

**Indianapolis Museum of Art – Virginia B. Fairbanks Art and Nature Park
Baseline Biotic Survey and Long-Term Monitoring Report**

Submitted by

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I. Introduction

The main purpose of the baseline biotic survey of the Virginia B. Fairbanks Art and Nature Park (VBFANP) is to establish a database that will allow for informed comparisons following changes in specific areas as development in the park proceeds. The inventory involved cataloging the presence of vertebrate species that may be important to retaining the remaining ecological integrity of the site. Additionally, the survey was intended to characterize the flora in an ecologically realistic manner, permitting the identification of areas of special concern (e.g., invasive species) and monitoring the changes in the flora that occur over the development of the park. This report represents a semi-preliminary set of findings based on work conducted at the VBFANP by faculty, staff, and students of Butler University. At the time of the report, work continues at the site; the report will be updated – especially with regards to a targeted floristic survey – in September 2006.

II. Vertebrate Inventory

Fish

The methodological complexity required for thorough sampling of the lake precluded the inclusion of fishes in the inventory. The breadth of the lake and in particular the depth at the northern end of lake would require electrofishing techniques which are beyond the scope of the project. Furthermore, we regarded this as the lowest priority with regards to the vertebrate inventory, as all species present are derived from the occasional flooding of the White River. Instead, we elected to use the funds allotted for the fish inventory to conduct a more thorough inventory of the plants that exist in the nine broad plant communities identified among the site features in the Park' Master Plan during the spring and summer of 2006 (see Section IV – Initial Conclusions and Ongoing Investigations for more details).

Amphibians and Reptiles

Amphibians and reptiles on the VBFANP were detected using both passive and active techniques. Active techniques included surveying standing water with D-frame dip nets and walking the property and turning potential cover items. Passive techniques included using turtle traps in the lake and canal and drift fence/cover board arrays in five locations throughout the park (roughly coincident with the location of the quantitative vegetative analysis transects – see Figure 2). Turtle traps were used for 35 trap nights in summer 2005, mainly to confirm the findings of previous surveys (e.g., Conner et al. 2005. *American Midland Naturalist* 153:428-435; enclosed). The drift fence arrays were monitored for approximately 750 trap nights in the summer and early autumn of 2005. One species of toad and two small mammals were detected in the drift fences.

Amphibians – The VBFANP has few resident amphibian species. The candidate list (Appendix 1) was based on historical range maps, but it was unlikely that all or even most of the species would be located on the site given its history of usage and the rather specific habitat requirements of the species. Nonetheless, only two amphibians have been detected on the site over the course of the inventory: the American toad, *Bufo americanus*, has been collected in the wooded areas both east (“The Woods”) and west (“The Wilds”) of the lake, both by hand and in the pitfall arrays. It is likely common throughout the site. Also, bullfrogs (*Rana catesbeiana*), are occasionally observed in the canal bordering the VBFANP. Surveys of the wetlands using dipnets and minnow traps are continuing through May 2006.

The absence of terrestrial salamanders (*Plethodon cinereus* and *P. glutinosus*) is consistent with our findings elsewhere in the immediate area. For example, neither species has been found in the wooded areas on the campus of Butler University, despite the fact that the habitat characteristics are generally a good match.

Reptiles – All six of the aquatic and semi-aquatic species of turtles expected based on historical range maps are present in the lake on the grounds of the VBFANP. Only juvenile map turtles (*Graptemys geographica*) have been found at this site; the absence of adults is expected as this is a riverine species rather than a pond dweller. All other species appear to show recruitment as evidenced by the presence of juveniles. Persistence of the turtle populations may well depend on the maintenance of adequate nesting areas which may be jeopardized depending on future development plans.

No lizards were detected on the site, and to this point only queen snakes (*Regina septemvittata*) and northern banded water snakes (*Nerodia sipedon*) have been collected on or near the site (both in the Central Canal). However, additional surveys are likely to uncover other species that are difficult to collect based on the habitation (i.e., fossorial species such as members of the genus *Storeria*).

BIRDS

The bird survey was initiated using fixed point count surveys. In this technique, the researcher would establish a position and record observations – either visual or aural – of birds within a 50 m radius for a 20 minute period. This same position was to be used in all subsequent observation periods. This technique however, was abandoned in favor of random spot counts; the researcher obtains a position at a haphazardly chosen location and records observations for a 15 minute period before obtaining a new position and making a new set of observations. A series of five observation points were used during each visit to the VBFANP. All observations were made at either dusk or dawn, and were made 2-3 weekly throughout the survey periods. Summer/Fall observations were made between 4 September and 19 December 2005. Winter/Spring observations were made between 20 January and 28 April 2006. More than 275 spot counts were made over the course of the study period.

The survey documented 109 species of birds on the VBFANP (Table 1). Originally we drafted a candidate species list of 67 species based on the annual Audubon Christmas Bird Counts (CBC) at Eagle Creek Park and Marian College Ecolab bird walks. Of the 67 candidate species, 43 (64%) were detected over the course of the study (Appendix 2). However, the candidate species list was based primarily on winter bird counts. In order to make better sense of our survey, we compared our species list against a more comprehensive species list from the Marian College Ecolab. The comprehensive list is based on bird walks over a three year period. The other benefit of using the Ecolab list is that the Ecolab is a plot of land similar to the VBFANP – an historically disturbed forest matrix with a large lake located near the White River in close proximity to the park (within 2 miles). The Ecolab list consists of 159 species, of which 138 are considered relatively common to the property. The VBFANP has 83 species in common with the more extensively studied Ecolab, and of those 78 species are considered common at the Ecolab (Table 1). The Sorensen Index is a basic ecological metric used to calculate a quotient of similarity, a value that indicates the overlap between species found at two different sites. The quotient of similarity for VBFANP and Ecolab is 64.2%, indicating both a considerable degree of overlap and a relatively high degree of avian diversity. One major difference between the sites is the absence of several species of ducks, vireos, and warblers on the VBFANP that are common at the Ecolab. At this point, however, it should be recognized that the Ecolab list was built up over three years of observations whereas the VBFANP list has been developed largely over the period of a single year. Furthermore, the purpose of the present inventory was simply to document the presence of species; no effort was made to determine habitat usage (e.g., whether the site is being used for nesting by any particular species).

MAMMALS

Survey efforts in summer-fall 2005 led to the documentation of 11 mammal species from the candidate list of 36 (30.5% of the total) that was drawn from historic range maps (Appendix 3). Documentation came from captures using live animal traps, tracks recorded on track boards, and direct observation.

Other observations

Two species of small mammals were collected in the pitfall traps arrays used in the amphibian-reptile survey:

Blarina brevicauda – Northern short-tailed shrew

**Peromyscus leucopus* – white-footed mouse

*see comment under Small Mammal Trapping Grids for a note on the identification of *P. leucopus*.

In addition, direct visual observations confirm the presence of the following:

Sciurus niger – fox squirrel

Odocoileus virginianus – white-tailed deer

Signs of mole activity such as tunnels and mounds were present throughout the site. Although no moles were captured, abundance and distribution records for the state of Indiana, strongly suggest the species to be the eastern mole (*Scalopus aquaticus*). This species is very common throughout the state.

Gnawing of trees along the White River indicates that beaver (*Castor Canadensis*) occupied the site in the past. No trees indicate recent beaver activity, although they are likely active in the area. In the Central Canal adjacent to VBFANP, muskrat (*Ondatra zibethicus*) have been commonly observed. Trapping on the shores of the lake failed to result in the capture of muskrats, nor were signs of muskrats evident on the turtle traps. On occasion we also have observed mink (*Mustela vison*) active in the canal as well; however there is no reason to expect that this species is active near the VBFANP.

In 2003, we found the skull of a fox (either common gray fox, *Urocyon cinereoargenteus*, or red fox, *Vulpes vulpes*) near the I-65 overpass. Although we did not document foxes in the present inventory, we consider it likely that foxes may occasionally visit the VBFANP.

III. Quantitative Vegetation Analysis

In 2000 and 2001, an inventory of plants found at the Virginia B. Fairbanks Art and Nature Park (VBFANP) site was conducted by Dr. Rebecca Dolan. The work was funded by the City of Indianapolis, Indy Greenways, and results were presented to Mark Zelonis of the IMA. That inventory found the site highly disturbed, with few large characteristic floodplain trees and little native understory, due to previous land use and a substantial presence of invasive non-native plants. Thirty-nine percent of the 187 plants recorded were non-native, including several that are highly invasive. The species list from that previous inventory is included in this report in Appendix 8.

In the present survey, we laid out a series of transects in order to quantify the vegetation at the VBFANP. The data will be available to allow comparison of pre-development and restoration vegetation with that following implementation of the plan. The site can also be compared to other natural areas in the city.

Five 100 m transects located throughout the VBFANP were surveyed (Figure 2) with the assistance of horticulture intern Pattie Quackenbush from the IMA. Sites were chosen to cover the range of plant community and cover types currently on site based on visible inspection. Global Positioning System data were used to map the transects and can be used to relocate sites for follow-up surveys in future years. Transect points were not permanently marked.

Transects 1 and 3 are in areas that have been largely cleared of bush honeysuckle during the last few years. Transect 2 is in an area that has been mostly cleared of honeysuckle. The area around Transect 4 has not had any honeysuckle removal. Transect 5, along the thin margin of land between the lake and the river to the west ("The Wilds"), has the largest native trees and the most diverse native wildflower understory.

We conducted point-quarter sampling of tree layer vegetation (= 10 cm diameter at breast height (dbh)) at 10 points, one located every 10 m, along each transect. We recorded the species, dbh and point-to-plant distance for each tree sampled (raw data in Appendix 4). We characterized the density of the herb and shrub layer in ten 1m² plots located every 10m along each transect. We recorded the presence of each herb layer species (herbaceous plant or woody plant with a dbh < 10 cm). We also estimated cover classes of aerial coverage of each herb-layer species present using the scale 1 = 1-7%, 2 = 8-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-90%, and 6 = 94-100% (raw data in Appendix 5). Not all plants could be identified to species due to lack of flowers or fruit during the time the surveys took place.

We characterized tree-layer vegetation in VBFANP by calculating frequency, density and dominance (basal area) from the point-quarter sampling data. These three measures were relativized and used to calculate an Importance Value (IV) for all trees sampled. Importance Values integrate frequency, density, and dominance into a single value for easy comparison. Importance Values were also calculated for the site as a whole by averaging values for each species in all five transects. Percent frequency (the percentage of sample plots containing each species) and average cover class were calculated for herb-layer vegetation.

