

2023 Floristic Report:
Wayne Cave Preserve

Submitted to:

Indiana Karst Conservancy

By:

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Wayne Cave preserve's sinkhole pond in early April

Site Overview

Wayne Cave preserve is a property owned and managed by Indiana Karst Conservancy (IKC) just southwest of Bloomington, Indiana. It hosts multiple karst features of intrigue, including access to an expansive cave system that draws many visitors. Wayne Cave preserve is located in the Escarpment Section of the Shawnee Hills Natural Region, defined by Homoya's "Natural Regions of Indiana" (Homoya 1984). This section represents a dynamic edge between the Mitchell Karst Plateau and the Crawford Upland sections. Sandstone-derived soils cover the hills and limestone-derived soils are present in lower elevations. The maps shown in Figures 1-3 display the soil types dominant at Wayne Cave preserve and the varying elevation of the property. The variable soils present on the property are conducive to higher vegetative diversity. The author observed a wide range of plant species occurring on the property indicative of low and high pH soils and various moisture preferences.

Project Overview

The author was contracted by the Indiana Karst Conservancy in 2023 to conduct floristic inventories around the Wayne Cave preserve in Bloomington, Indiana. On April 17, 2023, the author and a site manager walked the property. Three sites were chosen for floristic inventories and another two were chosen for vegetative plot assessments. A floristic quality assessment was conducted and is summarized in this report. Excel files containing the full results of the floristic quality assessment will be included with this report.



Figure 1 (Above left): Soils map of Wayne Cave preserve. Caneyville silt loams (CaD and Cb) are limestone derived. Zanesville and Wellston (TIB and WeC) are sandstone-derived (map from NRCS Web Soils Survey). Figure 2 (Above Right): LIDAR map of Wayne Cave preserve revealing numerous karst features and detailed elevation (map from USGS). Figure 3 (Below): Map Unit Legend for soil types map (Figure 1).

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CaD	Caneyville silt loam, 12 to 18 percent slopes	29.4	50.0%
Cb	Caneyville-Hagerstown silt loams, 2 to 18 percent slopes, karst	19.2	32.6%
TIB	Zanesville silt loam, 2 to 6 percent slopes	6.3	10.7%
WeC	Wellston silt loam, 6 to 12 percent slopes	3.9	6.7%
Totals for Area of Interest		58.8	100.0%

Methods

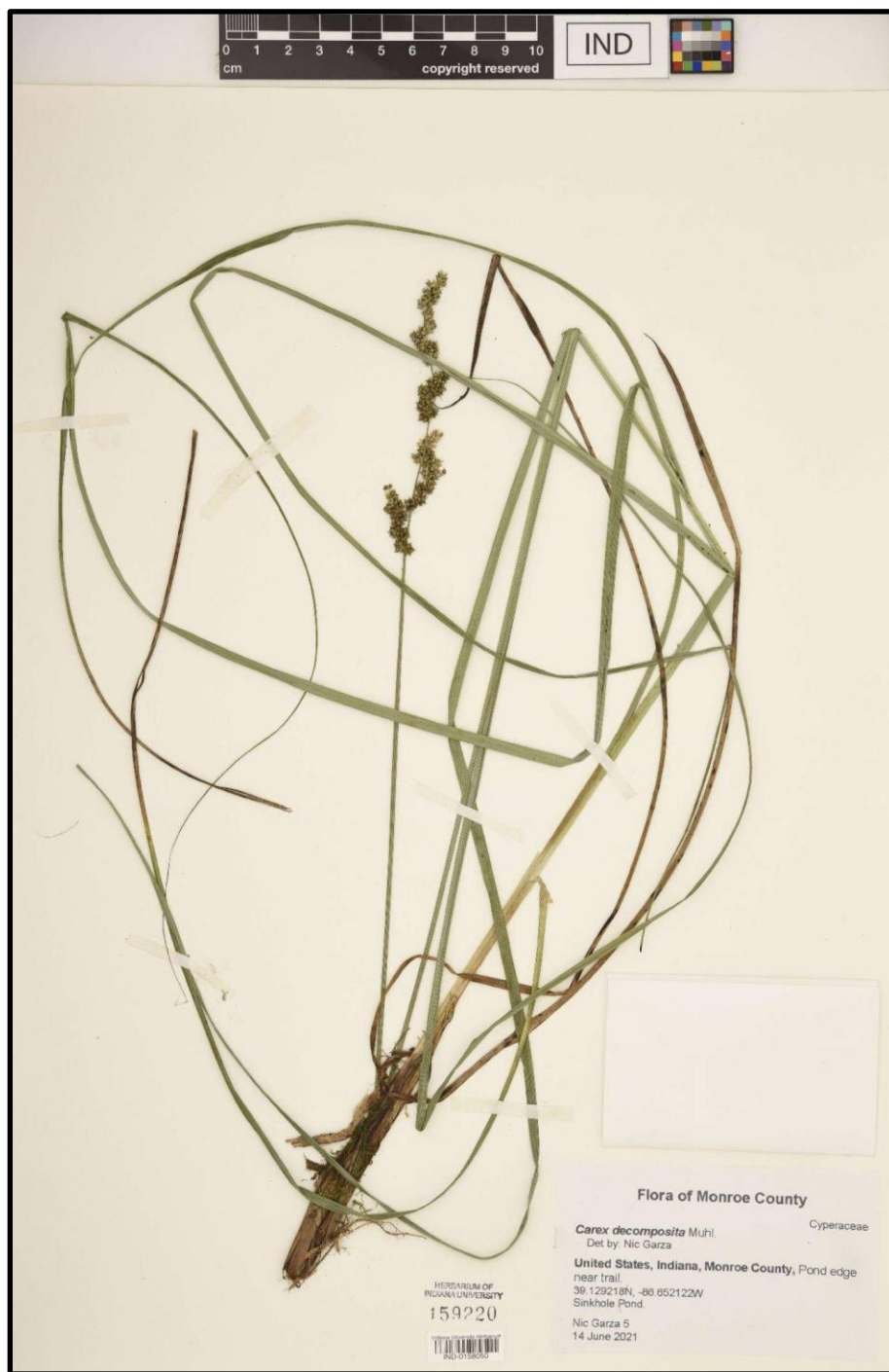
Floristic Inventory Methods

Three sites on the Wayne Cave preserve were selected for floristic inventories. Each site was visited on April 25, June 17, August 27, and November 12, 2023. Visiting the sites during different parts of the year ensures that all plant species are recorded regardless of phenology. The results of these inventories and their assessments can be found in Appendix B and in the accompanying excel files. Each site was traversed several times during each visit to record every plant species present.

The first site (Upland) was chosen as an example of a typical upland habitat on the property. The author used reflective flagging to demarcate four corners of a 25-pace x 25-pace (roughly 19m x 19m) square in which the inventory would be conducted. Species were identified and recorded in the marked square only. Every species was recorded within the marked square.

The second site (Big Sinkhole) was selected by members of IKC to represent a typical sinkhole feature on the Wayne Cave preserve. The largest sinkhole was chosen, and the author was asked to separate this site into three sections (Rim, Slope, and Bottom) to observe the differences in flora between elevations. The sections were delineated roughly by slope and a unique species list was written for each section.

The final site (Sinkhole Pond) was chosen for its high conservation quality and ecological stability. The author collected the state-threatened *Carex decomposita* from this area in June of 2021 which led to a number of professionals visiting the site to observe the surrounding habitat. The survey area was determined using general soil moisture indicators such as soil saturation and plant species' wetness ranking.



Cypress Knee Sedge (*Carex decomposita*) is a state-threatened species of sedge that occurs on rich humus in sinkhole ponds. *Cypress Knee Sedge* has been collected very sparsely in the state, and few populations are known to still exist. Photograph accessed via the consortium of Midwest herbaria (midwestherbaria.org).

Vegetative Plot Assessment Methods

The author surveyed two areas using vegetative plot assessments. These areas were visited on June 17, 2023, and their results and assessments are included in appendix B.

The property managers expressed interest in monitoring the development of a fallow field over time and after experimenting with different management techniques. The author also elected to survey a bottomland area adjacent to the fallow field site. Since the bottomland plot is slightly lower in elevation than the fallow field, it could incur nutrient runoff from management events occurring at the site and would be sensitive to any changes in hydrology that may occur at the site. Vegetative plot assessments were employed because they are simple to replicate and allow for changes in floristic integrity to be easily monitored. On June 17, 2023, the author randomly placed three $\frac{1}{4}$ m² quadrats throughout each area and recorded the species present and their densities. Using floristic quality assessment, the average C-value of the plots can be calculated. The quadrats' coordinates were recorded and red flags were placed in the southwest corner of each quadrat so that they may be revisited at a later date. Monitoring the change in

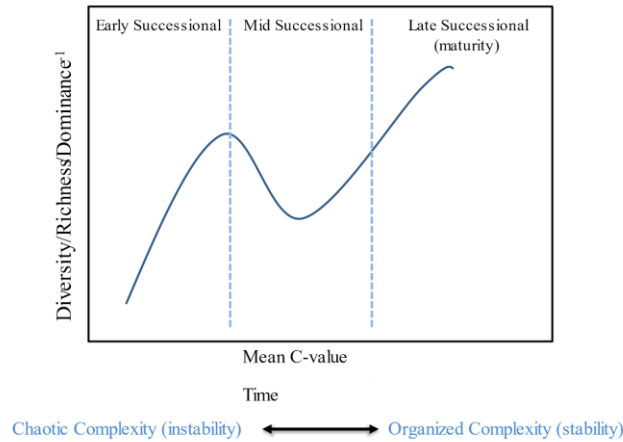


mean C-value over time is useful to determine that management techniques are successful. Although fewer species are recorded in vegetative plot assessments, they provide much more useful metrics for monitoring change over time than inventories.

