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Vascular Flora of Manito Prairie Nature Preserve, Tazewell County, Illinois

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ABSTRACT

The vascular flora of Manito Prairie Nature Preserve was studied during the growing seasons of 2001 and 2002. Located on a gravel terrace of the Illinois River valley 11 km southwest of Pekin, Illinois, much of the preserve has been disturbed by past plowing and grazing, although small gravel prairie remnants exist. On the gravel prairie remnants *Schizachyrium scoparium* (Michx.) Nash was the leading dominant with an Importance Value of 61.8. Other common prairie species include *Dichanthelium oligosanthes* (Schult.) Gould, *Dalea purpurea* Vent., and *Echinacea pallida* Nutt. A total of 223 vascular plant species were encountered in the preserve, two fern and fern-allies, 40 monocots, and 181 dicots. Non-native species were common with 56 taxa, representing about 25% of the flora. The Floristic Quality Index for the preserve is 40.51.

INTRODUCTION

At the time of European settlement prairie vegetation covered about 60% of Illinois (Iverson et al. 1991). Most was "black soil" tall-grass prairie of the Grand Prairie and much of the Southern Till Plain Natural Divisions (Schwegman 1973). Other prairie community types were also found in Illinois, including sand prairies, gravel prairies, loess hill prairies, and glacial drift prairies. Of these, gravel prairies are extremely uncommon (Fell and Fell 1956).

Gravel prairies are rare in the midwestern United States, many having been destroyed by mining and farming operations. Some occur on kames or eskers mostly in the Northeastern Morainal Division of Illinois, but most occur in the northern half of Illinois on glacial outwash plains that resulted from erosional events during Wisconsin glaciation (Willman and Frye 1970, Willman 1973, King 1981). Here they are associated with valley train deposits along major river systems. Fell and Fell (1956) listed plant species and associations of a few gravel prairies along the Rock River in Winnebago County, while McFall (1984) listed plants found on Manito gravel prairie in Tazewell County. More recently the flora of a reconstructed gravel prairie in the Wabash River valley, Lawrence County, Illinois was studied (Edgin et al. 2003). Also, three gravel prairies were studied along Wea Creek, a tributary of the Wabash River in north-central Indiana (Post et al. 1985).

As little is known about the flora of gravel prairies in Illinois, a study of one of the few remaining examples of this community type was undertaken. Because Manito Prairie Nature Preserve (MPNP) still contains small, intact remnants of gravel prairie, and there is an earlier study giving the floristic composition of the preserve (McFall 1984), it was decided to examine the vegetation of this site. This study was undertaken to determine vascular plant species composition, vegetation structure, and floristic quality of the major plant communities at the MPNP.

STUDY SITE

MPNP is located in southern Tazewell County, about 11 km southwest of Pekin, Illinois on a terrace above the Illinois River floodplain (SW1/4 S15 T24N R6W). This site lies at the edge of the Illinois River Section of the Illinois River and Mississippi River Sand Areas Natural Division (Schwegman 1973). The gravels and sands that form this terrace were deposited during the post-glacial period of Wisconsin glaciation about 14,500 years ago. At that time glacial deposits in northeastern Illinois were breached causing the Kankakee Torrent (Willman 1973). These flood waters carried huge amounts of sand and gravel which were deposited along the broad floodplain of the Illinois River starting below Hennepin, Illinois. Subsequent erosion created these extensive gravel bluffs.

MPNP was dedicated in 1985, is 7.94 ha in size, and is situated on a sand and gravel terrace which forms a 6-10 m bluff above the Illinois River floodplain (Hunter 1966). Evaluated by the Illinois Natural Areas Inventory in 1977, it was identified as a site of state-wide significance (White 1978). Originally called Shoop Prairie, it presently consists of about 3.2 ha of Grade B dry gravel hill prairie (McFall 1984, White and Madany 1978). Most of the prairie is along the bluff of County Road 850E, and consists of three parts separated by ravines. The remainder of the preserve consists of successional upland fields that, in some places, have a high concentrations of prairie species, and a few ravines that are mostly dominated by woody species.

