

## Floristic Composition and Structure of Two Dry Sand Prairies at Sand Ridge State Forest, Mason County, Illinois

Loy R. Phillippe, Paul B. Marcum, Daniel T. Busemeyer, Mary Ann Feist, William E. McClain, and John E. Ebinger  
Illinois Natural History Survey, Champaign, Illinois 61820

### ABSTRACT

Burns and Quiver prairies, located about 3 km apart, are dry sand prairies in small forest openings on ridges and swales of large stabilized dunes at Sand Ridge State Forest, Mason County, Illinois. Dominant species were nearly identical on both prairies. *Schizachyrium scoparium* (little bluestem) had an importance value of 40.1 on Quiver Prairie and 35.7 on Burns Prairie. *Tephrosia virginiana* (goat's-rue), *Opuntia humifusa* (common prickly pear), and *Ambrosia psilostachya* (western ragweed) were among the top five species on both prairies. Other common grasses were *Dichanthelium villosissimum* (hairy panic grass) on both prairies and *D. depauperatum* (panic grass) on Quiver Prairie. Both prairies, less than 5 ha in size, are situated in forest openings and are subjected to extensive woody encroachment. The C-value and FQI for all native species for Burns Prairie was 3.93 and 35.8 respectively with 13 species having a CC of 7 or greater. For Quiver Prairie the C-value was 4.25 and the FQI was 38.0 with 15 species having a CC of 7 or more. Prescribed burns at irregular intervals have reduced woody encroachment, but more effort is needed as trees species, particularly oaks and *Juniperus virginiana* (red cedar) are becoming more common.

### INTRODUCTION

At the time of settlement by European man, prairie vegetation covered about 60% of Illinois (Iverson et al. 1991). Most was tall-grass, black soil prairie common in the prairie peninsula of northeastern Illinois, though extensive tall grass prairies were also common in many parts of the state (Transeau 1935). Depending upon soil and topography, other prairie types were common, including loess hill prairies, glacial till prairies, sand prairies, dolomite prairies, and gravel prairies (Schwegman 1973). Before European settlement, sand prairies were relatively common in the northern half of Illinois, mostly on outwash plains that resulted from erosional events associated with Wisconsin glaciation (Willman and Frye 1970, King 1981). The most extensive of these sand deposits occurs in central Illinois in Mason and Cass counties (Gleason 1910, Schwegman 1973, Willman 1973). These deposits were formed about 14,500 years ago when glacial moraines and ice dams were breached, resulting in a flood known as the Kankakee Torrent (King 1981). This flood removed extensive deposits of sand and gravel from glacial lakes in northeastern Illinois and adjacent Indiana. Most of this sand and gravel was deposited when the waters of the Kankakee Torrent slowed upon entering the broad lowlands of the Illinois River below present-day Hennepin. These extensive sand deposits were then reworked by winds creating the present dune and swale topography.

Since early studies of Gleason (1910) very little has been published concerning the structure and composition of the ground layer vegetation of Illinois sand deposits. Though greatly modified by human activity, a few nature preserves and other high quality natural areas remain in these sand deposits. The present study was undertaken to determine vascular plant species composition, vegetation structure, and species richness (via Floristic Quality Index) of two of the largest remaining dry sand prairie openings at Sand Ridge State Forest in Mason County, Illinois.

### DESCRIPTION OF STUDY SITE

Sand Ridge State Forest is located in northwestern Mason County about 21 km north-east of Havana, and just west of Forest City, Illinois (parts of townships T22N R7W and T23N R7W). This 3,035 ha (11.7 sq. miles) state forest lies within the Illinois River Section of the Mississippi River and Illinois River Sand Area Natural Division (Schwegman 1973). Initial land purchases for the state forest began in 1939 for the purpose of stabilizing soil of abandoned farmlands, developing a wood product industry, and setting land aside for public recreation. From the 1940s into the 1950s, pine plantations were established mostly on old pastureland and abandoned cultivated fields, but also in dry sand prairies scattered throughout the forest. Presently, 1,012 ha of marketable pine plantations are present in the state forest while most of the remainder is oak-hickory dry sand forest and savanna

(Andrews 2004).