An example of a $\frac{1}{4}$ m² quadrat used in vegetative plot sampling at Wayne Cave preserve. This quadrat contained numerous mesic woodland species.

Floristic Quality Assessment and Coefficients of Conservatism

Floristic quality assessment was originally developed by Gerould Wilhelm (1977) and later expanded on by Wilhelm and Ladd (1988). It was conceived to measure and analyze floristic quality without the ambiguity of diversity indices, as often high-quality sites may be lower in species richness (diversity) than degraded sites. This phenomenon is illustrated below in the Floristic Integrity Curve by Justin Thomas (2015). Diversity is not directly correlated with floristic quality.



Floristic quality assessment has become widely adopted and has been developed in some form in over 30 states. The measurements provided in these assessments may refer to coefficients of conservatism, or C-values. C-values are numeric values ranging 0-10 prescribed to native plant species by a group of experts in a certain region and refer (generally) to chances out of 10 that the species occurs in

high-quality natural areas. The dataset used for this assessment was the 2019 update to Rothrock and Homoya (2005). Averaging C-values (Mean C-Value) in an area provides a number that can be monitored over time to determine whether the area is stabilizing or degrading. As habitats succeed ecologically and nitrogen (a primary driver of succession) is expelled, species of higher conservation value can grow. For example, in southern Indiana, a woodland may be clear-cut and immediately respond with a thick growth of briars (*Smilax*) and blackberries (*Rubus*). Nitrogen would be abundant, and the mean C-value of this area would be low (<2.0). As this habitat succeeds over time into a mature oak-hickory forest, available nitrogen would decrease, and its mean C-value will rise in tandem. A more thorough explanation of the C-value system can be found in Ladd and Thomas (2015). Mean C-values rarely exceed 5.0 and almost never exceed 6.0. included in floristic quality assessments is a floristic quality index. This measurement is problematic as it involves richness and is difficult to apply across sites of different scales (Spyreas 2019). Therefore, it is omitted from this report.

Also included as an output of the floristic quality assessment is mean wetness. Each plant species is assigned a wetness value (W) from (-5) to 5 with (-5) indicating a preference for abundant moisture and 5 indicating a preference for dry sites. Mean wetness can be used to delineate wetland areas and can also be a useful measurement to monitor changes in hydrology over time, especially as a result of management.

Results and Management Discussion

All of the floristic inventories conducted resulted in a diverse species list of medium to high conservation value. Clearly, many areas at Wayne Cave preserve are ecologically intact and representative of healthy habitats* in the Shawnee Hills natural region.

The **Upland** site inventory contains 113 species and a mean C-value of 3.4. Species indicating both sandstone and limestone-derived soils occurred in the sampling area. There were very few stems of invasive species present. These populations currently are easy to control and should be treated in a way that promotes as little disturbance as possible. Cut-stump treatment on woody invasives such as Multiflora rose (*Rosa multiflora*) and Callery pear (*Pyrus calleryana*) and dormant season foliar-spraying on evergreen vines such as wintercreeper (*Euonymus fortunei*) and Japanese honeysuckle (*Lonicera japonica*) should be employed.

The **Big Sinkhole** site was divided into three sections based on elevation. The uppermost section, the rim, had 61 total species and a mean C-value of 4.5. Its mean wetness was 2.2, indicating a slightly dry upland habitat. The middle section, the slope, contained 52 species and also had a mean C-value of 4.5. Its mean wetness was also 2.2, indicating little change in wetness between the rim and the overall slope. The bottommost section had 26 species and a mean C-value of 4.4. Its mean wetness was 1.6, indicating a significantly wetter habitat than the slope and rim. Species that occur in more than one section will be highlighted in the corresponding excel files. The author observed a concentration of glade fern (*Homaliosorus pycnocarpus*) and silvery spleenwort (*Deparia acrostichoides*) in the bottom of the sinkhole and small populations of smooth hydrangea (*Hydrangea arborescens*) and early meadow rue (*Thalictrum dioicum*) growing on rocks exposed by the sinkhole formation. Management is most likely not needed in this area, but if enacted should promote as little disturbance as possible. The steep slopes of sinkholes are especially vulnerable to soil erosion which can be exacerbated by uprooting large plants. The very few woody invasives here can be treated as mentioned above, using cut-stump treatment.

The **Sinkhole Pond** contains 36 species and has a mean C-Value of 4.4. An extremely conservative grouping of plant species is present including state-threatened cypress knee sedge (*C. decomposita*) and halberd-leaved tearthumb (*Persicaria arifolia*). Two species observed, *C. decomposita* and greater marsh St. Johnswort (*Triadenum walteri*), were newly recorded for Monroe County in 2021 by the author. This area is of very high quality and should be trafficked as little as possible. There are no threats present that are pertinent enough to risk degrading this habitat. The area directly upslope should be monitored, and

invasive species should be prevented from colonizing it using minimally-disturbing methods such as cut-stump treatment and dormant-season foliar spraying. In the immediate vicinity of this pond, if needed, it is best to use only herbicide labeled for aquatic habitats as there is a very healthy amphibian population in the pond who are especially susceptible to herbicide damage in certain stages of their lives.

The **Fallow Field** vegetative plot assessment revealed a mean C-value of 1.6. The richest 1 m² quadrat contained 17 species; 28 total species were recorded amongst the three quadrats. The fallow field is mostly dominated by non-native cool-season grasses such as Kentucky bluegrass (*Poa pratensis*) and orchard grass (*Dactylis glomerata*). Aggressive species such as old field blackberry (*Rubus alumnus*) and multiflora rose (*Rosa multiflora*) are scattered in dense populations throughout the field. Both of these species are nitrophilous; they will naturally reduce over time as available N is expelled from the system. Any cut-stump treatment should be carried out in late fall so that excess N can leach from the system over the dormant season. If intended to be kept open, a single annual mowing using a tall deck-height or a prescribed fire should be executed in the dormant season. Leaving some areas undisturbed can provide habitat for overwintering insects. Using herbicide treatment to control cool-season grasses during the growing season could result in an excessive flush of N leading to invasive species encroachment. This area should be resurveyed annually or biannually to monitor management effects to floristic quality.

The **Bottomland** vegetative plot assessment has a mean-C value of 3.4 and 29 total species were present. Although both the Bottomland and Fallow Field plots had similar floristic diversity (29 and 28 species, respectively), their mean C-values reflect significantly different levels of floristic integrity and ecological health. Bottomland habitats are especially vulnerable to changes in hydrology and eutrophication. As a result, their flora can change significantly in short spans of time. Invasive species along the nearby tree line can continue to be removed using cut-stump treatment in the dormant season. The author observed dense patches of an uncommon grass species, American beakgrass (*Diarrhena americana*) in the bottomland section. This section should be resurveyed annually or biannually to monitor changes in floristic quality.

Conclusion

Wayne Cave preserve is connected to a large tract of contiguous forest (5,000+ acres) that undoubtedly buffers the preserve from threats of invasive species monocultures and provides an ample number of plant species available for recruitment after disturbance events. Each survey site, despite their small sizes, included a relatively large number of plant species.

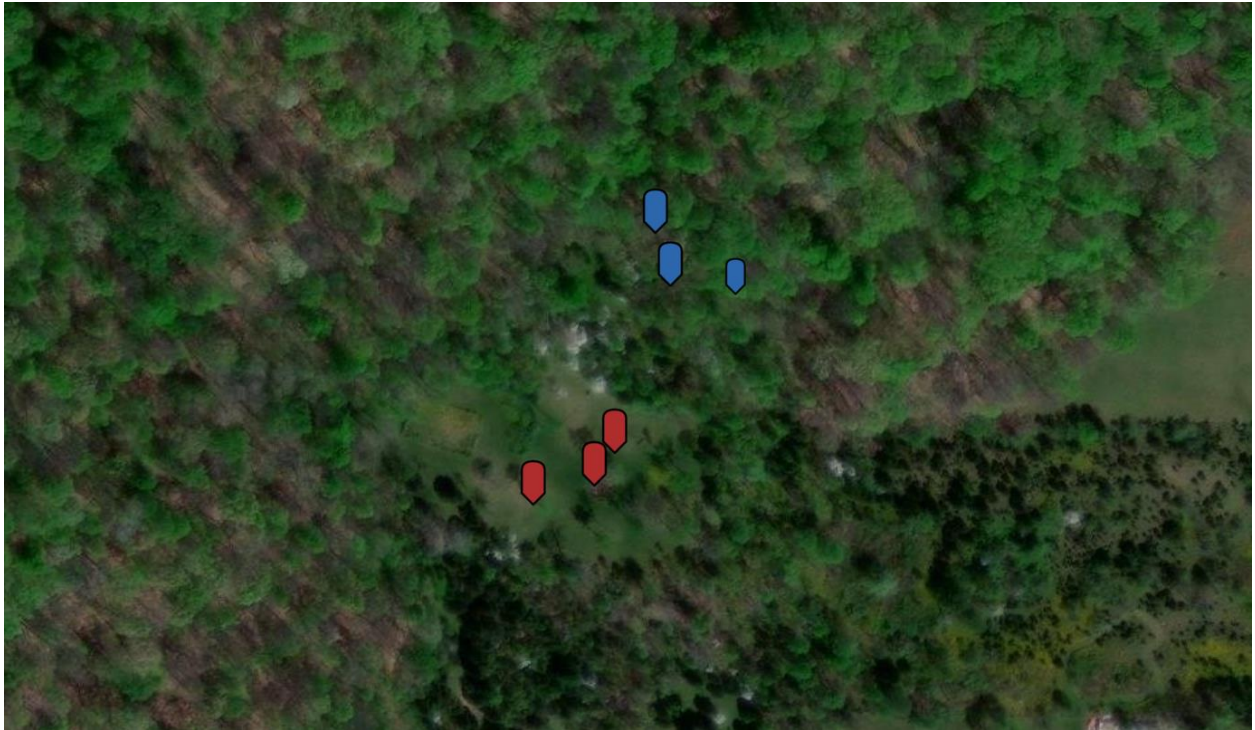
The floristic inventory conducted in the upland site yielded a large sample-size and was straightforward to collect data from. This method should be replicated in other areas throughout the property to reflect site-wide ecosystem health. The floristic inventory conducted in the big sinkhole, albeit interesting, would be difficult to extrapolate from given the unique topography of the area. This inventory suggests that the variable wetness created by karst features could lead to suitable habitat for moisture-loving plants. The sinkhole pond floristic inventory cataloged significant conservative plant species in a rare habitat. Any habitats of similar conservation value managed by IKC should be surveyed to document their diversity and floristic integrity before any large disturbance events take place that could negatively affect them. A sitewide inventory, beyond the scope of this project, would have undoubtedly resulted in many more plant species being documented and could have led to more notable collections such as those found in the sinkhole pond.

