

## Vascular Flora of the Sand Ridge State Forest, Mason County, Illinois

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

### ABSTRACT

The vascular plants of Sand Ridge State Forest, Mason County, Illinois, were surveyed between 2002 and 2006. This extensive forest tracts is the largest area of sand dominated plant communities owned and managed by the state of Illinois [3,035 ha (11.7 sq. miles)]. Dry sand forest and degraded dry sand savanna dominate the state forest along with a few dry sand prairies, ponds, and extensive cultural communities. The many anthropogenic-influenced areas include extensive pine plantations, a trail system exceeding 43 km, along with camping, picnicking, and other recreational sites. A total of 554 vascular plant species in 104 families were documented in the state forest, mostly with voucher specimens, though nearly 460 species were reported by earlier botanists, including some species that lack vouchers and could not be verified by the present study. A total of 141 non-native species (exotics) were found, mostly in the cultural communities, while two endangered species, *Astragalus distortus* Torr. & Gray (bent milk vetch) and *Lesquerella ludoviciana* (Nutt.) S. Wats. (silver bladderpod) were recorded along with one threatened species, *Cyperus grayoides* Mohlenbr. (sand prairie flatsedge). Active management will be needed to maintain and restore the quality of the plant communities at the Sand Ridge State Forest.

### INTRODUCTION

Wind-blown sand deposits from glacial outwash are common in the northern half of Illinois. The result of erosion events associated with Wisconsin glaciation (Willman and Frye 1970, Schwegman 1973, King 1981), these deposits account for nearly 5% of the state's land surface. The most extensive of these sand regions are along the Kankakee River in northeastern Illinois, and the Illinois River in Mason and Cass counties in the central part of the state (Gleason 1910, Schwegman 1973, Willman 1973).

The most extensive sand deposits owned and managed by the State of Illinois are at Sand Ridge State Forest in northwestern Mason County. This 3,035 ha (11.7 sq. miles) area contains numerous natural areas, including two state nature preserves (McFall and Karnes 1995). Since the early studies of Gleason (1910) the present authors and their associates have published a few articles concerning the composition of the vegetation of Illinois sand deposits, including detailed studies of four nature preserves within or near Sand Ridge State Forest. Because of its size and continuity we decided to determine the vascular plant species composition of Sand Ridge State Forest. This study significantly increases the data base of vascular plants of the area, provides additional information about endangered and threatened plant species, and adds to our ability to manage the botanical resources of this state forest.

### STUDY AREA

#### History

Early settlers of the Mason County sand region tried to make a living off the hilly, sandy soils in the northwestern part of the county. Time proved that these deep sandy soils could not sustain agricultural crops, and by the early 1930's many homesteads were abandoned. Initial land purchases for Sand Ridge 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 1950's, pine plantations were established 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 while most of the remainder is dry oak-hickory sand forest and degraded dry sand savanna (Andrews 2004). Besides being managed as a sustainable forest, numerous recreation features have been added, including more than 43 km of trail, picnicking, camping, skiing, archery, and horse-back riding facilities (Andrews 2004).

#### Physiography

Sand Ridge State Forest is located in northwestern Mason County about 21 km northwest 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). Much of the Sand Ridge State Forest is located on hilly ground, actually a dune and swale topography created by strong westerly winds after the sand was deposited but before being stabilized with vegetation.

#### Climate

Central Illinois 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 (Midwestern Regional Climate Center 2004).

#### Geology and Soils

The extensive sand deposits on the terraces of the Illinois River in parts of Putman, Marshall, Woodford, Peoria, Tazewell, Mason, Menard, Cass, Morgan, Scott, and Greene counties were formed during the Kankakee Torrents about 14,500 years ago (Willman 1973). At that time the Kankakee sand deposits of northeastern Illinois were formed when glacial lakes drained after glacial moraines and ice dams were breached, resulting in the Kankakee Torrent. The Illinois River sand deposits were formed when these waters of the Kankakee Torrent slowed on entering the broad lowlands of the Illinois River below present day Henne-

pin (Willman and Frye 1970, King 1981).

These windblown sand deposits, commonly referred to as Parkland Sands or The Parkland Formation, consist of dunes and sheet-like deposits between and bordering the dunes (Willman and Frye 1970, Calsyn 1995). The Parkland Formation is usually found on terraces along major river valleys in the northern half of Illinois and consists of medium-grained sands that are sorted by wind from the underlying glacial outwash. These sands were reworked by wind creating their characteristic dune and swale topography. Dunes 6 to 12 meters high are common and occasional dunes are 30 meters high. Some dunes have migrated onto the bluffs and uplands to the east of the river terraces.

### Plant Communities

**Dry Sand Forest:** Forests are generally defined as communities dominated by trees having nearly closed overstories with more than 80% cover (Nuzzo 1986, White and Madany 1978). In these forests the soils of the sand deposits commonly had an A horizon with some accumulated leaf litter, the ground cover had some prairie species but native shade-tolerant forest species were more common, while prairie bunch-grasses were rare except in forest openings. The dune and swale topography plus other natural fire breaks limited the frequency and severity of fires within dry sand forests.

Bishop's Woods Natural Area, a dry sand forest located in the southern part of Sand Ridge State Forest, was surveyed in 1990. This forest had an average density of 247.5 stems/ha ( $\geq 10$  cm dbh) and an average basal area of 16.1 m<sup>2</sup>/ha (Jenkins et al. 1991). *Quercus velutina* (black oak) dominated with an importance value (IV) of 144.9 (possible 200), averaged 150.1 stems/ha, and had an average basal area of 13.50 m<sup>2</sup>/ha. *Carya texana* (black hickory), *Q. marilandica* (blackjack oak), and *C. tomentosa* (mockernut hickory) were the other common species in the overstory. Post-settlement fire exclusion has increased the acreage of sand forest at the expense of sand savannas (White and Madany 1978, Anderson and Brown 1986, Anderson 1991, Abrams 1992).

