NASTURTIUM OFFICINALE W.T. Aiton; SYN: *Rorippa nasturtium-aquaticum* (L.) Hayek; Watercress; Creek north of gravel lot; Rare but locally abundant; C = 0; BSUH 18040.

Rorippa palustris (L.) Besser ssp. *fernaldiana* (Butters & Abbe) Jonsell; SYN: *Rorippa islandica* (Oeder) Borbás var. *fernaldiana* Butters & Abbe; Common or Fernald's Yellow Cress; Large vernal pool; Rare; C = 2; BSUH 17915.

THLASPI ARVENSE L.; Field Pennycress; Gravel lot; Rare but locally frequent; C = 0; BSUH 17767.

Campanulaceae (Bellflower Family)

Campanulastrum americanum (L.) Small; SYN: *Campanula americana* L.; Tall or
American Bellflower; Gravel lot and associated field; Abundant and widespread;
C = 4; BSUH 18044.

Lobelia inflata L.; Indian Tobacco; Gravel lot and associated field; Infrequent; C = 3;
BSUH 17874.

Lobelia siphilitica L. var. *siphilitica*; Great Blue Lobelia; Moist meadows; Infrequent; C
= 3; BSUH 17897.

Cannabaceae (Indian Hemp Family)

(#) *Humulus lupulus* L. var. *lupuloides* E. Small; Common or American Hops; Western
old-field; Rare but locally common; C = 5; BSUH 17775.

Caprifoliaceae (Honeysuckle Family) [7]

LONICERA MAACKII (Rupr.) Herder; Amur Bush Honeysuckle; Along northern creek;
Abundant and widespread; C = 0; BSUH 17789.

LONICERA MORROWII A. Gray; Morrow's Honeysuckle; Northern old-field;
Infrequent; C = 0; BSUH 17857.

LONICERA X BELLA Zabel; Showy Fly Honeysuckle; Northern old-field; Infrequent; C
= 0; BSUH 17859.

Sambucus nigra L. ssp. *canadensis* (L.) R. Bolli; SYN: *Sambucus canadensis* L.;
American Black Elderberry; Western old-field; Common and widespread; C = 2;
BSUH 18005.

Triosteum perfoliatum L.; Common Horse-Gentian, Feverwort; Flagpole path and field;
Rare; C =5; BSUH 17953.

Viburnum lentago L.; Nannyberry, Sheepberry; Along southeast creek; Rare; C = 5;
BSUH 17885.

Viburnum prunifolium L.; Black Haw; Southern upland mesic woods; Common and
widespread; C = 4; BSUH 17861.

Caryophyllaceae (Pink Family)

ARENARIA SERPYLLIFOLIA L.; Thyme-Leaved Sandwort; Building lawns; Rare but
one large colony; C = 0; BSUH 17981.

CERASTIUM FONTANUM Baumg. ssp. *VULGARE* (Hartm.) Greuter & Burdet; SYN:
Cerastium vulgatum L.; Mouse-Ear Chickweed, Big Chickweed; Western old-
field; Common and widespread in field; C = 0; BSUH 18047.

SILENE LATIFOLIA Poir. ssp. *ALBA* (Mill.) Greuter & Burdet; SYN: *Lychnis alba* Mill.;
Evening, White, or Bladder Campion; Gravel lot and associated field; Rare; C =
0; BSUH 17322.

Silene stellata (L.) W.T. Aiton; Starry Catchfly, Widowsfrill; Young successional slope
woods; Rare; C = 5; BSUH 17984.

Silene virginica L. var. *virginica*; Fire Pink; Low woods along southern moist meadow;
Rare but locally common; C = 7; BSUH 17319.

STELLARIA MEDIA (L.) Vill.; Common Chickweed; Building lawns; Abundant and widespread; C = 0; BSUH 17827.

Celastraceae (Staff-tree Family)

(#) *CELASTRUS ORBICULATUS* Thunb.; Oriental Bittersweet; Shrub thicket near gravel lot; Infrequent; C = 0; BSUH 17770.

Celastrus scandens L.; American Bittersweet; Woodland edge of western old-field; Rare; C = 2; BSUH 17780.

EUONYMUS ALATUS (Thunb.) Siebold var. *ALATUS*; Winged Euonymus, Winged Burning Bush; Upland mesic woods; Abundant and widespread; C = 0; BSUH 17808.

EUONYMUS FORTUNEI (Turcz.) Hand.-Maz. var. *fortunei*; Winter Creeper; Gravel lot and associated field; Rare; C = 0; BSUH 17296.

Chenopodiaceae (Goosefoot Family)

CHENOPODIUM ALBUM L. var. *ALBUM*; Lamb's-Quarters, Pigweed; Gravel lot and associated field; Rare; C = 0; BSUH 17921.

Clusiaceae (Mangosteen Family)

Hypericum punctatum Lam.; Spotted St.-John's-Wort; Northern old-field; Abundant and widespread in fields; C = 3; BSUH 17987.

Commelinaceae (Spiderwort Family)

COMMELINA COMMUNIS L.; Common or Asiatic Day-Flower; Gravel lot and associated field; Rare; C = 0; BSUH 17868.

Tradescantia subaspera Ker Gawl. var. *subaspera*; Zigzag or Broad-Leaved Spiderwort; Edge of western old-field; Infrequent; C = 4; BSUH 17906.

Tradescantia virginiana L.; Virginia Spiderwort; Upland mesic woods; Common and widespread; C = 7; BSUH 17801.

Convolvulaceae (Morning-glory Family)

Calystegia sepium (L.) R. Br.; Common Hedge Bindweed, Hedge False Bindweed; Gravel lot near creek; Abundant and widespread; C = 1; BSUH 17743.

IPOMOEA HEDERACEA Jacq.; Ivy-Leaved Morning-Glory; Gravel lot and associated field; Rare; C = 0; BSUH 17894.

Ipomoea pandurata (L.) G. Mey.; Wild Potato, Man-of-the-Earth; Northern old-field; Infrequent but locally abundant; C = 3; BSUH 18019.

IPOMOEA PURPUREA (L.) Roth; Common or Tall Morning-Glory; Gravel lot and associated field; Rare; C = 0; BSUH 18043.

Cornaceae (Dogwood Family)

Cornus drummondii C.A. Mey.; Rough-Leaved Dogwood; Gravel drive; Common and widespread; C = 2; BSUH 18049.

Cornus florida L.; Flowering Dogwood; Flagpole path and field; Abundant and widespread; C = 4; BSUH 17862.

Cornus obliqua Raf.; SYN: *Cornus amomum* Mill. var. *schuetzeana* (C.A. Mey.) Rickett; Silky Dogwood, Knob-Styled Dogwood; Northern moist meadow along creek; Rare; C = 5; BSUH 17332.

Crassulaceae (Stonecrop Family)

Sedum ternatum Michx.; Wild or Woodland Stonecrop; Campsites in upland mesic woods; Infrequent but locally abundant; C = 8; BSUH 17820.

Cuscutaceae (Dodder Family)

Cuscuta gronovii Willd. ex Schult.; Common Dodder, Scaldweed; Northern moist meadow; Infrequent, parasitic on *Lactuca floridana*; C = 2; BSUH 17898.