The vegetative plot assessments are essential for monitoring the effects of management practices and should be conducted whenever significant management is planned for a natural area. The vegetative plot assessments detailed in this report will only become useful when replicated over time. Larger plots would have yielded more accurate data but would have been beyond the scope of this project. Even so, the small size of these plots will still be useful for the purposes described.

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Appendix A: Approximate Quadrat Locations Map



Red Markers indicate approximate Fallow Field quadrat locations, blue markers indicate approximate Bottomland quadrat locations. Map from ArcGIS.

Appendix B: Floristic Quality Assessment Results

1. Upland Site

Mean C = 3.4

Species:

Species:

<i>Scientific Name</i>	Family	Acronym	Native?	C	W	Physiognomy	Duration	Common Name
<i>Acalypha virginica</i>	Euphorbiaceae	ACAVIR	native	0	3	forb	annual	virginia three-seeded mercury
<i>Acer rubrum</i> (including 2 varieties)	Sapindaceae	ACERUB	native	5	0	tree	perennial	red maple
<i>Acer saccharum</i> (including 1 variety)	Sapindaceae	ACESAR	native	4	3	tree	perennial	sugar maple
<i>Ageratina altissima</i> var. <i>altissima</i>	Asteraceae	AGEALT	native	2	3	forb	perennial	white snakeroot
<i>Agrimonia rostellata</i>	Rosaceae	AGRROS	native	5	3	forb	perennial	woodland agrimony
<i>Albizia julibrissin</i>	Fabaceae	ALBJUL	non-native	0	5	tree	perennial	silk tree
<i>Allium sativum</i>	Amaryllidaceae	ALLSAT	non-native	0	5	forb	perennial	garlic

<i>Allium tricoccum</i> var. <i>burdickii</i>	Amaryllidaceae	ALLTRB	native	6	3	forb	perennial	narrow-leaf wild leek
<i>Allium vineale</i>	Amaryllidaceae	ALLVIN	non-native	0	3	forb	perennial	field garlic
<i>Amphicarpaea bracteata</i>	Fabaceae	AMPBRA	native	5	0	vine	annual	hog-peanut
<i>Andropogon virginicus</i> var. <i>virginicus</i>	Poaceae	ANDVIR	native	1	3	grass	perennial	broom sedge
<i>Asimina triloba</i>	Annonaceae	ASITRI	native	6	0	tree	perennial	papaw
<i>Asplenium platyneuron</i>	1-aspleniaceae	ASPPLA	native	3	3	fern	perennial	ebony spleenwort
<i>Barbarea vulgaris</i>	Brassicaceae	BARVUL	non-native	0	0	forb	biennial	yellow rocket
<i>Borodinia laevigata</i>	Brassicaceae	BORLAE	native	5	5	forb	biennial	smooth rock cress
<i>Botrypus virginianus</i>	1-ophioglossaceae	BOTVIR	native	4	3	fern	perennial	rattlesnake fern
<i>Brachyelytrum erectum</i>	Poaceae	BRAERE	native	6	3	grass	perennial	long-awned wood grass
<i>Bromus pubescens</i>	Poaceae	BROPUB	native	4	3	grass	perennial	woodland brome
<i>Carex albicans</i> var. <i>albicans</i>	Cyperaceae	CXALBA	native	6	5	sedge	perennial	blunt-scaled oak sedge
<i>Carex amphibola</i>	Cyperaceae	CXAMPH	native	8	0	sedge	perennial	false gray sedge
<i>Carex blanda</i>	Cyperaceae	CXBLAN	native	1	0	sedge	perennial	common wood sedge

<i>Carex cephalophora</i>	Cyperaceae	CXCEPH	native	3	3	sedge	perennial	short-headed bracted sedge
<i>Carex glaucoidea</i>	Cyperaceae	CXGLAU	native	3	0	sedge	perennial	blue sedge
<i>Carex granularis</i>	Cyperaceae	CXGRAN	native	2	-3	sedge	perennial	pale sedge
<i>Carex hirsutella</i>	Cyperaceae	CXHIRS	native	3	3	sedge	perennial	hairy green sedge
<i>Carex leavenworthii</i>	Cyperaceae	CXLEAV	native	1	5	sedge	perennial	dwarf bracted sedge
<i>Carex oligocarpa</i>	Cyperaceae	CXOLIG	native	8	5	sedge	perennial	few-fruited gray sedge
<i>Carex rosea</i>	Cyperaceae	CXROSE	native	5	3	sedge	perennial	curly-styled bracted sedge
<i>Carex umbellata</i>	Cyperaceae	CXUMBE	native	5	5	sedge	perennial	early oak sedge
<i>Carya cordiformis</i>	Juglandaceae	CARCOR	native	5	3	tree	perennial	bitternut hickory
<i>Carya tomentosa</i>	Juglandaceae	CARTOM	native	6	5	tree	perennial	mockernut hickory
<i>Cercis canadensis var. canadensis</i>	Fabaceae	CERCAN	native	3	3	tree	perennial	eastern redbud
<i>Cinna arundinacea</i>	Poaceae	CINARU	native	4	-3	grass	perennial	common wood reed
<i>Circaea canadensis</i>	Onagraceae	CIRCAN	native	2	3	forb	perennial	enchanters nightshade
<i>Claytonia virginica</i>	Montiaceae	CLAVIR	native	2	3	forb	perennial	spring beauty
<i>Cornus florida</i>	Cornaceae	CORFLO	native	4	3	tree	perennial	flowering dogwood

<i>Danthonia spicata</i>	Poaceae	DANSPI	native	3	3	grass	perennial	poverty oat grass
<i>Desmodium paniculatum</i> <i>var. paniculatum</i>	Fabaceae	DESPAN	native	2	3	forb	perennial	panicked tick trefoil
<i>Dichanthelium</i> <i>acuminatum subsp.</i> <i>fasciculatum</i>	Poaceae	DICACF	native	2	0	grass	perennial	western witch grass
<i>Dichanthelium boscii</i>	Poaceae	DICBOS	native	4	5	grass	perennial	bearded witch grass
<i>Dichanthelium</i> <i>clandestinum</i>	Poaceae	DICCLA	native	3	-3	grass	perennial	deer-tongue grass
<i>Dioscorea villosa</i>	Dioscoreaceae	DIOVIL	native	4	0	vine	perennial	wild yam
<i>Diospyros virginiana</i>	Ebenaceae	DIOVIR	native	2	0	tree	perennial	persimmon
<i>Elaeagnus umbellata</i>	Elaeagnaceae	ELAUMB	non-native	0	3	shrub	perennial	autumn olive
<i>Elymus villosus</i>	Poaceae	ELYVIL	native	4	3	grass	perennial	silky wild rye
<i>Elymus virginicus</i> <i>(including 2 varieties)</i>	Poaceae	ELYVIR	native	3	-3	grass	perennial	virginia wild rye
<i>Endodeca serpentaria</i>	Aristolochiaceae	ENDSER	native	8	5	forb	perennial	birthwort
<i>Erigeron pulchellus var.</i> <i>pulchellus</i>	Asteraceae	ERIPUL	native	8	3	forb	perennial	robins plantain