Climate at MPNP is continental with warm summers and cold winters. Based on weather data from Peoria, 25 km to the northwest, the mean annual precipitation is 91.5 cm, with the month of May having the highest rainfall (10.6 cm). Mean annual temperature is 10.4^{o}C with the hottest month being July with an average of 23.9^{o}C, and the coldest January with an average of -5.3^{o}C. Frost-free days range from 150 to 204, the average being 176 (Midwestern Regional Climate Center 2002).

METHODS

MPNP was visited at various times during the growing seasons of 2001 to 2002. Voucher specimens of each plant species were collected, identified, and deposited in the Stover-Ebinger Herbarium of Eastern Illinois University, Charleston, Illinois (EIU), and the Illinois Natural History Survey, Champaign, Illinois (ILLS). Criteria for designating non-native species followed Mohlenbrock (1986) and Gleason and Cronquist (1991) while nomenclature follows Mohlenbrock 1986).

Four transects 25 m long were located randomly along cardinal compass directions in the mature gravel prairie remnants, and two transects 25 m long was located in the succes-

sional field. Along each transect, m^2 quadrats were located at 1 m intervals. Odd numbered quadrats were located on the right side of the transect line; even numbered quadrats on the left side of the transect line. Cover of each species was determined by using the Daubenmire cover class system (Daubenmire 1959) as modified by Bailey and Poulton (1968). The modified Daubenmire cover scale is as follows: class 1 = 0 to 1%; class 2 = >1 to 5%; class 3 = >5 to 25%; class 4 = >25 to 50%; class 5 = >50 to 75%; class 6 = >75 to 95%; class 7 = >95 to 100%. Importance value (IV) for ground layer species was determined by summing relative cover and relative frequency.

The Floristic Quality Index (FQI) was determined using the coefficient of conservatism (CC) assigned to each species by Taft et al. (1997). The CC for each taxon was determined by assigning an integer from 0 to 10 based on the species tolerance to disturbance and its fidelity to habitat integrity. The FQI is a weighted index of species richness (N), and is the arithmetic product of the mean CC, multiplied by the square-root of the species richness ($\sqrt{N}$) of an inventory sites: FQI = mean CC($\sqrt{N}$).

For relatively small areas the FQI gives a rapid means of comparison, and an indication of the floristic integrity of the site. When used along with other floristic measures, such as quadrat-based sampling methods, it provides a method of making comparisons among sites. Prairie sites with an FQI of 35 or higher are considered good quality (Taft et al. 1997).

RESULTS

A total of 223 plant species within 169 genera and 63 families were documented (Appendix I). Fern and fern-allies were represented by only two species. Of the remainder, 40 were monocots in 5 families and 27 genera, and 181 were dicots in 56 families and 140 genera. Non-native exotic species were common, 56 being found, representing about 25% of the flora. Though an obvious feature of the preserve, these non-native species were mostly restricted to disturbed areas in and at the edge of the preserve, and were rarely encountered in the high quality gravel prairie community. Woody species were also common with 40 being found, 18% of the flora. Though mostly native, many of the woody species were invading the gravel prairie, with a few confined to wooded ravines that traverse the preserve. The most important plant families were Poaceae with 30 species, and Asteraceae with 28 species, followed by the Rosaceae and Fabaceae.

Mature dry gravel prairie

Located on the west- and southwest-facing slopes of the preserve, this prairie was, in many places, overgrown with numerous woody species that formed dense thickets. Between the thickets and toward the crests of the steep hillside were dry prairie remnants of good quality. Some state endangered and threatened species occurred here, including *Astragalus tennesseensis* (Tennessee milk vetch) and *Besseya bullii* (kitten tails), along with *Hymenoxys acaulis* (lakeside daisy) which was planted and has persisted (Herkert and Ebinger 2002).