A few small prairie openings containing various quality dry sand prairie remnants are scattered throughout the forest (Phillippe et al. 2005). These dry sand prairie communities are mostly less than 5 ha in size. The two prairies studied are:

Burns Sand Prairie (S1/2 NW1/4 SW1/4 S4 T22N R7W), about 4 ha in size, is located on a broad dune ridge and is surrounded by *Quercus velutina* Lam. (black oak) dominated forest on three sides. To the east is an abandoned cultivated field with many prairie species. Seedlings and saplings of black oaks, mostly less than 2 m tall, are scattered throughout the prairie, their concentration increasing near the forest edge. When visited in the fall of 2014, woody encroachment had not increased significantly. No fire records are known for this prairie.

Quiver Sand Prairie (E1/2 NW1/4 SE1/4 S28 T23N R7W), about 2.4 ha in size, is located in a wide, shallow depression on the sides of surrounding dunes that are covered with black oak forest and closed savanna. A few small oaks and red cedars, usually less than 1 m tall, occur throughout the prairie, the number increasing at the forest/prairie boundary. When visited in fall of 2014, most of this woody encroachment had been removed. Some of these trees had reached a height of 2 m. This prairie has been burned twice since 1996.

According to the Midwestern Regional Cli-

mate Center (2004) Sand Ridge State Forest has a continental climate with warm summers and cold winters. Based on weather data from Havana mean annual precipitation is 96.0 cm, with May having the highest rainfall (11.3 cm). Mean annual temperature is 10.8°C with the hottest month being July (average of 24.6°C), and the coldest January (average of -5.0°C). Frost-free days range from 140 to 206, with the average being 173 days per year. The soils are mostly excessively drained Plainfield and Bloomfield sands (Calsyn 1995) that form the dune and swale topography known as the Parkland Formation (Willman and Frye 1970).

**METHODS**

Sand Ridge State Forest was visited more than 15 times from April through October in 2003 and 2005 to study the floristic composition of sand prairie and sand forest communities. Voucher specimens were collected, identified, and deposited in the herbarium of the Illinois Natural History Survey, Champaign, Illinois (ILLS). Determination of non-native (exotic) species followed Mohlenbrock (2002) and Gleason and Cronquist (1991). Nomenclature follows Mohlenbrock (2002), community classification follows White and Madany (1978), and threatened and endangered species follows Illinois Endangered Species Protection Board (2015).

In late summer of 2004 four 25 m transects were located randomly along cardinal compass directions in Burns and Quiver prairies. Along each transect, 1 m<sup>2</sup> quadrates were spaced at 1 m intervals (n=25/transect), odd-numbered quadrates to the right, even-numbered quadrates to the left. A random numbers table was used to determine the number of meters (0 to 9) the quadrate was located from the transect line. Species cover was determined using the Daubenmire cover class system (Daubenmire 1959) as modified by Bailey and Poulton (1968). 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). As used here, the FQI is a weighted index of species richness (N) and

is the arithmetic product of the mean coefficient of conservatism (C-value), multiplied by the square root of species richness ( $\sqrt{N}$ ) of the site [FQI = C-value ( $\sqrt{N}$ )].

**RESULTS**

In the two sand prairies a total of 124 vascular plant species within 101 genera and 45 families were documented. Of these, none were fern or fern-allies, four were gymnosperms, 83 were dicots in 72 genera and 39 families, and 37 were monocots in 27 genera and four families. One threatened species, *Cyperus grayoides* (sand prairie flatsedge) was encountered on Burns Prairie. The predominant plant families were the Poaceae with 24 species and the Asteraceae with 14 species (Appendix I). Only 13 exotic species were encountered on the two prairies. The C-value and FQI for all native species for Burns Prairie was 3.93 and 35.8 respectively with 13 species having

a CC of 7 or greater. For Quiver Prairie the C-value was 4.25 and the FQI was 38.0 with 15 species having a CC of 7 or more.