**Dry Sand Savanna:** Savanna communities are defined as having overstories of

scattered, open-grown trees and a ground cover dominated by grasses (Curtis 1959, Bray 1960, White and Madany 1978, Nuzzo 1986). The soils in dry sand savannas are sandy with little or no A horizon; the ground cover is composed of prairie species with dominant bunch-grasses mostly less than 1 m tall; while the canopy was dominated by *Quercus velutina* with a cover that averaged between 10 and 50%. Dry sand savannas were associated with dune and swale topography which probably limited the severity of fires (White and Madany 1978, Anderson and Brown 1986, Anderson 1991, Abrams 1992, McClain and Elzinga 1994).

Recent studies by Phillippe et al. (2013) indicate that sand savannas in which *Quercus velutina* was dominant, were common in the major sand deposits of Illinois. Most, however, have been extensively degraded by fire suppression and invasion by native woody species. Many are now dry sand forests that lack, or have a greatly reduced abundance of characteristic ground layer species. Degraded dry sand savannas, that are presently dry sand forests, are a dominant community of ridges and slopes on large stabilized dunes at Sand Ridge State Forest, Mason County, Illinois. In the community examined *Q. velutina* dominated with an IV of 143.5 (possible 200), averaged 321.1 stems/ha, and had an average basal area of 17.0 m<sup>2</sup>/ha. *Quercus marilandica* was second followed by the exotic *Pinus strobus* (white pine) and *Carya texana*. Based on aerial photographs from the early 1940s this dry sand forest had an open overstory with only about 50% canopy closure (Phillippe et al. 2013).

**Dry Sand Prairie:** Common in pre-settlement times, these prairies were found on the upper slopes and ridges of dunes and other dry areas throughout the Illinois River sand deposits. In this community the soil lacks a dark A horizon and grasses, most of which were bunch-grasses, were mostly less than 1 m tall. This community, in the absence of recurring fires, developed into a dry sand savanna community (White and Madany 1978). Gleason (1910) was probably the first to quantify the species composition of the Mixed Consociates of the Bunch-Grass Association, which corresponds to the dry sand prairie community of White and Madany (1978). As described by Gleason

(1910) this association was dominated by native bunch-grasses and sedges with most of the remaining species restricted to areas of bare soil between bunch-grasses. These secondary species were divided into ecological groups based on their habit and structure: large perennials and shrubs that competed with the bunch-grasses; mat-plants; interstitial herbs that were mostly annuals and were restricted to the bare sand between the bunch-grasses; and parasitic herbs.

Henry Allan Gleason Nature Preserve, located near the northwestern edge of Sand Ridge State Forest near the small village of Goofy Ridge, contains a small mature dry sand prairie. This small prairie remnant was dominated by dry sand prairie species (McClain et al. 2005). *Schizachyrium scoparium* (little bluestem) was the leading dominant with an IV of 84.6 (200 possible), followed by *Tephrosia virginiana* (goat's-rue), *Opuntia humifusa* (common prickly pear), *Ambrosia psilostachya* (western ragweed), and *Dichanthelium villosissimum* (hairy panic grass). Also, a few mature dry sand prairies, 2 to 5 ha in size, exist within the degraded savanna communities at Sand Ridge State Forest. Dominant species on two of these prairies were nearly identical. *Schizachyrium scoparium* had an IV of 40.1 (possible 200) on Quiver Prairie and 35.7 on Burns Prairie. *Tephrosia virginiana*, *Opuntia humifusa*, *Ambrosia psilostachya* were among the top five species on both prairies, while another common grasses was *Dichanthelium villosissimum* (Ebinger, unpublished data).

**Cultural:** This community class includes areas that were created by human disturbance. The many anthropogenic-influenced areas include extensive pine plantations, an extensive trail system, along with camping, picnicking, and other recreational sites. Also, a few ponds have been constructed, some which appear to be natural, but probably represent watering holes created for wildlife.

### METHODS

Sand Ridge State Forest was visited more than 15 times in 2003 to 2006 to study the floristic composition of sand prairie and sand forest communities. From 2006 to 2012, occasional trips to the state forest

have been made to visit new areas. 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 information about threatened and endangered species follows Illinois Endangered Species Protection Board (2011).

## RESULTS AND DISCUSSION

### Flora

A total of 554 vascular plant species in 104 families were documented from the Sand Ridge State Forest. Of these, 11 were fern or fern-allies in eight families, 12 gymnosperms in three families, 401 dicots in 80 families, and 130 monocots in 13 families. The plant families with the most taxa were the Poaceae (78 species), Asteraceae (72 species), Fabaceae (31 species), and Cyperaceae (28 species) (Appendix I).

### Rare Species

Only three rare species were found in the state forest: *Astragalus distortus* and *Lesquerella ludoviciana* are listed as state endangered while *Cyperus grayoides* is listed as threatened in Illinois. *Astragalus distortus* (bent milk vetch) has recently been rediscovered along a roadside in the state forest. This species is now known from only seven small populations in Illinois, all from disturbed habitats in the Illinois River sand deposits (McClain & Ebinger 2003). *Cyperus grayoides* (sand prairie flatsedge) is relatively common at the Henry Allan Gleason Nature Preserve where it is a dominant species in an active blow-out community (McClain et al. 2005). Also, it was encountered in low numbers at Burns Dry Sand Prairie Natural Area. *Lesquerella ludoviciana* (silvery bladderpod) is a common species of stabilized blow-out communities at Henry Allan Gleason Nature Preserve (McClain et al. 2005). It was first discovered in Illinois at that site in 1904 by H. A. Gleason (Jones and Fuller 1955).

### Exotic Species

A total of 141 species (25.6% of the flora) are non-native (exotic). These exotic species

commonly colonize all anthropogenic-disturbed habitats. The most notable of these aggressive species affecting Sand Ridge State Forest are: *Alliaria petiolata* (garlic mustard), *Elaeagnus umbellata* (autumn olive), *Festuca arundinacea* (tall fescue), *Lespedeza cuneata* (sericea lespedeza), *Lonicera x bella* (showy fly honeysuckle), *Lonicera maackii* (Amur honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Phalaris arundinacea* (reed canary grass), *Pinus strobus*, *Rosa multiflora* (multiflora rose), and *Saponaria officinalis* (bouncing bet). These exotic species, if not controlled, will continue the degradation of the plant communities at the Sand Ridge State Forest. Presently, the few remaining good quality dry sand prairies will need fire, and probably brush removal to decrease exotic species and control woody encroachment. Also, the combination of increased fire frequency, selective timber harvest, and possibly grazing will be necessary to restore and maintain the savanna communities that were once characteristic of this site.