Twenty-one different woody species were found along transects during vegetation analysis (Table 2). Three of these are not native to the United States: Tree of heaven, Amur bush honeysuckle (shrubs with diameters large enough to be classified in the tree layer), and White mulberry. Black locust is native to Indiana, but only along the Ohio River, according to Deam's Flora of Indiana. It is often planted in restorations and reforestation projects because it is in the legume family and is considered a soil improver. One specimen of Butternut was seen. This tree is on the Watch list maintained by the Indiana Department of Natural Resources, Division of Natural Preserves. It is becoming rarer across its range and is being tracked by state agencies. The other species are common native flood plain species.

Total density of trees at the site was estimated to be 949 trees per hectare. Box elder had the highest IV, followed by Black locust, Elm, and Ohio buckeye. Looking at components of IV, these species also had the highest density and frequency of occurrence. Silver maples and Cottonwoods were the largest trees.

On an individual transect basis, Transects 1 and 3, which have had extensive honeysuckle removal, had no Bush honeysuckle in the tree layer (Appendix 6). Transect 2 and 4 had large bush honeysuckle specimens. In fact, the student laying out the transect line had to crawl in #4. Transect 5, located in "The Wilds" had no honeysuckle and had more native species (Hickory, Basswood, Ohio Buckeye) than the other transects, reflecting the higher quality of the vegetation in this part of the VBFANP.

Thirty-seven species were encountered in the 1m² herb-layer sample plots (Table 3). The top five most frequently encountered plants were Amur bush honeysuckle, Garlic mustard, Winter creeper, Virginia creeper, and Yellow jewelweed. They were found in at least 9 of the 50 plots surveyed. The first three are widely recognized as invasive non-native species. Virginia creeper is a common woody vine that is native but is considered invasive. Yellow jewelweed is a common native species of moist woods.

The species with the highest mean cover class values were Cup-plant, Black locust seedlings, Amur bush honeysuckle, Tall goldenrod, and Appendaged waterleaf (Table 3). With the notable exception of the Bush honeysuckle, these plants did not occur on many plots, but where they were present, they covered an average of 8-50% of the plot. Cup-plant is a large plant, so it will cover a lot of a plot where it occurs. Appendaged waterleaf tends to grow in clumps. They are both desirable native species. Tall goldenrod is native but invasive.

Amur bush honeysuckle was found along all transects (Appendix 7), indicating that although it has been targeted for removal in some areas at VBFANP, plants are still common. Small plants were found in the areas where large plants have been removed. However, along transects in areas where it has not yet been removed, it was found in 10 out of 10 plots (Transect 4) and 7 of 10 (Transect 5) and covered from 26 – 75% of each plot. Thus, progress has been made.

Historical Vegetation

As stated in the 2001 report, historical overstory vegetation would have included Sycamores, Cottonwoods, Ashes, Maples, Hackberries, and Elms across most of the site, based on witness trees of the 1819 land survey (Blewett and Potzger, 1952, Butler University Botanical Studies 10:40-52). The highest and driest sites would have supported Beeches, Hickories, White oaks, Ohio buckeyes and Dogwoods. Historically, Paw paw and Spicebush would likely have been the most common shrubs.

Black locust is currently the predominate tree in the area adjacent to the Water Company's Central Canal. This species was not reported for the area in the 1819 land surveys. It was likely planted along with the Bush honeysuckle on the canal banks for erosion control and/or for general revegetation.

Comparison with Other Sites

A tree inventory of the nearby Crooked Creek watershed was conducted by the Center for Urban Policy and the Environment, School of Public and Environmental Affairs at IUPUI (96-E03, authors Hearne, Brothers, and Lindsey). In 1996, researchers found the most common native trees to be Green ash, Box elder, Cottonwood, Flowering dogwood, Hackberry, Red maple, Sugar maple, Silver maple, Sycamore, and Black walnut.

We have conducted quantitative vegetation analysis at another site along the White River in Marion County. At Southwestway Park in the southwest part of the county, Silver maple, Box elder, and Hackberry had the highest importance values in transects along a broad, sandy floodplain. Trees tended to be larger than those at VBFANP and occurred at a density of 400 trees per hectare, vs. 949 at VBFANP. Bush honeysuckle is a serious problem at more upland sites in the park, and is targeted for removal.

A system for quantifying the vegetation at a site from a natural areas perspective has recently been developed for Indiana (www.in.gov/idem/water/planbr/401/fqaintro.doc). Floristic quality assessment assigns a single value based on all native species present at a site. Based on the 2001 inventory at VBFANP, the site has the lowest score of over a dozen sites we have surveyed in the county. We hope to have all our surveys posted to our web site (www.butler.edu/herbarium) in the next few months. It will then be possible to easily find which native species occur in similar sites to VBFANP and should be considered for planting during restorations.

IV. Initial Conclusions, Ongoing, and Future Research

Vertebrates – The VBFANP has a depleted vertebrate fauna. In particular, the diversity of amphibians is very poor. This is most likely due to the history of land use at the site and limited recolonization by most amphibians based on low dispersal ability. Amphibian monitoring is continuing at this time, and we hope to identify areas used by *B. americanus* for breeding in June 2006. The reptile diversity is bolstered by the strong presence of the turtle assemblage. However, the presence of turtles should not be taken for granted. Development or significant alteration of the southern shoreline of the lake and the surrounding upland habitat could have a strong detrimental effect on the turtle populations as this area of the site represents the most likely nesting area for female turtles. The use of this area by adult turtles requires further study, should the maintenance of the turtle population be a concern for the Museum.

The mammals on the site are those that tend to be fairly common in urbanized areas (e.g., raccoons, opossums, mice, deer). There are no particularly rare species present. Clearing of the understory in wooded areas (“The Woods” in particular) may decrease the occurrence of small mammals (mice and shrews) while increasing access to visitors of the site.

Bird diversity at the VBFANP is a bright spot, however. The 109 species observed over the past year likely represents a partial list of avian visitors to the site, based on comparisons with the Ecolab's avifauna. Additional studies that determine how birds are using the site may be advisable in the future. The diversity of the avifauna on the site could represent a large point of interest for visitors to the site. Walks through the property could include commentary on the avifauna and how they persists in areas marked by human habitation.

Vegetation – As concluded from our general inventory, the vegetation at the VBFANP is highly degraded and shows evidence of past destructive land use at the site. Highest quality remaining sites are in “The Wilds” area on the perimeter buffer between the White River and the Lake. Native vegetation is threatened by several invasive exotic species. IMA staff is already addressing the problem by removing Amur bush honeysuckle. Unfortunately, Garlic mustard is colonizing open areas created by the removal. Other species of concern are Oriental bittersweet and Japanese hops. We have seen Japanese hops at several sites we have inventoried along the White River. It has caused a nasty infestation at Southwestway Park that is several acres of complete coverage. Eradication efforts are strongly recommended before this non-native becomes much harder to control.

A major effort to locate the plants identified in the 2000-2001 inventory within the natural areas identified by landscape architect Ed Blake is ongoing. Points within each of Ed's major vegetation communities will be marked using GPS technology, and a thorough inventory of plants within a 50 m radius of the point will be catalogued and mapped. The number of points within each of the community types will be proportional to the size and extent of the community type. This targeted inventory should be completed in August (allowing us to characterize both spring and summer blooming plants), and should prove valuable to Ed and the Museum in developing appropriate plans. An inventory of this type was not included in the original proposal; funds to cover cost of the inventory are being used from the amount originally allotted for the fish inventory.

Table 1. Bird species documented on the Virginia B. Fairbanks Art and Nature Park during 2005-2006. "X" indicates the detection during spot counts in the particular sampling period. "P" indicates detection during point counts in the Summer/Fall sampling period. "C?" indicates the species was identified by call only and is questionable. "Y" indicates that the species is also documented on the Marian County Eco Lab site; "Z" indicates that the species is also documented on the Eco Lab site, but that it is considered rare at that site.

	<u>Summer/Fall 2005</u>	<u>Winter/Spring 2006</u>	<u>Eco Lab?</u>
Acadian Flycatcher	X	X	Y
American Coot	X	X	
American Crow	X	X	Y
American Goldfinch	P/X	X	Y
American Kestrel	X	X	Y
American Redstart	X	X	Y
American Robin	P/X	X	Y
Baltimore Oriole	X	X	Y
Barn Swallow	X	X	Y
Belted Kingfisher	P		Y
Black-and-White Warbler	P/X	X	Y
Blackburnian Warbler		X	Y
Black-Capped Chickadee	P/X	X	
Black-Crowned Night Heron	X	X	
Blackpoll Warbler	X	X	Y
Black-Throated Blue Warbler		X	Y
Blue Jay	P/X	X	Y
Blue-Gray Gnatcatcher	X	X	Y
Bonapartes Gull		X	
Broad-Winged Hawk	X	X	Z
Brown Creeper	X	X	Y
Brown Thrasher	X	X	Y
Brown-Headed Cowbird	X	X	Y
Bufflehead		X	
Canada Goose	X	X	Y
Canvasback	X	X	
Carolina Wren	X	X	Y
Cedar Waxwing	X	X	Y
Cerulean Warbler		C?	
Chestnut-Sided Warbler	X	X	Y
Chimney Swift	P		Y
Chipping Sparrow	P/X	X	Y
Cliff Swallow	X	X	
Common (Northern) Flicker		X	
Common Goldeneye		X	
Common Grackle	X	X	Y
Common Nighthawk	X	X	Y
Common Yellowthroat	X	X	Y
Cooper's Hawk	X	X	Y
Double Crested Cormorant	P/X	X	Z
Downy Woodpecker	P/X	X	Y
Eastern Bluebird	X	X	Y
Eastern Kingbird	X	X	Y