*Schizachyrium scoparium* (little bluestem) had the highest importance value (IV) in both prairies. This species was present in nearly every plot and had an IV of 35.7 on Burns Prairie and 40.1 on Quiver Prairie (Table 1). *Tephrosia virginiana* (goat's-rue), *Opuntia humifusa* (common prickly pear), and *Ambrosia psilostachya* (western ragweed) were among the top five species on both prairies. Other common grasses were *Dichanthelium villosissimum* (hairy panic grass) on both prairies and *D. depauperatum* (panic grass) on Quiver Prairie. Overall, the five native prairie species that are typical components of dry sand prairies had IV's greater than 10 (Table 1). All would be expected to be common in high quality dry sand prairie communities in Illinois.

**Table 1.** Frequency (%), mean cover (% of total area), and importance value (IV) for the ground layer species encountered in Burns and Quiver Sand Prairie, Sand Ridge State Forest, Mason County, Illinois. (\*exotics)

Species	Quiver Dry Sand Prairie			Burns Dry Sand Prairie		
	Freq %	Mean Cover	I.V.	Freq %	Mean Cover	I.V.
<i>Schizachyrium scoparium</i>	100	25.90	40.1	99	18.26	35.7
<i>Ambrosia psilostachya</i>	98	19.62	32.7	96	8.21	20.8
<i>Opuntia humifusa</i>	100	9.46	21.4	84	6.51	17.2
<i>Tephrosia virginiana</i>	43	11.80	18.0	60	13.49	25.2
<i>Dichanthelium depauperatum</i>	63	6.18	13.7	7	0.52	1.4
<i>Dichanthelium villosissimum</i>	56	2.12	8.3	96	9.44	22.6
<i>Cyperus lupulinus</i>	68	0.42	7.7	73	0.37	7.3
<i>Sporobolus clandestinus</i>	36	1.50	5.5	--	--	--
<i>Monarda punctata</i>	36	1.40	5.4	--	--	--
<i>Oenothera clelandii</i>	41	0.63	5.0	21	0.13	2.2
<i>Rhus aromatic</i>	7	2.56	3.6	10	1.77	3.5
<i>Carex muhlenbergii</i>	22	0.83	3.3	64	0.55	6.8
<i>Crotonopsis linearis</i>	29	0.15	3.3	94	0.50	9.4
<i>Conyza canadensis</i>	26	0.21	3.0	50	0.33	5.1
<i>Dichanthelium oligosanthes</i>	22	0.46	2.8	5	0.10	0.7
<i>Physalis heterophylla</i>	15	0.74	2.5	--	--	--
<i>Fallopia cristata</i>	19	0.25	2.3	3	0.02	0.3
<i>Solidago nemoralis</i>	20	0.15	2.3	--	--	--
<i>Pseudognaphalium obtusifolium</i>	14	0.63	2.2	45	2.56	7.9
<i>Bouteloua histuta</i>	13	0.44	1.9	--	--	--
<i>Chamaecrista fasciculata</i>	11	0.35	1.6	--	--	--
<i>Brickellia eupatorioides</i>	9	0.44	1.5	--	--	--
<i>Eragrostis spectabilis</i>	10	0.37	1.5	14	0.49	2.0
<i>Lespedeza capitata</i>	11	0.13	1.4	10	0.54	1.7
<i>Polygonum tenue</i>	10	0.05	1.2	5	0.03	0.5
<i>Leptoloma cognatum</i>	5	0.08	0.6	33	2.76	7.0
<i>Commelina erecta</i>	5	0.05	0.6	58	0.34	5.9
<i>Carex tonsa</i>	6	0.28	0.9	43	0.74	5.1
<i>Croton glandulosus</i>	1	0.01	0.1	34	0.20	3.5
<i>Aristida tuberculosa</i>	--	--	--	12	0.11	1.3
<i>Cyperus schweinitzii</i>	6	0.03	0.6	10	0.05	1.0
Others (Burns 18 sp./Quiver 17 sp.)	--	0.90	5.0	--	1.22	5.9
Totals	--	88.14	200.0	--	69.14	200.0
Average Bare Ground and litter		15.06			27.31	

While only one exotic species was encountered in the plots, 12 were collected within the prairies (Appendix I). None were encountered in the plots on Quiver Prairie, while *Mollugo verticillata* (carpetweed) was present in low numbers on Burns Prairie. The remaining exotics were predominantly at the edges of the prairies, generally in areas of disturbance.

