

## **Vegetation of Claridon Railroad Prairie, a Remnant of the Sandusky Plains of Central Ohio**

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### **ABSTRACT**

The vascular flora of Claridon Prairie, a 2.2 ha prairie remnant prairie in Marion County, Ohio was studied quantitatively during the growing season of 1999. *Panicum virgatum* had the highest importance value, followed by *Solidago canadensis*, *Silphium terebinthinaceum*, *Carex* species, *Spartina pectinata*, and *Schizachyrium scoparium*. A total of 177 species were recorded between 1997 and 2002, consisting of 1 fern ally, 56 monocots and 120 dicots. Of this total, 12 were woody species and 29 introduced exotics, 1 of which was woody. The Floristic Quality Assessment Index (FQAI) for the site is 46.10, indicating sufficient conservatism and richness to be considered significant from a statewide perspective. The flora includes 5 state-listed rare plants.

### **INTRODUCTION**

During pre-settlement times an estimated 300 prairie openings present in Ohio covered an estimated 259,000 ha, approximately 2.4% of the state (Gordon 1969, Cusick and Troutman 1978). Ohio includes scattered outliers of the “prairie peninsula,” an eastward extension of the great midwestern prairie generally regarded to be a relict of particularly warm and dry conditions that prevailed 4,000–8,000 years ago during the Hypsithermal Interval (also referred to as the Xerothermic period), and maintained by prairie fires (Denny and Cooperrider 2001). Claridon Prairie is located within the “Sandusky Plains” (an historic name applied to one of Ohio’s largest prairie/savannah “islands”) in portions of present-day Marion, Crawford and Wyandot Counties. The region is flat to gently rolling, situated on a glacial till plain traversed by three east-west running end moraines that contributed to the formation of temporary post-glacial lakes (Troutman 1981). Fine-particle lake sediments and drifted calcareous till, remaining after the lakes drained, cause the lowland soils that developed in the region to be high in clay.

Marion County is cold in winter (average temperature  $-2.7^{\circ}\text{C}$ ) and rather warm in summer (average temperature  $21.6^{\circ}\text{C}$ ). Winter precipitation, often snow, results in a sizeable accumulation of soil moisture thereby minimizing drought on most soils. The total annual precipitation is about 86.4 cm. Of this about 50.8 cm or 60%, usually falls in April through September. In 2 years out of 10, the rainfall in April through September is less than 38.1 cm. (United States Department of Agriculture 1989). Prior to drainage improvements, the Plains were susceptible to severe spring flooding. A recently completed analysis of United States Government Congressional Survey records from the year 1819 shows that the original area of prairie grassland within the Sandusky Plains covered approximately 77,700 ha (Clutter 2001), of which less than 40 ha are still extant (Troutman 1981). The present study was undertaken to determine the plant species composition of the Claridon Railroad Prairie, to establish a reference standard to be used in its future management and also to serve as a “target” for local prairie restorations.