	Summer/Fall 2005	Winter/Spring 2006	Eco Lab?
Eastern Peewee	P		Y
Eastern Phoebe	P/X	X	Y
Eastern Screech Owl		X	Y
European Starling	X	X	Y
Field Sparrow	P		Y
Fox Sparrow	X	X	Y
Golden- Crowned Kinglet	X	X	
Gray Catbird	P/X	X	Y
Great Blue Heron	P/X	X	Y
Great Horned Owl	X	X	Y
Green-Winged Teal	X	X	
Hairy Woodpecker	P/X	X	Y
Hermit Thrush	X	X	Y
House Finch	X	X	Y
House Sparrow	P/X	X	Y
House Wren		X	
Indigo Bunting	X	X	Y
Killdeer	P/X	X	Y
Little Blue Heron	P/X	X	
Magnolia Warbler	X	X	Y
Mallard	P/X	X	Y
Marsh Wren	X	X	
Mocking Bird	P		
Mourning Dove	P/X	X	Y
Nashville Warbler		X	Y
Nighthawk	P		Y
Northern Cardinal	P/X	X	Y
Northern Mockingbird	X	X	Y
Northern Rough-Winged Swallow	X	X	Y
Ovenbird	X	X	
Palm Warbler	X	X	Y
Pied-Billed Grebe	X	X	Z
Pileated Woodpecker		X	Y
Red-Breasted Nuthatch	P/X	X	Y
Red-Eyed Vireo	X	X	Y
Red-Headed Woodpecker		X	Z
Red-Tailed Hawk	X	X	
Red-Winged Blackbird	X	X	Y
Ring-Billed Gull	X	X	Y
Rock Dove		X	Y
Rose-Breasted Grosbeak	X	X	Y
Ruby-Crowned Kinglet	X	X	Y
Ruby-Throated Hummingbird		X	
Rufous-Sided Towhee	X	X	
Sandhill Crane	X	X	Z
Scarlet Tanager	X	X	Y
Semipalmated Plover	X	X	
Slate-Colored Junco	X	X	
Snowy Egret	X	X	
Solitary Vireo	X	X	

	<u>Summer/Fall 2005</u>	<u>Winter/Spring 2006</u>	<u>Eco Lab?</u>
Song Sparrow	P/X	X	Y
Spotted Sandpiper	X	X	Y
Tree Swallow	X	X	Y
Tufted Titmouse	X	X	Y
Turkey Vulture	X	X	Y
Western Grebe		?	Y
Whip-Poor-Will		X	
White-Breasted Nuthatch	P/X	X	Y
White-Eyed Vireo	P		
White-Throated Sparrow	X	X	Y
Wood Duck	P/X	X	Y
Wood Thrush	X	X	Y
Yellow Warbler	X	X	Y
Yellow-Bellied Sapsucker	X	X	Y
Yellow-Billed Cuckoo	X	X	Y
Yellow-Rumped Warbler	X	X	Y

Table 2. Mean values for 5 transects for frequency, density, dominance and importance value of tree-layer vegetation.

Species	Common Name	FREQ	DEN	DOM	IV
<i>Acer negundo</i>	Box elder	64.00	140.00	8.55	26.19
<i>Acer saccharinum</i>	Silver maple	10.00	15.00	3.92	7.34
<i>Acer saccharum</i>	Sugar maple	2.00	2.00	0.03	0.44
<i>Aesculus glabra</i>	Ohio buckeye	18.00	84.40	17.53	12.51
<i>Ailanthus altissima</i> ⁺	Tree of heaven	2.00	2.00	0.03	0.50
<i>Carya cordiformis</i>	Bitternut hickory	4.00	4.20	0.22	1.14
<i>Carya glabra</i>	Pignut hickory	2.00	2.20	0.08	0.50
<i>Celtis occidentalis</i>	Hackberry	14.00	29.40	1.63	4.44
<i>Cercis canadensis</i>	Redbud	2.00	2.00	0.14	0.65
<i>Fraxinus pennsylvanica</i>	Green ash	2.00	2.20	0.04	0.45
<i>Fraxinus profunda</i>	Pumpkin-ash	2.00	2.20	0.02	0.43
<i>Gleditsia triacanthos</i>	Honey locust	6.00	5.80	0.60	1.74
<i>Lonicera maackii</i> ⁺	Amur bush honeysuckle	6.00	12.40	0.14	2.09
<i>Juglans cinerea</i>	Butternut	2.00	3.40	0.60	0.69
<i>Morus alba</i> [*]	White mulberry	8.00	14.00	0.53	2.32
<i>Platanus occidentalis</i>	Sycamore	4.00	4.20	0.20	1.13
<i>Populus deltoides</i>	Cottonwood	10.00	13.20	2.40	4.33
<i>Prunus serotina</i>	Black cherry	6.00	11.40	1.52	3.00
<i>Robinia pseudoacacia</i>	Black locust	38.00	63.00	6.88	16.37
<i>Tilia americana</i>	Basswood or linden	4.00	5.40	0.22	1.14
<i>Ulmus</i> sp.	Elm sp.	36.00	76.00	2.46	12.59

FREQ = Frequency (% of points)

DEN = Density (tree/ha)

DOM = Dominance or Basal Area (m²/ha)

IV = Importance Value (relative frequency + relative density + relative dominance/3*100)

* = non-native

+ = invasive

Table 3. Number of plots and mean cover class for herb-layer vegetation found in 50 1m² sample plots (10 each for the 5 transects). Five greatest values are in bold.

Species	Common Name	# Plots	Mean Cover Class
<i>Acer negundo</i>	Box elder	4	1.3
<i>Aesculus glabra</i>	Ohio buckeye	1	1.0
<i>Alliaria petiolata</i> *+	Garlic mustard	20	2.2
<i>Ambrosia artemesiifolia</i>	Common ragweed	1	1.0
<i>Ambrosia trifida</i>	Giant ragweed	1	2.0
<i>Asarum canadense</i>	Wild ginger	3	1.8
<i>Bidens coronata</i>	Bidens	1	1.0
<i>Carex</i> sp.	Sedge	4	1.3
<i>Celastrus orbiculatus</i> *+	Oriental bittersweet	2	2.5
<i>Celtis occidentalis</i>	Hackberry	2	1.5
<i>Convolvulus arvensis</i> *	Field bindweed	1	1.0
<i>Cryptotaenia canadensis</i>	Honewort	3	2.3
<i>Euonymus alatus</i> *	Winged burning bush	1	1.0
<i>Euonymus fortunei</i> *+	Winter creeper	15	2.1
<i>Eupatorium serotinum</i>	Late-flowering thoroughwort	1	2.0
<i>Fraxinus</i> sp.	Ash	1	2.0
<i>Geum canadense</i>	Avens – white	5	2.2
<i>Glechoma hederacea</i> *	Creeping charley, ground ivy	3	2.0
<i>Humulus japonicus</i> *+	Japanese hops	1	1.0
<i>Hydrophyllum appendiculatum</i>	Appendaged waterleaf	5	2.8
<i>Impatiens pallida</i>	Yellow jewelweed	9	1.5
<i>Laportea candensis</i>	Wood nettle	4	2.2
<i>Lonicera maackii</i> *+	Amur honeysuckle	29	3.1
<i>Lysimachia ciliata</i>	Fringed loosestrife	1	1.0
<i>Oxalis stricta</i>	Wood sorrel	1	1.0
<i>Parthenocissus quinquefolia</i>	Virginia creeper	14	1.8
<i>Pilea pumila</i>	Clearweed	4	2.0
<i>Polygonum</i> sp.	Knotweed	2	1.5
<i>Robinia pseudoacacia</i>	Black locust	3	3.3
<i>Rudbeckia laciniata</i>	Green-headed coneflower	2	2.5
<i>Sanicula marilandica</i>	Black snakeroot	3	2.0
<i>Silphium perfoliatum</i>	Cup-plant	1	3.5
<i>Smilax herbacea</i>	Greenbriar	1	2.0
<i>Solidago altissima</i>	Tall goldenrod	1	3.0
<i>Toxicodendron radicans</i>	Poison ivy	1	2.0
<i>Viola</i> sp.	Violet	4	2.0
<i>Vitis</i> sp.	Grape	2	1.7

* = non-native

+ = invasive



Figure 1. Location of small mammal trapping grids (red asterisks), Tomahawk live traps (green squares), and track boards (yellow circles), for mammal inventory in Fall 2005.



Figure 2. Location of vegetation sampling transects; the drift fence/pitfall trap arrays are roughly coincident with transects.

Appendix 1. Amphibians and reptiles that may be found on the VBFANP, based on historical range maps. Documented species appear in **bold font**.

AMPHIBIANS

Salamanders

Lake	Common mudpuppy – <i>Necturus maculosus</i>
Wetlands	Spotted salamander – <i>Ambystoma maculatum</i>
	Marbled salamander – <i>Ambystoma opacum</i>
	Smallmouth salamander – <i>Ambystoma texanum</i>
	Eastern tiger salamander – <i>Ambystoma tigrinum</i>
	Four-toed salamander – <i>Hemidactylium scutatum</i>
	Red-spotted newt – <i>Notophthalmus viridescens</i>
Woodlands	Redback salamander – <i>Plethodon cinereus</i>
	Northern slimy salamander – <i>Plethodon glutinosus</i>

Frogs and Toads

Blanchard's cricket frog – *Acris crepitans blanchardi*

American toad – *Bufo americanus*

Fowler's toad – *Bufo woodhouseii fowleri*

Eastern gray treefrog – *Hyla versicolor*

Spring peeper – *Pseudacris crucifer*

Chorus frog – *Pseudacris triseriata*

Bullfrog – *Rana catesbeiana*

Green frog – *Rana clamitans*

Wood frog – *Rana sylvatica*

Northern leopard frog – *Rana pipiens*

REPTILES

Turtles

Eastern spiny soft-shell – *Apalone spinifera spinifera*

Snapping turtle – *Chelydra serpentina*

Midland painted turtle – *Chrysemys picta marginata*

Common map turtle – *Graptemys geographica*

Common musk turtle (Stinkpot) – *Sternotherus odoratus*

Eastern box turtle – *Terrapene carolina carolina*

Red-eared slider – *Trachemys scripta elegans*

Lizards

Five-lined skink – *Eumeces fasciatus*

Broadhead skink – *Eumeces laticeps*

Snakes

Kirtland's snake – *Clonophis kirtlandii*

Northern black racer – *Coluber c. constrictor*

Northern ringneck snake – *Diadophis punctatus edwardsii*

Black rat snake – *Elaphe obsoleta obsoleta*

Eastern hognose snake – *Heterodon platirhinos*

Butler's garter snake – *Thamnophis butleri*

Eastern garter snake – *Thamnophis sirtalis sirtalis*

Eastern ribbon snake – *Thamnophis s. sauritus*

Rough green snake – *Opheodrys aestivus*

Eastern milk snake – *Lampropeltis t. triangulum*

Northern banded water snake – *Nerodia sipedon sipedon*

Queen snake – *Regina septemvittata*

Midland brown snake – *Storeria dekayi wrightorum*

Northern redbelly snake – *Storeria occipitomaculata*

Range maps from Minton, S. A., Jr. 2001. Amphibians and Reptiles of Indiana. Indiana Academy of Sciences, Indianapolis.