## DISCUSSION

Burns and Quiver prairies are very similar to the mature dry sand prairies at Henry Allen Gleason Nature Preserve (McClain et al. 2005), Long Branch Nature Preserve (Phillippe et al. 2004), and Sand Prairie-Scrub Oak Nature Preserve (McClain et al. 2008), all in Mason County, Illinois. Four of the top five dominants were identical in all preserves with *Schizachyrium scoparium* dominant and *Ambrosia psilostachya*, *Opuntia humifusa*, and *Tephrosia virginiana* important subdominants. Of these species, *T. virginiana* was not found in the plots at Long Branch Nature Preserve. This species is relatively common on that prairie, but has a clumped distribution and was absent in the general area where the line transects were randomly placed (Phillippe et al. 2004).

Gleason (1910) referred to dry sand prairie communities as the bunch-grass association and listed many of the species and dominants recorded during the present study. In all dry sand prairies *Schizachyrium scoparium* generally formed dense, various-sized clumps, usually circular in outline. These clumps were generally between 15 and 35 cm wide, some appearing dead in the center, an indication of their age. Open sand was common between the clumps or was occupied by occasional forbs. Bare ground and litter averaged 15.06 for Quiver Prairie and 27.31 for Burns Prairie (Table 1).

The lack of exotic species, high species diversity, and number of conservative prairie species (C-values of 7 or more), indicate that the mature dry sand prairie openings at Sand Ridge State Forest are of high natural quality. This is also indicated by the high FQI's for both Burns and Quiver dry sand prairie (Taft et al. 1997). Many prairie openings were destroyed when pines were planted in them in the 1940s and early 1950s. Also, many small remnants have been lost due to woody encroachment and

fire suppression. The few remaining sand prairie openings should be managed by periodic fires and by the removal of encroaching trees, particularly at the prairie/forest boundary.

## ACKNOWLEDGMENTS

The authors thank John Wilker, Natural Areas Program Manager, Illinois Department of Natural Resources, for his help and advice. The Illinois Department of Natural Resources, Wildlife Preservation Fund supported this project.

## LITERATURE CITED

- Andrews, K. 2004. Forest Treasures. Outdoor Illinois. December 2004:2-5.
- 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.
- Calsyn, D.E. 1995. Soil survey of Mason County, Illinois. Soil Report 146, University of Illinois Agricultural Experiment Station, Urbana. ix+211 pp.
- Daubenmire, R. 1959. A canopy coverage method of vegetation analysis. Northwest Science 33:43-64.
- Gleason, H.A. 1910. The vegetation of the inland sand deposits of Illinois. Bulletin of the Illinois State Laboratory of Natural History 9:21-174.
- Gleason, H.A. and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. Second Edition. The New York Botanical Garden, Bronx, New York. xxv+910 pp.
- Illinois Endangered Species Protection Board. 2015. Checklist of Illinois endangered and threatened animals and plants. Springfield, Illinois.
- 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.
- McClain, W.E., L.R. Phillippe, and J.E. Ebinger. 2005. Floristic assessment of the Henry Allen Gleason Nature Preserve, Mason County, Illinois. Castanea 70:146-154.
- McClain, W.E., J.E. Schwegman, T.A. Strole, L.R. Phillippe, and J.E. Ebinger. 2008. Floristic study of Sand Prairie-Scrub Oak Nature Preserve, Mason County, Illinois. Castanea 73:29-39.
- Midwestern Regional Climate Center. 2004. <http://mcc.sws.uiuc.edu>
- Mohlenbrock, R.H. 2002. Vascular Flora of Illinois. Southern Illinois University Press, Carbondale, Illinois. xi+490 pp.
- Phillippe, L.R., M.A. Feist, J.E. Ebinger, and W.E. McClain. 2004. Vascular Flora of Long Branch Nature Preserve, Mason County, Illinois. Transactions of the Illinois State Academy of Science 97:197-208.
- Phillippe, L.R., P.B. Marcum, D.T. Busemeyer, M.A. Feist, W.E. McClain and J.E. Ebinger. 2005. Floristic composition and structure of two dry sand prairies at Sand Ridge State Forest, Mason County, Illinois. In Ebinger, J.E. A Site Inventory of Nature Preserves and State Forest in the Illinois River Section of the Illinois River and Mississippi River Sand Areas Natural Division. Illinois Natural History Survey Technical Report 2005(4). Prepared for the Illinois Department of Natural Resources, Division of Natural Heritage, Springfield, Illinois.
- 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. map+32 pp.
- Taft, J.B., G.S. Wilhelm, D.M. Ladd, and L.A. Maters. 1997. Floristic quality assessment for vegetation in Illinois, a method for assessing vegetation integrity. Eriogon 15:3-95.
- Transeau, E.N. 1935. The prairie peninsula. Ecology 16:423-437.
- 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.