<i>Euonymus fortunei</i>	Celastraceae	EUOFOR	non-native	0	5	shrub	perennial	winter-creeper
<i>Fagus grandifolia</i>	Fagaceae	FAGGRA	native	8	3	tree	perennial	american beech
<i>Festuca subverticillata</i>	Poaceae	FESSUB	native	4	3	grass	perennial	nodding fescue
<i>Fraxinus americana</i>	Oleaceae	FRAAME	native	4	3	tree	perennial	white ash
<i>Fraxinus smallii</i>	Oleaceae	FRASMA	native	4	3	tree	perennial	blue ash
<i>Galium aparine</i>	Rubiaceae	GALAPA	native	1	3	forb	perennial	sticky-willy
<i>Galium circaezans</i>	Rubiaceae	GALCIR	native	6	3	forb	perennial	wild licorice
<i>Galium triflorum</i>	Rubiaceae	GALTRI	native	5	3	forb	perennial	fragrant bedstraw
<i>Geum canadense</i>	Rosaceae	GEUCAN	native	1	0	forb	perennial	white avens
<i>Geum vernum</i>	Rosaceae	GEUVER	native	1	3	forb	perennial	spring avens
<i>Hieracium gronovii</i>	Asteraceae	HIEGRO	native	5	5	forb	perennial	hairy hawkweed
<i>Houstonia purpurea</i> (including 1 variety)	Rubiaceae	HROUPUR	native	6	5	forb	perennial	large houstonia
<i>Hypericum punctatum</i>	Hypericaceae	HYPPUN	native	3	0	forb	perennial	spotted st. johns wort
<i>Juncus tenuis</i>	Juncaceae	JUNTEN	native	0	0	rush	perennial	path rush

<i>Juniperus virginiana</i> var. <i>virginiana</i>	2-cupressaceae	JUNVIR	native	2	3	shrub	perennial	eastern red cedar
<i>Leersia virginica</i>	Poaceae	LEEVIR	native	4	-3	grass	perennial	white grass
<i>Lindera benzoin</i>	Lauraceae	LINBEN	native	5	-3	shrub	perennial	hairy spicebush
<i>Lobelia inflata</i>	Lobeliaceae	LOBINF	native	3	3	forb	annual	indian tobacco
<i>Lonicera japonica</i>	Caprifoliaceae	LONJAP	non-native	0	3	vine	perennial	japanese honeysuckle
<i>Lonicera maackii</i>	Caprifoliaceae	LONMAA	non-native	0	5	shrub	perennial	amur honeysuckle
<i>Luzula bulbosa</i>	Juncaceae	LUZBUL	native	6	3	rush	perennial	bulbous wood rush
<i>Lysimachia lanceolata</i>	Primulaceae	LYSLAN	native	7	0	forb	perennial	lance-leaved loosestrife
<i>Mertensia virginica</i>	Boraginaceae	MERVIR	native	6	-3	forb	perennial	virginia bluebells
<i>Muhlenbergia schreberi</i>	Poaceae	MUHSCH	native	0	0	grass	perennial	nimblewill
<i>Nabalus altissimus</i>	Asteraceae	NABALT	native	5	3	forb	perennial	tall white lettuce
<i>Onoclea sensibilis</i>	1-onocleaceae	ONosen	native	4	-3	fern	perennial	sensitive fern
<i>Ophioglossum vulgatum</i>	1-ophioglossaceae	OPHVUL	native	4	-3	fern	perennial	southern adders tongue fern
<i>Packera aurea</i>	Asteraceae	PACAUR	native	4	-3	forb	perennial	golden ragwort

<i>Parthenocissus quinquefolia</i>	Vitaceae	PARQUI	native	2	3	vine	perennial	virginia creeper
<i>Persicaria virginiana (=tovara virginiana)</i>	Polygonaceae	PERVIR	native	3	0	forb	perennial	jumpseed
<i>Phryma leptostachya</i>	Verbenaceae	PHRLEP	native	4	5	forb	perennial	lopseed
<i>Poa compressa</i>	Poaceae	POACOM	non-native	0	3	grass	perennial	canadian blue grass
<i>Podophyllum peltatum</i>	Berberidaceae	PODPEL	native	3	3	forb	perennial	may apple
<i>Polygonatum biflorum</i>	Asparagaceae	POLBIF	native	4	3	forb	perennial	small solomons seal
<i>Polystichum acrostichoides</i>	1-dryopteridaceae	POLACR	native	5	5	fern	perennial	christmas fern
<i>Populus grandidentata</i>	Salicaceae	POPGRA	native	4	3	tree	perennial	big-tooth aspen
<i>Potentilla simplex</i>	Rosaceae	POTSIM	native	2	3	forb	perennial	common cinquefoil
<i>Prunus serotina var. serotina</i>	Rosaceae	PRUSER	native	1	3	tree	perennial	wild black cherry
<i>Pyrus calleryana</i>	Rosaceae	PYRCAL	non-native	0	5	tree	perennial	bradford pear
<i>Quercus alba</i>	Fagaceae	QUEALB	native	5	3	tree	perennial	white oak
<i>Quercus imbricaria</i>	Fagaceae	QUEIMB	native	3	3	tree	perennial	jack oak

<i>Quercus muehlenbergii</i>	Fagaceae	QUEMUE	native	4	3	tree	perennial	chinkapin oak
<i>Quercus rubra</i>	Fagaceae	QUERUB	native	4	3	tree	perennial	northern red oak
<i>Quercus velutina</i>	Fagaceae	QUEVEL	native	4	5	tree	perennial	black oak
<i>Ranunculus abortivus</i>	Ranunculaceae	RANABO	native	0	-3	forb	perennial	little-leaf buttercup
<i>Ranunculus hispidus</i> var. <i>hispidus</i>	Ranunculaceae	RANHIS	native	7	0	forb	perennial	rough buttercup
<i>Ribes cynosbati</i>	Grossulariaceae	RIBCYN	native	4	0	shrub	perennial	prickly wild gooseberry
<i>Rosa multiflora</i>	Rosaceae	ROSMUL	non-native	0	3	shrub	perennial	japanese rose
<i>Sanicula canadensis</i> (including 1 variety)	Apiaceae	SANCAN	native	2	3	forb	perennial	canadian black snakeroot
<i>Sanicula odorata</i>	Apiaceae	SANODO	native	2	0	forb	perennial	clustered black snakeroot
<i>Sassafras albidum</i>	Lauraceae	SASALB	native	1	3	forb	perennial	sassafras
<i>Schedonorus</i> <i>arundinaceus</i> (= <i>festuca</i> <i>elatior</i>)	Poaceae	SCHARU	non-native	0	3	grass	perennial	tall fescue
<i>Sisyrinchium</i> <i>angustifolium</i>	Iridaceae	SISANG	native	3	0	forb	perennial	stout blue-eyed grass

<i>Smilax glauca</i>	Smilacaceae	SMIGLA	native	4	3	vine	perennial	sawbrier
<i>Smilax rotundifolia</i>	Smilacaceae	SMIROT	native	4	0	vine	perennial	catbrier
<i>Smilax tamnoides</i> (= <i>smilax hispida</i>)	Smilacaceae	SMITAM	native	3	0	vine	perennial	bristly greenbrier
<i>Stellaria pubera</i>	Caryophyllaceae	STEPUB	native	7	5	forb	perennial	great chickweed
<i>Symphotrichum</i> <i>lateriflorum</i>	Asteraceae	SYMLAT	native	3	-3	forb	perennial	side-flowering aster
<i>Symphotrichum</i> <i>urophyllum</i>	Asteraceae	SYMURO	native	4	5	forb	perennial	arrow-leaved aster
<i>Ulmus americana</i>	Ulmaceae	ULMAME	native	3	-3	tree	perennial	american elm
<i>Ulmus rubra</i>	Ulmaceae	ULMRUB	native	3	0	tree	perennial	slippery elm
<i>Viola pubescens</i> (including 1 variety)	Violaceae	VIOPUB	native	5	3	forb	perennial	downy yellow violet
<i>Viola sagittata</i> (including 1 variety)	Violaceae	VIOSAG	native	6	0	forb	perennial	arrow-leaved violet
<i>Viola sororia</i>	Violaceae	VIOSOR	native	1	0	forb	perennial	woolly blue violet
<i>Vitis cinerea</i> (including 1 variety)	Vitaceae	VITCIN	native	4	-3	vine	perennial	winter grape

2. Big Sinkhole

Big Sinkhole (Rim)

Mean C = 4.5

Species:

<u>Scientific Name</u>	<u>Family</u>	<u>Acronym</u>	<u>Native?</u>	<u>C</u>	<u>W</u>	<u>Physiognomy</u>	<u>Duration</u>	<u>Common Name</u>
<i>Acer saccharum</i>	Sapindaceae	ACESAR	native	4	3	tree	perennial	sugar maple
<i>Actaea racemosa</i>	Ranunculaceae	ACTRAC	native	9	5	forb	perennial	false bugbane
<i>Ageratina altissima</i> var. <i>altissima</i>	Asteraceae	AGEALT	native	2	3	forb	perennial	white snakeroot
<i>Agrimonia parviflora</i>	Rosaceae	AGRPAR	native	4	-3	forb	perennial	swamp agrimony
<i>Agrimonia pubescens</i>	Rosaceae	AGRPUB	native	5	5	forb	perennial	soft agrimony
<i>Andropogon virginicus</i> var. <i>virginicus</i>	Poaceae	ANDVIR	native	1	3	grass	perennial	broom sedge
<i>Aplectrum hyemale</i>	Orchidaceae	APLHYE	native	7	0	forb	perennial	adam-and-eve
<i>Arisaema triphyllum</i>	Araceae	ARITRI	native	4	-3	forb	perennial	indian turnip
<i>Asimina triloba</i>	Annonaceae	ASITRI	native	6	0	tree	perennial	papaw