Cyperaceae (Sedge) [34]

(#) *Carex aggregata* Mack.; Smooth Clustered Sedge, Glomerate Sedge; Path along west side of vernal pool; Abundant and widespread; C = 2; BSUH 17268.

Carex amphibola Steud.; Gray Sedge, Eastern Narrowleaf Sedge; Upland mesic woods; Rare; C = 8; BSUH 17934.

(#) *Carex annectens* E.P. Bicknell; Large Yellow Fox Sedge, Yellow-Fruit Sedge; Western old-field along western side; Rare but locally common; C = 3; BSUH 17936.

Carex blanda Dewey; Common Wood Sedge, Eastern Woodland Sedge; Western old-field along western side; Abundant and widespread; C = 1; BSUH 17269.

Carex cephalophora Muhl. ex Willd.; Short-Headed Bracted Sedge, Oval-Leaf Sedge; Western old-field; Abundant and widespread; C = 3; BSUH 17271.

Carex conjuncta Boott; Green-Headed or Soft Fox Sedge; Small vernal pool in northwest corner; Abundant; C = 6; BSUH 17270.

Carex cristatella Britton; Crested Oval Sedge; Eastern moist meadow; Common; C = 3; BSUH 17272.

Carex davisii Schwein. & Torr.; Awned Graceful Sedge, Davis' Sedge; Western old-field; Abundant and widespread; C = 3; BSUH 17273.

Carex frankii Kunth; Bristly Cattail Sedge, Frank's Sedge; Gravel lot and associated field; Infrequent but widespread; C = 2; BSUH 17310.

Carex granulatis Muhl. ex Willd.; Pale Sedge, Limestone Meadow Sedge; Fields and creek banks east of entrance road; Common and widespread; C = 2; BSUH 17274.

Carex grisea Wahlenb.; Wood Gray Sedge, Inflated Narrow-Leaf Sedge; Fields and creek banks east of entrance road; Abundant and widespread; C = 3; BSUH 17275.

Carex hirsutella Mack.; Hairy Green Sedge, Fuzzy-Wuzzy Sedge; Upland mesic woods; Common and widespread; C = 3; BSUH 17276.

- Carex hirtifolia* Mack.; Hairy Wood Sedge, Pubescent Sedge; Creek near northern old field; Infrequent; C = 5; BSUH 17277.
- (#) *Carex hystericina* Muhl. ex Willd.; Porcupine or Bottlebrush Sedge; Southern moist meadow; Infrequent but locally abundant; C = 5; BSUH 17278.
- Carex jamesii* Schwein.; Grass Sedge, James' Sedge; Young successional woods north of creek; Abundant and widespread; C = 4; BSUH 17813.
- Carex laevivaginata* (Kük) Mack.; Smooth-Sheathed Fox Sedge; Northern moist meadow; Infrequent but locally common; C = 7; BSUH 17279.
- Carex laxiculmis* Schwein.; Weak-Stemmed Wood Sedge; Upland mesic woods; Abundant and widespread; C = 7; BSUH 17935.
- (#) *Carex lupulina* Muhl. ex Willd.; Common Hop Sedge; Western old-field near vernal pool; Rare; C = 4; BSUH 18061.
- Carex molesta* Mach. ex Bright; Field Oval Sedge; Northern old field; Common; C = 2; BSUH 17966.
- Carex normalis* Mack.; Spreading Oval Sedge; Near northern moist meadow; Common and widespread; C = 3; BSUH 17280.
- Carex radiata* (Wahlenb.) Small; Straight-Styled Wood Sedge, Eastern Star Sedge; Gravel lots and lawns; Abundant and widespread; C = 4; BSUH 17765.
- Carex rosea* Schkuhr ex Willd.; Curly-Styled Wood Sedge, Rosy Sedge; Upland mesic woods; Infrequent but locally common; C = 5; BSUH 17933.

Carex shortiana Dewey; Short's Sedge; Gravel lot and associated fields; Infrequent but widespread; C = 3; BSUH 17796.

Carex sparganioides Muhl. ex Willd.; Loose-Headed Bracted Sedge, Bur-Reed Sedge; Fields and creek east of the entrance drive; Infrequent but widespread; C = 4; BSUH 17281.

Carex stipata Muhl. ex Willd. var. *stipata*; Common Fox Sedge, Owlfruit Sedge; Fields and creek east of entrance drive; Common; C = 2; BSUH 17282.

Carex stricta Lam.; Tussock Sedge; Along northern creek and moist meadow; Abundant; C = 5; BSUH 18063.

(#) *Carex texensis* (Torr.) L.H. Bailey; Texas Bracted Sedge; Western old field; Rare but locally common; C = 0; BSUH 17264. NOTE: this species is north of its range.

Carex tribuloides Wahlenb. var. *tribuloides*; Awl-Fruited Oval Sedge; Western old field; Abundant; C = 5; BSUH 17971.

(#) *Carex trichocarpa* Muhl. ex Willd.; Hairy-Fruited Lake Sedge; Northern moist meadow; Infrequent; C = 4; BSUH 17283.

Carex vulpinoidea Michx. var. *vulpinoidea*; Brown Fox Sedge; Gravel lot and associated fields; Infrequent but locally abundant; C = 2; BSUH 17749.

Cyperus strigosus L.; Long-Scaled or False Nut Sedge, Straw-Colored Flatsedge; Western old-field; Abundant and widespread; C = 0; BSUH 17884.

Eleocharis erythropoda Steud.; Red-Rooted Spike Rush; Western old-field along vernal pool; Rare but locally abundant; C = 2; BSUH 17318.

Schoenoplectus tabernaemontani (C.C. Gmel.) Palla; SYN: *Scirpus validus* Vahl; Great or Soft-Stemmed (Softstem) Bulrush; Northern moist meadow; Infrequent but locally common; C = 4; BSUH 17941.

Scirpus atrovirens Willd.; Dark Green Bulrush; Gravel lot and associated fields; Common and widespread; C = 4; BSUH 18001.

Scirpus pendulus Muhl.; Red or Rufous Bulrush; Edge of northern old-field; Rare but locally abundant; C = 2; BSUH 17943.

Elaeagnaceae (Oleaster Family)

ELAEAGNUS UMBELLATA Thunb. var. *PARVIFOLIA* (Wall. ex Royle) C.K. Schneid.; Autumn Olive; By creek at entrance road; Infrequent; C = 0; BSUH 17810.

Euphorbiaceae (Spurge Family)

Acalypha rhomboidea Raf.; SYN: *Acalypha virginica* L. var. *rhomboidea* (Raf.) Cooperr.; Common Three-Seeded Mercury; Goring in a cart; Common and widespread C = 0; BSUH 17896.

Chamaesyce maculata (L.) Small; SYN: *Euphorbia maculata* L.; Milk Purslane, Spotted Spurge, Spotted Sandmat, Creeping Spurge; Lawn of the RTC Office; Common; C = 0; BSUH 17910.

Chamaesyce nutans (Lag.) Small; SYN: *Euphorbia nutans* Lag.; (Small) Eyebane,
Nodding Spurge; Gravel parking lot and fields; Infrequent; C = 0; BSUH 17872.