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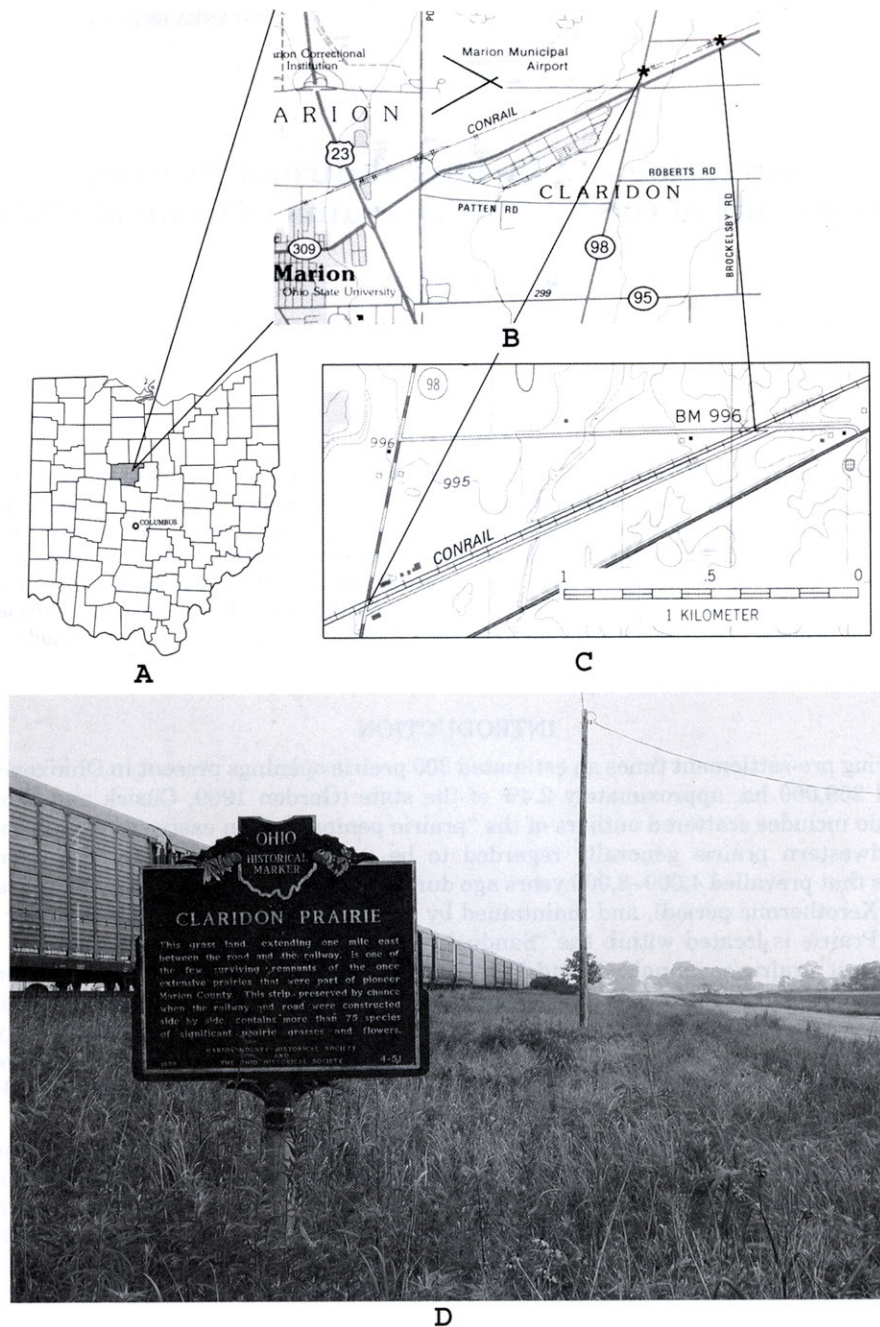


Figure 1. Location of Marion County, Ohio (A), the Claridon Prairie vicinity (B, situated between the asterisks), Claridon Prairie (C) and photo taken July 2001 of the prairie at its western end (D).

#### DESCRIPTION OF THE STUDY AREA

Claridon Prairie is a linear remnant, 1450 m long  $\times$  15 m wide (2.2 ha), situated between an active set of CSX railroad tracks and County Road 114 (Marion-Galion Road). The site is owned by the railroad corporation and has no formal protection. The predominant soil of the



Claridon prairie, comprising 70% of its area, is Elliot silty clay loam, characterized as a deep, somewhat poorly drained, moderately slowly permeable soil on ground moraines that formed on loamy glacial till. The remaining 30% of the prairie is occupied by Pewamo silty clay loam, a deep, very poorly drained, moderately slowly permeable soil on ground moraines and end moraines which formed in moderately fine textured, calcareous glacial till (United States Department of Agriculture 1989).

Since 1985 management activities have consisted of selective herbicide spraying, digging, and mowing to control invasive natives such as *Rubus* spp. and *Phalaris arundinacea* and invasive exotics such as *Dipsacus fullonum*. No prescribed burning has been conducted. The area is used to provide local ecotype seeds for several prairie restoration projects.