See next page for Appendix I.

**Appendix I.** Vascular species encountered at Burns (b) and Quiver (q) dry sand prairies at Sand Ridge State Forest, Mason County, Illinois, listed alphabetically by family under the major plant groups. An asterisk indicates non-native (exotic) species (\*). Collecting numbers are preceded by the initial of the collector's name: (B) Daniel T. Busemeyer, (F) Mary Ann Feist, (G) Sophia Gehlhausen, (M) Paul B. Marcum, and (P) Loy R. Phillippe.

**GYMNOSPERMS**

**Cupressaceae**

*Juniperus virginiana* L.: P36479 (b)

**Pinaceae**

\**Pinus resinosa* Ait.: P37183 (b)

\**Pinus strobus* L.: P37175 (b)

\**Pinus sylvestris* L.: P36481 (b)

**MONOCOTS**

**Commelinaceae**

*Commelina erecta* L. var. *erecta*: P36950, F2781 (b/q)

*Tradescantia ohiensis* Raf.: P36780, P36752 (b/q)

**Cyperaceae**

*Bulbostylis capillaris* (L.) C.B. Clarke: P36952 (b)

*Carex meadii* Dewey: P36782, P36737 (b/q)

*Carex muhlenbergii* Schk.: P36757, P36736 (b/q)

*Carex tonsa* (Fern.) Bickn.: P36478, F2522 (b/q)

*Cyperus grayoides* Mohlenbr.: P36748 (b)

*Cyperus lupulinus* (Spreng.) Marcks var. *macilentus* (Fern.) Marcks: P36949, F2784 (b/q)

*Cyperus schweinitzii* Torr.: P36945, F2794 (b/q)

*Eleocharis erythropoda* Steud.: P36955 (b)

*Eleocharis ovata* (Roth) Roem. & Schultes: P36953 (b)

**Juncaceae**

*Juncus acuminatus* Michx.: P36951 (b)

*Juncus interior* Wieg.: P36763 (b)

**Poaceae**

*Agrostis hyemalis* (Walt.) BSP.: P36759, F2785 (b/q)

*Andropogon gerardii* Vitman: P37173 (b)

*Aristida tuberculosa* Nutt.: P37169, M2848 (b/q)

*Bouteloua curtipendula* (Michx.) Torr.: M2826 (q)

*Bouteloua hirsuta* Lag.: M2660 (q)

\**Bromus tectorum* L.: P36775 (b)

*Calamovilfa longifolia* (Hook.) Scribn.: M2685 (b)

*Dichanthelium depauperatum* (Muhl.) Gould: P36760, P36735 (b/q)

*Dichanthelium oligosanthes* (Schult.) Gould: P36772, P36738 (b/q)

*Dichanthelium villosissimum* (Nash) Freckm.: P36756, P36739 (b/q)