Fabaceae (Pea or Bean Family) [12]

Amphicarpaea bracteata (L.) Fernald; American Hog-Peanut; Marsh and moist path
along creek; Abundant; C = 5; BSUH 17876.

(#) *Apios americana* Medik.; Common Groundnut, Wild Bean; Marsh and moist path
along creek; Infrequent but locally abundant; C = 3; BSUH 17877.

Cercis canadensis L. var. *canadensis*; Eastern Redbud; Woodland edge of large field;
Infrequent; C = 3; BSUH 17847.

Desmodium canadense (L.) DC.; Canadian Tick-Trefoil, Showy Tick-Trefoil; Old
pumpkin-patch field; Common and widespread; C = 3; BSUH 17297.

Gleditsia triacanthos L.; Honey Locust; Large field on the west side of the property;
Infrequent; C = 1; BSUH 17982.

Gymnocladus dioicus (L.) K. Koch; Kentucky Coffeetree; Entrance Road near the
caretaker's house – outside the main gate; Infrequent; C = 4; BSUH 18013.

MEDICAGO LUPULINA L.; Black Medic; Large gravel parking lot and field along the
entrance road; Infrequent; C = 0; BSUH 17790.

MELILOTUS ALBA Medik.; SYN: *Melilotus officinalis* (L.) Pall.; White Sweet Clover;
Entrance Road, gravel parking lot, and fields around the lot; Common and
widespread; C = 0; BSUH 17959.

MELILOTUS OFFICINALIS (L.) Lam.; Yellow Sweet Clover; Flagpole path and field;
Infrequent; C = 0; BSUH 17741.

TRIFOLIUM HYBRIDUM L.; Alsike Clover; Large gravel parking lot and nearby fields;
Infrequent but widespread; C = 0; BSUH 17952.

TRIFOLIUM PRATENSE L.; Red Clover; Large gravel parking lot and field along the
entrance road; Infrequent; C = 0; BSUH 17787.

TRIFOLIUM REPENS L.; White Clover ; Large gravel parking lot and field along the
entrance road; Infrequent but locally common; C = 0; BSUH 17791.

Fagaceae (Beech Family)

Quercus alba L.; White Oak; Parking lot and yards around the RTC Office; Common and
widespread; C = 5; BSUH 17760.

Quercus imbricaria Michx.; Single-Oak; Happy Hollow Camp Sites – successional
woodland; Rare, one site; C = 3; BSUH 18045.

Quercus rubra L.; Northern Red Oak; Parking lot and yards around the RTC Office;
Infrequent but widespread; C = 4; BSUH 17747.

Geraniaceae (Geranium Family)

Geranium maculatum L.; Wild Geranium, Spotted Geranium; Old woods in the south
half of property; Common and widespread; C = 4; BSUH 17853.

Grossulariaceae (Gooseberry)

Ribes cynosbati L.; Dogberry, Eastern Prickly Gooseberry; Old woods in the south half of property; Infrequent; C = 4; BSUH 17858.

Hippocastanaceae (Horse-chestnut Family)

Aesculus glabra Willd. var. *glabra*; Ohio Buckeye; Entrance Road near the caretaker's house – outside the main gate; Rare but locally frequent; C = 5; BSUH 18002.

Hydrangeaceae (Hydrangea Family)

PHILADELPHUS INODORUS L.; Scentless Mock-Orange; RTC Office lawn – planted; Rare; C = 0; BSUH 17325.

Hydrophyllaceae (Waterleaf Family)

Hydrophyllum macrophyllum Nutt.; Hairy or Large-leaf Waterleaf; Woods; Parking area and fields/lawns around the buildings; Abundant and widespread; C = 7; BSUH 17948.

Phacelia purshii Buckley; Miami Mist; Fields and meadows near creek east of entrance road; Infrequent but locally common; C = 3; BSUH 17793.

Iridaceae (Iris Family)

Iris virginica L. var. *shrevei* (Small) E.S. Anderson; SYN: *Iris shrevei* Small; Southern Blue Flag, Shreve's Iris; Marsh – north; Infrequent; C = 5; BSUH 17957.

Sisyrinchium angustifolium Mill.; Stout Blue-eyed Grass, Narrowleaf Blue-eyed Grass;
Edge of the pumpkin patch old-field; Infrequent but locally abundant; C = 3;
BSUH 17954.

Juglandaceae (Walnut Family)

Carya cordiformis (Wangenh.) K. Koch; Bitternut Hickory; Woodland between the
northern marsh and the pumpkin patch field; Common and widespread; C = 5;
BSUH 17330.

Carya glabra (Mill.) Sweet; Pignut Hickory; Older mesic woods; Common; C = 4;
BSUH 17772.

Carya ovata (Mill.) K. Koch; Shagbark Hickory; Older mesic woods; Common; C = 4;
BSUH 17773.

Juglans nigra L.; Black Walnut; Older mesic woods; Common; C = 2; BSUH 17774.

Juncaceae (Rush Family)

(#) *Luzula multiflora* (Ehrh.) Lej.; Common Wood Rush; Older woodland in the southern
half of the property; Infrequent; C = 6; BSUH 17854.

Juncus dudleyi Wiegand; SYN: *Juncus tenuis* Willd. var. *dudleyi* (Wiegand) F.J. Herm.;
Dudley's Rush; Large gravel parking lot and field along the entrance road and
south of creek; Infrequent; C = 2; BSUH 17939.

Juncus tenuis Willd.; Path Rush, Poverty Rush; Upper (northern-most) path north of
creek; Common and widespread; C = 0; BSUH 17938.

(#) *Juncus torreyi* Coville; Torrey's Rush; Old pumpkin patch field; Rare; C = 3; BSUH 17891.

Lamiaceae (Mint Family) [14]

Agastache nepetoides (L.) Kuntze; Catnip Giant Hyssop, Yellow Giant Hyssop; Path from gravel lot to marsh east; Rare; C = 4; BSUH 17880.

GLECHOMA HEDERACEA L.; Ground Ivy, Gill-Over-The-Ground, Creeping Charlie; Gravel Parking lot downhill (south) of RTC office; Abundant and widespread; C = 0; BSUH 17860.

LAMIUM AMPLEXICAULE L.; Henbit (Dead Nettle); Lawn and woodlands around the RTC office; Infrequent; C = 0; BSUH 17829.

LAMIUM PURPUREUM L. var. *PURPUREUM*; Purple Dead Nettle; Lawn and woodlands around the RTC office; C = 0; BSUH 17834.

Lycopus americanus Muhl. ex W. Barton; Common or American Water Horehound, American Bugleweed; Marsh – north; Infrequent; C = 3; BSUH 17900.

Lycopus uniflorus Michx. var. *uniflorus*; Northern Water Horehound or Bugleweed; Dry vernal pool north of old-field (in woods and along path); Infrequent but widespread; C = 5; BSUH 17919.

Mentha arvensis L.; SYN: *Mentha arvensis* L. var. *villosa* (Benth.) S.R. Stewart, *Mentha arvensis* L. var. *canadensis* (L.) Kuntze; Field or Wild Mint; Marsh on east side; Rare; C = 4; BSUH 17924.