Appendix 2. Birds likely to be found in the VBFANP, based on sampling from the 2004 Indianapolis Audubon Christmas Bird Count and spring 2005 bird walks at the Ecolab (Marian College). Documented species from the VBFANP appear in **bold font**.

Canada Goose

Mute Swan

Wood Duck

Gadwall

American Black Duck

Mallard

Blue-winged Teal

Ring-necked Duck

Lesser Scaup

Hooded Merganser

Ruddy Duck

Pied-billed Grebe**Great Blue Heron**

Bald Eagle

Sharp-shinned Hawk

Cooper's Hawk

Red-shouldered Hawk

Red-tailed Hawk**American Kestrel****American Coot**

Sandhill Crane

Killdeer**Bonaparte's Gull****Ring-billed Gull****Mourning Dove****Rock Dove****Great Horned Owl**

Barred Owl

Rufous Hummingbird

Belted Kingfisher

Red-bellied Woodpecker

Red-headed Woodpecker**Yellow-bellied Sapsucker****Downy Woodpecker****Hairy Woodpecker**

Northern Flicker

Pileated Woodpecker**Blue Jay****American Crow**

Carolina Chickadee

Tufted Titmouse**Red-breasted Nuthatch****White-breasted Nuthatch****Brown Creeper**

Northern Pintail

Carolina Wren

Winter Wren

Golden-crowned Kinglet**Eastern Bluebird****American Robin****Northern Mockingbird****European Starling****Cedar Waxwing**

American Tree Sparrow

Fox Sparrow**Song Sparrow****White-throated Sparrow**

White-crowned Sparrow

Dark-eyed (Slate-colored) Junco

Northern Cardinal**Red-winged Blackbird**

Purple Finch

House Finch

Common Grackle

Pine Siskin

American Goldfinch**House Sparrow**

Appendix 3. Mammals that may be found on the VBFANP, based on historical range maps. Documented species from the VBFANP appear in **bold font**.

Virginia opossum – *Didelphis virginiana*

Southeastern shrew – *Sorex longirostris*

Northern short-tailed shrew – *Blarina brevicauda*

Least shrew – *Cryptotis parva*

Eastern mole – *Scalopus aquaticus*

Little brown myotis – *Myotis lucifugus*

Indiana myotis – *Myotis sodalis*

Silver-haired bat – *Lasionycteris noctivagans*

Eastern pipistrelle – *Pipistrellus subflavus*

Big brown bat – *Eptesicus fuscus*

Red bat – *Lasiurus borealis*

Hoary bat – *Lasiurus cinereus*

Raccoon – *Procyon lotor*

Eastern cottontail – *Sylvilagus floridanus*

Common gray fox – *Urocyon cinereoargenteus*

Red fox – *Vulpes vulpes*

Long-tailed weasel – *Mustela frenata*

Mink – *Mustela vison*

Striped skunk *Mephitis mephitis*

White-tailed deer – *Odocoileus virginianus*

Eastern chipmunk – *Tamias striatus*

Woodchuck – *Marmota monax*

Eastern gray squirrel – *Sciurus carolinensis*

Eastern fox squirrel – *Sciurus niger*

Thirteen-lined ground squirrel – *Spermophilus tridecemlineatus*

Red squirrel – *Tamiasciurus hudsonicus*

Beaver – *Castor canadensis*

Deer mouse – *Peromyscus maniculatus*

White-footed mouse – *Peromyscus leucopus*

Prairie vole – *Microtus ochrogaster*

Meadow vole – *Microtus pennsylvanicus*

Woodland (Pine) vole – *Microtus pinetorum*

Muskrat – *Ondatra zibethicus*

Norway rat – *Rattus norvegicus*

House mouse – *Mus musculus*

Meadow jumping mouse – *Zapus hudsonius*

Range maps from Mumford, R. E., and J. O. Whitaker, Jr. 1982. Mammals of Indiana. University of Indiana Press, Bloomington.

Appendix 4. Raw data for transects – tree layer species.

Code	Species	Common Name
ACENEG	<i>Acer negundo</i>	Box elder
ACESRN	<i>Acer saccharinum</i>	Silver maple
ACESAC	<i>Acer saccharum</i>	Sugar maple
AESGLA	<i>Aesculus glabra</i>	Ohio buckeye
AILALT	<i>Ailanthus altissima</i>	Tree of heaven
CARCOR	<i>Carya cordiformis</i>	Bitternut hickory
CARGLA	<i>Carya glabra</i>	Pignut hickory
CELOCC	<i>Celtis occidentalis</i>	Hackberry
CERCAN	<i>Cercis canadensis</i>	Redbud
FRAPEN	<i>Fraxinus pennsylvanica</i>	Green ash
FRAPRO	<i>Fraxinus profunda</i>	Pumpkin-ash
GLETRI	<i>Gleditsia triacanthos</i>	Honey-locust
JUGCIN	<i>Juglans cinerea</i>	Butternut
LONMAA	<i>Lonicera maackii</i>	Amur bush honeysuckle
MORALB	<i>Morus alba</i>	White mulberry
PLAOCC	<i>Platanus occidentalis</i>	Sycamore
POPDEL	<i>Populus deltoides</i>	Cottonwood
PRUSER	<i>Prunus serotina</i>	Black cherry
ROBPSE	<i>Robinia pseudoacacia</i>	Black locust
TILAME	<i>Tilia americana</i>	Basswood or linden
ULMSPP	<i>Ulmus sp.</i>	Elm sp.

Transect 1

Point	Quart. #	Species	Distance (m)	DBH (cm)
1	1	CARCOR	0.8	22.0
	2	ULMSPP	2.7	15.2
	3	ULMSPP	4.0	12.4
	4	PLAOCC	4.1	17.7
2	1	ROBPSE	5.9	42.0
	2	ULMSPP	6.7	16.5
	3	ULMSPP	4.0	21.8
	4	ROBPSE	5.2	38.0
3	1	ULMSPP	0.6	12.8
	2	CELOCC	4.7	29.9
	3	ACENEG	5.9	28.0
	4	ULMSPP	3.8	24.5
4	1	ULMSPP	13.3	31.5
	2	ACENEG	10.9	12.5
	3	ACENEG	1.9	12.0
	4	ACENEG	7.7	42.1
5	1	CARCLA	4.7	26.8
	2	ACENEG	7.2	38.2
	3	POPDEL	5.4	19.1
	4	ROBPSE	12.6	41.5
6	1	ACENEG	5.5	24.0
	2	ACENEG	3.8	16.0
	3	POPDEL	11.3	86.0
	4	ACENEG	3.6	20.0
7	1	ROBPSE	3.0	40.2
	2	FRAPEN	1.7	15.0
	3	ACENEG	2.4	37.5
	4	ACENEG	3.9	17.8
8	1	MORALB	1.3	21.3
	2	ROBPSE	8.3	19.9
	3	FRAPRO	2.8	12.0
	4	ULMSPP	3.9	10.5
9	1	ULMSPP	1.1	16.8
	2	ULMSPP	3.2	13.5
	3	ACENEG	2.6	16.7
	4	ROBPSE	3.6	26.8
10	1	ULMSPP	2.7	15.8
	2	ULMSPP	6.4	21.8
	3	ROBPSE	2.3	41.7
	4	ULMSPP	2.9	21.7

Transect 2

Point	Quart. #	Species	Distance (m)	DBH (cm)
1	1	ACENEG	1.7	22.7
	2	ACENEG	2.4	15.9
	3	ACENEG	3.0	23.6
	4	ACENEG	4.1	20.4
2	1	PLAOCC	2.5	31.0
	2	ACENEG	5.7	33.5
	3	ACENEG	3.7	30.2
	4	ACENEG	2.7	17.0
3	1	ACENEG	2.5	16.3
	2	ACENEG	5.8	14.9
	3	ACENEG	6.9	18.5
	4	CARCOR	10.8	24.5
4	1	ACENEG	5.7	17.0
	2	ACENEG	6.4	14.5
	3	ACENEG	5.5	20.4
	4	ACENEG	3.4	15.5
5	1	POPDEL	1.2	25.1
	2	ACESRN	4.0	34.2
	3	ACENEG	2.7	11.0
	4	ACENEG	6.5	15.0
6	1	CERCAN	0.7	30.0
	2	ACENEG	4.1	10.5
	3	LONMAA	4.6	10.0
	4	LONMAA	4.4	14.2
7	1	LONMAA	5.6	10.0
	2	LONMAA	3.7	14.0
	3	AESGLA	4.2	18.2
	4	ACENEG	2.6	39.0
8	1	LONMAA	1.4	11.0
	2	TILAME	1.3	24.1
	3	AESGLA	4.3	17.8
	4	LONMAA	4.1	12.5
9	1	ACENEG	3.5	25.0
	2	ACESRN	4.1	14.2
	3	AILALT	9.1	13.0
	4	ACENEG	7.4	24.4
10	1	ACENEG	8.6	15.0
	2	ACESRN	7.0	123.7
	3	ACESRN	14.9	26.3
	4	ACESRN	14.8	22.3

Transect 3

Point	Quart. #	Species	Distance (m)	DBH (cm)
1	1	ACENEG	2.9	11.9
	2	ULMSPP	2.0	29.7
	3	ROBPSE	5.2	34.5
	4	ULMSPP	6.9	15.8
2	1	ACENEG	5.1	24.9
	2	ROBPSE	6.9	33.6
	3	ROBPSE	6.1	48.3
	4	ROBPSE	3.5	30.0
3	1	ROBPSE	5.5	20.0
	2	ACESRN	6.0	50.0
	3	ACENEG	1.7	33.1
	4	ACENEG	4.5	19.0
4	1	ACENEG	4.8	28.0
	2	ULMSPP	4.5	14.9
	3	ULMSPP	3.0	12.7
	4	ULMSPP	3.0	29.0
5	1	ROBPSE	4.2	25.3
	2	ULMSPP	3.0	28.6
	3	ACENEG	2.8	18.9
	4	ACENEG	3.0	27.0
6	1	ULMSPP	1.6	18.7
	2	ULMSPP	3.9	17.0
	3	ROBPSE	7.8	26.7
	4	ULMSPP	2.1	29.1
7	1	ULMSPP	2.8	29.9
	2	ULMSPP	4.7	22.0
	3	ULMSPP	5.8	14.1
	4	MORALB	13.0	20.1
8	1	ROBPSE	1.0	29.6
	2	ACENEG	1.8	23.2
	3	ULMSPP	4.1	13.9
	4	ACENEG	4.9	30.5
9	1	ROBPSE	2.5	21.1
	2	ACENEG	1.1	11.3
	3	ROBPSE	3.8	25.4
	4	ACENEG	7.3	11.8
10	1	ACENEG	2.6	21.1
	2	MORALB	4.1	15.9
	3	ULMSPP	3.9	12.8
	4	MORALB	5.7	14.8