## MATERIALS AND METHODS

Quantitative sampling was conducted during 7 July through 3 August 1999, using 229 m<sup>2</sup> quadrats located by randomly selecting points along the 1.6 km flanking road, and from each point positioning a quadrat at a randomly chosen lateral distance ranging from 0 to 15 m into the prairie. That distance is the width of the prairie exclusive of the disturbed edges immediately alongside the road and railroad.

Percent cover was determined following Daubenmire (1959) with slight modification. This system has the following cover scale values: class 1 = 0–1%; class 2 = 1%–5%; class 3 = 5%–10%; class 4 = 10%–25%; class 5 = 25%–50%; class 6 = 50%–75%; class 7 = 75%–100%. Midpoints of these ranges were used to compute relative cover for each species, calculated as the sum of the cover values for the species divided by the grand total of cover values for all species. Relative frequency is calculated similarly, as the number of quadrats in which a species was recorded, divided by the total number of such occurrences for all species. Importance value (IV) was determined by summing relative cover and relative frequency. Vascular plant collections were made throughout the growing seasons of 1998 through 2001 and vouchers deposited in the Ohio State University Herbarium in Columbus (OS). The Floristic Quality Assessment Index was determined for the site using the coefficient of conservatism (CC) assigned to each species by Andreas et al. (2002). The CC, with values ranging from 0 to 10, is an estimate of the degree to which a species is associated with high-quality natural communities. Following Herman et al. (1997), the FQAI is a weighted index of species richness (N) and is the arithmetic product of the average coefficient of conservatism ( $\overline{CC}$ ), multiplied by the square root of the species richness ( $\sqrt{N}$ ) of an inventory site [ $FQI = \overline{CC}(\sqrt{N})$ ]. Exotic species are not assigned CC values and thus do not enter into the calculation of FQAI. Nomenclature follows Cooperrider et al. (2001).

## RESULTS AND DISCUSSION

*Panicum virgatum* was the dominant species (IV = 17.35) with the second-highest frequency and the highest total cover, followed by *Solidago canadensis* (IV = 13.75), *Silphium terebinthinaceum* (IV = 13.21), various unidentified *Carex* sedge species (IV = 12.83), *Spartina pectinata* (IV = 10.38), *Schizachyrium scoparium* (IV = 8.23), and *Fragaria virginiana* (IV = 8.04). *Andropogon gerardii*, which is often dominant in tallgrass prairies (Edgin and Ebinger 2000), was only 8th in order of importance.

A total of 177 vascular plant species were collected from the site (Appendix I). Of these, 1 is a pteridophyte, 54 are monocots in 35 genera and 8 families, while 122 are dicots in 87 genera and 38 families. The largest family represented was the Asteraceae with 34 species, followed by the Poaceae with 24 and the Cyperaceae with 14 species. Exotics are moderately common, with 20 forbs, 8 grasses and 1 shrub (29 alien species total) comprising 16.4% of the flora.

Of the 177 species observed on the site, 120 were present in the 219 quadrats used for determining cover and importance value (Table 1). Many of the “missing” species were spring-flowering ephemerals observed to be frequent and abundant earlier in the growing season such as *Sisyrinchium albidum*, *Hypoxis hirsuta*, and *Carex* species. Of the species sampled in the quadrats, 24 (20%) were introduced species, two of which were among those having an IV greater than 2: *Hemerocallis fulva* (IV = 2.68) and *Agrostis stolonifera* (IV = 2.60). *Hemerocallis*,



**Table 1. Frequency, cover and importance values for vascular plant species at Claridon Prairie, Marion County, Ohio. Asterisk denotes introduced exotics**