## ACKNOWLEDGMENTS

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## APPENDIX I

Vascular plant species encountered and collected at Sand Ridge State Forest, Mason County, Illinois are listed alphabetically by family under the major plant groups. An asterisk indicates non-native (exotic) species (\*), but also includes a few native species that are planted in the sand areas and out of their natural range in Illinois. Collecting numbers are preceded by the initial of the collector's name: (B) Daniel T. Busemeyer, (E) John E. Ebinger, (F) Mary Ann Feist, (M) Paul B. Marcum, and (P) Loy R. Phillippe. Voucher specimens are deposited in the Illinois Natural History Survey herbarium (ILLS). The Illinois Natural History Survey herbarium (ILLS) and the University of Illinois herbarium (ILL) were also searched for past collections from Sand Ridge State Forest. Specimens were discovered that were collected by the following individuals: John K. Bouseman, Virginius H. Chase, Irene M. Cull, F. C. Gates, Steven R. Hill, Alfred C. Koelling, Chris T. Maier, Maison, Kenneth R. Robertson, Julian A. Steyermark, and David Voegtlin. C. T. Maier (1976) collected extensively at Sand Ridge State Forest in 1974-75, and his collections have the designation (Maier 1976) in the list. Most of these citations are vouchers, but a few could not be located at ILL.

## PTERIDOPHYTA

### ASPLENIACEAE

*Asplenium platyneuron* (L.) Oakes - B1817

### DENNSTAEDTIACEAE

*Pteridium aquilinum* (L.) Kuhn - P37120

### DRYOPTERIDACEAE

*Cystopteris protrusa* (Weatherby) Blasdell - B1816

*Dryopteris carthusiana* (Villars) H.P. Fuchs - P37136

*Woodsia obtusa* (Spreng.) Torr. - M2860

### EQUISETACEAE

*Equisetum hyemale* L. - (Maier 1976)

### ONOCLEACEAE

*Onoclea sensibilis* L. - (Maier 1976)

### OPHIOGLOSSACEAE

*Botrychium dissectum* Spreng. - (Maier 1976)

*Botrychium virginianum* (L.) Sw. - P37147

### OSMUNDACEAE

*Osmunda claytoniana* L. - B1839

### THELYPTERIDACEAE

*Thelypteris palustris* Schott - B1838

## GYMNASPERMAE

### CUPRESSACEAE

*Juniperus virginiana* L. - P36479

### PINACEAE

\**Pinus banksiana* Lamb. - M2673

\**Pinus densiflora* Siebold & Zuccarini - (Maier 1976)

\**Pinus echinata* Mill. - M3160

\**Pinus resinosa* Ait. - P37183

\**Pinus rigida* Mill. - M2645

\**Pinus strobus* L. - P37175

\**Pinus sylvestris* L. - P36481

\**Pinus thunbergii* Parlato - (Maier 1976)

\**Pinus virginiana* Mill. - (Maier 1976)

\**Pseudotsuga menziesii* (Mirbel) Franco - (Maier 1976)

### TAXODIACEAE

\**Taxodium distichum* (L.) Rich. - B1844

## ANGIOSPERMAE - DICOTYLEDONAE

### ACANTHACEAE

*Ruellia humilis* Nutt. - F2719

### ACERACEAE

*Acer negundo* L. - B1630

*Acer saccharinum* L. - M2674

*Acer saccharum* Marsh. - M2822

### AMARANTHACEAE

*Amaranthus albus* L. - B2088

\**Amaranthus hybridus* L. - (Maier 1976)

*Froelichia floridana* (Nutt.) Moq. - M2629

*Froelichia gracilis* (Hook.) Moq. - M2803

### ANACARDIACEAE

*Rhus aromatica* Ait. - P36767

*Rhus glabra* L. - F2803

*Rhus hirta* L. - B1845

*Toxicodendron radicans* (L.) Kuntze - P37138

### APIACEAE

*Cryptotaenia canadensis* (L.) DC - (Maier 1976)

\**Daucus carota* L. - M2871

*Osmorhiza longistylis* (Torr.) DC. var. *villicaulis* Fern. - B1699

\**Pastinaca sativa* L. - (Maier 1976)

*Sanicula canadensis* L. - M2655

### APOCYNACEAE

*Apocynum cannabinum* L. - P37161

### ASCLEPIADACEAE

*Ampelamus albidus* (Nutt.) Britt. - (Maier 1976)

*Asclepias amplexicaulis* Small - P36766

*Asclepias hirtella* (Pennell) Woodson - P36956

*Asclepias incarnata* L. - (Maier 1976)

*Asclepias syriaca* L. - F2806

*Asclepias tuberosa* L. - F2790

*Asclepias verticillata* L. - B2112

*Asclepias viridiflora* Raf. - (Maier 1976)

### ASTERACEAE

\**Achillea millefolium* L. - B1856

*Ageratina altissima* (L.) R. M. King & H. Rob. - M2659

*Ambrosia artemisiifolia* L. - P37121

*Ambrosia psilostachya* DC. - P37172

*Ambrosia trifida* L. - P37123

*Antennaria neglecta* Greene - (Maier 1976)

*Antennaria parlinii* Fern. ssp. *fallax* (Greene) Bayer & Stebbins - B1664

\**Arctium minus* Schk. - M3167

*Arnoglossum atriplicifolium* (L.) H. Rob. - P37143

*Artemisia campestris* L. - (Maier 1976)

*Aster ericoides* L. - M2866

*Aster lanceolatus* Willd. - B2117

*Aster lateriflorus* (L.) Britt. - B2117

*Aster oblongifolius* Nutt. - E28250

*Aster ontarionis* Wieg. - (Maier 1976)

*Aster oolentangiensis* Riddell - M2853

*Aster pilosus* Willd. - M2819

*Aster sagittifolius* Willd. - (Maier 1976)

*Bidens bipinnata* L. - M2675

*Bidens frondosa* L. - B2095

*Brickellia eupatorioides* (L.) Shinnars - M2835

\**Carduus nutans* L. - (Maier 1976)

*Chrysopsis camporum* Greene - F2780

*Cirsium altissimum* (L.) Spreng. - M2867

*Cirsium discolor* (Muhl.) Spreng. - P37140

\**Cirsium vulgare* (Savi) Tenore - (Maier 1976)

*Conyza canadensis* (L.) Cronq. - M2832

*Coreopsis lanceolata* L. - B1722

*Coreopsis palmata* Nutt. - Bouseman s.n.