Transect 4

Point	Quart. #	Species	Distance (m)	DBH (cm)
1	1	PRUSER	5.0	48.5
	2	PRUSER	4.4	10.0
	3	PRUSER	6.6	57.5
	4	PRUSER	7.2	12.0
2	1	PRUSER	0.9	52.6
	2	CELOCC	7.7	14.5
	3	ULMSPP	5.0	24.9
	4	ACESRN	7.5	58.0
3	1	ULMSPP	0.7	21.0
	2	ACENEG	4.9	34.6
	3	ACENEG	6.8	40.2
	4	GLETRI	7.4	30.0
4	1	ROBPSE	5.4	46.7
	2	ACESAC	8.8	14.8
	3	ACENEG	9.5	25.1
	4	ACENEG	8.0	28.3
5	1	GLETRI	9.6	37.8
	2	ACENEG	8.1	27.6
	3	ULMSPP	3.4	10.5
	4	ACENEG	6.0	22.9
6	1	ROBPSE	4.7	68.9
	2	ROBPSE	6.6	37.7
	3	ACENEG	2.8	20.2
	4	ROBPSE	3.0	46.0
7	1	ULMSPP	3.0	13.6
	2	GLETRI	4.8	41.0
	3	ROBPSE	2.1	38.2
	4	ROBPSE	3.6	44.0
8	1	ROBPSE	4.3	42.2
	2	CELOCC	3.3	13.6
	3	ROBPSE	5.9	67.0
	4	ACENEG	10.7	28.2
9	1	ACENEG	3.5	54.9
	2	ACENEG	3.6	30.2
	3	ROBPSE	2.8	32.5
	4	ACENEG	3.5	24.5
10	1	ACENEG	2.3	25.1
	2	PRUSER	4.6	38.8
	3	ROBPSE	3.5	34.0
	4	ACENEG	3.2	31.7

Transect 5

Point	Quart. #	Species	Distance (m)	DBH (cm)
1	1	TILAME	1.2	21.7
	2	POPDEL	3.6	51.4
	3	MORALB	6.3	31.0
	4	Unknown*	5.1	47.5
2	1	CELOCC	4.0	35.2
	2	POPDEL	8.0	29.4
	3	CELOCC	4.0	19.3
	4	AESGLA	5.6	18.0
3	1	AESGLA	2.9	13.0
	2	AESGLA	5.8	20.9
	3	ACENEG	1.4	49.0
	4	AESGLA	4.0	25.1
4	1	ACENEG	0.7	38.5
	2	CELOCC	6.9	24.5
	3	CELOCC	3.4	30.5
	4	ACENEG	2.3	26.8
5	1	CELOCC	2.8	21.5
	2	AESGLA	3.0	12.5
	3	AESGLA	2.7	10.1
	4	CELOCC	5.8	39.0
6	1	ACENEG	5.3	70.8
	2	AESGLA	9.9	24.0
	3	AESGLA	4.2	10.0
	4	CELOCC	6.0	16.8
7	1	AESGLA	3.4	20.4
	2	AESGLA	1.9	16.5
	3	AESGLA	2.5	26.0
	4	AESGLA	1.5	24.0
8	1	AESGLA	1.6	17.0
	2	AESGLA	3.1	23.0
	3	AESGLA	2.7	17.3
	4	AESGLA	5.1	15.5
9	1	AESGLA	0.2	15.4
	2	AESGLA	1.3	11.0
	3	AESGLA	3.5	10.0
	4	AESGLA	5.0	21.7
10	1	AESGLA	2.9	15.7
	2	AESGLA	1.9	26.6
	3	AESGLA	3.8	19.5
	4	AESGLA	9.3	36.2

Appendix 5. Raw data for transects – herb layer species.

Transect 1

Species	Common Name	Cover Class									
		1 = 1-7%, 2 = 8-25%, 3= 26-50%, 4 = 51-75%, 5 = 76-93%, 6 = 94-100%									
		Point:									
		1	2	3	4	5	6	7	8	9	10
<i>Acer negundo</i>	Box elder										1
<i>Cryptotaenia canadensis</i>	Honewort		3								
<i>Eupatorium serotinum</i>	Late-flowering thoroughwort					2					
<i>Hydrophyllum appendiculatum</i>	Appendaged waterleaf	4									
<i>Laportea canadensis</i>	Wood nettles		2								
<i>Lonicera maackii</i> ⁺	Amur honeysuckle									2	2
<i>Lysimachia ciliata</i>	Fringed loosestrife					2					
<i>Pilea pumila</i>	Clearweed			2	1		1				
<i>Polygonum sp.</i>	Knotweed				1	2					
<i>Robinia pseudoacacia</i>	Black locust	1									
<i>Sanicula marilandica</i>	Black snakeroot		2								
<i>Viola sp.</i>	Violets		2								

* = non-native
 + = invasive

Transect 2

Species	Common Name	Cover Class									
		1 = 1-7%, 2 = 8-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-93%, 6 = 94-100%									
		Point									
		1	2	3	4	5	6	7	8	9	10
<i>Alliaria petiolata</i> **	Garlic mustard						2			3	
<i>Ambrosia artemisiifolia</i>	Common ragweed									1	
<i>Ambrosia trifida</i>	Giant ragweed									2	
<i>Asarum canadense</i>	Wild ginger				2						
<i>Carex sp.</i>	Sedge								1		
<i>Celastrus orbiculatus</i> **	Oriental bittersweet						2	3			
<i>Celtis occidentalis</i>	Hackberry							2			1
<i>Cryptotaenia canadensis</i>	Honewort								1		
<i>Euonymus alatus</i> *	Winged burning bush				1						
<i>Euonymus fortunei</i> **	Winter creeper						2				
<i>Fraxinus sp.</i>	Ash seedling						2				
<i>Geum canadense</i>	Avens - white								2		
<i>Glechoma hederacea</i> *	Creeping charley, ground ivy	1					2				3
<i>Humulus japonicus</i> **	Japanese hops										1
<i>Impatiens pallida</i>	Yellow jewelweed								1		
<i>Lactuca floridana</i>	Wild lettuce										
<i>Lonicera maackii</i> **	Amur honeysuckle		1		1	5		4	4	3	2
<i>Oxalis stricta</i>	Wood sorrel									1	
<i>Parthenocissus quinquefolia</i>	Virginia creeper				2						
<i>Pastinaca sativa</i> *	Wild parsnip										
<i>Robinia pseudoacacia</i>	Black locust							5			
<i>Ruellia strepens</i>	Wild petunia										
<i>Sanicula marilandica</i>	Black snakeroot						1			1	
<i>Toxicodendron radicans</i>	Poison ivy										2
<i>Viola sp.</i>	Violets									1	

* = non-native

+ = invasive

Transect 3

Species	Common Name	Cover Class									
		1 = 1-7%, 2 = 8-25%, 3= 26-50%, 4 = 51-75%, 5 = 76-93%, 6 = 94-100%									
		Point									
		1	2	3	4	5	6	7	8	9	10
<i>Alliaria petiolata</i> **	Garlic mustard	5	4	5	6	5	2		1	2	2
<i>Carex sp.</i>	Sedge						1				
<i>Euonymus fortunei</i> **	Winter creeper	1		2	3	1					
<i>Geum canadense</i>	Avens - white						2	2	3	2	
<i>Impatiens pallida</i>	Yellow jewelweed						1	2	2	2	2
<i>Laportea candensis</i>	Wood nettle								2		
<i>Lonicera maackii</i> **	Amur honeysuckle		1	4		2					
<i>Parthenocissus quinquefolia</i>	Virginia creeper	1	2				1	2	3		2
<i>Solidago altissima</i>	Tall goldenrod								3		
<i>Viola sp.</i>	Violets						1		2	2	
<i>Vitis sp.</i>	Grape		1								

* = non-native

+ = invasive

Transect 4

Species	Common Name	Cover Class									
		1 = 1-7%, 2 = 8-25%, 3= 26-50%, 4 = 51-75%, 5 = 76-93%, 6 = 94-100%									
		Point									
		1	2	3	4	5	6	7	8	9	10
<i>Acer negundo</i>	Box elder								1		4
<i>Alliaria petiolata</i> **	Garlic mustard	1	3		2	1		1	1		2
<i>Carex sp.</i>	Sedge						1				
<i>Euonymus fortunei</i> **	Winter creeper	1	3	1							
<i>Lonicera maackii</i> **	Amur honeysuckle	3	3	6	5	5	5	3	3	5	2
<i>Parthenocissus quinquefolia</i>	Virginia creeper	2			3	1	2	1			
<i>Polygonum virginianum</i>	Virginia knotweed							2			
<i>Vitis sp.</i>	Grape								2		

* = non-native

+ = invasive

Transect 5

Species	Common Name	Cover Class									
		1 = 1-7%, 2 = 8-25%, 3= 26-50%, 4 = 51-75%, 5 = 76-93%, 6 = 94-100%									
		Point									
		1	2	3	4	5	6	7	8	9	10
<i>Acer negundo</i>	Box elder	1									1
<i>Aesculus glabra</i>	Ohio buckeye		3								
<i>Alliaria petiolata</i> ⁺	Garlic mustard					1					1
<i>Asarum canadense</i>	Wild ginger			1		2					
<i>Bidens coronata</i>	Bidens										1
<i>Carex</i> sp.	Sedge					2					
<i>Celtis occidentalis</i>	Hackberry										1
<i>Convolvulus arvensis</i> [*]	Field bindweed						1				
<i>Cryptotaenia canadensis</i>	Honewort								3		
<i>Euonymus fortunei</i> ⁺	Winter creeper	3	2	3			5	1		3	1
<i>Hydrophyllum appendiculatum</i>	Appendaged waterleaf		1		1	2					2
<i>Impatiens pallida</i>	Yellow jewelweed					3		1			1
<i>Laportea canadensis</i>	Wood nettle					3				2	
<i>Lonicera maackii</i> ⁺	Amur honeysuckle	2	4	3	6			1		3	3
<i>Parthenocissus quinquefolia</i>	Virginia creeper					2			1		
<i>Rudbeckia laciniata</i>	Green-headed coneflower							3	2		
<i>Sanicula marilandica</i>	Black snakeroot								3		
<i>Silphium perfoliatum</i>	Cup-plant					3		2			
<i>Smilax herbacea</i>	Greenbriar			2							
<i>Viola</i> sp.	Violets					2					3