The bunch-grass *Schizachyrium scoparium* (little bluestem) was the dominant species with an IV of 61.8, being more than four times as abundant as the next most important species, *Dichanthelium oligosanthes* (panic grass) with an IV of 12.3 (Table 1). Other

common grasses included *Sorghastrum nutans* (Indian grass), *Sproroblus cladestinus* (dropseed), and *Bouteloua curtipendula* (sideoats grama). Common forbs included *Dalea purpurea* (purple prairie clover), *Echinacea pallida* (pale coneflower), *Ambrosia psilostachya* (western ragweed) and *Opuntia humifusa* (pricky-pear).

Forty-one taxa were found in the plots, four of which were non-native species, while two were native woody invaders (Table 1). Of the remainder, ten were grasses and sedges and the rest were prairie forbs commonly associated with dry gravel prairies (White and Madany 1978). Bare ground and litter accounted for about 25% of the cover (Table 1). Most forbs were growing between the clumps of grasses. These clumps were commonly 10-35 cm across, bare ground being common between them.

Upland old field

All uplands in the preserve had been plowed before the area was acquired. Old plow-lines and distinct changes in vegetation determined disturbance. Though not diverse floristically, prairie plants were common in much of the uplands, and were the dominant species in many areas. Nineteen taxa were encountered in the plots (Table 2). Indian grass dominated with an IV of 86.5, while other common prairie grasses included *Dichanthelium oligosanthes* (IV of 17.9), and little bluestem (IV of 4.7). Only a few native prairie forbs were present, but non-native species were common components. Woody invasion was obvious with the presence of *Malus ioensis* (Iowa crab apple) which ranked second in IV (Table 2).

DISCUSSION

The floristic integrity of the entire nature preserve, as measured by the FQI of Taft et al. (1997) was 40.71, while the mean Coefficient of Conservation (CC) was 2.71. Twenty-three species had a CC of seven or greater. If non-native species were excluded from the calculation, the FQI was 46.81 and the mean CC was 3.62. Though exotic species were common site components, most were restricted to areas of disturbance. Only four exotic species were encountered in the plots of the high quality prairie and these all had IV's of less than 1.4 (Table 1). The high species diversity along with the high FQI qualifies this site as being regionally noteworthy (Taft et al. 1997).

The small remnants of dry gravel hill prairie within the MPNP represent a rare community type in the midwest. For this reason steps should be taken to maintain and expand this community. Extensive brush removal and prescribed burning will be needed to restore this gravel prairie to its former extent and quality. This need becomes obvious when comparisons are made with the species list of McFall (1984) and the present study. Some obvious losses have already occurred, and it is likely that more will occur in the future as the size of the remnants decrease. At least six prairie species appear to have been extirpated, including *Asclepias amplexicaulis* (sand milkweed), *Froelichia gracilis* (cottonweed), *Helianthus tuberosus* (Jerusalem artichoke), *Oenothera rhombipetala* (sand primrose), *Psoralea onobrychis* (French grass), and *Tephrosia virginiana* (goat's-rue). Other species appear to have declined in abundance. Both *Besseya bullii* and *Muhlenbergia cuspidata* are restricted to one small population each. *Hymenoxys acaulis*, though originally planted in six spots, is reduced to one small population with only one

individual flowering in 2002. It is likely that more species will be extirpated in the future as remnant size decreases.

McFall (1984) recorded 212 vascular plant species from the MPNP, while during the present study 223 taxa were recorded. Much of the increase is in non-native species, though some woody taxa reported by McFall (1984) could not be relocated. Recent management activities on the preserve probably account for this decrease. Presently most of the gullies have been cleared of woody vegetation, and some of the thickets surrounding the gravel prairies have been removed. Also, the use of occasional fires on various parts of the preserve has help reduce woody invasion. Extensive thickets remain, however, and these will need to be removed.

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LITERATURE CITED

Bailey, A. W., and C. E. Poulton. 1968. Plant communities and environmental relationships in a portion of the Tillamook burn, northwestern Oregon. Ecology 49:1-13.