Monarda fistulosa L. ssp. *fistulosa* var. *mollis* (L.) Benth.; Wild Bergamot; Marsh on the northern side and along creek; Common; C = 3; BSUH 18055.

NEPETA CATARIA L.; Catnip; Entrance road, gravel parking lot, and associated fields; Rare but locally common; C = 0; BSUH 17991.

PRUNELLA VULGARIS L. var. *VULGARIS*; Common Self Heal, Lawn Prunella, Heal-All; Large old-field; Infrequent but widespread; C = 0; BSUH 18000.

Scutellaria incana Biehler var. *incana*; Downy or Hoary Skullcap; Open woodlands north of east meadow; Path between entrance road at the bridge and the marsh on the east side; Rare but locally common; C = 4; BSUH 17994.

Scutellaria lateriflora L. var. *lateriflora*; Mad-dog Skullcap, Blue Skullcap; Vernal pool, open woods, north of the large-old field; Infrequent; C = 4; BSUH 17883.

Stachys tenuifolia Willd.; SYN: *Stachys tenuifolia* Willd. var. *hispida* (Pursh) Fernald, *Stachys hispida* Pursh; Smooth Hedge-Nettle; Marsh on the east side; Infrequent; C = 4; BSUH 17996.

Teucrium canadense L. var. *canadense*; SYN: *Teucrium canadense* L. var. *virginicum* (L.) Eaton; Canadian (American) Germander; Entrance road, gravel parking lot, and associated fields; Common and widespread; C = 3; BSUH 17989.

Lauraceae (Laurel Family)

Lindera benzoin (L.) Blume; Northern or Hairy Spice Bush; Mesic woods – upland; infrequent but locally common; C = 5; BSUH 17848.

Sassafras albidum (Nutt.) Nees; Sassafras; Path east of road, between Happy Hollow
Camp Site and the caretaker's house; Rare; C = 1; BSUH 17754.

Lemnaceae (Duckweed Family)

Lemna minor L.; Lesser, Small, or Common Duckweed; Northern sedge meadow;
Locally abundant in a small pool of water; C = 3; BSUH 17803.

Liliaceae (Lily Family) [10]

Allium burdickii (Hanes) A.G. Jones; SYN: *Allium tricoccum* Aiton var. *burdickii* Hanes;
Narrow-leaf Wild Leek; Older woods south of RTC Office; Abundant and
widespread; C = 6; BSUH 17782.

Allium canadense L. var. *canadense*; Wild or Meadow Garlic; Path from RTC Office to
the screen house next to the field; Infrequent; C = 1; BSUH 17323.

(#) *ASPARAGUS OFFICINALIS* L.; Garden Asparagus; Entrance road, gravel parking
lot, and associated fields; Rare; C = 0; BSUH 17992.

Camassia scilloides (Raf.) Cory; Early-Blooming Wild Hyacinth, Atlantic Camas;
Woodland in southern half of property; Rare; C = 5; BSUH 17817.

HEMEROCALLIS FULVA (L.) L.; Orange Day Lily; Entrance Road, gravel parking lot,
and fields around the lot; Infrequent; C = 0; BSUH 17960.

NARCISSUS PSEUDONARCISSUS L.; Daffodil; Lawn and woodlands around the RTC
office; Rare; C = 0; BSUH 17833.

Maianthemum racemosum (L.) Link ssp. *racemosum*; SYN: *Smilacina racemosa* (L.)

Desf.; Feathery False Solomon's Seal, Feathery Solomon's Plume, Feathery False

Lily of the Valley; Fields and meadows near creek east of entrance road;

Infrequent but widespread; C = 4; BSUH 17755.

Polygonatum biflorum (Walter) Elliott var. *biflorum*; Small or Smooth Solomon's Seal;

Slope woods between RTC Office and sedge meadow north; Abundant and

widespread; C = 4; BSUH 17320.

(#) *Polygonatum biflorum* (Walter) Elliott var. *commutatum* (Schult. & Schult. f.)

Morong; (Giant) Smooth Solomon's Seal; Fields and meadows near creek east of

entrance road; Infrequent; C = 4; BSUH 17795.

Trillium sessile L.; Toadshade, Sessile Trillium, Sessile-Flowered Wake-Robin; Lawn

and woodlands around the RTC office; Abundant and widespread; C = 4; BSUH

17832.

Limnanthaceae (Meadow-foam Family)

Floerkea proserpinacoides Willd.; False Mermaidweed; Upland woods (mesic);

Common and locally abundant; C = 5; BSUH 17825.

Lythraceae (Loosestrife Family)

Lythrum alatum Pursh var. *alatum*; Winged Loosestrife, Winged Lythrum; Old pumpkin

patch field; Rare; C = 5; BSUH 17977.

Magnoliaceae (Magnolia Family)

Liriodendron tulipifera L.; Tulip Poplar, Tulip Tree, Yellow Poplar; Parking lot and yards around the RTC Office and other nearby buildings; Rare; C = 4; BSUH 17762.

Malvaceae (Mallow Family)

ABUTILON THEOPHRASTI Medik.; Velvetleaf; Gravel lot, entrance road and associated fields; Rare; C = 0; BSUH 17287.

HIBISCUS TRIONUM L.; Flower-of-an-Hour; Large old-field, west side of property; Rare; C = 0; BSUH 17291.

SIDA SPINOSA L.; Prickly Sida, Prickly Mallow, Prickly Fanpetals; Northern border of the large old field; Infrequent; C = 0; BSUH 17928.

Menispermaceae (Moonseed Family)

Menispermum canadense L.; (Common) Moonseed; Hillside woods between office and sedge meadow north; Common; C = 3; BSUH 17806.

Moraceae (Mulberry Family)

MORUS ALBA L.; White Mulberry; SYN: *Morus tatarica* L.; Parking lots at office and north down the hill; Infrequent but widespread; C = 0; BSUH 17761.

Morus rubra L. var. *rubra*; Red Mulberry; Older mesic woods; Infrequent; C = 4; BSUH 17771.

Oleaceae (Olive Family)

Fraxinus americana L.; White Ash; Northern-most path, north of creek, west of entrance road; Common and widespread; C = 4; BSUH 17756.

Fraxinus pennsylvanica Marsh.; SYN: *Fraxinus pennsylvanica* Marsh. var.

subintegerrima (Vahl) Fernald, *F. pennsylvanica* Marsh. var. *lanceolata* (Borkh.)

Sarg.; Green Ash; Large gravel parking lot and field along the entrance road and south of creek; Common and widespread; C = 1; BSUH 17786.

LIGUSTRUM OBTUSIFOLIUM Siebold & Zucc.; Border Privet; Northern marsh and along creek; Abundant and widespread; C = 0; BSUH 17735.

Onagraceae (Evening Primrose Family)

Circaea lutetiana L. ssp. *canadensis* (L.) Asch. & Magnus; Common or Broadleaf

Enchanter's Nightshade; Path south of creek, from entrance road to the marsh on the east side; Abundant and widespread; C = 2; BSUH 18009.

Epilobium coloratum Biehler; Eastern, Cinnamon or Purple-Leaf Willow-Herb; Marsh on the east side; Infrequent; C = 3; BSUH 17913.