<i>Brachyelytrum erectum</i>	Poaceae	BRAERE	native	6	3	grass	perennial	long-awned wood grass
<i>Cardamine angustata</i>	Brassicaceae	CARANG	native	5	0	forb	perennial	slender toothwort
<i>Cardamine concatenata</i>	Brassicaceae	CARCON	native	4	3	forb	perennial	toothwort
<i>Carex albicans</i> var. <i>albicans</i>	Cyperaceae	CXALBA	native	6	5	sedge	perennial	blunt-scaled oak sedge
<i>Carex albursina</i>	Cyperaceae	CXALBU	native	7	5	sedge	perennial	blunt-scaled wood sedge
<i>Carex blanda</i>	Cyperaceae	CXBLAN	native	1	0	sedge	perennial	common wood sedge
<i>Carex communis</i> var. <i>communis</i>	Cyperaceae	CXCOMM	native	8	5	sedge	perennial	common beech sedge
<i>Carex laxiculmis</i> var. <i>laxiculmis</i>	Cyperaceae	CXLAXL	native	7	3	sedge	perennial	weak-stemmed wood sedge
<i>Carex rosea</i>	Cyperaceae	CXROSE	native	5	3	sedge	perennial	curly-styled bracted sedge
<i>Carpinus caroliniana</i> subsp. <i>virginiana</i>	Betulaceae	CARCAR	native	5	0	tree	perennial	blue beech
<i>Carya ovata</i>	Juglandaceae	CAROVA	native	4	3	tree	perennial	shagbark hickory
<i>Carya tomentosa</i>	Juglandaceae	CARTOM	native	6	5	tree	perennial	mockernut hickory

<i>Circaea canadensis</i>	Onagraceae	CIRCAN	native	2	3	forb	perennial	enchanters nightshade
<i>Diarrhena obovata</i>	Poaceae	DIAOBO	native	5	0	grass	perennial	obovate beak grass
<i>Dichanthelium boscii</i>	Poaceae	DICBOS	native	4	5	grass	perennial	bearded witch grass
<i>Dioscorea villosa</i>	Dioscoreaceae	DIOVIL	native	4	0	vine	perennial	wild yam
<i>Fagus grandifolia</i>	Fagaceae	FAGGRA	native	8	3	tree	perennial	american beech
<i>Fraxinus smallii</i>	Oleaceae	FRASMA	native	4	3	tree	perennial	blue ash
<i>Galium circaezans</i>	Rubiaceae	GALCIR	native	6	3	forb	perennial	wild licorice
<i>Galium concinnum</i>	Rubiaceae	GALCON	native	5	3	forb	perennial	shining bedstraw
<i>Galium triflorum</i>	Rubiaceae	GALTRI	native	5	3	forb	perennial	fragrant bedstraw
<i>Lindera benzoin</i>	Lauraceae	LINBEN	native	5	-3	shrub	perennial	hairy spicebush
<i>Liriodendron tulipifera</i>	Magnoliaceae	LIRTUL	native	4	3	tree	perennial	tulip poplar
<i>Maianthemum racemosum</i> subsp. <i>racemosum</i>	Asparagaceae	MAIRAC	native	4	3	forb	perennial	feathery false solomon seal
<i>Mertensia virginica</i>	Boraginaceae	MERVIR	native	6	-3	forb	perennial	virginia bluebells
<i>Nabalus altissimus</i>	Asteraceae	NABALT	native	5	3	forb	perennial	tall white lettuce

<i>Nyssa sylvatica</i>	Nyssaceae	NYSSYL	native	5	0	tree	perennial	black gum
<i>Ophioglossum vulgatum</i>	1-ophioglossaceae	OPHVUL	native	4	-3	fern	perennial	southern adders tongue fern
<i>Oxalis violacea</i>	Oxalidaceae	OXAVIO	native	7	5	forb	perennial	violet wood-sorrel
<i>Parthenocissus quinquefolia</i>	Vitaceae	PARQUI	native	2	3	vine	perennial	virginia creeper
<i>Persicaria virginiana</i>	Polygonaceae	PERVIR	native	3	0	forb	perennial	jumpseed
<i>Podophyllum peltatum</i>	Berberidaceae	PODPEL	native	3	3	forb	perennial	may apple
<i>Polystichum acrostichoides</i>	1-dryopteridaceae	POLACR	native	5	5	fern	perennial	christmas fern
<i>Prunus serotina</i> var. <i>serotina</i>	Rosaceae	PRUSER	native	1	3	tree	perennial	wild black cherry
<i>Quercus alba</i>	Fagaceae	QUEALB	native	5	3	tree	perennial	white oak
<i>Quercus velutina</i>	Fagaceae	QUEVEL	native	4	5	tree	perennial	black oak
<i>Rosa multiflora</i>	Rosaceae	ROSMUL	non-native	0	3	shrub	perennial	japanese rose
<i>Rubus pensilvanicus</i>	Rosaceae	RUBPEN	native	5	5	shrub	perennial	pennsylvania blackberry
<i>Sanguinaria canadensis</i>	Papaveraceae	SANGCA	native	5	-3	forb	perennial	bloodroot

<i>Sanicula canadensis</i>	Apiaceae	SANCAN	native	2	3	forb	perennial	canadian black snakeroot
<i>Sanicula odorata</i>	Apiaceae	SANODO	native	2	0	forb	perennial	clustered black snakeroot
<i>Sassafras albidum</i>	Lauraceae	SASALB	native	1	3	forb	perennial	sassafras
<i>Scutellaria ovata subsp. ovata</i>	Lamiaceae	SCUOVA	native	7	3	forb	perennial	heart-leaved skullcap
<i>Smilax rotundifolia</i>	Smilacaceae	SMIROT	native	4	0	vine	perennial	catbrier
<i>Solidago caesia</i> var. <i>caesia</i>	Asteraceae	SOLCAE	native	7	3	forb	perennial	bluestem goldenrod
<i>Stellaria pubera</i>	Caryophyllaceae	STEPUB	native	7	5	forb	perennial	great chickweed
<i>Symphotrichum drummondii</i> var. <i>drummondii</i>	Asteraceae	SYMDRU	native	4	5	forb	perennial	drummonds aster
<i>Trillium recurvatum</i>	Melanthiaceae	TRIREC	native	4	3	forb	perennial	red trillium
<i>Ulmus americana</i>	Ulmaceae	ULMAME	native	3	-3	tree	perennial	american elm
<i>Viola pubescens</i>	Violaceae	VIOPUB	native	5	3	forb	perennial	downy yellow violet
<i>Viola sagittata</i>	Violaceae	VIOSAG	native	6	0	forb	perennial	arrow-leaved violet
<i>Viola sororia</i>	Violaceae	VIOSOR	native	1	0	forb	perennial	woolly blue violet

Big Sinkhole (Slope)

Mean C = 4.5

Species:

<u>Scientific Name</u>	<u>Family</u>	<u>Acronym</u>	<u>Native?</u>	<u>C</u>	<u>W</u>	<u>Physiognomy</u>	<u>Duration</u>	<u>Common Name</u>
<i>Acer saccharum</i>	Sapindaceae	ACESAR	native	4	3	tree	perennial	sugar maple
<i>Actaea pachypoda</i>	Ranunculaceae	ACTPAC	native	7	3	forb	perennial	dolls-eyes
<i>Ageratina altissima</i> var. <i>altissima</i>	Asteraceae	AGEALT	native	2	3	forb	perennial	white snakeroot
<i>Arisaema triphyllum</i>	Araceae	ARITRI	native	4	-3	forb	perennial	indian turnip
<i>Asimina triloba</i>	Annonaceae	ASITRI	native	6	0	tree	perennial	papaw
<i>Borodinia laevigata</i>	Brassicaceae	BORLAE	native	5	5	forb	biennial	smooth rock cress
<i>Botrypus virginianus</i>	1- ophioglossaceae	BOTVIR	native	4	3	fern	perennial	rattlesnake fern
<i>Brachyelytrum erectum</i>	Poaceae	BRAERE	native	6	3	grass	perennial	long-awned wood grass
<i>Cardamine angustata</i>	Brassicaceae	CARANG	native	5	0	forb	perennial	slender toothwort

<i>Cardamine concatenata</i>	Brassicaceae	CARCON	native	4	3	forb	perennial	toothwort
<i>Carex albursina</i>	Cyperaceae	CXALBU	native	7	5	sedge	perennial	blunt-scaled wood sedge
<i>Carex blanda</i>	Cyperaceae	CXBLAN	native	1	0	sedge	perennial	common wood sedge
<i>Carex laxiculmis</i> var. <i>copulata</i>	Cyperaceae	CXLAXC	native	5	3	sedge	perennial	spreading sedge
<i>Carpinus caroliniana</i> subsp. <i>virginiana</i>	Betulaceae	CARCAR	native	5	0	tree	perennial	blue beech
<i>Collinsonia canadensis</i>	Lamiaceae	COLCAN	native	8	0	forb	perennial	citronella horse balm
<i>Deparia acrostichoides</i>	1-athyriaceae	DEPACR	native	8	0	fern	perennial	silvery spleenwort
<i>Erigenia bulbosa</i>	Apiaceae	ERIBUL	native	5	3	forb	perennial	harbinger of spring
<i>Euonymus alata</i>	Celastraceae	EUOALA	non-native	0	5	shrub	perennial	winged euonymus
<i>Fraxinus smallii</i>	Oleaceae	FRASMA	native	4	3	tree	perennial	blue ash
<i>Galium aparine</i>	Rubiaceae	GALAPA	native	1	3	forb	perennial	sticky-willy
<i>Galium circaezans</i>	Rubiaceae	GALCIR	native	6	3	forb	perennial	wild licorice
<i>Galium concinnum</i>	Rubiaceae	GALCON	native	5	3	forb	perennial	shining bedstraw
<i>Galium triflorum</i>	Rubiaceae	GALTRI	native	5	3	forb	perennial	fragrant bedstraw