\**Echinochloa crus-gali* (L.) P. Beauv.: P36954 (b)

*Eragrostis spectabilis* (Pursh) Steud.: P37170, M2839 (b/q)

*Eragrostis trichodes* (Nutt.) Wood: observed, M2845 (b/q)

*Heterostipa spartea* (Trin.) Barkworth: P36781, F2805 (b/q)

*Hordeum pusillum* Nutt.: P36774 (b)

*Leptoloma cognatum* (Schult.) Chase: M2683, M2836 (b/q)

*Paspalum bushii* Nash: M2682 (b)

\**Poa pratensis* L.: F2799 (q)

*Schizachyrium scoparium* (Michx.) Nash: observed, M2829 (b/q)

*Sorghastrum nutans* (L.) Nash: P37180, M2834 (b/q)

*Sporobolus clandestinus* (Biehler) Hitchc.: M2838 (q)

*Tridens flavus* (L.) Hitchc.: observed (q)

*Triplasis purpurea* (Walt.) Chapm.: M2847 (q)

*Vulpia octoflora* (Walt.) Rydb. var. *tenella* (Willd.) Fern.: P36773, P36751 (b/q)

**DICOTS**

**Acanthaceae**

*Ruellia humilis* Nutt.: F2791 (q)

**Amaranthaceae**

*Froelichia floridana* (Nutt.) Moq.: M2679, observed (b/q)

**Anacardiaceae**

*Rhus aromatica* Ait.: P36767, F2801 (b/q)

*Rhus glabra* L.: F2803 (q)

*Rhus hirta* L.: F2802 (q)

**Apocynaceae**

*Apocynum sibiricum* Jacq.: observed (b)

**Asclepiadaceae**

*Asclepias amplexicaulis* Small: P36766, F2796 (b/q)

*Asclepias hirtella* (Pennell) Woodson: P36956 (b)

*Asclepias tuberosa* L.: F2790 (q)

*Asclepias verticillata* L.: M2664 (q)

**Asteraceae**

\**Achillea millefolium* L.: F2783 (q)

*Ambrosia psilostachya* DC.: P37172, M2840 (b/q)

*Brickellia eupatorioides* (L.) Shinnars: M2835 (q)

*Chrysopsis camporum* Greene: P36795, M2828 (b/q)

*Conyza canadensis* (L.) Cronq.: P37178, M2832 (b/q)

*Erigeron strigosus* Muhl.: P36784, F2778 (b/q)

*Helianthus occidentalis* Riddell: M2852 (q)

*Krigia virginica* (L.) Willd.: B1673, P36741 (b/q)

*Lactuca canadensis* L.: P37184, M2842 (b/q)

*Liatris aspera* Michx.: observed (b)

*Pseudognaphalium obtusifolium* (L.) Hilliard & Burt.: P37176, M2837 (b/q)

*Rudbeckia hirta* L.: F2787 (q)

*Senecio plattensis* Nutt.: P36776, P36749 (b/q)

*Solidago nemoralis* Ait.: P37174, M2833 (b/q)

**Boraginaceae**

*Lithospermum croceum* Fern.: P36768, P36740 (b/q)

**Brassicaceae**

\**Alliaria perfoliata* (Bieb.) Cavara & Grande: B1676 (b)

*Arabis canadensis* L.: P36747 (q)

*Draba reptans* (Lam.) Fern.: F2524 (q)

\**Lepidium densiflorum* Schrad.: P36770, P36746 (b/q)

*Lepidium virginicum* L.: P36769, F2792 (b/q)

**Cactaceae**

*Opuntia humifusa* (Raf.) Raf.: P36755, F2788 (b/q)

**Caesalpiniaceae**

*Chamaecrista fasciculata* (Michx.) Greene: P37253, M2663 (b/q)

**Campanulaceae**

*Triodanis perfoliata* (L.) Nieuwl.: P36758, F2793 (b/q)

**Chenopodiaceae**

*Chenopodium standleyanum* Aellen: M2665 (q)

*Cycloloma atriplicifolium* (Spreng.) Coult.: P36958 (b)