Daubenmire, R. 1959. A canopy coverage method of vegetation analysis. Northwest Science 33:43-64.

Edgin, B., B. Garrard, G. C. Tucker, and J. E. Ebinger. 2003. Vegetation of Allison Prairie - a gravel prairie reconstruction in Lawrence County, Illinois. Erigenia 19:52-59.

Fell, E. W. and G. B. Fell. 1956. The gravel-hill prairies of Rock River Valley in Illinois. Transactions of the Illinois State Academy of Science. 49:47-62.

Gleason, H. A., and A. Cronquist. 1991. Manual of the vascular flora of northeastern United States and adjacent Canada. Second Edition. The New York Botanical Garden, Bronx, New York. lxxv + 910 pp.

Herkert, J. R. and J. E. Ebinger, 2002. editors. Endangered and threatened species of Illinois: Status and distribution. Volume 1. Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 161 pp.

Hunter, R. E. 1966. Sand and gravel resources of Tazewell County, Illinois. State Geological Survey Circular 399. 22 pp.

Iverson, L. R., G. L. Rolfe, T. J. Jacob, A. S. Hodgins, and M. R. Jeffords. 1991. Forests of Illinois. Illinois Council on Forest development, Urbana, and Illinois Natural History Survey, Champaign, Illinois.

King, J. E. 1981. Late Quaternary vegetational history of Illinois. Ecological Monographs 51:43-62.

McFall, D. W. 1984. Vascular plants of the Manito Gravel Prairie, Tazewell County, Illinois. Transaction of the Illinois State Academy of Science 77:9-14.

Midwestern Regional Climate Center. 2002. http://mcc.sws.uiuc.edu

Mohlenbrock, R. H. 1986. Guide to the Vascular Flora of Illinois, revised and enlarged edition, Southern Illinois University Press, Carbondale, Illinois. viii + 507 pp.

Post, T. W., J. A. Bacone, and J. R. Aldrich. 1985. Gravel prairies of Indiana. Proceedings of the Indiana Academy 94:457-463.

Schwegman, J. E. 1973. Comprehensive plan for the Illinois nature preserves system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford, Illinois. 32 pp + map.

Taft, J. B., G. S. Wilhelm, D. M. Ladd, and L. A. Masters. 1997. Floristic quality assessment for vegetation in Illinois, a method for assessing vegetation integrity. Erigenia 15:3-95.

White J. 1978. Illinois Natural Areas inventory. Technical report. Volume I. Survey methods and results. Illinois Natural Areas Inventory, Urbana. Xix + 426 pp.

White, J., and M. H. Madany. 1978. Classification of natural communities in Illinois. Pp. 310-405 in Illinois natural areas inventory. Technical report. (J. White, Editor). Illinois Natural Areas Inventory, Urbana, Illinois.

Willman, H. B. 1973. Geology along the Illinois waterway - a basis for environmental planning. Illinois State Geological Survey Circular 478. Urbana. 48 pp.

Willman, H. B. and J. C. Frye. 1970. Pleistocene stratigraphy of Illinois. Illinois State Geological Survey Bulletin 94:1-204.

Table 1. Frequency (%), average cover, relative frequency, relative cover, and importance value of ground layer species in a xeric gravel prairie at Manito Prairie Nature Preserve, Tazewell County, Illinois. (* = non-native)