Gaura biennis L.; Biennial Gaura, Biennial Beeblossum; Old pumpkin-patch field; Rare; C = 3; BSUH 17888.

Ludwigia palustris (L.) Elliott; Common Water Purslane, Marsh Purslane, Marsh

Seedbox; Former small pond east of entrance road, south of creek, north of path to marsh east; Rare but locally abundant; C = 3; BSUH 17926.

Oenothera biennis L.; Common Evening Primrose; Entrance road, gravel parking lot, and adjacent fields; Rare; C = 0; BSUH 18015.

Orchidaceae (Orchid Family)

Aplectrum hyemale (Muhl. ex Willd.) Torr.; Putty-Root Orchid, Adam and Eve; Successional woodlands north of the RTC office; Infrequent but widespread; C = 7; BSUH 17818.

(#) *Spiranthes ovalis* Lindl. var. *erostellata* Catling; Lesser Ladies Tresses, October Ladies Tresses; Lawn of RTC Office; Rare; C = 3; BSUH 17286. [Watch List]

Oxalidaceae (Wood Sorrel Family)

Oxalis stricta L. Upright Yellow Wood Sorrel, Common Yellow Oxalis; Large gravel parking lot and field along the entrance road and south of creek; Common and widespread; C = 0; BSUH 17788.

Papaveraceae (Poppy Family)

Sanguinaria canadensis L.; Bloodroot; Lawn and woodlands around the RTC office; Infrequent but widespread; C = 5; BSUH 17838.

Phytolaccaceae (Pokeweed Family)

Phytolacca americana L. var. *americana*; American Pokeweed or Pokeberry; Entrance Road, gravel parking lot, and fields around the lot; Abundant and widespread; C = 0; BSUH 17958.

Plantaginaceae (Plantain Family)

PLANTAGO LANCEOLATA L.; English or Narrow-Leaf Plantain, Buckhorn; Parking area and fields/lawns around the buildings; Infrequent but widespread; C = 0; BSUH 17950.

Plantago rugelii Decne. var. *rugelii*; American, Purple-Stemmed or Blackseed Plantain; Entrance Road, gravel parking lot, and fields around the lot; Abundant and widespread; C = 0; BSUH 17887.

Platanaceae (Plane-tree Family)

Platanus occidentalis L.; American Sycamore, Buttonwood; Path by creek (south side) and northern marsh; Infrequent; C = 3; BSUH 18060.

Poaceae (Grass Family) [43]

(#) *AGROSTIS GIGANTEA* Roth; Redtop; Old pumpkin patch field; Common and widespread; C = 0; BSUH 17970.

Agrostis perennans (Walter) Tuck.; Autumn or Upland Bent-Grass, Thin-Grass; Lawn and area around RTC office to last building; Common; C = 2; BSUH 17929.

(#) *Andropogon virginicus* L. var. *virginicus*; Broomsedge (Bluestem); Old-field on the west side; Infrequent; C = 1; BSUH 17284.

BROMUS COMMUTATUS Schrad.; SYN: *Bromus racemosum* L.; Hairy Chess, Hairy or Meadow Brome; Old pumpkin patch field; Infrequent; C = 0; BSUH 17967.

BROMUS INERMIS Leysser; Smooth or Hungarian Brome; Large gravel parking lot and nearby fields; Common and locally abundant; C = 0; BSUH 17942.

Bromus pubescens Muhl. ex Willd.; Hairy Woodland Brome; Parking area and fields/lawns around the buildings; Infrequent; C = 4; BSUH 17267.

BROMUS TECTORUM L.; Junegrass, Cheat Grass, Downy Chess or Brome; Gravel parking lot and fields down the hill north of the RTC Office; Infrequent; C = 0; BSUH 17750.

Cinna arundinacea L.; Common or Sweet Woodreed; Marsh on the northern side and along creek; Abundant and widespread; C = 4; BSUH 18041.

DACTYLIS GLOMERATA L.; Orchard Grass; Parking lot and yards around the RTC Office; Infrequent but widespread; C = 0; BSUH 17766.

Danthonia spicata (L.) P. Beauv. ex Roem. & Schult.; Poverty Oatgrass; Flagpole path and field; Abundant; C = 3; BSUH 17326.

Dichanthelium acuminatum (Sw.) Gould & C.A. Clark var. *fasciculatum* (Torr.) Freckmann; SYN: *Panicum implicatum* Scribn., *Panicum lanuginosum* Elliot var. *implicatum* (Scribn.) Fernald; Woolly, Western, or Old-Field Panic Grass; Large field on the west side of the property; Abundant; C = 2; BSUH 17331.

(#) *DIGITARIA CILIARIS* (Retz.) Koeler; SYN: *Digitaria sanguinalis* (L.) Scop. var. *ciliaris* (Retz.) Parl.; Southern Crab-Grass; Lawn at the RTC Office; Rare but locally common; C = 0; BSUH 17886.

DIGITARIA SANGUINALIS (L.) Scop.; Northern or Hairy Crab-Grass; Gravel parking lot, roadside, and associated fields; Common; C = 0; BSUH 17965.

ECHINOCHLOA CRUS-GALLI (L.) P. Beauv.; Barnyard Grass; Gravel parking lot, entrance road, and associated fields; Infrequent; C = 0; BSUH 17266.

Echinochloa muricata (P. Beauv.) Fernald var. *muricata*; Rough Barnyard-Grass; Vernal pool (dry/moist) on west side of the large old-field; Rare but locally abundant; C = 1; BSUH 17265.

ELEUSINE INDICA (L.) Gaertn.; Yard Grass; Indian Goosegrass; Crowfoot Grass; Lawn and drive at RTC office; Infrequent; C = 0; BSUH 18030.

Elymus hystrix L. var. *hystrix*; SYN: *Hystrix patula* Moench; (Eastern) Bottlebrush Grass; Southern woods, adjacent to marsh on east side; Rare but locally frequent; C = 5; BSUH 18029.

ELYMUS REPENS (L.) Gould; SYN: *Elytrigia repens* (L.) Nevski.; Quack Grass; Entrance road and field around the large gravel parking lot; Infrequent; C = 0; BSUH 18057.

Elymus villosus Muhl. ex. Willd.; Downy or Hairy Wild Rye; Creek bank, entrance road, east side of road; Abundant and widespread; C = 4; BSUH 17969.

Elymus virginicus L.; Virginia Wild Rye; Creek bank, entrance road, east side of road; Infrequent but widespread; C = 3; BSUH 17968.

Festuca subverticillata (Pers.) E. Alexeev; SYN: *Festuca obtusa* Biehler; Nodding
Fescue; Path from RTC Office to the screen house next to the field; Abundant and
widespread; C = 4; BSUH 17312.

Glyceria striata (Lam.) Hitchc.; Fowl Manna-Grass; Northern marsh and along creek;
Abundant and widespread; C = 4; BSUH 17328.

(#) *HOLCUS LANATUS* L.; Common Velvet-Grass; West old-field; Abundant; C = 0;
BSUH 17327.

HORDEUM JUBATUM L. ssp. *JUBATUM*; Foxtail Barley; Gravel parking lot and
associated field; Rare; C = 0; BSUH 17746.