Species	Freq. (%)	Mean Cover (%)	Relative Freq. (%)	Relative Cover (%)	IV
<i>Carex</i> spp.	71.74	6.91	7.23	5.60	12.83
<i>Solidago canadensis</i>	56.09	9.26	5.65	8.10	13.75
<i>Panicum virgatum</i>	54.35	13.16	5.48	11.88	17.35
<i>Fragaria virginiana</i>	50.00	3.88	5.04	3.01	8.04
<i>Helianthus grosseserratus</i>	44.78	3.83	4.51	3.03	7.55
<i>Silphium terebinthinaceum</i>	39.13	10.22	3.94	9.27	13.21
<i>Aster lateriflorus</i>	30.43	4.05	3.07	3.46	6.52
<i>Cornus amomum</i>	30.00	3.51	3.02	2.94	5.96
<i>Spartina pectinata</i>	26.52	8.39	2.67	7.71	10.38
<i>Calystegia sepium</i>	26.09	1.40	2.63	0.97	3.60
<i>Schizachyrium scoparium</i>	23.48	6.45	2.37	5.87	8.23
<i>Rosa carolina</i>	21.74	1.43	2.19	1.05	3.24
<i>Equisetum arvense</i>	20.87	1.79	2.10	1.42	3.52
<i>Andropogon gerardii</i>	20.43	6.10	2.06	5.57	7.63
<i>Ratibida pinnata</i>	20.00	2.27	2.01	1.89	3.91
<i>Apocynum cannabinum</i>	19.13	1.07	1.93	0.75	2.67
<i>Calamagrostis canadensis</i>	16.52	4.89	1.66	4.47	6.13
<i>Pycnanthemum virginianum</i>	16.09	2.10	1.62	1.79	3.41
* <i>Agrostis stolonifera</i>	16.09	1.26	1.62	0.98	2.60
<i>Euphorbia corollata</i>	15.65	0.73	1.58	0.47	2.05
<i>Solidago riddellii</i>	12.17	1.50	1.23	1.26	2.49
<i>Sporobolus asper</i>	8.26	2.24	0.83	2.03	2.87
* <i>Hemerocallis fulva</i>	6.52	2.19	0.66	2.03	2.68
Others (97 species)	—	—	34.91	14.48	49.39

although abundant, was present in notably low frequency (6.52%), as it occupied mainly a dense patch at the western end of the remnant. *Agrostis* was more widespread, having a frequency of 16.09%.

The floristic integrity, as measured using the Floristic Quality Assessment Index (FQAI) applied to the complete flora was 46.10 for the site, while the average Coefficient of Conservatism ( $\overline{CC}$ ) was 3.79. In general, areas with a FQAI greater than 35 possess sufficient conservatism and richness that they are floristically important from a statewide perspective (Herman et al. 1997). Among the species having high CC values are several state-listed taxa (Ohio Department of Natural Areas and Preserves 1998). *Baptisia alba* (Potentially Threatened) is represented by post-1960 specimen records from 11 counties, and pre-1960 records from an additional 11 counties. This perennial forb occurs in wet to dry, open to semi-shaded situations such as open upland woods, rocky upland slopes, prairies, and alluvial soil along streams, as well as waste fields and along railroad tracks. *Panicum leibergii* (Threatened) is known from only one county through a post-1970 record, but there are pre-1970 records from three other counties. This grass prefers neutral to slightly alkaline sandy loam and is found on dry to wet prairies, open woods, and meadows. *Silene regia* (Potentially Threatened) is known from post-1960 collections from 6 central Ohio counties and a pre-1960 specimen from one additional county. In Ohio, the species is found in prairie remnants, cemeteries, railroad and power line rights-of-way, and roadsides. However, few new locations are likely to be found (although this study provided one) and several known locations have become degraded. *Spenopholis obtusata* (Threatened) has been collected from 3 counties since 1980, and another 10 counties before then. Its habitat is very generalized, including moist to dry soil of open woods, prairies, old fields, and fen meadows. *Eleocharis compressa* (Potentially Threatened) is known from 5 counties through pre-1960 collections, and 5 by post-1960 ones. This sedge, the most terrestrial Ohio spikerush, occurs in dry to moist calcareous openings including quarries, fens,

prairies, and seeps, often in barren or only seasonably moist situations. Known and probable hazards cited for these species include overshadowing by woody plants through succession (all 5 species), grazing (*Baptisia*, *Panicum* and *Sphenopholis*), soil compaction (*Eleocharis*), and casual picking by wildflower enthusiasts, spraying of railroad rights-of-way, and the spread of *Bromus inermis*, a non-native grass (*Silene*). The recovery potentials of these state-listed species are apparently good, since they are known from a variety of habitats, including some markedly disturbed sites (McCance and Burns 1984).