<i>Hydrangea arborescens</i>	Hydrangeaceae	HYDARB	native	7	3	shrub	perennial	wild hydrangea
<i>Hydrophyllum canadense</i>	Boraginaceae	HYDCAN	native	8	-3	forb	perennial	canada waterleaf
<i>Lindera benzoin</i>	Lauraceae	LINBEN	native	5	-3	shrub	perennial	hairy spicebush
<i>Liriodendron tulipifera</i>	Magnoliaceae	LIRTUL	native	4	3	tree	perennial	tulip poplar
<i>Maianthemum racemosum</i> subsp. <i>racemosum</i>	Asparagaceae	MAIRAC	native	4	3	forb	perennial	feathery false solomon seal
<i>Nabalus altissimus</i>	Asteraceae	NABALT	native	5	3	forb	perennial	tall white lettuce
<i>Nyssa sylvatica</i>	Nyssaceae	NYSSYL	native	5	0	tree	perennial	black gum
<i>Osmorhiza claytonii</i>	Apiaceae	OSMCLA	native	3	3	forb	perennial	hairy sweet cicely
<i>Oxalis violacea</i>	Oxalidaceae	OXAVIO	native	7	5	forb	perennial	violet wood-sorrel
<i>Parthenocissus quinquefolia</i>	Vitaceae	PARQUI	native	2	3	vine	perennial	virginia creeper
<i>Phegopteris hexagonoptera</i>	1- thelypteridaceae	PHEHEX	native	7	3	fern	perennial	broad beech fern
<i>Phryma leptostachya</i>	Verbenaceae	PHRLEP	native	4	5	forb	perennial	lopseed

<i>Podophyllum peltatum</i>	Berberidaceae	PODPEL	native	3	3	forb	perennial	may apple
<i>Polystichum acrostichoides</i>	1- dryopteridaceae	POLACR	native	5	5	fern	perennial	christmas fern
<i>Populus grandidentata</i>	Salicaceae	POPGRA	native	4	3	tree	perennial	big-tooth aspen
<i>Prunus serotina</i> var. <i>serotina</i>	Rosaceae	PRUSER	native	1	3	tree	perennial	wild black cherry
<i>Rosa multiflora</i>	Rosaceae	ROSMUL	non-native	0	3	shrub	perennial	japanese rose
<i>Sanguinaria canadensis</i>	Papaveraceae	SANGCA	native	5	-3	forb	perennial	bloodroot
<i>Sanicula canadensis</i>	Apiaceae	SANCAN	native	2	3	forb	perennial	canadian black snakeroot
<i>Sanicula odorata</i>	Apiaceae	SANODO	native	2	0	forb	perennial	clustered black snakeroot
<i>Smilax rotundifolia</i>	Smilacaceae	SMIROT	native	4	0	vine	perennial	catbrier
<i>Smilax tamnoides</i>	Smilacaceae	SMITAM	native	3	0	vine	perennial	bristly greenbrier
<i>Solidago caesia</i> var. <i>caesia</i>	Asteraceae	SOLCAE	native	7	3	forb	perennial	bluestem goldenrod
<i>Stellaria pubera</i>	Caryophyllaceae	STEPUB	native	7	5	forb	perennial	great chickweed

<i>Symphotrichum cordifolium</i>	Asteraceae	SYMCOR	native	5	5	forb	perennial	heart-leaved aster
<i>Thalictrum dioicum</i>	Ranunculaceae	THADIO	native	7	3	forb	perennial	early meadow rue
<i>Trillium flexipes</i>	Melanthiaceae	TRIFLE	native	5	3	forb	perennial	declined trillium
<i>Trillium recurvatum</i>	Melanthiaceae	TRIREC	native	4	3	forb	perennial	red trillium
<i>Viola sororia</i>	Violaceae	VIOSOR	native	1	0	forb	perennial	woolly blue violet

Big Sinkhole (Bottom)

Mean C = 4.4

Species:

<u>Scientific Name</u>	<u>Family</u>	<u>Acronym</u>	<u>Native?</u>	<u>C</u>	<u>W</u>	<u>Physiognomy</u>	<u>Duration</u>	<u>Common Name</u>
<i>Actaea pachypoda</i>	Ranunculaceae	ACTPAC	native	7	3	forb	perennial	dolls-eyes
<i>Arisaema triphyllum</i>	Araceae	ARITRI	native	4	-3	forb	perennial	indian turnip
<i>Borodinia laevigata</i>	Brassicaceae	BORLAE	native	5	5	forb	biennial	smooth rock cress
<i>Cardamine angustata</i>	Brassicaceae	CARANG	native	5	0	forb	perennial	slender toothwort

<i>Cardamine concatenata</i>	Brassicaceae	CARCON	native	4	3	forb	perennial	toothwort
<i>Carex laxiculmis</i> var. <i>copulata</i>	Cyperaceae	CXLAXC	native	5	3	sedge	perennial	spreading sedge
<i>Cystopteris protrusa</i>	1-cystopteridaceae	CYSPRO	native	4	-3	fern	perennial	common fragile fern
<i>Deparia acrostichoides</i>	1-athyriaceae	DEPACR	native	8	0	fern	perennial	silvery spleenwort
<i>Fraxinus smallii</i>	Oleaceae	FRASMA	native	4	3	tree	perennial	blue ash
<i>Galium aparine</i>	Rubiaceae	GALAPA	native	1	3	forb	perennial	sticky-willy
<i>Homalosorus pyncocarpon</i>	1-athyriaceae	HOMPYC	native	9	3	fern	perennial	glade fern
<i>Hydrangea arborescens</i>	Hydrangeaceae	HYDARB	native	7	3	shrub	perennial	wild hydrangea
<i>Lindera benzoin</i>	Lauraceae	LINBEN	native	5	-3	shrub	perennial	hairy spicebush
<i>Liriodendron tulipifera</i>	Magnoliaceae	LIRTUL	native	4	3	tree	perennial	tulip poplar

<i>Maianthemum racemosum</i> subsp. <i>racemosum</i>	Asparagaceae	MAIRAC	native	4	3	forb	perennial	feathery false solomon seal
<i>Osmorhiza claytonii</i>	Apiaceae	OSMCLA	native	3	3	forb	perennial	hairy sweet cicely
<i>Persicaria virginiana</i>	Polygonaceae	PERVIR	native	3	0	forb	perennial	jumpseed
<i>Pilea pumila</i>	Urticaceae	PILPUM	native	2	-3	forb	annual	canada clearweed
<i>Polygonatum biflorum</i>	Asparagaceae	POLBIF	native	4	3	forb	perennial	small solomons seal
<i>Polystichum acrostichoides</i>	1-dryopteridaceae	POLACR	native	5	5	fern	perennial	christmas fern
<i>Rosa multiflora</i>	Rosaceae	ROSMUL	non-native	0	3	shrub	perennial	japanese rose
<i>Sanicula odorata</i>	Apiaceae	SANODO	native	2	0	forb	perennial	clustered black snakeroot
<i>Stellaria pubera</i>	Caryophyllaceae	STEPUB	native	7	5	forb	perennial	great chickweed
<i>Thalictrum dioicum</i>	Ranunculaceae	THADIO	native	7	3	forb	perennial	early meadow rue
<i>Trillium flexipes</i>	Melanthiaceae	TRIFLE	native	5	3	forb	perennial	declined trillium
<i>Vitis riparia</i>	Vitaceae	VITRIP	native	1	-3	vine	perennial	riverbank grape

3. Sinkhole Pond

Mean C = 4.4

Species:

<u>Scientific Name</u>	<u>Family</u>	<u>Acronym</u>	<u>Native?</u>	<u>C</u>	<u>W</u>	<u>Physiognomy</u>	<u>Duration</u>	<u>Common Name</u>
<i>Alisma subcordatum</i>	Alismataceae	ALISUB	native	2	-5	forb	perennial	common water plantain
<i>Bidens discoidea</i>	Asteraceae	BIDDIS	native	5	-3	forb	annual	swamp beggars ticks
<i>Bidens tripartita</i> (= <i>bidens comosa</i>)	Asteraceae	BIDTRP	native	2	-5	forb	annual	swamp tickseed
<i>Boehmeria cylindrica</i> (including 1 variety)	Urticaceae	BOECYL	native	3	-5	forb	perennial	false nettle
<i>Carex comosa</i>	Cyperaceae	CXCOMO	native	6	-5	sedge	perennial	bristly sedge
<i>Carex crinita</i> var. <i>crinita</i>	Cyperaceae	CXCRIN	native	8	-5	sedge	perennial	fringed sedge
<i>Carex decomposita</i>	Cyperaceae	CXDECO	native	10	-5	sedge	perennial	broad-leaved panicled sedge
<i>Carex lupulina</i>	Cyperaceae	CXLUPU	native	4	-5	sedge	perennial	common hop sedge