Leersia oryzoides (L.) Sw.; Rice Cut-Grass; Wet meadows, especially the east meadow;
Infrequent but locally abundant; C = 2; BSUH 17307.

Leersia virginica Willd.; White-Grass; Woodlands; Abundant; C = 4; BSUH 17930.

(#) *Muhlenbergia frondosa* (Poir.) Fernald; Common Satin-Grass, Wirestem Muhly;
Creek bank, SE corner; Infrequent but widespread; C = 3; BSUH 17911.

Muhlenbergia schreberi J.F. Gmel.; Nimblewill; Gravel parking lot and associated fields;
Abundant and widespread; C = 0; BSUH 18033.

Panicum dichotomiflorum Michx. var. *dichotomiflorum*; Knee Grass, Fall Panic Grass;
Gravel parking lot, entrance road, and associated fields; Infrequent; C = 0; BSUH
17306.

Panicum philadelphicum Bernh. ex Trin.; Philadelphia Panic Grass; Gravel parking lot, entrance road, and associated fields; Infrequent; C = 4; BSUH 17305.

(#) *PHALARIS ARUNDINACEA* L.; Reed Canary Grass; Large gravel parking lot and nearby fields; Abundant and widespread; C = 0; BSUH 17945.

PHLEUM PRATENSE L.; Timothy; In the old pumpkin patch field; Common; C = 0; BSUH 18058.

(#) *Phragmites australis* (Cav.) Trin. ex Steud.; Common Reed; East meadow; Rare but locally common; C = 0; BSUH 17881.

POA ANNUA L.; Annual Bluegrass, Speargrass; Path from RTC Office to the screen house next to the field; Common and widespread; C = 0; BSUH 17309.

POA COMPRESSA L.; Canada Bluegrass; Flagpole path and field; Abundant and widespread; C = 0; BSUH 17946.

POA PRATENSIS L. ssp. *PRATENSIS*; Kentucky Bluegrass; Fields, roadside, and open woodlands; C = 0; BSUH 17759.

Poa sylvestris A. Gray; Forest or Woodland Bluegrass; Path to the west of the large vernal pool; Abundant and widespread; C = 5; BSUH 17797.

POA TRIVIALIS L.; Rough Bluegrass; Northern marsh and along creek; Abundant and widespread; C = 0; BSUH 17329.

SCHEDONORUS PHOENIX (Scop.) Holub; SYN: *Lolium arundinaceum* (Schreb.) S.J. Darbyshire, *Festuca arundinacea* Schreb., *Festuca elatior* L. var. *arundinacea*

(Schreb.) Hook; Tall Fescue; Fields and roadsides; Abundant; C = 0; BSUH
17944.

SETARIA FABERI Herrm.; Nodding or Giant Foxtail-Grass, Japanese Bristlegrass;
Entrance road, gravel parking lot, and adjacent fields; Infrequent; C = 0; BSUH
18024.

SETARIA PUMILA (Poir.) Roem. & Schult. ssp. *PUMILA*; SYN: *Setaria glauca* (L.) P.
Beauv.; Yellow Foxtail-Grass; Field between gravel parking lot and the creek;
Infrequent; C = 0; BSUH 17909.

Sorghum halepense (L.) Pers.; Johnson-Grass; Entrance road, gravel parking lot, and
associated fields; Rare; C = 0; BSUH 17986.

Tridens flavus (L.) Hitchc. var. *flavus*; SYN: *Triodia flava* (L.) Smyth; Purpletop,
Purpletop Tridens; Old pumpkin-patch field; Infrequent but widespread; C = 1;
BSUH 18031.

Polemoniaceae (Phlox Family)

Phlox divaricata L. ssp. *divaricata*; Wild Blue or Woodland Phlox; Young successional
woods, north of the RTC office; Abundant and widespread; C = 5; BSUH 17866.

Phlox paniculata L.; Garden, Summer or Fall Phlox; Along the creek – near the northern
marsh; Rare; C = 3; BSUH 17979.

Polemonium reptans L. var. *reptans*; Greek Valerian, Spreading Jacob's-Ladder; Young successional woods, north of the RTC office; Common and widespread; C = 5; BSUH 17865.

Polygonaceae (Smartweed Family) [10]

POLYGONUM AVICULARE L.; SYN: *Polygonum monspeliense* Pers.; Doorweed, Common or Prostrate Knotweed; Lawn and area around RTC office to last building; Infrequent; C = 0; BSUH 17923.

(#) *POLYGONUM CESPITOSUM* Blume var. *LONGISETUM* (Bruijn) A.N. Steward; SYN: *Persicaria caespitosa* (Blume) Nakai var. *longiseta* (Bruijn) C.F. Reed, *Polygonum longisetum* Bruijn; Creeping Smartweed, Oriental Lady's Thumb; Pumpkin Patch old-field; Abundant and widespread; C = 0; BSUH 17963.

Polygonum pensylvanicum L.; SYN: *Persicaria pensylvanica* (L.) Small; Pinkweed, Pennsylvania Smartweed; Vernal pool (dry/moist) on west side of the large old-field; Infrequent but locally abundant; C = 0; BSUH 17916.

POLYGONUM PERSICARIA L.; SYN: *Persicaria vulgaris* Webb & Moq., *Polygonum dubium* Stein; Spotted Lady's-Thumb; Entrance road, gravel parking lot, and associated fields; Infrequent; C = 0; BSUH 18048.

Polygonum punctatum Elliott var. *confertiflorum* (Meisn.) Fassett; SYN: *Persicaria punctata* (Elliott) Small var. *leptostachya* (Meisn.) Small; Dotted or Water Smartweed; Creek, sandy shoreline (near large old-field); Common; C = 3; BSUH 17875.

Polygonum scandens L. var. *scandens*; SYN: *Fallopia scandens* (L.) Holub; Climbing False Buckwheat; Old pumpkin-patch field; Abundant and widespread; C = 0; BSUH 17293.

Polygonum virginianum L.; SYN: *Tovara virginiana* (L.) Raf., *Persicaria virginiana* (L.) Gaertn.; Jumpseed, Virginia Knotweed; Successional woodland north of creek; Abundant and widespread; C = 3; BSUH 18018.

RUMEX ACETOSELLA L.; Field Sorrel, Common Sheep Sorrel; Old-field on the west side; Rare but locally abundant; C = 0; BSUH 17800.

RUMEX CRISPUS L. ssp. *CRISPUS*; Curly Dock, Sour Dock; Gravel parking lot and fields down the hill north of the RTC Office; Infrequent but widespread; C = 0; BSUH 17752.

RUMEX OBTUSIFOLIUS L.; Bitter Dock, Blunt-Leaved Dock; Entrance road and field around the large gravel parking lot; Common and widespread; C = 0; BSUH 18062.

Portulacaceae (Purslane Family)

Claytonia virginica L. var. *virginica*; Virginia Spring Beauty; Woodlands and fields; Abundant; C = 2; BSUH 17831.

Primulaceae (Primrose Family)

Lysimachia ciliata L.; Fringed Loosestrife; Path between entrance road at the bridge and the marsh on the east side; Common and widespread; C = 4; BSUH 17993.