*Erechtites hieracifolia* (L.) Raf. - P37160

*Erigeron annuus* (L.) Pers. - (Maier 1976)

*Erigeron strigosus* Muhl. - F2778

*Eupatoriadelphus purpureus* (L.) R.M. King & H. Rob. - M2870

*Eupatorium altissimum* L. - M2868

*Eupatorium perfoliatum* L. - (Maier 1976)

*Eupatorium serotinum* Michx. - P37139

*Euthamia graminifolia* (L.) Nutt. - (Maier 1976)

\**Helianthus annuus* L. - (Maier 1976)

- Helianthus divaricatus* L. – (Maier 1976)  
*Helianthus hirsutus* Raf. - M2658  
*Helianthus occidentalis* Riddell - M2852  
*Helianthus pauciflorus* Nutt. – (Maier 1976)  
\**Helianthus petiolaris* Nutt. - M2631  
*Helianthus strumosus* L. - M2795  
*Helianthus tuberosus* L. - M2872  
*Heliopsis helianthoides* (L.) Sweet – (Maier 1976)  
*Hieracium longipilum* Torr. – (Maier 1976)  
*Hieracium scabrum* Michx. - P37124  
*Ionactis linariifolius* (L.) Greene – (Maier 1976)  
*Krigia virginica* (L.) Willd. - B1667  
*Lactuca canadensis* L. - M2842  
*Lactuca floridana* (L.) Gaertn. - P37142  
\**Lactuca serriola* L. - (Maier 1976)  
\**Leucanthemum vulgare* Lam. - (Maier 1976)  
*Liatis aspera* Michx. – (Maier 1976)  
\**Matricaria discoidea* DC. - B1828  
*Pseudognaphalium obtusifolium* (L.) Hilliard & Burt. - M2837  
*Ratibida pinnata* (Vent.) Barnh. - M2858  
*Rudbeckia hirta* L. - F2787  
*Senecio plattensis* Nutt. - P36749  
*Solidago altissima* L. - B2090  
*Solidago canadensis* L. - M2863  
*Solidago gigantea* Ait. - (Maier 1976)  
*Solidago juncea* Ait. – (Maier 1976)  
*Solidago nemoralis* Ait. - M2833  
*Solidago speciosa* Nutt. - Maier (1976)  
*Solidago ulmifolia* Muhl. - M2864  
\**Taraxacum officinale* Weber - B1633  
\**Tragapogon dubius* Scop. - B1723  
\**Tragapogon pratensis* L. - (Maier 1976)  
*Vernonia missurica* Raf. – (Maier 1976)  
*Xanthium strumarium* L. – (Maier 1976)  
**BERBERIDACEAE**  
*Podophyllum peltatum* L. – (Maier 1976)  
**BETULACEAE**  
\**Alnus glutinosa* (L.) Gaertn. – (Maier 1976)  
*Betula nigra* L. - B1840  
**BIGNONIACEAE**  
*Campsis radicans* (L.) Seem. - (Maier 1976)  
\**Catalpa speciosa* Warder - P37135  
**BORAGINACEAE**  
\**Buglossoides arvensis* (L.) I. M. Johnston; - B1693  
\**Cynoglossum officinale* L. – (Maier 1976)  
*Hackelia virginiana* (L.) I. M. Johnston - M2653  
*Lithospermum canescens* (Michx.) Lehm. - B1660  
*Lithospermum croceum* Fern. - P36740  
*Lithospermum incisum* Lehm. – (Maier 1976)  
*Mertensia virginica* (L.) Pers. - (Maier 1976)  
*Myosotis verna* Nutt. - B1736  
**BRASSICACEAE**  
\**Alliaria petiolata* (Bieb.) Cavara & Grande - B1676  
\**Arabis thaliana* (L.) Heynh. - B1726  
*Arabis canadensis* L. - P36747  
*Arabis glabra* (L.) Bernh. - B1694  
\**Barbarea vulgaris* R. Br. - M3174  
\**Brassica nigra* (L.) Koch - (Maier 1976)  
\**Capsella bursa-pastoris* (L.) Medic. - B1666  
*Descurainia pinnata* (Walt.) Britt. – (Maier 1976)  
*Draba reptans* (Lam.) Fern. - B1628  
*Erysimum capitatum* (Dougl.) Greene - B1665  
\**Hesperis matronalis* L. - (Maier 1976)  
\**Lepidium campestre* (L.) R. Br. - (Maier 1976)  
\**Lepidium densiflorum* Schrad. - P36746  
*Lepidium virginicum* L. - B1730  
*Lesquerella ludoviciana* (Nutt.) S. Wats. - E27791  
*Rorippa palustris* (L.) Besser var. *fernaldiana* (Butters & Abbe) Stuckey - P37155  
*Rorippa sessiliflora* (Nutt.) A. Hitchc. - B1830  
\**Sisymbrium altissimum* L. – (Maier 1976)  
\**Sisymbrium loeselii* L. - M3171  
\**Sisymbrium officinale* (L.) Scop. - (Maier 1976)  
\**Thlaspi arvense* L. - M3175  
**CACTACEAE**  
*Opuntia humifusa* (Raf.) Raf. - P36755  
**CAESALPINIACEAE**  
*Cercis canadensis* L. - (Maier 1976)  
*Chamaecrista fasciculata* (Michx.) Greene - M2663  
*Gleditsia triacanthos* L. - (Maier 1976)  
*Gymnocladus dioica* (L.) K. Koch - M2625  
*Senna marilandica* (L.) Link – (Maier 1976)  
**CALLITRICHACEAE**  
*Callitriche heterophylla* Pursh - M3180  
**CAMPANULACEAE**  
*Campanulastrum americanum* (L.) Small - M2687  
*Triodanis perfoliata* (L.) Nieuwl. - B1834  
**CANNABINACEAE**  
\**Cannabis sativa* L. - Robertson 1301  
**CAPPARACEAE**  
*Polanisia dodecandra* (L.) DC. - M2635  
**CAPRIFOLIACEAE**  
\**Lonicera x bella* Zabel - P37129  
\**Lonicera maackii* (Rupr.) Maxim. - B1690  
\**Lonicera morrowii* Gray - B1659  
*Sambucus canadensis* L. - P37130  
*Symphoricarpos orbiculatus* Moench – (Maier 1976)  
\**Viburnum opulus* L. - M2799  
*Viburnum recognitum* Fern. - M2800  
**CARYOPHYLLACEAE**  
\**Arenaria serpyllifolia* L. - B1682  
\**Cerastium fontanum* Baum. – (Maier 1976)  
\**Cerastium semidecandrum* L. - B1683  
\**Dianthus armeria* L. - M2620  
\**Holosteum umbellatum* L. - B1625  
*Paronychia canadensis* (L.) Wood - M2652  
*Paronychia fastigiata* (Raf.) Fern. - M2855a  
\**Saponaria officinalis* L. - F2813  
*Silene antirrhina* L. - B1829  
\**Silene pratensis* (Spreng.) Gordon & Gren. - B1837  
*Silene stellata* (L.) Ait. f. - M2654  
\**Stellaria media* (L.) Cyrillo - B1717  
**CELASTRACEAE**  
*Celastrus scandens* L. - B1708  
*Euonymus atropurpureus* Jacq. – (Maier 1976)  
**CERATOPHYLLACEAE**  
*Ceratophyllum demersum* L. - B2106  
**CHENOPODIACEAE**  
\**Chenopodium album* L. - Koelling 649  
\**Chenopodium ambrosioides* L. - (Maier 1976)  
*Chenopodium standleyanum* Aellen - M2665  
*Cycloloma atriplicifolium* (Spreng.) Coult. - M2632  
\**Kochia scoparia* (L.) Roth - (Maier 1976)  
\**Salsola tragus* L. - E28134  
**CISTACEAE**  
*Helianthemum bicknellii* Fern. - M3158  
*Helianthemum canadense* (L.) Michx. - B1737  
*Lechea tenuifolia* Michx. – (Maier 1976)  
**CONVOLVULACEAE**  
\**Ipomoea hederacea* (L.) Jacq. - M2621  
*Ipomoea lacunosa* L. - (Maier 1976)  
**CORNACEAE**  
*Cornus drummondii* C.A. Mey. - P36790  
*Cornus florida* L. – (Maier 1976)  
*Cornus obliqua* Raf. - M2798  
*Cornus racemosa* Lam. - B1826  
**CORYLACEAE**  
*Corylus americana* Walt. - P37153  
**CUCURBITACEAE**  
*Sicyos angulatus* L. – (Maier 1976)  
**CUSCUTACEAE**  
*Cuscuta cuspidata* Engelm. - (Maier 1976)  
**EBENACEAE**  
*Diospyros virginiana* L. - M2824  
**ELAEAGNACEAE**  
\**Elaeagnus umbellata* Thunb. - B1669  
**EUPHORBACEAE**  
*Acalypha rhomboidea* Raf. - (Maier 1976)  
*Acalypha virginica* L. - M2820  
*Chamaesyce geyeri* (Engelm.) Small - Hill 28809  
*Chamaesyce maculata* (L.) Small - B2086