* = non-native

+ = invasive

Appendix 6. Point Quarter Analysis for Each Transect

Transect 1

Relative frequency, density, dominance, and importance value by species

Species	Common Name	REL FREQ	REL DEN	REL DOM	IV*	Density (trees/ha)	Dominance (m ² /ha)	Frequency
<i>Acer negundo</i>	Box elder	21.43	27.50	22.19	23.71	124	6.33	60
<i>Acer saccharinum</i>	Silver maple	-	-	-	-	-	-	-
<i>Acer saccharum</i>	Sugar maple	-	-	-	-	-	-	-
<i>Aesculus glabra</i>	Ohio buckeye	-	-	-	-	-	-	-
<i>Ailanthus altissima</i>	Tree of heaven	-	-	-	-	-	-	-
<i>Carya cordiformis</i>	Bitternut hickory	3.57	2.50	2.17	2.75	11	0.62	10
<i>Carya glabra</i>	Pignut hickory	3.57	2.50	1.47	2.51	11	0.42	10
<i>Celtis occidentalis</i>	Hackberry	3.57	2.50	2.70	2.92	11	0.77	10
<i>Cercis canadensis</i>	Redbud	-	-	-	-	-	-	-
<i>Fraxinus pennsylvanica</i>	Green ash	3.57	2.50	0.67	2.25	11	0.19	10
<i>Fraxinus profunda</i>	Pumpkin-ash	3.57	2.50	0.42	2.16	11	0.12	10
<i>Gleditsia triacanthos</i>	Honey locust	-	-	-	-	-	-	-
<i>Lonicera maackii</i>	Amur bush honeysuckle	-	-	-	-	-	-	-
<i>Juglans cinerea</i>	Butternut	-	-	-	-	-	-	-
<i>Morus alba</i>	White mulberry	3.57	2.50	1.37	2.48	11	0.39	10
<i>Platanus occidentalis</i>	Sycamore	3.57	2.50	0.95	2.34	11	0.27	10
<i>Populus deltoides</i>	Cottonwood	7.14	5.00	24.58	12.24	23	7.01	20
<i>Prunus serotina</i>	Black cherry	-	-	-	-	-	-	-
<i>Robinia pseudoacacia</i>	Black locust	21.43	17.50	29.42	22.78	79	8.39	60
<i>Tilia americana</i>	Basswood or linden	-	-	-	-	-	-	-
<i>Ulmus</i> spp.**	Elm sp.	25.00	32.50	14.06	23.85	146	4.01	70

*IV = Importance Value (relative frequency + relative density + relative dominance)/3x100

**elms could not be reliably identified to species but were likely Slippery elm (*Ulmus rubra*) and American elm (*U. americana*).

Transect 2

Relative frequency, density, dominance, and importance value by species

Species	Common Name	REL FREQ	REL DEN	REL DOM	IV*	Density (trees/ha)	Dominance (m ² /ha)	Frequency
<i>Acer negundo</i>	Box elder	36.36	52.50	29.60	39.49	215	7.8	80
<i>Acer saccharinum</i>	Silver maple	13.64	12.50	54.30	26.81	51	14.3	30
<i>Acer saccharum</i>	Sugar maple	-	-	-	-	-	-	-
<i>Aesculus glabra</i>	Ohio buckeye	9.09	5.00	2.01	5.37	21	0.53	20
<i>Ailanthus altissima</i>	Tree of heaven	4.55	2.50	0.49	2.51	10	0.13	10
<i>Carya cordiformis</i>	Bitternut hickory	4.55	2.50	1.78	2.94	10	0.47	10
<i>Carya glabra</i>	Pignut hickory	-	-	-	-	-	-	-
<i>Celtis occidentalis</i>	Hackberry	-	-	-	-	-	-	-
<i>Cercis canadensis</i>	Redbud	4.55	2.50	2.69	3.25	10	0.71	10
<i>Fraxinus pennsylvanica</i>	Green ash	-	-	-	-	-	-	-
<i>Fraxinus profunda</i>	Pumpkin-ash	-	-	-	-	-	-	-
<i>Gleditsia triacanthos</i>	Honey locust	-	-	-	-	-	-	-
<i>Lonicera maackii</i>	Amur bush honeysuckle	13.64	15.00	2.69	10.44	62	0.71	30
<i>Juglans cinerea</i>	Butternut	-	-	-	-	-	-	-
<i>Morus alba</i>	White mulberry	-	-	-	-	-	-	-
<i>Platanus occidentalis</i>	Sycamore	4.55	2.50	2.85	3.30	10	0.75	10
<i>Populus deltoides</i>	Cottonwood	4.55	2.50	1.86	2.97	10	0.49	10
<i>Prunus serotina</i>	Black cherry	-	-	-	-	-	-	-
<i>Robinia pseudoacacia</i>	Black locust	-	-	-	-	-	-	-
<i>Tilia americana</i>	Basswood or linden	4.55	2.50	1.75	2.93	10	0.46	10
<i>Ulmus sp.</i>	Elm sp.	-	-	-	-	-	-	-

*IV = Importance Value (relative frequency + relative density + relative dominance)/3*100

Transect 3

Relative frequency, density, dominance, and importance value by species

Species	Common Name	REL FREQ	REL DEN	REL DOM	IV*	Density (trees/ha)	Dominance (m ² /ha)	Frequency
<i>Acer negundo</i>	Box elder	32.00	30.00	21.80	27.93	168	5.9	80
<i>Acer saccharinum</i>	Silver maple	4.00	3.00	9.98	5.66	14	2.7	10
<i>Acer saccharum</i>	Sugar maple	-	-	-	-	-	-	-
<i>Aesculus glabra</i>	Ohio buckeye	-	-	-	-	-	-	-
<i>Ailanthus altissima</i>	Tree of heaven	-	-	-	-	-	-	-
<i>Carya cordiformis</i>	Bitternut hickory	-	-	-	-	-	-	-
<i>Carya glabra</i>	Pignut hickory	-	-	-	-	-	-	-
<i>Celtis occidentalis</i>	Hackberry	-	-	-	-	-	-	-
<i>Cercis canadensis</i>	Redbud	-	-	-	-	-	-	-
<i>Fraxinus pennsylvanica</i>	Green ash	-	-	-	-	-	-	-
<i>Fraxinus profunda</i>	Pumpkin-ash	-	-	-	-	-	-	-
<i>Gleditsia triacanthos</i>	Honey locust	-	-	-	-	-	-	-
<i>Lonicera maackii</i>	Amur bush honeysuckle	-	-	-	-	-	-	-
<i>Juglans cinerea</i>	Butternut	-	-	-	-	-	-	-
<i>Morus alba</i>	White mulberry	8.00	7.00	3.55	6.18	42	0.96	20
<i>Platanus occidentalis</i>	Sycamore	-	-	-	-	-	-	-
<i>Populus deltoides</i>	Cottonwood	-	-	-	-	-	-	-
<i>Prunus serotina</i>	Black cherry	-	-	-	-	-	-	-
<i>Robinia pseudoacacia</i>	Black locust	28.00	25.00	37.69	30.23	140	10.2	70
<i>Tilia americana</i>	Basswood or linden	-	-	-	-	-	-	-
<i>Ulmus sp.</i>	Elm sp.	28.00	35.00	26.98	29.99	196	7.3	70

*IV = Importance Value (relative frequency + relative density + relative dominance)/3*100

Transect 4

Relative frequency, density, dominance, and importance value by species

Species	Common Name	REL FREQ	REL DEN	REL DOM	IV*	Density (trees/ha)	Dominance (m ² /ha)	Frequency
<i>Acer negundo</i>	Box elder	25.93	32.50	24.15	27.53	124.00	9.70	70.00
<i>Acer saccharinum</i>	Silver maple	3.70	2.50	6.47	4.22	10.00	2.60	10.00
<i>Acer saccharum</i>	Sugar maple	3.70	2.50	0.42	2.21	10.00	0.17	10.00
<i>Aesculus glabra</i>	Ohio buckeye	-	-	-	-	-	-	-
<i>Ailanthus altissima</i>	Tree of heaven	-	-	-	-	-	-	-
<i>Carya cordiformis</i>	Bitternut hickory	-	-	-	-	-	-	-
<i>Carya glabra</i>	Pignut hickory	-	-	-	-	-	-	-
<i>Celtis occidentalis</i>	Hackberry	7.41	5.00	0.72	4.38	19.00	0.29	20.00
<i>Cercis canadensis</i>	Redbud	-	-	-	-	-	-	-
<i>Fraxinus pennsylvanica</i>	Green ash	-	-	-	-	-	-	-
<i>Fraxinus profunda</i>	Pumpkin-ash	-	-	-	-	-	-	-
<i>Gleditsia triacanthos</i>	Honey locust	11.11	7.50	7.47	8.69	29.00	3.00	30.00
<i>Lonicera maackii</i>	Amur bush honeysuckle	-	-	-	-	-	-	-
<i>Juglans cinerea</i>	Butternut	-	-	-	-	-	-	-
<i>Morus alba</i>	White mulberry	-	-	-	-	-	-	-
<i>Platanus occidentalis</i>	Sycamore	-	-	-	-	-	-	-
<i>Populus deltoides</i>	Cottonwood	-	-	-	-	-	-	-
<i>Prunus serotina</i>	Black cherry	11.11	15.00	18.90	15.00	57.00	7.60	30.00
<i>Robinia pseudoacacia</i>	Black locust	22.22	25.00	39.30	28.84	96.00	15.80	60.00
<i>Tilia americana</i>	Basswood or linden	-	-	-	-	-	-	-
<i>Ulmus sp.</i>	Elm sp.	14.81	10.00	2.49	9.10	38.00	1.01	40.00

*IV = Importance Value (relative frequency + relative density + relative dominance)/3*100