This study affirms earlier appraisals (Cusick and Troutman 1978, Troutman 1981) that Claridon Prairie, despite its small size, is one of the most diverse prairie sites in the state. The effectiveness of local prairie restoration projects may be enhanced or evaluated by assessing the degree to which certain attributes of the vegetation of this prairie are replicated. These include its species composition rich in conservative prairie taxa, high overall species richness, the occurrence of a substantial number of spring-flowering plants, and a prevalence of sedges.

This survey also indicates that Claridon Prairie would benefit from more active management. While the prairie has a relatively high FQAI, that measure doesn't take species abundances into account, nor does it consider introduced taxa. Several of the more important plants on the site, such as the natives *Panicum virgatum*, *Solidago canadensis*, and *Fragaria virginiana*, and the exotic *Hemerocallis fulva*, are fairly aggressive species. Invasion or increase of aggressive plants generally indicates disturbance or degradation of the natural ecosystem including alteration of hydrology or the absence of fire (Solecki 1997). Hopefully the findings presented here will strengthen efforts to obtain an agreement with the owner of Claridon Prairie to allow its appropriate management.

## APPENDIX I

The vascular flora observed on a natural prairie remnant in Claridon, Marion County, Ohio during 1998–2001. An asterisk precedes taxa that are introduced. Nomenclature follows Cooperrider 2001.

PTERIDOPHYTES	IRIDACEAE
<i>Equisetum arvense</i> L.	<i>Iris versicolor</i> L.
	<i>Sisyrinchium albidum</i> Raf.
	<i>Sisyrinchium angustifolium</i> Miller
MONOCOTS	
COMMELINACEAE	JUNCACEAE
<i>Tradescantia ohioensis</i> Raf.	<i>Juncus tenuis</i> Willd.
	<i>Juncus torreyi</i> Cov.
CYPERACEAE	<i>Luzula multiflora</i> (Retz) Lej.
<i>Carex buxbaumii</i> Wahlenb.	
<i>Carex granularis</i> Muhl. ex Willd.	LILIACEAE
<i>Carex meadii</i> Dewey	<i>Allium canadense</i> L.
<i>Carex molesta</i> Mack. ex Bright	<i>Allium cernuum</i> Roth
<i>Carex normalis</i> Mackenzie	* <i>Asparagus officinalis</i> L.
<i>Carex pellita</i> Muhl.	<i>Camassia scilloides</i> (Raf.) Cory
<i>Carex stricta</i> Lam.	* <i>Hemerocallis fulva</i> (L.) L.
<i>Carex tetanica</i> Schkuhr.	<i>Hypoxis hirsuta</i> (L.) Cov.
<i>Carex vulpinoidea</i> Michx.	<i>Lilium michiganense</i> Farw.
<i>Eleocharis compressa</i> Sull. (coll.: Greg Schneider #1998:67)	<i>Polygonatum biflorum</i> (Walter) Elliot
<i>Eleocharis tenuis</i> (Willd.) Schultes var. <i>verrucosa</i> (Svenson) Svenson	POACEAE
<i>Schoenoplectus acutus</i> (Muhl. ex Bigelow) A. Love & D. Love	* <i>Agrostis gigantea</i> Roth
<i>Scirpus atrovirens</i> Willd.	* <i>Agrostis stolonifera</i> L.
<i>Scirpus pendulus</i> Muhl.	<i>Andropogon gerardii</i> Vitman
	* <i>Bromus inermis</i> Leysser
DIOSCOREACEAE	<i>Calamagrostis canadensis</i> (Michx.) P. Beauv.
<i>Dioscorea villosa</i> L.	<i>Elymus canadensis</i> L.
	<i>Glyceria striata</i> (Lam.) Hitchc.
	* <i>Lolium perenne</i> L.