*Chamaesyce nutans* (Lag.) Small - B2089

*Croton glandulosus* L. - F2800

*Crotonopsis linearis* Michx. - M2626

*Euphorbia corollata* L. - F2786

\**Euphorbia marginata* Pursh - (Maier 1976)

*Poinsettia dentata* (Michx.) Kl. & Garcke - P37165

#### FABACEAE

*Amorpha canescens* Pursh - M2804

*Amorpha fruticosa* L. - F2789

*Amphicarpaea bracteata* (L.) Fern. - M2857

*Apios americana* Medic. - M3161

*Astragalus distortus* Torr. & Gray - (Maier 1976)

*Baptisia bracteata* Ell. - M3191

*Crotalaria sagittalis* L. - Chase 18444

*Dalea candida* (Michx.) Willd. - (Maier 1976)

*Dalea purpurea* Vent. - (Maier 1976)

*Desmodium glutinosum* (Muhl.) A. Wood - M2657

*Desmodium illinoense* Gray - M2642

*Desmodium paniculatum* (L.) DC. - M2818

*Desmodium sessilifolium* (Torr.) Torr. & Gray - M2851

\**Glycine max* (L.) Merr. - (Maier 1976)

\**Kummerowia stipulacea* (Maxim.) Makino - P37168

*Lespedeza capitata* Michx. - P37179

\**Lespedeza cuneata* (Dum.-Cours.) G. Don - B2115

\**Medicago lupulina* L. - B1684

\**Medicago sativa* L. - P37154

\**Melilotus albus* Medic. - F2815

\**Melilotus officinalis* (L.) Pallas - F2814

\**Robinia pseudoacacia* L. - B1733

\**Securigera varia* (L.) Lassen - (Maier 1976)

*Strophostyles helvula* (L.) Ell. - M2634

*Strophostyles leiosperma* (Torr. & Gray) Piper - M2843

*Tephrosia virginiana* (L.) Pers. - M2841

\**Trifolium hybridum* L. - (Maier 1976)

\**Trifolium pratense* L. - M3172

\**Trifolium repens* L. - M3169

\**Vicia villosa* Roth - B1729

\**Vigna unguiculata* (L.) Walp. - Steyermark 68854

#### FAGACEAE

*Quercus x bushii* Sarg. - E28112

*Quercus marilandica* Muench. - M2667

*Quercus velutina* Lam. - P37171

#### FUMARIACEAE

*Corydalis micrantha* (Engelm.) Gray - B1678

*Dicentra cucullaria* (L.) Bernh. - F2528

#### GERANIACEAE

*Geranium carolinianum* L. - P36792

#### GROSSULARIACEAE

*Ribes missouriense* Nutt. - P36482

\**Ribes odoratum* Wendl. f. - (Maier 1976)

#### HAMAMELIDACEAE

\**Liquidambar styraciflua* L. - B2116

#### HYDROPHYLLACEAE

*Ellisia nyctelea* L. - B1680

#### HYPERICACEAE

*Hypericum gentianoides* (L.) BSP - (Maier 1976)

*Hypericum mutilum* L. - B2102

\**Hypericum perforatum* L. - B1855

*Hypericum punctatum* Lam. - M2650

*Hypericum sphaerocarpum* Michx. - Cull s.n.