Species	Freq. %	Average Cover	Rel. Freq.	Rel. Cover	I. V.
Schizachyrium scoparium	100	35.43	13.2	48.6	61.8
Dichanthelium oligosanthes	52	3.91	6.9	5.4	12.3
Dalea purpurea	53	3.55	7.0	4.9	11.9
Echinacea pallida	35	4.99	4.6	6.8	11.4
Ambrosia psilostachya	40	2.60	5.3	3.6	8.9
Sorghastrum nutans	31	2.97	4.0	4.1	8.1
Opuntia humifusa	45	1.54	6.0	2.1	8.1
Lespedeza capitata	40	1.99	5.3	2.7	8.0
Heterotheca camporum	29	2.93	3.9	4.0	7.9
Sporobolus clandestinus	31	1.65	4.0	2.3	6.3
Senecio plattensis	20	1.88	2.6	2.6	5.2
Bouteloua curtipendula	28	0.95	3.7	1.3	5.0
Malus ioensis	16	2.03	2.1	2.8	4.9
Sporobolus asper	20	1.37	2.6	1.9	4.5
Euphorbia corollata	17	1.09	2.3	1.5	3.8
Asclepias verticillata	27	0.13	3.5	0.2	3.7
Bouteloua hirsuta	17	0.93	2.3	1.3	3.6
Cyperus filiculmis	24	0.15	3.2	0.2	3.4
Desmodium illinoense	15	0.56	1.9	0.8	2.7
Ruellia humilus	15	0.37	1.9	0.5	2.4
Potentilla arguta	13	0.33	1.8	0.5	2.3
Oxalis dillenii	13	0.07	1.8	0.1	1.9
Brickellia eupatorioides	9	0.21	1.1	0.3	1.4
**Poa pratensis*	9	0.15	1.1	0.2	1.3
**Achillea millefolium*	9	0.11	1.1	0.1	1.2
Oenothera biennis	8	0.11	1.1	0.1	1.2
**Mirabilis nyctaginea*	7	0.10	0.9	0.1	1.0
Crataegus mollis	3	0.08	0.4	0.1	0.5
Eupatorium altissimum	3	0.08	0.4	0.1	0.5
Gaura biennis	3	0.08	0.4	0.1	0.5
Silene stellata	3	0.05	0.4	0.1	0.5
Solidago juncea	3	0.08	0.4	0.1	0.5
Carex spp.	4	0.02	0.5	--	0.5
Cassia fasciculate	4	0.02	0.5	--	0.5
Antennaria neglecta	1	0.20	0.2	0.2	0.4
**Kummerowia stipulacea*	3	0.01	0.4	--	0.4
Phlox bifida	3	0.01	0.4	--	0.4
Aster pilosus	1	0.04	0.2	0.1	0.3
Callirhoe triangulata	1	0.04	0.2	0.1	0.3
Lactuca canadensis	1	0.04	0.2	0.1	0.3
Oxalis violacea	1	0.01	0.2	--	0.2
Totals		72.86	100.0	100.0	200.0
Average bare ground and litter		25.10			

Table 2. Frequency (%), average cover, relative frequency, relative cover, and importance value of ground layer species in an upland old field at Manito Prairie Nature Preserve, Tazewell County, Illinois. (* = non-native)

Species	Freq. %	Average Cover	Rel. Freq.	Rel. Cover	Freq. I. V.
Sorghastrum nutans	100	71.10	14.3	72.2	86.5
Malus ioensis	92	10.34	13.1	10.5	23.6
Dichanthelium oligosanthes	96	4.10	13.7	4.2	17.9
**Poa pratensis*	100	3.48	14.3	3.5	17.8
**Rumex acetosella*	76	0.48	10.8	0.5	11.3
Fragaria virginiana	56	3.12	8.0	3.2	11.2
Oxalis dillenii	44	0.32	6.3	0.3	6.6
Asclepias verticillata	32	0.46	4.6	0.5	5.1
Schizachyrium scoparium	16	2.40	2.3	2.4	4.7
**Bromus inermis*	12	1.22	1.7	1.2	2.9
Carex spp.	16	0.48	2.3	0.5	2.8
Oenothera biennis	12	0.26	1.7	0.3	2.0
Potentilla simplex	12	0.16	1.7	0.2	1.9
**Potentilla recta*	12	0.06	1.7	0.1	1.8
**Kummerowia stipulacea*	8	0.04	1.1	0.1	1.2
Potentilla arguta	4	0.12	0.6	0.1	0.7
Rubus occidentalis	4	0.12	0.6	0.1	0.7
**Verbascum thapsus*	4	0.12	0.6	0.1	0.7
Conyza canadensis	4	0.02	0.6	--	0.6
Totals		98.40	100.0	100.0	200.0
Average bare ground and litter		0.50			

APPENDIX I.