\**Lolium pratense* (Huds.) Darbysh.  
*Muhlenbergia mexicana* (L.) Trin.  
*Panicum acuminatum* Sw.  
*Panicum capillare* L.  
*Panicum flexile* (Gatt.) Scribn.  
*Panicum leibergii* (Vasey) Scribn.  
*Panicum virgatum* L.  
*Phalaris arundinacea* L.  
*\*Poa compressa* L.  
*\*Poa pratensis* L.  
*Schizachyrium scoparium* (Michx.) Nash  
*\*Setaria viridis* (L.) P. Beauv.  
*Sorghastrum nutans* (L.) Nash  
*Spartina pectinata* Link  
*Sphenopholis obtusata* (Michx.) Scribn.  
*Sporobolus compositus* (Poir.) Merr.

#### SMILACACEAE

*Smilax herbacea* L.

#### DICOTS

##### ACANTHACEAE

*Ruellia humilis* Nutt.

##### ANACARDIACEAE

*Toxicodendron radicans* (L.) Kuntze

##### APIACEAE

*Angelica venenosa* (Greenway) Fern.  
*Cicuta maculata* L.  
*\*Daucus carota* L.  
*Oxyopolis rigidior* (L.) Raf.  
*Sanicula canadensis* L.  
*Thaspium trifoliatum* (L.) A. Gray  
*Zizia aurea* (L.) W.D.J. Koch

##### APOCYNACEAE

*Apocynum cannabinum* L.

##### ASCLEPIADACEAE

*Asclepias incarnata* L.  
*Asclepias purpurascens* L.  
*Asclepias sullivantii* Engelm. ex A. Gray  
*Asclepias syriaca* L.  
*Asclepias tuberosa* L.  
*Cynanchum laeve* (Michx.) Pers.

##### ASTERACEAE

*Achillea millefolium* L.  
*Ambrosia artemisiifolia* L.  
*Ambrosia trifida* L.  
*Aster lateriflorus* (L.) Britton  
*Aster novae-angliae* L.  
*Aster pilosus* Willd.  
*Aster praealtus* Poir.  
*Aster sagittifolius* Wedem. ex Willd.  
*\*Chrysanthemum leucanthemum* L.  
*\*Cirsium arvense* (L.) Scop.  
*Cirsium discolor* (Muhl. ex Willd.) Spreng.  
*Conyza canadensis* (L.) Cronquist  
*Coreopsis tripteris* L.  
*Erigeron philadelphicus* L.  
*Eupatorium altissimum* L.  
*Euthamia graminifolia* (L.) Nutt.  
*Helenium autumnale* L.

*Helianthus giganteus* L.  
*Helianthus grosseserratus* M. Martens  
*Helianthus hirsutus* Raf.  
*Heliopsis helianthoides* (L.) Sweet  
*Lactuca canadensis* L.  
*\*Lactuca serriola* L.  
*Liatris spicata* (L.) Willd.  
*Ratibida pinnata* (Vent.) Barnhart  
*Rudbeckia hirta* L.  
*Silphium terebinthinaceum* Jacq.  
*Silphium trifoliatum* L.  
*Solidago canadensis* L.  
*Solidago juncea* Aiton  
*Solidago riddellii* Frank ex Riddell  
*Solidago rigida* L.  
*\*Taraxacum officinale* Weber ex Wiggers  
*Vernonia gigantea* (Walter) Trel. ex Branner & Coville

##### BETULACEAE

*Corylus americana* Walter

##### BORAGINACEAE

*Lithospermum canescens* (Michx.) Lehm.

##### BRASSICACEAE

*\*Alliaria petiolata* (Bieb.) Cavara & Grande  
*\*Barbarea vulgaris* R. Br.  
*\*Lepidium campestre* (L.) R. Br.  
*\*Thlaspi arvense* L.