<i>Carex vulpinoidea</i>	Cyperaceae	CXVULP	native	2	-5	sedge	perennial	brown fox sedge
<i>Cephalanthus occidentalis</i>	Rubiaceae	CEPOCC	native	5	-5	shrub	perennial	buttonbush
<i>Chelone obliqua var. speciosa</i>	Plantaginaceae	CHEOBL	native	8	-5	forb	perennial	pink turtlehead
<i>Cicuta maculata</i> (including 1 variety)	Apiaceae	CICMAC	native	6	-5	forb	biennial	common water hemlock
<i>Conoclinium coelestinum</i> (= <i>eupatorium coelestinum</i>)	Asteraceae	CONCOE	native	2	-3	forb	perennial	mistflower
<i>Decodon verticillatus</i>	Lythraceae	DECVER	native	8	-5	shrub	perennial	swamp loosestrife
<i>Dichanthelium boscii</i>	Poaceae	DICBOS	native	4	5	grass	perennial	bearded witch grass
<i>Galium tinctorium</i>	Rubiaceae	GALTIN	native	6	-5	forb	perennial	stiff bedstraw
<i>Geum canadense</i>	Rosaceae	GEUCAN	native	1	0	forb	perennial	white avens
<i>Glyceria striata</i>	Poaceae	GLYSTR	native	4	-5	grass	perennial	fowl manna grass
<i>Impatiens capensis</i>	Balsaminaceae	IMPCAP	native	2	-3	forb	annual	spotted touch-me-not
<i>Impatiens pallida</i>	Balsaminaceae	IMPPAL	native	4	-3	forb	annual	pale touch-me-not

<i>Leersia oryzoides</i>	Poaceae	LEEORY	native	2	-5	grass	perennial	rice cut grass
<i>Lemna minor</i>	Araceae	LEMMIN	native	3	-5	forb	perennial	small duckweed
<i>Lycopus virginicus</i>	Lamiaceae	LYCVIR	native	5	-5	forb	perennial	bugle weed
<i>Muhlenbergia schreberi</i>	Poaceae	MUHSCH	native	0	0	grass	perennial	nimblewill
<i>Osmunda regalis var. spectabilis</i>	1-osmundaceae	OSMREG	native	8	-5	fern	perennial	regal fern
<i>Persicaria arifolia</i>	Polygonaceae	PERARI	native	10	-5	forb	annual	halbred-leaved tear-thumb
<i>Persicaria hydropiperoides</i>	Polygonaceae	PERHYD	native	4	-5	forb	perennial	mild water pepper
<i>Persicaria maculosa</i>	Polygonaceae	PERMAC	non-native	0	-3	forb	annual	ladys thumb
<i>Persicaria punctata</i>	Polygonaceae	PERPUN	native	3	-5	forb	annual	smartweed
<i>Podophyllum peltatum</i>	Berberidaceae	PODPEL	native	3	3	forb	perennial	may apple
<i>Scutellaria lateriflora</i>	Lamiaceae	SCULAT	native	4	-5	forb	perennial	mad-dog skullcap
<i>Smilax rotundifolia</i>	Smilacaceae	SMIROT	native	4	0	vine	perennial	catbrier

<i>Solidago ulmifolia</i> <i>var. ulmifolia</i>	Asteraceae	SOLULM	native	5	5	forb	perennial	elm-leaved goldenrod
<i>Symphotrichum lanceolatum</i> (including varieties)	Asteraceae	SYMLAN	native	3	0	forb	perennial	panicled aster
<i>Symphotrichum lateriflorum</i>	Asteraceae	SYMLAT	native	3	-3	forb	perennial	side-flowering aster
<i>Triadenum walteri</i>	Hypericaceae	TRIWAL	native	8	-5	forb	perennial	marsh st. johns wort

Appendix B: Vegetative Plot Assessments

1. Fallow Field

Mean C = 1.6

Quadrat/Subplot Level Metrics:

<u>Quadrat/Subplot</u>	<u>Total</u> <u>Species</u> <u>Richness</u>	<u>Native</u> <u>Species</u> <u>Richness</u>	<u>Total</u> <u>Mean C</u>	<u>Native</u> <u>Mean C</u>	<u>Total</u> <u>Mean</u> <u>Wetness</u>	<u>Native</u> <u>Mean</u> <u>Wetness</u>	<u>Latitude</u>	<u>Longitude</u>
Q1	17	11	1.6	2.5	2.2	1.6	39.1284	-86.6487
Q2	10	4	1.2	3	1.9	0.5	39.12214	-86.6266
Q3	13	9	1.5	2.2	1.3	0.9	39.12856	-86.6484
Average	13.3	8	1.4	2.6	1.8	1	n/a	n/a
Standard Deviation	2.9	2.9	0.2	0.3	0.4	0.5	n/a	n/a

Quadrat/Subplot Q1 Species:

<u>Scientific Name</u>	<u>Family</u>	<u>Acronym</u>	<u>%</u> <u>Cover</u>	<u>%</u> <u>Range</u> <u>(Midpt)</u>	<u>Native?</u>	<u>C</u>	<u>W</u>	<u>Physiognomy</u>	<u>Duration</u>	<u>Common</u> <u>Name</u>
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<i>Andropogon virginicus</i> var. <i>virginicus</i>	Poaceae	ANDVIR	10	% Cover (0 - 100)	native	1	3	grass	perennial	broom sedge
<i>Dactylis glomerata</i>	Poaceae	DACGLO	5	% Cover (0 - 100)	non-native	0	3	grass	perennial	orchard grass
<i>Daucus carota</i>	Apiaceae	DAUCAR	6	% Cover (0 - 100)	non-native	0	5	forb	biennial	queen annes lace
<i>Desmodium glabellum</i>	Fabaceae	DESGLA	1	% Cover (0 - 100)	native	3	5	forb	perennial	smooth tick trefoil
<i>Dianthus armeria</i> subsp. <i>armeria</i>	Caryophyllaceae	DIAARM	4	% Cover (0 - 100)	non-native	0	5	forb	annual	deptford pink
<i>Dichanthelium acuminatum</i> subsp. <i>fasciculatum</i>	Poaceae	DICACF	4	% Cover (0 - 100)	native	2	0	grass	perennial	western witch grass
<i>Euthamia graminifolia</i>	Asteraceae	EUTGRA	3	% Cover (0 - 100)	native	3	-3	forb	perennial	grass-leaved goldenrod
<i>Hypericum punctatum</i>	Hypericaceae	HYPPUN	0	% Cover (0 - 100)	native	3	0	forb	perennial	spotted st. johns wort

<i>Lysimachia ciliata</i>	Primulaceae	LYSCIL	3	% Cover (0 - 100)	native	4	-3	forb	perennial	fringed loosestrife
<i>Physalis heterophylla</i>	Solanaceae	PHYHET	2	% Cover (0 - 100)	native	3	5	forb	perennial	clammy ground cherry
<i>Poa pratensis</i>	Poaceae	POAPRA	13	% Cover (0 - 100)	non- native	0	0	grass	perennial	kentucky blue grass
<i>Potentilla simplex</i>	Rosaceae	POTSIM	10	% Cover (0 - 100)	native	2	3	forb	perennial	common cinquefoil
<i>Rubus allegheniensis</i>	Rosaceae	RUBALL	20	% Cover (0 - 100)	native	2	3	shrub	perennial	common blackberry
<i>Rumex acetosella</i>	Polygonaceae	RUMACE	1	% Cover (0 - 100)	non- native	0	3	forb	perennial	field sorrel
<i>Schedonorus arundinaceus</i>	Poaceae	SCHARU	3	% Cover (0 - 100)	non- native	0	3	grass	perennial	tall fescue
<i>Solidago nemoralis</i>	Asteraceae	SOLNEM	9	% Cover (0 - 100)	native	3	5	forb	perennial	old-field goldenrod
<i>Viola sororia</i>	Violaceae	VIOSOR	0	% Cover (0 - 100)	native	1	0	forb	perennial	woolly blue violet

Quadrat/Subplot Q2 Species:

<u>Scientific Name</u>	<u>Family</u>	<u>Acronym</u>	<u>% Cover</u>	<u>% Range (Midpt)</u>	<u>Native?</u>	<u>C</u>	<u>W</u>	<u>Physiognomy</u>	<u>Duration</u>	<u>Common Name</u>
<i>Agrimonia parviflora</i>	Rosaceae	AGRPAR	8	% Cover (0 - 100)	native	4	-3	forb	perennial	swamp agrimony
<i>Dactylis glomerata</i>	Poaceae	DACGLO	14	% Cover (0 - 100)	non- native	0	3	grass	perennial	orchard grass
<i>Daucus carota</i>	Apiaceae	DAUCAR	0	% Cover (0 - 100)	non- native	0	5	forb	biennial	queen annes lace
<i>Desmodium glabellum</i>	Fabaceae	DESGLA	8	% Cover (0 - 100)	native	3	5	forb	perennial	smooth tick trefoil
<i>Euthamia graminifolia</i>	Asteraceae	EUTGRA	5	% Cover (0 - 100)	native	3	-3	forb	perennial	grass-leaved goldenrod
<i>Lonicera japonica</i>	Caprifoliaceae	LONJAP	22	% Cover (0 - 100)	non- native	0	3	vine	perennial	japanese honeysuckle

<i>Poa pratensis</i>	Poaceae	POAPRA	25	% Cover (0 - 100)	non- native	0	0	grass	perennial	kentucky blue grass
<i>Potentilla simplex</i>	Rosaceae	POTSIM	20	% Cover (0 - 100)	native	2	3	forb	perennial	common cinquefoil
<i>Schedonorus arundinaceus</i>	Poaceae	SCHARU	3	% Cover (0 - 100)	non- native	0	3	grass	perennial	tall fescue
<i>Taraxacum officinale</i>	Asteraceae	TAROFF	4	% Cover (0 - 100)	non- native	0	3	forb	perennial	common dandelion

Quadrat/Subplot Q3 Species:

