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The Illinois Native Plant Society is dedicated to the preservation, conservation, and study of the native plants and vegetation of Illinois.

COVER ILLUSTRATION

Drawing of *Corylus americana*, hazelnut, by Caleb Shelby.

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Illinois Native Plant Society
P.O. Box 3341
Springfield, Illinois 62708
e-mail: ilnps@aol.com

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About Our Authors

Paul Bollinger is the Chief Environmental Scientist at Bollinger, Lach & Associates. Paul obtained his M.S. degree in biology with an emphasis in botany from Northern Michigan University. He is responsible for all ecology related projects, which include plant community mapping, vegetative inventories, wetland delineations and mitigation, restoration plans, endangered/threatened species searches and tree surveys for public and private organizations.

Dan Busemeyer is currently an Environmental Planner with Ghostpine Environmental Services Ltd. in Calgary, Alberta. His primary duties include writing environmental conservation and reclamation reports for pipelines, wellsites and access roads and ensuring legislative compliance with regard to various environmental issues relating to oil and natural gas development. He earned an M.S. in Biological Sciences from the University of Cincinnati and a B.S. in Anthropology from the University of Chicago.

Ken Dritz is a computer scientist at Argonne National Laboratory. Well known locally, he is responsible for numerous additions to the Chicago flora over more than 35 years. Ken is also an occasional instructor at the Morton Arboretum, where he has taught hordes of prairie managers how to identify sedges.

John E. Ebinger is emeritus professor of botany at Eastern Illinois University. His research focuses on the structure and composition of forest, glade, and sand prairie communities in Illinois as well as the tropical genus *Acacia*.

James Ellis works as a field botanist for the Critical Trends Assessment Program at the Illinois Natural History Survey. He earned a B.S. in ecology from the University of Illinois and an M.S. in natural resource ecology and management from the University of Michigan.

Mary Ann Feist is a wetland botanist at the Illinois Natural History Survey. She conducts wetland determinations and wetland monitoring for the Illinois Department of Transportation. She is also a graduate student at the University of Illinois in the Department of Plant Biology where she is studying the systematics of *Ptilimnium* and *Oxypolis* from the Apiaceae family.

Don Gardner is a retired dentist with a long interest in agriculture and in prairie restoration. His paper in this issue is a follow-up to papers that appeared in *Erigenia* in 1995 concerning restoration of the same area.

Vincent Gutowski is a professor of geography at Eastern Illinois University, where he has taught for 23 years. He earned his Ph.D. at the University of Pittsburgh. His specialties include geomorphology, field methods, environmental studies, cartography and applied geography.

Ken Johnson works as a restoration ecologist for Conservation Design Forum in Elmhurst, Illinois, and also works part time for Campton Township in Kane County. Most of his professional work involves conducting botanical inventories, vegetation monitoring, and preparing restoration management plans.

Sean Jones holds a B.S. in biology from the University of Central Oklahoma and an M.S. from Eastern Illinois University. His interests include mycology, forest and prairie succession and ectomychorrizal relationships.

Richard L. Larimore is a wetland ecologist with the Illinois Natural History Survey. He is interested in fire ecology, particularly as fire relates to species composition in woodlands.

Paul B. Marcum is an associate research scientist with the Illinois Natural History Survey. His primary duties include conducting wetland delineations, monitoring restored wetlands and performing site assessments for potential wetland restorations. He earned a B.S. in Natural Sciences from Shawnee State

University in Portsmouth, Ohio, and a M.S. in Biological Sciences from Marshall University in Huntington, West Virginia.

April McDonnell is currently a master of science candidate in the Department of Biological Sciences, Eastern Illinois University. Her graduate work focused on the Illinois state endangered plant species *Hiamma remota*. She conducted field work and physiological research on the reproductive biology of this species.

Henry R. Owen is a botany professor at Eastern Illinois University, teaching a wide range of courses for majors, non-majors and M.S. students. His research areas include plant physiology, genetics and tissue culture. He is also the national president of Phi Sigma, the biological sciences honor society.

Loy R. Phillippe is the collections manager for the vascular plants and fungi at the Illinois Natural History Survey. His primary duties include herbarium computerization, specimens collection and preparation and the daily operations of the herbarium. Loy earned a B.S. and M.S. in botany from Eastern Illinois University and a Ph.D. in plant taxonomy from the University of Tennessee.

Robert Van Lonkhuyzen is an ecologist at Argonne National Laboratory where he is primarily involved in the assessment of impacts to wetlands, threatened and endangered species, and terrestrial communities, and the development of impact mitigation. He also conducts biological surveys and develops habitat restoration and management plans.