#### JUGLANDACEAE

*Carya ovalis* (Wangenh.) Sarg. - B2114

*Carya texana* Buckl. - B1850

*Carya tomentosa* (Poir.) Nutt. - F2820

*Juglans nigra* L. - B1721

#### LAMIACEAE

*Agastache nepetoides* (L.) Ktze. - M2671

*Hedeoma hispida* Pursh - (Maier 1976)

*Hedeoma pulegioides* (L.) Pers. - Maison s.n.

\**Lamium amplexicaule* L. - M3170

\**Leonurus cardiaca* L. - M2874

*Lycopus americanus* Muhl. - B2094

*Lycopus virginicus* L. - B2101

*Monarda fistulosa* L. - (Maier 1976)

*Monarda punctata* L. - F2797

\**Nepeta cataria* L. - (Maier 1976)

*Physoctegia virginiana* (L.) Benth. - E30369

*Prunella vulgaris* L. - (Maier 1976)

*Pycnanthemum pilosum* Nutt. - (Maier 1976)

*Scutellaria lateriflora* L. - B2092

*Scutellaria leonardii* Epling - M3156

*Stachys tenuifolia* Willd. - Cull s.n.

*Teucrium canadense* L. - P37177

#### LAURACEAE

*Sassafras albidum* (Nutt.) Nees - M2670

#### LYTHRACEAE

*Rotala ramosior* (L.) Koehne - B2099

#### MAGNOLIACEAE

*Liriodendron tulipifera* L. - B2116

#### MALVACEAE

*Callirhoe triangulata* (Leavenw.) A. Gray - M2641

\**Sida spinosa* L. - P37125

#### MELASTOMACEAE

*Rhexia virginica* L. - M2646

#### MENISPERMACEAE

*Menispermum canadense* L. - P37137

#### MOLLUGINACEAE

\**Mollugo verticillata* L. - P36765

#### MORACEAE

\**Maclura pomifera* (Raf.) Schneider - M2876

\**Morus alba* L. - B1711

*Morus rubra* L. - (Maier 1976)

\**Morus tatarica* L. - P36789

#### NYCTAGINACEAE

\**Mirabilis nyctaginea* (Michx.) MacM. - B1727

#### OLEACEAE

\**Syringa vulgaris* L. - B1670

#### ONAGRACEAE

*Circaea lutetiana* L. - P37146

*Gaura biennis* L. - M2617

*Ludwigia alternifolia* L. - M2647

*Ludwigia palustris* (L.) Elliott - B2098

*Oenothera biennis* L. - P37122

*Oenothera clelandii* W. Dietr., Raven, & W.L. Wagner - P36957

*Oenothera laciniata* Hill - M2633

#### OXALIDACEAE

*Oxalis fontana* Bunge - M2862

*Oxalis stricta* L. - B1718

*Oxalis violacea* L. - P36754

#### PHRYMACEAE

*Phryma leptostachya* L. - M2656

#### PHYTOLACCACEAE

*Phytolacca americana* L. - M2618

#### PLANTAGINACEAE

*Plantago aristata* Michx. - M2813

\**Plantago lanceolata* L. - M3173

\**Plantago patagonica* Jacq. - P36751

*Plantago rugelii* Decne. - M2619

*Plantago virginica* L. - B1687

#### PLATANACEAE

*Platanus occidentalis* L. - M2875

#### POLEMONIACEAE

*Phlox bifida* Beck - P36484

#### POLYGALACEAE

*Polygala polygama* Walt. - (Maier 1976)

*Polygala sanguinea* L. - M2649

#### POLYGONACEAE

*Antenoron virginianum* (L.) Roberty & Vautier - P37145

\**Fagopyrum esculentum* Moench - (Maier 1976)

\**Fallopia convolvulus* (L.) A. Love - P37252

*Fallopia cristata* (Engelm. & Gray) Holub - M2640

*Fallopia scandens* (L.) Holub - M2873

*Persicaria amphibia* (L.) S.F. Gray - (Maier 1976)

\**Persicaria cespitosa* (Blume) Nakai - P37131

*Persicaria coccinea* (Muhl.) Greene - (Maier 1976)

*Persicaria hydropiperoides* (Michx.) Small - B2105

*Persicaria pensylvanica* (L.) Small - P37134

*Persicaria punctata* (Ell.) Small - P37132

*Polygonella articulata* (L.) Meisn. - Hill 28805

\**Polygonum aviculare* L. - (Maier 1976)

*Polygonum tenue* Michx. - M2827

\**Rumex acetosella* L. - B1734

\**Rumex crispus* L. - F2819

*Tracaulon sagittatum* (L.) Small - (Maier 1976)

#### PORTULACACEAE

*Claytonia virginica* L. - B1698

\**Portulacca oleracea* L. - B2085

*Talinum rugospermum* Holz. - P36764

#### PRIMULACEAE

*Androsace occidentalis* Pursh - B1627

*Lysimachia lanceolata* Walt. - F2810

#### RANUNCULACEAE

*Anemone caroliniana* Walt. - (Maier 1976)

*Anemone cylindrica* Gray - M3189

*Anemone virginiana* L. - M2854

*Aquilegia canadensis* L. - B1661

*Ranunculus abortivus* L. - B1688

#### RHAMNACEAE

*Ceanothus americanus* L. - B1862

\**Rhamnus cathartica* L. - B2113

#### ROSACEAE

*Agrimonia gryposepala* Wallr. - P37148

*Agrimonia parviflora* Sol. - B2103

*Agrimonia pubescens* Wallr. - P37150

*Fragaria virginiana* Duchesne - B1663

*Geum canadense* Jacq. - P36778

*Malus ioensis* (Wood) Britt. - B1841

\**Potentilla norvegica* L. - M3186

\**Potentilla recta* L. - B1857

*Potentilla simplex* Michx. - B1701

*Prunus americana* Marsh. - (Maier 1976)