Transect 5

Relative frequency, density, dominance, and importance value by species

Species	Common Name	REL FREQ	REL DEN	REL DOM	IV*	Density (trees/ha)	Dominance (m ² /ha)	Frequency
<i>Acer negundo</i>	Box elder	15.79	10.00	11.10	12.30	69.00	13.00	30.00
<i>Acer saccharinum</i>	Silver maple	-	-	-	-	-	-	-
<i>Acer saccharum</i>	Sugar maple	-	-	-	-	-	-	-
<i>Aesculus glabra</i>	Ohio buckeye	36.84	60.00	74.70	57.18	401.00	87.10	70.00
<i>Ailanthus altissima</i>	Tree of heaven	-	-	-	-	-	-	-
<i>Carya cordiformis</i>	Bitternut hickory	-	-	-	-	-	-	-
<i>Carya glabra</i>	Pignut hickory	-	-	-	-	-	-	-
<i>Celtis occidentalis</i>	Hackberry	21.05	17.50	6.09	14.88	117.00	7.10	40.00
<i>Cercis canadensis</i>	Redbud	-	-	-	-	-	-	-
<i>Fraxinus pennsylvanica</i>	Green ash	-	-	-	-	-	-	-
<i>Fraxinus profunda</i>	Pumpkin-ash	-	-	-	-	-	-	-
<i>Gleditsia triacanthos</i>	Honey locust	-	-	-	-	-	-	-
<i>Lonicera maackii</i>	Amur bush honeysuckle	-	-	-	-	-	-	-
<i>Juglans cinerea</i>	Butternut	5.26	2.50	2.57	3.44	17.00	3.00	10.00
<i>Morus alba</i>	White mulberry	5.26	2.50	1.11	2.96	17.00	1.30	10.00
<i>Platanus occidentalis</i>	Sycamore	-	-	-	-	-	-	-
<i>Populus deltoides</i>	Cottonwood	10.53	5.00	3.86	6.46	33.00	4.50	20.00
<i>Prunus serotina</i>	Black cherry	-	-	-	-	-	-	-
<i>Robinia pseudoacacia</i>	Black locust	-	-	-	-	-	-	-
<i>Tilia americana</i>	Basswood or linden	5.26	2.50	0.54	2.77	17.00	0.63	10.00
<i>Ulmus sp.</i>	Elm sp.	-	-	-	-	-	-	-

*IV = Importance Value (relative frequency + relative density + relative dominance)/3*100

Appendix 7. Number of plots and mean cover class for herb layer species by transect

Species	Common Name	# Plots	Ave. Cover Class
<u>Transect 1</u>			
<i>Acer negundo</i>	Box elder seedling	1	1.0
<i>Cryptotaenia canadensis</i>	Honewort	1	3.0
	Late-flowering		
<i>Eupatorium serotinum</i>	thoroughwort	1	2.0
<i>Hydrophyllum appendiculatum</i>	Appendaged waterleaf	1	4.0
<i>Lonicera maackii</i> ⁺	Amur honeysuckle	2	2.0
<i>Lysimachia ciliata</i>	Fringed loosestrife	1	2.0
<i>Pilea pumila</i>	Clearweed	4	2.0
<i>Polygonum</i> sp.	Knotweed	2	1.5
<i>Robinia pseudoacacia</i>	Black locust seedling	1	1.0
<i>Sanicula marilandica</i>	Black snakeroot	1	2.0
<i>Urtica dioica</i> [*]	Stinging nettles	1	2.0
<i>Viola</i> sp.	Violets	1	2.0
<u>Transect 2</u>			
<i>Acer negundo</i>	Box elder seedling	1	2.0
<i>Alliaria petiolata</i> ⁺	Garlic mustard	2	2.5
<i>Ambrosia artemesiifolia</i>	Common ragweed	1	1.0
<i>Ambrosia trifida</i>	Giant ragweed	1	2.0
<i>Asarum canadense</i>	Wild ginger	1	2.0
<i>Carex</i> sp.	Sedge	1	1.0
<i>Celastrus orbiculatus</i> ⁺	Oriental bittersweet	2	2.5
<i>Celtis occidentalis</i>	Hackberry Seedling	1	2.0
<i>Cryptotaenia canadensis</i>	Honewort	1	1.0
<i>Euonymus alatus</i> [*]	Winged burning bush	1	1.0
<i>Euonymus fortunei</i> ⁺	Winter creeper	1	2.0
<i>Fraxinus</i> sp.	Ash seedling	1	2.0
<i>Geum canadense</i>	Avens - white	1	2.0
<i>Glechoma hederacea</i> [*]	Creeping charley, ground ivy	3	2.0
<i>Humulus japonicus</i> ⁺	Japanese hops	1	1.0
<i>Impatiens pallida</i>	Yellow jewelweed	1	1.0
<i>Lonicera maackii</i> ⁺	Amur honeysuckle	7	2.9
<i>Oxalis stricta</i>	Wood sorrel	1	1.0
<i>Parthenocissus quinquefolia</i>	Virginia creeper	1	2.0
<i>Robinia pseudoacacia</i>	Black locust seedling	1	5.0
<i>Sanicula marilandica</i>	Black snakeroot	2	1.0
<i>Toxicodendron radicans</i>	Poison ivy	1	2.0
<i>Viola</i> sp.	Violets	1	1.0

Transect 3

<i>Alliaria petiolata</i> **	Garlic mustard	9	3.5
<i>Carex</i> sp.	Sedge	1	1.0
<i>Euonymus fortunei</i> **	Winter creeper	4	1.8
<i>Geum canadense</i>	Avens - white	4	2.3
<i>Impatiens pallida</i>	Yellow jewelweed	5	1.8
<i>Lonicera maackii</i> **	Amur honeysuckle	3	3.5
<i>Parthenocissus quinquefolia</i>	Virginia creeper	6	1.8
<i>Solidago altissima</i>	Tall goldenrod	1	3.0
<i>Urtica dioica</i> *	Stinging nettles	1	2.0
<i>Viola</i> sp.	Violets	3	2.5
<i>Vitis</i> sp.	Grape	1	1.0

Transect 4

<i>Alliaria petiolata</i> **	Garlic mustard	7	1.6
<i>Carex</i> sp.	Sedge	1	1.0
<i>Euonymus fortunei</i> **	Winter creeper	3	1.7
<i>Lonicera maackii</i> **	Amur honeysuckle	10	4.0
<i>Parthenocissus quinquefolia</i>	Virginia creeper	5	1.8
<i>Robinia pseudoacacia</i>	Black locust seedling	1	4.0
<i>Vitis</i> sp.	Grape	1	2.0

Transect 5

<i>Acer negunda</i>	Box elder seedling	2	1.0
<i>Aesculus glabra</i>	Ohio buckeye seedling	1	1.0
<i>Alliaria petiolata</i> **	Garlic mustard	2	1.0
<i>Asarum canadense</i>	Wild ginger	2	1.5
<i>Bidens coronata</i>	Bidens	1	1.0
<i>Carex</i> sp.	Sedge	1	2.0
<i>Celtis occidentalis</i>	Hackberry Seedling	1	1.0
<i>Convolvulus arvensis</i> *	Field bindweed	1	1.0
<i>Cryptotaenia canadensis</i>	Honewort	1	3.0
<i>Euonymus fortunei</i> **	Winter creeper	7	2.8
<i>Hydrophyllum appendiculatum</i>	Appendaged waterleaf	4	1.5
<i>Impatiens pallida</i>	Yellow jewelweed	3	1.7
<i>Laportea canadensis</i>	Wood nettles	2	2.5
<i>Lonicera maackii</i> **	Amur honeysuckle	7	3.1
<i>Parthenocissus quinquefolia</i>	Virginia creeper	2	1.5
<i>Rudbeckia laciniata</i>	Green-headed coneflower	2	2.5
<i>Sanicula marilandica</i>	Black snakeroot	1	3.0
<i>Silphium perfoliatum</i>	Cup-plant	2	2.5
<i>Smilax herbacea</i>	Greenbriar	1	2.0
<i>Viola</i> sp.	Violets	2	2.5

(*non-native; +invasive)

Appendix 8. Species List -- Indianapolis Museum of Art, Art and Nature Park; Spring-Summer 2000-2001

Species	Common Name	Canal	Woods Near Canal	Site Meadow Area	Location Lake Shore	"The Wilds" Lakeside Trail
<i>Abutilon theophrasti</i> *	Velvet leaf			X		
<i>Acer negundo</i>	Box elder	X	X	X		
<i>Acer saccharinum</i>	Silver maple					X
<i>Acer saccharum</i>	Sugar maple					X
<i>Achillea millefolium</i> *	Yarrow			X		
<i>Aesculus glabra</i>	Ohio buckeye		X			
<i>Alliaria petiolata</i> **	Garlic mustard	X	X			X
<i>Allium cernuum</i> *	Nodding wild onion		X			
<i>Allium vineale</i> *	Field garlic		X	X		
<i>Ambrosia artemesiifolia</i>	Common ragweed		X			
<i>Ambrosia trifida</i>	Giant ragweed			X		X
<i>Arctium minus</i> *	Common burdock	X				
<i>Arenaria serpyllifolia</i> *	Thyme-leaved sandwort	X				
<i>Artemisia annua</i> *	Annual wormwood					X
<i>Asarum canadense</i>	Wild ginger	X	X			X
<i>Asclepias syriaca</i>	Common milkweed				X	
<i>Asimina triloba</i>	Paw paw					X
<i>Asplenium platyneuron</i>	Ebony spleenwort					X
<i>Aster novae-angliae</i>	New England aster			X		
<i>Aster pilosus</i>	White aster		X			X
<i>Barbarea vulgaris</i> *	Bitter winter cress		X			
<i>Bidens bipinnata</i>	Spanish needles	X		X		
<i>Buglossoides arvensis</i> *	Corn gromwell	X				
<i>Cacalia atriplicifolia</i>	Pale Indiana plantain					X
<i>Campanula americana</i>	Giant bellflower					X
<i>Campsis radicans</i>	Trumpet creeper vine					X
<i>Capsella bursa-pastoris</i> *	Shepherd's-purse	X				
<i>Cardamine concatenata</i>	Cut-leaved toothwort		X			
<i>Carex sparganioides var. aggregata</i>	Aggregate sedge	X				
<i>Catalpa speciosa</i>	Catalpa		X			
<i>Celastrus orbiculatus</i> **	Oriental bittersweet					X
<i>Celtis occidentalis</i>	Hackberry	X				X
<i>Cercis canadensis</i>	Redbud			X		
<i>Chaerophyllum procumbens</i>	Wild chervil	X				
<i>Chenopodium album</i> *	Lamb's quarters		X			X
<i>Chrysanthemum leucanthemum</i> *	Ox-eye daisy			X		
<i>Cichorium intybus</i> *	Chicory	X				
<i>Circaea lutetiana</i>	Enchanter's nightshade					X
<i>Cirsium arvense</i> **	Canada thistle	X				
<i>Claytonia virginica</i>	Spring beauty					X
<i>Commelina communis</i> *	Asiatic dayflower	X				
<i>Convolvulus arvensis</i> *	Field bindweed			X	X	
<i>Conyza canadensis</i>	Horseweed		X			