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Continuing Vegetation Analyses of a Prairie Restoration in Ford County, Illinois

Don Gardner[1]

Abstract: Prairie restoration work started in 1974 on a former permanent pasture in northern Ford County, Illinois. In 1993, a vegetation analysis of the site and of an included unrestored control area was conducted using point-intercept technique. Frequency and density data were collected and importance value (IV) assigned to individual species. In 1998 and 2004, the analysis was repeated. This paper reports the results from those two more recent surveys with data from both the restoration and the control area. Comparisons illustrate population dynamics on an evolving prairie over the twelve-year period of the study. Native species encountered on the restoration increased from 66.2% (1993) to 71.6% (1998) to 75.8% (2004). *Andropogon gerardii* held the highest IV rank in all sampling years. There were increases in absolute numbers and IV of some conservative species including *Sporobolus heterolepis, Dodecatheon meadia, Dalea candida,* and *D. purpurea*. There were decreases in some exotic species including *Daucus carota, Achillea millefolium,* and *Phleum pratense*. However, other aliens such as *Trifolium pratense, Melilotus* spp. and *Bromus inermis* maintained or increased their numbers. On the control area, the percentage of native species encountered rose from 48.5% (1993) to 58.6% (1998) to 67.9% (2004). Qualitative floristic surveys recorded an increase in absolute numbers of native species from 138 to 154. It is suggested that the periodic collection of quantitative data can contribute significantly to the long-term evaluation and management of a prairie restoration or reconstruction.

Introduction

A 2.95 ha (7.3-acre) former pasture located in northern Ford County near Kempton, Illinois, was selected in 1974 for prairie restoration and reconstruction (Sec 6 T28N R9E; Lat.40.93366° N, Long. 88.23690° W). This work continued with annual preparation and seeding of successive small plots. The final plots were added in 1990 (Gardner 1995a). Within the field, an unrestored 0.19 ha (0.47 acre) serves as a control. In this area, there was no introduction of additional species or intervention other than annual burning. Although the restoration field has doubled in size in recent years, the focus of this study is the original 2.95 ha. It lies within the Grand Prairie Section of the Grand Prairie Division of the Natural Divisions of Illinois (Schwegman et al. 1973). The soils are Swygert and Bryce, somewhat poorly drained, fine-textured silty clay loams (Fehrenbacher 1990). The topography is gently rolling with an elevation difference of about 4.5 m between the high and low portions of the field. Most land in the immediate area is under corn and soybean cultivation. A floristic survey of the field, 1991–1994, documented 138 native vascular species and 51 exotics (Gardner 1995a). A 2003–2004 unpublished floristic survey identified 154 native species on the field, which compares with 180 prairie species found on 29 silt-loam cemetery prairie remnants (Betz and Lamp 1988). The continued presence of about 46 non-native species underscores the developing status of the site.

Monitoring of data can permit identification of population trends and evaluation of the direction of restoration development (Masters 1997). Thus, baseline vegetation data, including species density and frequency, were recorded from the restoration field in 1993 (Gardner 1995b). Vegetation data again were collected in 1998 and 2004. Dates of data collection in the three sampling years were between 28 May and 2 July. This paper reports results of those two subsequent surveys with comparisons to the results of the 1993 survey.

Methods

Five line transects were established in the restoration area in June 1993 and retained for the sampling in

[1] 3584 N 1300 East Rd., Kempton, Illinois 60946.

1998 and 2004. Vegetation along these transects was identified and recorded using a point-intercept method (Mueller-Dombois and Ellenberg 1974). This method was modified by using five holes spaced at 20 cm intervals in the horizontal portion of the point-intercept frame, which was supported about one meter above ground level by four folding legs. A pointed steel rod, 3.4 mm in diameter, was passed successively through each hole. Each plant contacted by the point during descent of the rod was recorded by species. Upon completion of the five intercept readings, the frame was moved along the line transect and the process repeated at 1.5 m intervals. Readings in both 1998 and 2004 were taken at 970 intercept points along the transects on the restoration portion of the study site.

One transect passed through the 0.19 ha control area where no taxa were introduced. There was sampling at 150 intercept points in 1998 and 155 in 2004. Both the restoration and the control were burned annually in late winter or very early spring.

Point-intercept can provide accurate quantitative estimates of non-forest communities for description purposes (Becker and Crockett 1973, Mueller-Dombois and Ellenberg 1974). A disadvantage is that this method is difficult to implement under windy conditions. Wind moves the vegetation and prevents accurate readings beneath the descending point. Heavy accumulations of old vegetation can present another hindrance. Ease of sampling was enhanced by conducting the analysis following burning of the site the previous February or March.

Determinations were made for relative density and relative frequency as described by Mueller-Dombois and Ellenberg (1974) and Cox (1990). Relative density (RD) is computed by dividing the number of intercepted individual stems of a species (I) by the total number of individual stems intercepted of all species (TI) and multiplying by 100, RD = (I/TI) × 100. Relative frequency (RF) is an expression of the number of points at which a species occurs (F), divided by the points of occurrence for all species (TF), and multiplying by 100, RF = (F/TF) × 100. Thus, density is a count of the individual stems intercepted by the descending point. Frequency is an expression of the distribution of the species over the extent of the transects. The sum of relative density and relative frequency gives the importance value (IV) for each species (RD + RF = IV). For the sake of brevity, these numbers are condensed with the IV results presented in this paper.