Vascular taxa encountered at Manito Prairie Nature Preserve, Tazewell County, Illinois, are listed alphabetically by family under major plant groups. Non-native (exotic) species are indicated by an asterisk (*). For each species the author's collection number (JEE) is given, and the specimens are deposited in the Stover-Ebinger Herbarium of Eastern Illinois University (EIU). Collecting number preceded by P were collected by Loy R. Phillippe, and the specimens are deposited in the Illinois Natural History Survey Herbarium (ILLS).

FERN AND FERN-ALLIES

Aspleniaceae
Asplenium platyneuron (L.) BSP. P35679

Equisetaceae
Equisetum laevigatum A.Br. 30720

MONOCOTS

Commelinaceae
**Commelina communis* L. 31168
Tradescantia ohiensis Raf. 30721

Cyperaceae
Carex aggregata Mack. P35681
Carex bebbii (Bailey) Fern. 30722
Carex blanda Dewey 30551
Carex muhlenbergii Willd. 30723
Carex pensylvanica Lam. 30552
Cyperus filiculmis Vahl 30906

Liliaceae
**Asparagus officinalis* L. 30861

Poaceae
**Agropyron repens* (L.) Beauv. 30862
Agrostis hyemalis (Walt.) BSP. P35684
Andropogon gerardii Vitman 31169
Bouteloua curtipendula (Michx.) Torr. 30907
Bouteloua hirsuta Lag. 31122
**Bromus inermis* Leyss. 30724
**Bromus tectorum* L. 30553
**Chloris verticillata* Nutt. 31170
**Dactylis glomerata* L. 30725
Dichanthelium oligosanthes (Schult.) Gould 30727
**Digitaria sanguinalis* (L.) Scop. 31171
Elymus canadensis L. 30908
Elymus virginicus L. 30909
Eragrostis spectabilis (Pursh) Steud. 31172
Eragrostis trichodes (Nutt.) Wood 31067
**Festuca pratensis* Huds. 30726
Leptoloma cognatum (Schult.) Chase 31083
Muhlenbergia cuspidata (Torr.) Rydb. 31084
Muhlenbergia frondosa (Poir.) Fern. 31173
Muhlenbergia schreberi J.F. Gmel. P36147
**Poa compressa* L. 30728
**Poa pratensis* L. 30729
Schizachyrium scoparium (Michx.) Nash 31068
**Setaria viridis* (L.) Beauv. 31069
Sorghastrum nutans (L.) Nash 31085
Sporobolus asper (Michx.) Kunth 31121
Sporobolus clandenstinus (Biehler) Hitchc. 31120
Sporobolus heterolepis (Gray) Gray 31174
Tridens flavus (L.) Hitchcock 31070
Vulpia octoflora (Walt.) Rydb. 31086

Smilacaceae
Smilax hispida Muhl. 30730

DICOTS

Acanthaceae
Ruellia humilis Nutt. 30863

Anacardiaceae
Rhus aromatica Ait. 30554
Rhus glabra L. 31087
Toxicodendron radicans (L.) Kuntze 30731

Apiaceae
Sanicula canadensis L. 30864
Spermolepis inermis (Nutt.) Math. & Constance P35685

Apocynaceae
Apocynum cannabinum L. 30865

Asclepiadaceae
Asclepias syriaca L. 30866
Asclepias tuberosa L. 30867
Asclepias verticillata L. 30868
Asclepias viridiflora Raf. P35686

