

Quantitative Vegetation Analysis of
The Virginia B. Fairbanks Art and Nature Park,
Indianapolis Museum of Art

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Introduction

In 2000 and 2001, we conducted an inventory of plants found at the Virginia B. Fairbanks Art and Nature Park (VBFANP) site. The work was funded by the City of Indianapolis, Indy Greenways, and results were presented to Mark Zelonis. We found the site highly disturbed, with few 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. Our species list from that previous inventory is included in this report in Appendix E.

We report here on work, funded by the Indianapolis Museum of Art, conducted during late July and early August of 2005. 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.

Methods and Results

Quantitative Vegetation Analysis -- Five 100 m transects located throughout the VBFANP were surveyed (Figure 1) with the assistance of a horticulture intern 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.



Figure 1. Location of vegetation sampling transects

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 A). We characterized the density of the herb and shrub layer in ten 1m^2 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 B). Not all species 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 1). 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 project 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.

Table 1. 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)

On an individual transect basis, Transects 1 and 3, which have had extensive honeysuckle removal, had no bush honeysuckle in the tree layer (Appendix C). 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 2). The top five most frequently encountered plants were 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, Appendaged waterleaf, Oriental bittersweet, and Honewort (Table 2). 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, Appendaged waterleaf, and Honewort are desirable native species. Cup-plant is a large plant, so where it occurs it will cover a lot of a plot. Appendaged waterleaf tends to grow in clumps. Oriental bittersweet is an invasive non-native woody vine.

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

Table 2. 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>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>Urtica dioica</i> *	Stinging nettles	4	2.2
<i>Viola</i> sp.	Violet	4	2.0
<i>Vitis</i> sp.	Grape	2	1.7

* = non-native
+ = invasive

Historical Vegetation

As we stated in our 2001 report, Historical overstory vegetation on the site 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 Canal. This tree 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 it 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 our 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.

Conclusions

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 become much harder to control.

Appendix A

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 occudentalis</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	FRAPEN? OR	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 B

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>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>Urtica dioica</i> *	Stinging nettles		2								
<i>Viola sp.</i>	Violets		2								

* = non-native

+ = invasive

Transect 2

Species	Common Name	Cover Class									
		1	2	3	4	5	6	7	8	9	10
		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 artemesiifolia</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>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>Urtica dioica</i> *	Stinging nettles								2		
<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>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>Urtica dioica</i> [*]	Stinging nettles					3				2	
<i>Viola</i> sp.	Violets					2					3

* = non-native

+ = invasive

Appendix C

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

Appendix C
Point Quarter Analysis for Each Transect

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

Appendix C
Point Quarter Analysis for Each Transect

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 D

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
<i>Eupatorium serotinum</i>	Late-flowering 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>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>Urtica dioica</i> *	Stinging nettles	2	2.5
<i>Viola</i> sp.	Violets	2	2.5

Appendix E

Species List for 2001 Floristic Inventory

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

Species (* = alien; + = invasive)	Common Name	Site			Location	
		Canal	Woods Near Canal	Meadow Area	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</i> var. <i>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 palustris</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>	Canada nettle				X
<i>Lemna sp.</i>	Duckweed				X
<i>Lepidium campestre*</i>	Field-cress			X	
<i>Ligustrum obtusifolium**</i>	Privet hedge				X

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