**Cistaceae**

*Helianthemum canadense* (L.) Michx.: P36785, P36750 (b/q)

**Cornaceae**

*Cornus drummondii* C.A. Mey.: P36790 (b)

**Euphorbiaceae**

*Croton glandulosus* L.: M2680, F2800 (b/q)

*Crotonopsis linearis* Michx.: M2677, M2831 (b/q)

*Euphorbia corollata* L.: observed, F2786 (b/q)

**Fabaceae**

*Amorpha canescens* Pursh: F2789 (q)

*Desmodium sessilifolium* (Torr.) Torr. & Gray: M2851(q)

*Lespedeza capitata* Michx.: P37179, M2830 (b/q)

*Strophostyles leiosperma* (Torr. & Gray) Piper: M2843 (q)

*Tephrosia virginiana* (L.) Pers.: P36947, M2841 (b/q)

**Fagaceae**

*Quercus marilandica* Muench.: M2667 (q)

*Quercus velutina* Lam.: P37171 (b)

**Fumariaceae**

*Corydalis micrantha* (Engelm.) Gray var. *micrantha*: P36793 (b)

**Geraniaceae**

*Geranium carolinianum* L.: P36792 (b)

**Grossulariaceae**

*Ribes missouriense* Nutt.: P36482 (b)

**Lamiaceae**

*Monarda punctata* L.: F2797 (q)

*Teucrium canadense* L.: P37177, F2798 (b/q)

**Malvaceae**

*Callirhoe triangulata* (Leavenw.) Gray: M2686, M2661 (b/q)

**Molluginaceae**

\**Mollugo verticillata* L.: P36765 (b)

**Moraceae**

\**Morus tatarica* L.: P36789 (b)

**Onagraceae**

*Oenothera clelandii* W. Dietr., Raven, & W.L. Wagner: P36957, F2779 (b/q)

**Oxalidaceae**

*Oxalis violacea* L.: P36754 (q)

**Plantaginaceae**

*Plantago patagonica* Jacq.: P36761 (b)

**Polemoniaceae**

*Phlox bifida* Beck: P36484, F2525 (b/q)

**Polygonaceae**

*Fallopia cristata* (Engelm. & Gray) Holub.: P37252, M2666 (b/q)

*Polygonum tenue* Michx.: P37251, M2827 (b/q)

**Portulacaceae**

*Talinum rugospermum* Holz.: P36764, G36 (b/q)

**Primulaceae**

*Androsace occidentalis* Pursh: P36483, F2523 (b/q)

**Rosaceae**

*Fragaria virginiana* Duchesne: P36777, P36743 (b/q)

*Geum canadense* Jacq.: P36778 (b)

*Prunus serotina* Ehrh.: P36783, F2804 (b/q)

*Rosa carolina* L. var. *carolina*: P36786 (b)

*Rubus allegheniensis* Porter: P36788 (b)

*Rubus occidentalis* L.: P36779 (b)

**Rubiaceae**

*Diodia teres* Walt.: M2681(b)

*Galium aparine* L.: P36771, P36733 (b/q)

**Rutaceae**

*Ptelea trifoliata* L.: P36744 (q)

**Scrophulariaceae**

*Lindernia anagallidea* (Michx.) Pennell: M2678 (b)

*Nuttallanthus canadensis* (L.) D. Sutton: B1674, P36734 (b/q)

*Penstemon pallidus* Small: P36748 (q)

**Solanaceae**

*Physalis heterophylla* Nees: P37181, F2795 (b/q)

*Physalis virginiana* Mill.: P36762 (b)

*Solanum carolinense* L.: P36791 (b)

*Solanum ptychanthum* Dunal: P36787 (b)

**Urticaceae**

*Parietaria pensylvanica* Muhl.: P36745 (q)

**Violaceae**

*Viola pedata* L.: P36753 (q)

\**Viola rafinesquii* Greene: P36480, P36742 (b/q)

**Zygophyllaceae**

\**Tribulus terrestris* L.: P36794 (b)