Samolus valerandi L. ssp *parviflorus* (Raf.) Hultén; SYN: *Samolus floribundus* Kunth,
Samolus parviflorus Raf.; (Seaside) Brookweed, Water Pimpernel; East meadow;
Rare; C = 5; BSUH 17914.

Ranunculaceae (Buttercup Family) [7]

Anemone virginiana L. var. *virginiana*; Tall Anemone, (Tall) Thimbleweed; Old
pumpkin patch field; Rare; C = 4; BSUH 18052.

Caltha palustris L. var. *palustris*; (Yellow) Marsh Marigold, Cowslip; Wetlands in SW
corner; Rare but locally abundant; C = 7; BSUH 17849.

Hepatica nobilis Schreb. var. *acuta* (Pursh) Steyerl.; SYN: *Hepatica acutiloba* DC.,
Anemone acutiloba (DC.) G. Lawson; Sharp-lobed Hepatica; Hillside woods
between office and sedge meadow north; Rare; C = 8; BSUH 17815.

Hydrastis canadensis L.; Goldenseal, Yellowroot; Creek bank and meadow in the SE
corner of the property; Rare but locally common; C = 7; BSUH 17784. [Watch
List]

Ranunculus abortivus L.; Kidney-Leaved Buttercup or Crowfoot, Small-Flowering
Crowfoot; Little-Leaf Buttercup; Lawn and woodlands around the RTC office;
Common and widespread; C = 0; BSUH 17842.

Ranunculus hispidus Michx. var. *caricetorum* (Greene) T. Duncan; SYN: *Ranunculus*
caricetorum Greene, *Ranunculus septentrionalis* Poir. var. *caricetorum* (Greene)

Fernald; Bristly or Hispid Buttercup, Swamp Buttercup; Creek and marsh – east side; Common and locally abundant; C = 10; BSUH 17821.

Thalictrum revolutum DC.; Waxy-Leaved or Skunk Meadow Rue; Northern marsh and along creek; Common and widespread; C = 5; BSUH 17737.

Rosaceae (Rose Family) [18]

(#) *Agrimonia gryposepala* Wallr.; Tall Hairy or Common Agrimony; Woods – southern half of property; Common and widespread; C = 2; BSUH 17997.

Agrimonia parviflora Aiton; Southern, Swamp, or Small-Flowered Agrimony, Harvestlice; Border (west) of large old-field; Infrequent; C = 4; BSUH 18037.

Agrimonia pubescens Wallr.; Downy or Soft Agrimony; Creek bank, succession woods, east of entrance road; Infrequent; C = 5; BSUH 18017.

Crataegus mollis Scheele; Downy Hawthorn; Woods south of the large field and vernal pool; Infrequent; C = 2; BSUH 17777.

Crataegus punctata Jacq.; Dotted Hawthorn; Mesic (successional) woods north of the large old-field; Infrequent; C = 2; BSUH 17776.

(#) *DUCHESNEA INDICA* (Andrews) Focke; Mock or Indian Strawberry; Lawns, woodland edges, and fields; Common; C = 0; BSUH 17816.

Geum canadense Jacq. var. *canadense*; White Avens; Woodlands; Abundant; C = 1; BSUH 18008.

Geum laciniatum Murray; Rough Avenas; East meadow; Rare; C = 3; BSUH 17892.

Geum vernum (Raf.) Torr. & A. Gray; Spring Avenas; Woodlands; Abundant; C = 1;
BSUH 17864.

Potentilla norvegica L. ssp. *monspeliensis* (L.) Aschers & Graebn. Rough Cinquefoil,
Norwegian Cinquefoil; Old pumpkin patch field; Rare but locally abundant; C =
0; BSUH 17976.

POTENTILLA RECTA L.; Sulfur Cinquefoil, Sulfur Five-Fingers; Large field on the west
side of the property; Rare; C = 0; BSUH 17739.

Potentilla simplex Michx.; Common or Old-Field Cinquefoil, Old-Field Five-Fingers;
Hillside slope (east-facing) at SE corner of property; above the sedge meadow;
Rare but locally common; C = 2; BSUH 17802.

Prunus serotina Ehrh. var. *serotina*; Wild Black Cherry; Large old-field; Abundant and
widespread; C = 1; BSUH 17781.

ROSA MULTIFLORA Thunb.; Multiflora or Japanese Rose; Woodlands; Abundant and
widespread; C = 0; BSUH 17949.

Rosa setigera Michx.; Climbing Prairie Rose, Illinois Rose; Marsh on the east side;
Infrequent but widespread; C = 4; BSUH 18011.

Rubus allegheniensis T.C. Porter var. *allegheniensis*; Common or Allegheny Blackberry;
Gravel parking lot and fields down the hill north of the RTC Office; Common; C
= 2; BSUH 17768.

Rubus occidentalis L.; Black Raspberry; Parking lot and yards around the RTC Office and other nearby buildings; Common; C = 1; BSUH 17764.

Rubus pensilvanicus Poir.; SYN: *Rubus abactus* L.H. Bailey; Pennsylvania or Yankee Blackberry; Large field on the west side of the property; Common; C = 5; BSUH 17315.

Rubiaceae (Madder Family)

Cephalanthus occidentalis L.; Common Buttonbush; East meadow; Rare; C = 5; BSUH 18004.

Galium aparine L.; Cleavers, Annual Bedstraw, Sticky-Willy; Old woods in the south half of property; Abundant and widespread; C = 1; BSUH 17869.

Galium circaezans Michx. var. *circaezans*; Forest Bedstraw, Smooth Wild Licorice, Licorice Bedstraw; Path from RTC Office to the screen house next to the field; Abundant and widespread; C = 7; BSUH 17313.

Galium concinnum Torr. & A. Gray; Shining Bedstraw; Woodlands; Common; C = 5; BSUH 17736.

(#) *Galium tinctorium* (L.) Scop.; Stiff Marsh Bedstraw; East meadow; Infrequent but locally common; C = 6; BSUH 18026.

Galium triflorum Michx.; Sweet-Scented or Fragrant Bedstraw; Creek bank at the bridge on the entrance road; Abundant and widespread; C = 5; BSUH 17973.

Salicaceae (Willow Family)

Populus deltoides Bartram ex. Marsh. var. *deltoides*; Eastern Cottonwood; Large gravel parking lot and field along the entrance road and south of creek (down the hill [north] of the RTC Office; Abundant and widespread; C = 1; BSUH 17751.

Salix amygdaloides Andersson; Peach-Leaf Willow; Large field on the west side of the property; Rare; C = 4; BSUH 17308.

Salix nigra Marsh.; Black Willow; Marsh on the east side; Rare; C = 3; BSUH 18003.

Scrophulariaceae (Figwort Family) [11]

Mimulus alatus Aiton; Winged or Sharp-Wing Monkey-Flower; Marsh on the northern side and along creek; Common; C = 4; BSUH 18053.

Mimulus ringens L. var. *ringens*; Allegheny Monkey-Flower; Marsh on east side; Common; C = 4; BSUH 18038.

Penstemon calycosus Small; SYN: *Penstemon laevigatus* Ait. ssp. *calycosus* (Small) Benn.; (Eastern) Smooth Beard-Tongue, Long-Sepal Beard-Tongue; Large field on the west side of the property; Rare; C = 4; BSUH 17314.