Scientific Name	Family	Acronym	% Cover	% Range (Midpt)	Native?	C	W	Physiognomy	Duration	Common Name
<i>Ageratina altissima</i> var. <i>altissima</i>	Asteraceae	AGEALT	10	% Cover (0 - 100)	native	2	3	forb	perennial	white snakeroot
<i>Dactylis glomerata</i>	Poaceae	DACGLO	10	% Cover (0 - 100)	non- native	0	3	grass	perennial	orchard grass

<i>Desmodium glabellum</i>	Fabaceae	DESGLA	20	% Cover (0 - 100)	native	3	5	forb	perennial	smooth tick trefoil
<i>Galium triflorum</i>	Rubiaceae	GALTRI	3	% Cover (0 - 100)	native	5	3	forb	perennial	fragrant bedstraw
<i>Geum vernum</i>	Rosaceae	GEUVER	10	% Cover (0 - 100)	native	1	3	forb	perennial	spring avens
<i>Juncus tenuis</i>	Juncaceae	JUNTEN	2	% Cover (0 - 100)	native	0	0	rush	perennial	path rush
<i>Packera aurea</i>	Asteraceae	PACAUR	5	% Cover (0 - 100)	native	4	-3	forb	perennial	golden ragwort
<i>Packera glabella</i>	Asteraceae	PACGLA	4	% Cover (0 - 100)	native	0	-3	forb	biennial	butterweed
<i>Poa pratensis</i>	Poaceae	POAPRA	5	% Cover (0 - 100)	non- native	0	0	grass	perennial	kentucky blue grass
<i>Rubus allegheniensis</i>	Rosaceae	RUBALL	8	% Cover (0 - 100)	native	2	3	shrub	perennial	common blackberry
<i>Schedonorus arundinaceus</i>	Poaceae	SCHARU	5	% Cover (0 - 100)	non- native	0	3	grass	perennial	tall fescue

<i>Trifolium repens</i>	Fabaceae	TRIREP	15	% Cover (0 - 100)	non- native	0	3	forb	perennial	white clover
<i>Verbesina alternifolia</i>	Asteraceae	VERALT	20	% Cover (0 - 100)	native	3	-3	forb	perennial	Wingstem

2. Bottomland

Mean C = 3.4

Quadrat/Subplot Level Metrics:

Quadrat/Subplot	Total Species Richness	Native Species Richness	Total Mean C	Native Mean C	Total Mean Wetness	Native Mean Wetness	Latitude	Longitude
Q1	15	14	3.3	3.5	1.3	1.1	39.12856	-86.6484
Q2	13	13	4	4	1.1	1.1	39.12924	-86.6482
Q3	10	10	3	3	0.8	0.8	39.12905	-86.6479
Average	12.7	12.3	3.4	3.5	1.1	1	n/a	n/a
Standard Deviation	2.1	1.7	0.4	0.4	0.2	0.1	n/a	n/a

Quadrat/Subplot Q1 Species:

<u>Scientific Name</u>	<u>Family</u>	<u>Acronym</u>	<u>% Cover</u>	<u>% Range (Midpt)</u>	<u>Native?</u>	<u>C</u>	<u>W</u>	<u>Physiognomy</u>	<u>Duration</u>	<u>Common Name</u>
<i>Arisaema triphillum</i>	Araceae	ARITRI	4	% Cover (0 - 100)	native	4	-3	forb	perennial	indian turnip
<i>Cardamine concatenata</i>	Brassicaceae	CARCON	6	% Cover (0 - 100)	native	4	3	forb	perennial	toothwort
<i>Carex blanda</i>	Cyperaceae	CXBLAN	4	% Cover (0 - 100)	native	1	0	sedge	perennial	common wood sedge
<i>Claytonia virginica</i>	Montiaceae	CLAVIR	4	% Cover (0 - 100)	native	2	3	forb	perennial	spring beauty
<i>Delphinium tricornae</i>	Ranunculaceae	DELTRI	3	% Cover (0 - 100)	native	5	0	forb	perennial	dwarf larkspur
<i>Festuca subverticillata</i>	Poaceae	FESSUB	6	% Cover (0 - 100)	native	4	3	grass	perennial	nodding fescue
<i>Hydrophyllum macrophyllum</i>	Boraginaceae	HYDMAC	21	% Cover (0 - 100)	native	7	3	forb	perennial	large-leaf waterleaf

<i>Packera aurea</i>	Asteraceae	PACAUR	12	% Cover (0 - 100)	native	4	-3	forb	perennial	golden ragwort
<i>Parthenocissus quinquefolia</i>	Vitaceae	PARQUI	3	% Cover (0 - 100)	native	2	3	vine	perennial	virginia creeper
<i>Sanicula odorata</i>	Apiaceae	SANODO	12	% Cover (0 - 100)	native	2	0	forb	perennial	clustered black snakeroot
<i>Solidago nemoralis</i>	Asteraceae	SOLNEM	1	% Cover (0 - 100)	native	3	5	forb	perennial	old-field goldenrod
<i>Stellaria media</i>	Caryophyllaceae	STEMED	0	% Cover (0 - 100)	non- native	0	3	forb	annual	common chickweed
<i>Stellaria pubera</i>	Caryophyllaceae	STEPUB	2	% Cover (0 - 100)	native	7	5	forb	perennial	great chickweed
<i>Symphotrichum lateriflorum</i>	Asteraceae	SYMLAT	6	% Cover (0 - 100)	native	3	-3	forb	perennial	side- flowering aster
<i>Viola sororia</i>	Violaceae	VIOSOR	0	% Cover (0 - 100)	native	1	0	forb	perennial	woolly blue violet

Quadrat/Subplot Q2 Species:

Scientific Name	Family	Acronym	% Cover	% Range (Midpt)	Native?	C	W	Physiognomy	Duration	Common Name
<i>Ageratina altissima</i> var. <i>altissima</i>	Asteraceae	AGEALT	2	% Cover (0 - 100)	native	2	3	forb	perennial	white snakeroot
<i>Amphicarpaea bracteata</i>	Fabaceae	AMPBRA	4	% Cover (0 - 100)	native	5	0	vine	annual	hog-peanut
<i>Carex amphibola</i>	Cyperaceae	CXAMPH	3	% Cover (0 - 100)	native	8	0	sedge	perennial	false gray sedge
<i>Claytonia virginica</i>	Montiaceae	CLAVIR	3	% Cover (0 - 100)	native	2	3	forb	perennial	spring beauty
<i>Diarrhena americana</i>	Poaceae	DIAAME	11	% Cover (0 - 100)	native	5	-3	grass	perennial	american beak grass
<i>Galium circaezans</i>	Rubiaceae	GALCIR	2	% Cover (0 - 100)	native	6	3	forb	perennial	wild licorice

<i>Galium triflorum</i>	Rubiaceae	GALTRI	4	% Cover (0 - 100)	native	5	3	forb	perennial	fragrant bedstraw
<i>Nabalus altissimus</i>	Asteraceae	NABALT	10	% Cover (0 - 100)	native	5	3	forb	perennial	tall white lettuce
<i>Ranunculus abortivus</i>	Ranunculaceae	RANABO	2	% Cover (0 - 100)	native	0	-3	forb	perennial	little-leaf buttercup
<i>Sanicula odorata</i>	Apiaceae	SANODO	5	% Cover (0 - 100)	native	2	0	forb	perennial	clustered black snakeroot
<i>Smilax rotundifolia</i>	Smilacaceae	SMIROT	2	% Cover (0 - 100)	native	4	0	vine	perennial	catbrier
<i>Stellaria pubera</i>	Caryophyllaceae	STEPUB	3	% Cover (0 - 100)	native	7	5	forb	perennial	great chickweed
<i>Viola sororia</i>	Violaceae	VIOSOR	0	% Cover (0 - 100)	native	1	0	forb	perennial	woolly blue violet

Quadrat/Subplot Q3 Species:

Scientific Name	Family	Acronym	% Cover	% Range (Midpt)	Native?	C	W	Physiognomy	Duration	Common Name
<i>Cardamine concatenata</i>	Brassicaceae	CARCON	2	% Cover (0 - 100)	native	4	3	forb	perennial	toothwort
<i>Carex grisea</i>	Cyperaceae	CXGRIS	12	% Cover (0 - 100)	native	3	0	sedge	perennial	common gray sedge
<i>Claytonia virginica</i>	Montiaceae	CLAVIR	3	% Cover (0 - 100)	native	2	3	forb	perennial	spring beauty
<i>Festuca subverticillata</i>	Poaceae	FESSUB	12	% Cover (0 - 100)	native	4	3	grass	perennial	nodding fescue
<i>Geum vernum</i>	Rosaceae	GEUVER	14	% Cover (0 - 100)	native	1	3	forb	perennial	spring avens
<i>Impatiens capensis</i>	Balsaminaceae	IMPCAP	0	% Cover (0 - 100)	native	2	-3	forb	annual	spotted touch-me- not

<i>Packera glabella</i>	Asteraceae	PACGLA	0	% Cover (0 - 100)	native	0	-3	forb	biennial	butterweed
<i>Ranunculus recurvatus</i> var. <i>recurvatus</i>	Ranunculaceae	RANREC	1	% Cover (0 - 100)	native	5	-3	forb	perennial	hooked buttercup
<i>Sanicula odorata</i>	Apiaceae	SANODO	70	% Cover (0 - 100)	native	2	0	forb	perennial	clustered black snakeroot
<i>Stellaria pubera</i>	Caryophyllaceae	STEPUB	2	% Cover (0 - 100)	native	7	5	forb	perennial	great chickweed