*Prunus hortulana* Bailey - B1629

\**Prunus persica* (L.) Batsch - (Maier 1976)

*Prunus serotina* Ehrh. - B1685

*Prunus virginiana* L. - B1636

\**Pyrus communis* L. - (Maier 1976)

*Rosa carolina* L. - P36786

\**Rosa multiflora* Thunb. - M2805

*Rosa palustris* Marshall - F2808

*Rubus allegheniensis* Porter - B1706

*Rubus flagellaris* Willd. - (Maier 1976)

*Rubus hispidus* L. - B1705

*Rubus occidentalis* L. - B1689

*Rubus pensilvanicus* Poir. - M3163

#### RUBIACEAE

*Cephalanthus occidentalis* L. - (Maier 1976)

*Diodia teres* Walt. - M2636

*Galium aparine* L. - B1686

*Galium circaezans* Michx. - F2807

\**Galium pedemontanum* (Bellardi) All. - B1858

*Galium pilosum* Ait. - M2651

#### RUTACEAE

*Ptelea trifoliata* L. - B1728

*Zanthoxylum americanum* Mill. - B1631

#### SALICACEAE

*Populus deltoides* Marsh. - B1732

*Salix amygdaloides* Anderss. - B1731

*Salix eriocephala* Michx. - (Maier 1976)

*Salix humilis* Marsh. var. *microphylla* (Anderss.) Fern. - B1632

*Salix interior* Rowlee - Voegtlin 82-69

*Salix nigra* Marsh. - B2107

#### SANTALACEAE

*Comandra umbellata* (L.) Nutt. - M2669

#### SCROPHULARIACEAE

*Aureolaria grandiflora* (Benth.) Pennell - (Maier 1976)

\**Linaria genistifolia* (L.) Mill. - (Maier 1976)

*Lindernia anagallidea* (Michx.) Pennell - M2678

*Nuttallanthus canadensis* (L.) D. Sutton - B1668

*Penstemon pallidus* Small - P36748

*Scrophularia lanceolata* Pursh - B1696

\**Verbascum thapsus* L. - M3166

\**Veronica arvensis* L. - B1671

*Veronica peregrina* L. var. *xalapensis* (HBK) St. John - B1836

#### SOLANACEAE

\**Datura stramonium* L. - (Maier 1976)

*Physalis heterophylla* Nees - F2795

*Physalis virginiana* Mill. - B1827

*Solanum carolinense* L. - P36791

\**Solanum dulcamara* L. - M3177

*Solanum ptychanthum* Dunal - P36787

#### TILIACEAE

*Tilia americana* L. - M3165

#### ULMACEAE

*Celtis occidentalis* L. - B1635

*Ulmus americana* L. - M2672

*Ulmus rubra* Muhl. - M2794

#### URTICACEAE

*Boehmeria cylindrica* (L.) Sw. - B2110

*Parietaria pensylvanica* Muhl. - P36745

#### VERBENACEAE

*Phyla lanceolata* (Michx.) Greene - (Maier 1976)

*Verbena hastata* L. - Cull s.n.

*Verbena stricta* Vent. - F2816

*Verbena urticifolia* L. - M2690

#### VIOLACEAE

*Viola fimbriatula* Smith - (Maier 1976)

*Viola lanceolata* L. - B1843

*Viola palmata* L. - M2856

*Viola pedata* L. - P36753

*Viola pratensis* Greene - B1702

\**Viola rafinesquei* Greene - B1626

*Viola sagittata* L. - B1842

#### VITACEAE

*Parthenocissus quinquefolia* (L.) Planch. - M2796

*Vitis aestivalis* Michx. - (Maier 1976)

*Vitis riparia* L. - B1714

*Vitis vulpina* L. - M2861

#### ZYGOPHYLLACEAE

\**Tribulus terrestris* L. - P36794

#### ANGIOSPERMAE – MONOCOTYLEDONAE

#### COMMELINACEAE

*Commelina erecta* L. - F2781

*Tradescantia ohiensis* Raf. - P3675

#### CYPERACEAE

*Bulbostylis capillaris* (L.) C. B. Clarke - P36952

*Carex albicans* Willd. - M3183

*Carex blanda* Dewey - B1709

*Carex brevior* (Dewey) Mack. - B1849

*Carex cephalophora* Muhl. - B1821

*Carex davisii* Schwein. & Torr. - (Maier 1976)

*Carex festucacea* Schk. - B1823

*Carex grayi* Carey - M3176

*Carex meadii* Dewey - M3190

*Carex muhlenbergii* Schk. - P36736

*Carex pellita* Willd. - (Maier 1976)

*Carex pensylvanica* Lam. - B1713

*Carex rosea* Schk. - B1719

*Carex scoparia* Schkuhr - M3181

*Carex tonsa* (Fern.) Bickn. - B1677

*Carex vulpinoidea* Michx. - M3184

*Cyperus erythrorhizos* Muhl. - (Maier 1976)

*Cyperus esculentus* L. - (Maier 1976)

*Cyperus grayoides* Mohlenbr. - M2684

*Cyperus lupulinus* (Spreng.) Marcks - F2784

*Cyperus schweinitzii* Torr. - F2794

*Cyperus strigosus* L. - B2100

*Eleocharis acicularis* (L.) Roem. & Schultes - (Maier 1976)

*Eleocharis erythropoda* Steud. - P36955

*Eleocharis ovata* (Roth) Roem. & Schultes - P36953

*Fimbristylis autumnalis* (L.) Roem. & Schultes - B2096

*Hemicarpha micrantha* (Vahl) Pax - (Maier 1976)

*Schoenoplectus pungens* (Vahl) Palla - B2093

#### DIOSCOREACEAE

*Dioscorea villosa* L. - M3187

#### IRIDACEAE

\**Iris x germanica* L. - (Maier 1976)

*Sisyrinchium campestre* Bickn. - (Maier 1976)