Scrophularia marilandica L.; Eastern or Late Figwort, Carpenter's-Square; Happy Hollow Camp Sites – successional woodland; Infrequent; C = 5; BSUH 18046.

VERBASCUM BLATTARIA L.; Moth Mullein; Large gravel parking lot near the creek; Rare; C = 0; BSUH 17744.

VERBASCUM THAPSUS L.; Common or Woolly Mullein; Edge of gravel parking lot; Rare but locally common; C = 0; BSUH 17961.

Veronica anagallis-aquatica L.; SYN: *Veronica catenata* Pennell; Water Speedwell; In and around the marsh (not sedge meadow) on the east; Common; C = 5; BSUH 17321.

VERONICA ARVENSIS L.; Corn Speedwell; Old field – old pumpkin patch; Abundant; C = 0; BSUH 17855.

VERONICA POLITA Fr.; Gray Field Speedwell, Wayside Speedwell; Lawn and woodlands around the RTC office; Infrequent but locally common; C = 0; BSUH 17819.

(#) *VERONICA PERSICA* Poir.; Birdseye Speedwell; Large gravel parking lot and field along the entrance road and south of creek (down the hill [north] of the RTC Office; Rare but locally common; C = 0; BSUH 17937.

VERONICA SERPYLLIFOLIA L. ssp. *SERPYLLIFOLIA*; Thyme-Leaved Speedwell; Old field – old pumpkin patch; Abundant; C = 0; BSUH 17856.

Simaroubaceae (Quassia Family)

AILANTHUS ALTISSIMA (Mill.) Swingle; Tree-of-Heaven; Scattered in woodland in the northern section of the property; Infrequent; C = 0; BSUH 17995.

Smilacaceae (Catbrier Family)

Smilax ecirrhata (Engelm. ex Kunth) S. Watson; Upright Carrion Flower; Woodlands; Infrequent; C = 5; BSUH 17748.

Smilax tamnoides L.; SYN: *Smilax hispida* Muhl. ex Torr., *Smilax tamnoides* L. var. *hispida* (Muhl. ex Torr.) Fernald; Bristly Greenbrier or Catbrier; : In and around the marsh (not sedge meadow) on the east; Common and widespread; C = 3; BSUH 17792.

Solanaceae (Nightshade Family)

Physalis longifolia Nutt. var. *subglabrata* (Mack. & Bush) Cronquist; SYN: *Physalis subglabrata* Mack. & Bush; Long-Leaved Ground Cherry, Smooth Ground Cherry; Northern border of the large old field; Rare; C = 0; BSUH 17927.

Solanum carolinense L. var. *carolinense*; (Carolina) Horse-Nettle, Carolina Poppy; Old pumpkin patch field; Common; C = 0; BSUH 18050.

Solanum ptycanthum Dunal; SYN: *Solanum nigrum* auct. non L., *Solanum americanum* auct. non Mill.; Eastern Black Nightshade, West Indiana Nightshade; Dry vernal pool north of old-field; Rare; C = 0; BSUH 17918.

Typhaceae (Cattail Family)

TYPHA ANGUSTIFOLIA L.; Narrow-Leaved Cattail; Meadows; Infrequent; C = 0; BSUH 18028.

Typha latifolia L.; Common or Broad-Leaved Cattail; Meadows; Infrequent but locally common; C = 1; BSUH 17893.

Ulmaceae (Elm Family)

Celtis occidentalis L.; Northern or Common Hackberry; Woodlands; Abundant; C = 3;
BSUH 17317.

Ulmus americana L.; White or American Elm; Woodlands, Abundant; C = 3; BSUH
17799.

Ulmus rubra Muhl.; Red or Slippery Elm; Woodlands; Common; C = 3; BSUH 17956.

Urticaceae (Nettle Family)

Boehmeria cylindrica (L.) Sw.; (Small-Spike) False Nettle; Meadows; Infrequent but
locally common; C = 3; BSUH 17899.

Laportea canadensis (L.) Weddell; SYN: *Urtica canadensis* L.; Canadian Wood Nettle;
Moist woodlands; Abundant; C = 2; BSUH 17901.

Parietaria pensylvanica Muhl. ex Willd.; Pennsylvania Pellitory; Large old-field on west
side; Infrequent but locally abundant; C = 1; BSUH 17902.

(#) *Pilea fontana* (Lunell) Rydb.; Bog or Lesser Clearweed; Northern meadow; Rare; C =
5; BSUH 17298.

Pilea pumila (L.) A. Gray var. *pumila*; (Canadian) Clearweed; Along creek in SE corner;
Abundant and widespread; C = 2; BSUH 17304.

Urtica dioica L. ssp. *gracilis* (Aiton) Seland.; SYN: *Urtica dioica* L. var. *procera* (Muhl.
ex Willd.) Weddell, *Urtica procera* Muhl. ex Willd.; Tall Nettle, California
Nettle, Stinging Nettle; Creek bank at the bridge on the entrance road; west side
of road; Abundant and widespread; C = 1; BSUH 17974.

Valerianaceae (Valerian Family)

Valerianella umbilicata (Sull.) Alph. Wood; Navel or Navel-Fruited Cornsalad; Young successional woodland north of the creek; Abundant; C = 5; BSUH 17811.

Verbenaceae (Vervain Family)

Phryma leptostachya L.; American Lopseed; Woodland; Common; C = 4; BSUH 18007.

Phyla lanceolata (Michx.) Greene; SYN: *Lippia lanceolata* Michx.; Lance-Leaf Fogfruit; West field bordering large vernal pool; Rare but locally common; C = 2; BSUH 17999.

Verbena hastata L. var. *hastata*; Common, Blue, or Swamp Vervain; Entrance road, gravel parking lot, and associated fields; Rare but locally common; C = 3; BSUH 17990.

Verbena urticifolia L. var. *urticifolia*; White Vervain; Creek bank – SE corner of property; Infrequent but widespread; C = 3; BSUH 17998.

Violaceae (Violet Family)

Viola pubescens Aiton; Forest Yellow Violet; Lawn and woodlands around the RTC office; Abundant and widespread; C = 5; BSUH 17828. [Watch List]

Viola sororia Willd.; Common Blue Violet, Dooryard Violet; Lawn and woodlands around the RTC office; Abundant and widespread; C = 1; BSUH 17844.

Viola striata Aiton; Striped Cream Violet, Cream Violet, White Violet; Lawn and woodlands around the RTC office; Abundant and widespread; C = 4; BSUH 17841.

Vitaceae (Grape Family)

Parthenocissus quinquefolia (L.) Planch.; Virginia Creeper, Woodbine; Woodlands; Abundant; C = 2; BSUH 17763.

Vitis cinerea (Engelm.) Engelm. ex Millard var. *cinerea*; Graybark or Winter Grape; On shrubs between the east meadow and creek; Rare but locally abundant; C = 4; BSUH 17985.

Vitis riparia Michx.; Riverbank Grape; Gravel parking lot, roadside, and associated fields; Rare; C = 1; BSUH 18032.

Vitis vulpina L.; Frost or Fox Grape; Gravel parking lot and fields down the hill north of the RTC Office; Common and widespread; C = 3; BSUH 17769.

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