Asteraceae
**Achillea millefolium* L. 30732

Ambrosia artemisiifolia L. 31071
Ambrosia psilostachya DC. 31072
Ambrosia trifida L. 31073
Antennaria neglecta Greene 30555
**Arctium minus* Bernh. 31175
Aster ericoides L. 31177
Aster pilosus Willd. 31176
Brickellia eupatorioides (L.) Shinners 31074
Cirsium discolor (Muhl.) Spreng. 31088
**Cirsium vulgare* (Savi) Tenore 30910
Conyza canadensis (L.) Cronq. 31075
Echinacea pallida Nutt. 30869
Erigeron strigosus Muhl. 30733
Eupatorium altissimum L. 31090
Eupatorium rugosum Houtt. 31089
Gnaphalium obtusifolium L. 31178
Heterotheca camporum (Greene) Shinners 30870
Hymenoxys acaulis (Pursh) Parker 30591
Lactuca canadensis L. 30911
**Lactuca serriola* L. 30912
Rudbeckia hirta L. 30871
Senecio plattensis Nutt. 30556
Solidago canadensis L. 31179
Solidago juncea Ait. 30913
**Sonchus oleraceus* L. 30914
**Taraxacum officinale* Weber 30557
**Tragopogon dubius* Scop. 30734

Boraginaceae
**Buglossoides arvense* (L.) I.M. Johnston 30558
Hackelia virginiana (L.) I.M.Johnston 30872
Lithospermum incisum Lehm. 31180
Mertensia virginica (L.) Pers. 30559
Onosmodium hispidissimum Mack. 30873

Brassicaceae
**Alliaria petiolata* (Bieb.) Cavara & Grande 30560
Arabis glabra (L.) Bernh. 30735
Arabis shortii (Fern.) Gl. 30564
**Capsella bursa-pastoris* (L.) Medic. 30561
Draba reptans (Lam.) Fern. 30562
**Lepidium campestre* (L.) R. Br. 30736
**Lepidium densiflorum* Schrad. 30563
Lepidium virginicum L. 30737

Cactaceae
Opuntia humifusa (Raf.) Raf. 30877

Caesalpiniaceae
Cassia fasciculata Michx. 30917
Gleditsia triacanthos L. 30918
Gymnocladus dioica (L.) K. Koch. 31185

Campanulaceae
Campanula americana L. 30874
Triodanis perfoliata (L.) Nieuwl. 30738

Caprifoliaceae
**Lonicera maackii* (Rupr.) Maxim. 30739
Sambucus canadensis L. 31091

Caryophyllaceae
**Arenaria serpyllifolia* L. P35683
**Cerastium glomeratum* Thuill. 30565
**Cerastium vulgatum* L. 30566
**Dianthus armeria* L. 30916
**Holosteum umbellatum* L. 30567
**Lychnis alba* Mill. 30568
Minuartia stricta (Michx.) Hiern. 30740
**Saponaria officinalis* L. 30875
Silene antirrhina L. 30569
Silene stellata (L.) Ait.f. 30876
**Stellaria media* (L.) Vill. 30570

Celastraceae
Celatrus scandens L. 31092

Chenopodiaceae
**Chenopodium album* L. 31181

Cornaceae
Cornus drummondii C.A. Mey. 30878

Elaeagnaceae
**Elaeagnus umbellata* Thunb. 31182

Euphorbiaceae
Acalypha rhomboidea Raf. 31183
Chamaesyce maculata (L.) Small 31093
Croton glandulosus L. 31184
Euphorbia corollata L. 30879
Poinsettia cyathophora (Murr.) Kl. & Garcke 31095
Poinsettia dentata (Michx.) Kl. & Garcke 31094

Fabaceae
Amorpha canescens Pursh 30880
Amorpha fruticosa L. 30741
Astragalus tennesseensis Gray 30571
Dalea purpurea Vent. 30882
Desmodium illinoense Gray 30883
Lespedeza capitata Michx. 31076
**Kummerowia stipulacea* (Maxim.) Makino 31123
**Medicago lupulina* L. 30742
**Melilotus alba* Medic. 30881
**Melilotus officinalis* (L.) Pallas 30743
**Trifolium arvense* L. P36145

Fagaceae
Quercus imbricaria Michx. 30919
Quercus macrocarpa Michx. 30920
Quercus rubra L. 31077