#### JUNCACEAE

*Juncus acuminatus* Michx. - P36951

*Juncus interior* Wieg. - P36763

*Juncus tenuis* Willd. - M2821

#### LEMNACEAE

*Lemna minor* L. - B2111

*Spirodela polyrhiza* (L.) Schleiden - (Maier 1976)

*Wolffia brasiliensis* Weddell - B2109

#### LILIACEAE

\**Allium vineale* L. - B1835

\**Asparagus officinalis* L. - (Maier 1976)

*Polygonatum commutatum* (Schult.) A. Dietr. - B1700

*Smilacina racemosa* (L.) Desf. - B1703

*Smilacina stellata* (L.) Desf. - E28323

#### ORCHIDACEAE

*Cypripedium pubescens* Willd. - B1825

*Spiranthes cernua* (L.) Rich. - (Maier 1976)

#### POACEAE

*Agrostis gigantea* Roth - (Maier 1976)

*Agrostis hyemalis* (Walt.) BSP - B1831

*Andropogon gerardii* Vitman - M2638

*Andropogon virginicus* L. - (Maier 1976)

*Aristida desmantha* Trin. & Rupr. - M2811

*Aristida purpurascens* Poir. - (Maier 1976)

*Aristida tuberculosa* Nutt. - M2848

\**Avena sativa* L. - (Maier 1976)

*Bouteloua curtipendula* (Michx.) Torr. - M2826

*Bouteloua hirsuta* Lag. - M2660

*Bromus ciliatus* L. - (Maier 1976)

\**Bromus inermis* Leyss. - P37163

\**Bromus japonicus* Thunb. - (Maier 1976)

\**Bromus racemosus* L. - F2817

\**Bromus tectorum* L. - B1662

*Buchloe dactyloides* (Nutt.) Engelm. - M2808

*Calamovilfa longifolia* (Hook.) Scribn. - M2685

*Cenchrus longispinus* (Hack.) Fern. - M2676

*Cinna arundinacea* L. - M2859

\**Dactylis glomerata* L. - B1720

*Danthonia spicata* (L.) Roem. & Schultes - B1853

*Dichanthelium acuminatum* (Sw.) Gould & Clark var. *implicatum* (Scribn.) Gould & Clark - M2825

*Dichanthelium depauperatum* (Muhl.) Gould - B1735

*Dichanthelium oligoanthes* (Schult.) Gould - B1725

*Dichanthelium perlongum* (Nash) Freckm. - P36735

*Dichanthelium praecocius* (Hitchc. & Chase) Mohlenbr. - (Maier 1976)

*Dichanthelium villosissimum* (Nash) Freckm. - P36739

\**Digitaria ciliaris* (Retz.) Koeler - P37159

*Digitaria filiformis* (L.) Koeler - M2869

\**Digitaria ischaemum* (Schreb.) Schreb. - M2806

\**Digitaria sanguinalis* (L.) Scop. - (Maier 1976)

\**Echinochloa crus-galli* (L.) P. Beauv. - P36954

*Echinochloa muricata* (Michx.) Fern. var. *wiegandii* (Fassett) Mohlenbr. - P37157

\**Eleusine indica* (L.) Gaertn. - B2082

*Elymus canadensis* L. - M2688

*Elymus hystrix* L. - M2816

\**Elytrigia repens* (L.) Desvaux - (Maier 1976)

\**Eragrostis cilianensis* (All.) Vign. - M2810

*Eragrostis hypnoides* (Lam.) BSP - (Maier 1976)

*Eragrostis pectinacea* (Michx.) Nees - B2084

*Eragrostis spectabilis* (Pursh) Steud. - M2839

*Eragrostis trichodes* (Nutt.) Wood - M2845

\**Festuca arundinacea* Schreb. - M3168

*Heterostipa spartea* (Trin.) Barkworth - B1724

*Hordeum pusillum* Nutt. - B1681

*Koeleria macrantha* (Ledeb.) Spreng.- (Maier 1976)

*Leersia oryzoides* (L.) Swartz - B2091

*Leersia virginica* Willd. - P37152

*Leptoloma cognatum* (Schult.) Chase - M2683

*Muhlenbergia frondosa* (Poir.) Fern. - (Maier 1976)

*Muhlenbergia racemosa* (Michx.) BSP - (Maier 1976)

*Muhlenbergia schreberi* J. F. Gmel. - P37127

*Panicum capillare* L. - B2083

*Panicum dichotomiflorum* Michx. - P37158

*Panicum virgatum* L. - M2639

*Paspalum bushii* Nash - M2630

*Paspalum setaceum* Michx. - (Maier 1976)

\**Phalaris arundinacea* L. - M3185

\**Phleum pratense* L. - F2818

\**Poa annua* L. - B1715

\**Poa compressa* L. - M2815

\**Poa nemoralis* L. - B1695

\**Poa pratensis* L. - F2799

*Poa sylvestris* Gray - (Maier 1976)

*Schizachyrium scoparium* (Michx.) Nash - M2829

\**Setaria faberi* R.A.W. Herrm. (Maier 1976)

\**Setaria glauca* (L.) P. Beauv. - M2809

\**Setaria viridis* (L.) P. Beauv. - B2087

*Sorghastrum nutans* (L.) Nash - M2834

*Sphenopholis obtusata* (Michx.) Scribn. - B1863

*Sporobolus clandestinus* (Biehler) Hitchc. - M2838

*Sporobolus cryptandrus* (Torr.) Gray - M2802

*Sporobolus vaginiflorus* (Torr.) A. Wood - (Maier 1976)

*Tridens flavus* (L.) Hitchc. - M2623

*Triplasis purpurea* (Walt.) Chapm. - M2847

\**Triticum aestivum* L. - (Maier 1976)

*Vulpia octoflora* (Walt.) Rydb. - P36751

\**Zea mays* L. - (Maier 1976)

#### POTAMOGETONACEAE

\**Potamogeton crispus* L. - M3179

*Potamogeton diversifolius* Raf. - (Maier 1976)

#### SMILACACEAE

*Smilax lasioneuron* Hook. - P37149

*Smilax tamnoides* L. - B1704

#### TYPHACEAE

*Typha angustifolia* L. - B2097

#### XYRIDACEAE

*Xyris torta* Sm. - M2648