##### CAESALPINACEAE

*Chamaecrista fasciculata* (Michx.) Greene

##### CAMPANULACEAE

*Lobelia spicata* Lam.

##### CAPRIFOLIACEAE

*Sambucus canadensis* L.  
*Viburnum prunifolium* L.

##### CARYOPHYLLACEAE

*\*Cerastium fontanum* Baumg.  
*Silene regia* Sims

##### CLUSIACEAE

*\*Hypericum perforatum* L.  
*Hypericum punctatum* Lam.

##### CONVOLVULACEAE

*Calystegia sepium* (L.) R. Br.  
*\*Convolvulus arvensis* L.

##### CORNACEAE

*Cornus amomum* Miller

##### DIPSACACEAE

*\*Dipsacus fullonum* L.

##### ELEAGNACEAE

*\*Eleagnus umbellata* Thunb.

##### EUPHORBIACEAE

*Euphorbia corollata* L.

FABACEAE	RHAMNACEAE
<i>Apios americana</i> Medikus	<i>Ceanothus americanus</i> L.
<i>Baptisia alba</i> , (L.) Vent. var. <i>macrophylla</i> (Larisey) Isely	ROSACEAE
<i>Desmodium canadense</i> (L.) DC.	<i>Fragaria virginiana</i> Duchesne
<i>Lathyrus palustris</i> L.	<i>Geum canadense</i> Jacq.
<i>Lespedeza capitata</i> Michx.	<i>Potentilla canadensis</i> L.
<i>Lespedeza violacea</i> (L.) Pers.	<i>Potentilla simplex</i> Michx.
FAGACEAE	<i>Rosa carolina</i> L.
<i>Quercus macrocarpa</i> Michx.	<i>Rubus flagellaris</i> Willd.
GENTIANACEAE	<i>Rubus occidentalis</i> L.
<i>Gentiana andrewsii</i> Griseb.	<i>Spiraea alba</i> Du Roi
GERANIACEAE	RUBIACEAE
<i>Geranium maculatum</i> L.	<i>Galium aparine</i> L.
LAMIACEAE	<i>Galium concinnum</i> T.&G.
<i>Lycopus americanus</i> Muhl. ex W.P.C. Barton	* <i>Galium mollugo</i> L.
<i>Monarda fistulosa</i> L.	<i>Galium obtusum</i> Bigelow
<i>Physostegia virginiana</i> (L.) Benth.	SALICACEAE
<i>Prunella vulgaris</i> L.	<i>Salix eriocephala</i> Michx.
<i>Pycnanthemum virginianum</i> (L.) Durand & B.D. Jack. ex B.L. Rob. & Fernald	SANTALACEAE
<i>Stachys tenuifolia</i> Willd.	<i>Comandra umbellata</i> (L.) Nutt.
<i>Teucrium canadense</i> L.	SCROPHULARIACEAE
LYTHRACEAE	* <i>Linaria vulgaris</i> Miller
<i>Lythrum alatum</i> Pursh	<i>Penstemon digitalis</i> Nutt. ex Sims
NYCTAGINACEAE	* <i>Verbascum thapsus</i> L.
* <i>Mirabilis nyctaginea</i> (Michx.) MacMillan	<i>Veronica peregrina</i> L.
PORTULACEAE	<i>Veronicastrum virginicum</i> (L.) Farw.
<i>Claytonia virginica</i> L.	SOLANACEAE
PRIMULACEAE	<i>Physalis longifolia</i> Nutt.
<i>Lysimachia ciliata</i> L.	<i>Physalis pubescens</i> L.
<i>Lysimachia lanceolata</i> Walter	* <i>Solanum carolinense</i> L.
<i>Lysimachia quadriflora</i> Sims.	VERBENACEAE
RANUNCULACEAE	<i>Phryma leptostachya</i> L.
<i>Anenome virginiana</i> L.	VIOLACEAE
<i>Thalictrum dasycarpum</i> Fisch. & Ave-Lall.	<i>Viola sororia</i> Willd.

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