Geraniaceae
Geranium carolinianum L. 30744

Grossulariaceae
Ribes missouriense Nutt. 30745

Hydrophyllaceae
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Hydrophyllum virginianum L. 30746

Hypericaceae
Hypericum sphaerocarpum Michx. 30884

Juglandaceae
Carya tomentosa (Poir.) Nutt. 31186
Juglans nigra L. 31078

Lamiaceae
Agastache nepetoides (L.) Ktze. 31096
Hedeoma hispida Pursh P35677
**Lamium amplexicaule* L. 30573
**Leonurus cardiaca* L. 30747
**Nepeta cataria* L. 30885
Scutellaria parvula Michx. 30748
Teucrium canadense L. 30886
Trichostema brachiatum L. 31079

Lauraceae
Sassafras albidum (Nutt.) Nees 30921

Lythraceae
Cuphea viscosissima Jacq. 31097

Malvaceae
Callirhoe triangulata (Leavenw.) Gray 30887

Menispermaceae
Menispermum canadense L. 30749

Moraceae
**Cannabis sativa* L. 31080
**Morus alba* L. 30922
Morus rubra L. 31098

Nyctaginaceae
**Mirabilis nyctaginea* (Michx.) MacM. 30750

Oleaceae
Fraxinus americana L. 31187

Onagraceae
Gaura biennis L. 30923
Oenothera biennis L. 30888

Oxalidaceae
Oxalis dillenii Jacq. 30751
Oxalis stricta L. P35680
Oxalis violacea L. 30574

Papaveraceae
Corydalis micrantha (Engelm.) Gray 30575

Phytolaccaceae
Phytolacca americana L. 31099

Plantaginaceae
**Plantago lanceolata* L. 30924
Plantago rugelii Dcne. 31081
Plantago virginica L. 30752

Platanaceae
Platanus occidentalis L. 31188

Polemoniaceae
Phlox bifida Beck 30576

Polygalaceae
Polygala verticillata L. P36144

Polygonaceae
**Polygonum convolvulus* L. P36149
Polygonum scandens L. 31189
Polygonum tenue Michx. 31100
**Rumex acetosella* L. 30577
Rumex altissimus Wood P35687
**Rumex crispus* L. 30753

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Dodecatheon meadia L. 30579

Ranunculaceae
Anemone caroliniana Walt. 30581
Anemone cylindrica Gray 30754
Aquilegia canadensis L. 30582
Clematis pitcheri Torr. & Gray 30755
Ranunculus abortivus L. 30583

Rhamnaceae
Rhamnus lanceolata Pursh 29544

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Fragaria virginiana Duchesne 30585
Geum canadense Jacq. 30889
Malus ioensis (Wood) Britt. 30586
Potentilla arguta Pursh 30890

**Potentilla recta* L. 30891
Potentilla simplex Michx. 31124
Prunus americana Marsh. 31298
Prunus serotina Ehrh. 30756
**Rosa multiflora* Thunb. 30757
Rubus flagellaris Willd. 30587
Rubus occidentalis L. 30758

Rubiaceae
Galium aparine L. 30759
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Rutaceae
Ptelea trifoliata L. 30760
Zanthoxylum americanum Mill. 30925

Saxifragaceae
Heuchera richardsonii R. Br. 30761

Scrophulariaceae
Besseya bullii (Eat.) Rydb. 30590
Penstemon pallidus Small 30762
Scrophularia lanceolata Pursh 30893
**Verbascum thapsus* L. 30894
**Veronica arvensis* L. 30580

Solanaceae
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Physalis virginiana Mill. P35678
Solanum carolinense L. 30926

Ulmaceae
Celtis occidentalis L. 30927
**Ulmus pumila* L. 31101
Ulmus rubra Muhl. 30928

Urticaceae
Parietaria pensylvanica Muhl. 31082

Verbenaceae
Verbena stricta Vent. 30896
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**Viola rafinesquii* Greene 30588
Viola sororia Willd. 30589

Vitaceae
Parthenocissus quinquefolia (L.) Planch. 30929
Vitis riparia Michx. 30763