<i>Cornus sericea</i>	Red osier dogwood			X	
<i>Coronilla varia</i> **	Crownvetch	X			
<i>Cryptotaenia canadensis</i>	Honewort				X
<i>Cyperus strigosus</i>	False nutsedge		X		
<i>Dactylis glomerata</i> *	Orchard grass	X			
<i>Daucus carota</i> *	Queen Anne's lace			X	
<i>Desmodium canescens</i>	Hoary tick-trefoil				X
<i>Dicentra canadensis</i>	Squirrelcorn				X
<i>Dicentra cucullaria</i>	Dutchman's breeches				X
<i>Duchesnea indica</i> **	Indian strawberry	X	X		
<i>Eleocharis palus tris</i>	Creeping spike-rush			X	
<i>Elymus riparius</i>	Stream bank wild rye	X			
<i>Elytrigia repens</i> *	Quack grass				X
<i>Equisetum arvense</i>	Field horsetail	X			X
<i>Erigeron annuus</i>	Daisy fleabane	X		X	
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	X			
<i>Erysimum repandum</i> *	Treacle mustard	X			
<i>Euonymus fortunei</i> **	Winter creeper		X		X
<i>Eupatorium perfoliatum</i>	Boneset				X
<i>Eupatorium rugosa</i>	White snakeroot		X		
<i>Eupatorium serotinum</i>	Late-flowering thoroughwort		X	X	X
<i>Euphorbia esula</i> *	Leafy spurge				X
<i>Euphorbia supina</i>	Milk-purslane			X	
<i>Festuca elatior</i> **	Tall fescue			X	
<i>Galium aparine</i>	Cleavers	X	X		
<i>Gaura biennis</i>	Biennial gaura				X
<i>Geranium carolinianum</i>	Carolina cranesbill			X	
<i>Glechoma hederacea</i> *	Creeping charley, ground ivy	X		X	X
<i>Gleditsia triacanthos</i>	Honey locust	X			X
<i>Helianthus annuus</i>	Common sunflower			X	
<i>Helianthus tuberosus</i>	Jerusalem-artichoke			X	X
<i>Heuchera americana</i>	Common alumroot				X
<i>Hibiscus laevis</i> (observed in the river water)	Smooth rose-mallow			X	
<i>Hibiscus trionum</i> *	Flower-of-an-hour			X	
<i>Humulus japonicus</i> **	Japanese hops				X
<i>Hydrophyllum appendiculatum</i>	Appendaged waterleaf		X		X
<i>Hydrophyllum virginianum</i>	Virginia waterleaf				X
<i>Impatiens capensis</i>	Spotted jewelweed				X
<i>Impatiens pallida</i>	Yellow jewelweed		X		X
<i>Isopyrum biternatum</i>	False-rue anemone				X
<i>Juglans nigra</i>	Black walnut	X			
<i>Justicia americana</i>	Water willow	X			X
<i>Lactuca biennis</i>	Tall blue wild lettuce	X			
<i>Lactuca canadensis</i>	Yellow wild lettuce	X		X	
<i>Lactuca floridana</i>	Wild lettuce		X		X
<i>Lamium purpureum</i> *	Dead nettles	X			
<i>Laportea canadensis</i>	Wood nettle				X
<i>Lemna sp.</i>	Duckweed				X
<i>Lepidium campestre</i> *	Field-cress			X	
<i>Ligustrum obtusifolium</i> **	Privet hedge				X

<i>Lindera benzoin</i>	Spice bush					X
<i>Lonicera japonica</i> **	Japanese honeysuckle	X	X			
<i>Lonicera maackii</i> **	Amur honeysuckle	X	X			X
<i>Lonicera morrowii</i> **	Morrow honeysuckle					X
<i>Lysimachia nummularia</i> **	Moneywort	X				
<i>Matricaria matricarioides</i> *	Pineapple weed				X	
<i>Melilotus alba</i> *	White sweet clover	X			X	
<i>Melilotus officinalis</i> *	Yellow sweet clover				X	
<i>Menispermum canadense</i>	Canada moonseed	X				
<i>Mimulus alatus</i>	Sharpwing monkey-flower				X	
<i>Morus alba</i> *	Mulberry	X			X	
<i>Nasturtium officinale</i> *	Water cress				X	
<i>Nepeta cataria</i> *	Catnip		X			
<i>Oenothera biennis</i>	Evening primrose		X		X	
<i>Osmorhiza claytonii</i>	Sweet Cicily	X				X
<i>Oxalis stricta</i>	Wood sorrel		X			X
<i>Panicum capillare</i>	Witch grass				X	
<i>Parietaria pensylvanica</i>	Pellitory					X
<i>Parthenocissus quinquefolia</i>	Virginia creeper	X	X			
<i>Pastinaca sativa</i> *	Wild parsnip				X	
<i>Penstemon digitalis</i>	Tall white beard-tongue					X
<i>Phacelia bipinnatifida</i>	Forest phacelia				X	X
<i>Phlox divaricata</i>	Blue phlox, woodland phlox					X
<i>Phryma leptostachya</i>	Lopseed				X	
<i>Physalis subglabrata</i>	Ground cherry				X	
<i>Phytolacca americana</i>	Pokeweed				X	X
<i>Pilea pumila</i>	Clearweed	X				
<i>Plantago lanceolata</i> *	English plantain	X			X	
<i>Plantago major</i> *	Common plantain	X			X	
<i>Platanus occidentalis</i>	Sycamore		X			X
<i>Poa pratensis</i> *	Kentucky bluegrass				X	
<i>Polygonatum biflorum</i>	True Solomon's seal		X			X
<i>Polygonum persicaria</i> *	Lady's thumb		X			
<i>Polygonum virginianum</i>	Virginia knotweed					X
<i>Polymnia canadensis</i>	Small-flowered leafcup					X
<i>Populus deltoides</i>	Cottonwood		X			X
<i>Potentilla norvegica</i>	Potentilla cinquefoil				X	
<i>Prunus serotina</i>	Black cherry		X		X	X
<i>Quercus bicolor</i>	Swamp white oak					X
<i>Quercus prinoides</i>	Chinquapin oak	X				
<i>Ranunculus abortivus</i>	Kidney-leaf buttercup	X				
<i>Ranunculus ficaria</i> *	Lesser celandine	X			X	
<i>Ranunculus septentrionalis</i>	Rough buttercup					X
<i>Rhus glabra</i>	Smooth sumac				X	
<i>Robinia pseudoacacia</i>	Black locust		X			
<i>Rudbeckia laciniata</i>	Green-headed coneflower	X				X
<i>Rudbeckia triloba</i>	Thin leaved coneflower	X	X		X	
<i>Ruellia strepens</i>	Wild petunia					X
<i>Rumex acetosa</i> *	Sleep sorrel	X				
<i>Rumex crispus</i> *	Curly dock	X				

<i>Salix nigra</i>	Black willow			X	
<i>Sambucus canadensis</i>	Elderberry				X
<i>Sanguinaria canadensis</i>	Bloodroot				X
<i>Sanicula marilandica</i>	Black snakeroot				X
<i>Saponaria officinalis</i> *	Bouncing bet	X			
<i>Schrophularia lanceolata</i>	Figwort				X
<i>Scirpus validus</i>	American great bulrush			X	
<i>Senecio aureus</i>	Golden ragwort	X	X		
<i>Senecio glabellus</i>	Yellowtop		X		
<i>Setaria glauca</i> *	Yellow fox-tail grass		X		
<i>Silene antirrhina</i>	Sleepy catchfly			X	
<i>Silene vulgaris</i> *	Bladder campion			X	
<i>Silphium perfoliatum</i>	Cup-plant	X			
<i>Sisymbrium officinale</i> *	Tumble mustard	X			
<i>Smilax herbacea</i>	Greenbriar				X
<i>Solanum nigrum</i> *	Nightshade			X	
<i>Solidago altissima</i>	Tall goldenrod	X		X	
<i>Stachys tenuifolia</i>	Smooth hedge-nettle				X
<i>Stellaria media</i> *	Common chickweed	X			
<i>Stylophorum diphyllum</i>	Celandine poppy		X		
<i>Taraxacum officinale</i> *	Dandelion	X		X	
<i>Tilia americana</i>	Basswood or linden				X
<i>Toxicodendron radicans</i>	Poison ivy	X		X	X
<i>Tradescantia subaspera</i>	Spiderwort	X	X		
<i>Trifolium campestre</i> *	Pinnate hop-clover	X			
<i>Trifolium pratense</i> *	Red clover	X		X	
<i>Trifolium repens</i> *	White clover	X		X	
<i>Trillium sessile</i>	Toadshade, Sessile trillium				X
<i>Ulmus rubra</i>	Slippery elm		X		
<i>Verbascum blattaria</i> *	Moth mullein		X		
<i>Verbascum thapsus</i> *	Common mullein			X	
<i>Verbena stricta</i>	Hoary vervain		X		
<i>Verbena urticifolia</i>	White verbena				X
<i>Veronica anagallis-aquatica</i>	Water speedwell				X
<i>Veronica arvensis</i> *	Corn speedwell	X			
<i>Veronica peregrina</i>	Purslane speedwell	X		X	
<i>Veronica persica var persica</i> *	Birdseye speedwell	X			
<i>Veronica polita</i> *	Wayside speedwell	X			
<i>Viburnum dentatum</i>	Southern arrowwood				X
<i>Vinca minor</i> **	Periwinkle, or myrtle		X		
<i>Viola sororia</i>	Common blue violet	X			X
<i>Viola striata</i>	Cream white violet				X
<i>Vitis labrusca</i>	Fox grape	X			

(*non-native; +invasive)