The non-native grasses, *Poa pratensis* (Kentucky bluegrass) and *P. compressa* (Canada blue grass) were combined as *Poa* spp. due to difficulty at times in distinguishing them in the field. Early in the growing season it can be difficult to differentiate *Melilotus alba* (white sweet clover) and *M. officinalis* (yellow sweet clover). They have been combined as *Melilotus* spp. Nomenclature follows Mohlenbrock (2002).

Results

Restoration transects

The three principal families encountered in all years were Poaceae, Asteraceae, and Fabaceae. Absolute numbers of individual intercepts for natives and exotics of those families appear in Table 1.

Individual counts of native Poaceae increased from 743 to 879 over the 1993–2004 period. Largest numbers were recorded for *Andropogon gerardii* (big bluestem) with an increase from 526 to 665. *Schizachyrium scoparium* (little bluestem) has shown a progressive decline from 97 in 1993 to 28 in 2004, possibly reflecting the mesic nature of the silty clay loam soil. *Elymus canadensis* (nodding wild rye) also showed a decline, as might be expected with this pioneering species.

Both native and non-native Poaceae had dramatic increases in individual count numbers in 1998. Precipitation in March through May that year was 38.74 cm (15.25 inches), 34% higher than the 1995–2005 average of 28.85 cm (11.36 inches) (Illinois State Water Survey 2005). This may have been one factor in promoting increased vegetative growth in 1998. Among the non-natives, *Poa* spp. and *Bromus inermis* (smooth brome) had population spikes in 1998 (Table 1). From 1993 to 2004, *Poa* spp. decreased from 61 to 37 while *B. inermis* increased from 24 to 71 and *Dactylis glomerata* (orchard grass) increased from 3 to 24.

Numbers of individual native Asteraceae encountered have dropped from 350 in 1993 to 209 in 2004. The principal factor in this decrease is *Aster pilosus* (hairy aster) with 148 encounters in 1993 and 13 in 2004. This species was a major component on the field before the start of restoration work, but has since declined with the establishment of more conservative species. Individual counts of *Aster ericoides* (heath aster) and *Ambrosia artemisiifolia* (common ragweed) also show decreases. Among the increasing Asteraceae are *Parthenium integrifolium* (wild quinine), *Oligoneuron rigidum* (stiff goldenrod), *Rudbeckia hirta* (black-eyed Susan), and *Aster novae-angliae* (New England aster). Non-native Asteraceae decreased from 124 individual plant encounters in 1993 to 36 in 2004. This was largely due to *Achillea millefolium* (yarrow), which decreased from 102 to 30.

Native Fabaceae had increases in absolute numbers from 41 from 1993 to 69 in 2004. *Dalea candida* (white prairie clover), *D. purpurea* (purple prairie clover), *Amorpha canescens* (leadplant), and *Lespedeza capitata* (round-headed bush clover) all showed increases, while

Table 1: The three predominant families on the restoration with comparisons of *absolute numbers* of individual native and alien plant contacts in each of the three survey years.

Natives	1993	1998	2004	Non-natives	1993	1998	2004
ASTERACEAE	350	234	209	**ASTERACEAE**	124	93	36
Ambrosia artemisiifolia	52	6	9	*Achillea millefolium*	102	89	30
Ambrosia trifida	2	4	5	*Leucanthemum vulgare*	8	0	3
Aster ericoides	33	30	0	*Sonchus oleraceus*	2	0	0
Aster novae-angliae	1	3	9	*Taraxacum officinale*	12	4	3
Aster pilosus	148	29	13				
Coreopsis palmata	2	11	4	**FABACEAE**	118	141	79
Coreopsis tripteris	0	3	2	*Medicago lupulina*	39	0	4
Echinacea pallida	9	5	9	*Melilotus* spp.	25	84	25
Echinacea purpurea	2	3	0	*Trifolium pratense*	52	57	50
Erigeron annuus	4	7	5	*Trifolium repens*	2	0	0
Eupatorium altissimum	3	0	2				
Helianthus pauciflorus	27	18	22	**POACEAE**	85	247	136
Lactuca canadensis	0	0	1	*Agrostis gigantea*	7	2	0
Liatris pycnostachya	1	0	9	*Bromus inermis*	24	108	71
Oligoneuron rigidum	5	18	44	*Dactylis glomerata*	3	10	24
Parthenium integrifolium	7	3	16	*Elytrigia repens*	16	16	0
Ratibida pinnata	43	71	32	*Phleum pratense*	35	8	4
Rudbeckia hirta	3	8	13	*Poa* spp.	61	103	37
Silphium integrifolium	0	0	3				
Silphium laciniatum	7	15	8				
Solidago altissima	0	0	3				
FABACEAE	41	39	69				
Amorpha canescens	15	18	19				
Baptisia alba	12	5	3				
Dalea candida	8	8	25				
Dalea purpurea	5	4	16				
Lespedeza capitata	1	4	6				
POACEAE	743	1301	879				
Andropogon gerardii	526	1053	665				
Elymus canadensis	17	6	3				
Schizachyrium scoparium	97	78	28				
Sorghastrum nutans	103	133	108				
Sporobolis heterolepis	0	31	75				

Baptisia alba (white wild indigo) declined. Non-native Fabaceae decreased with 118 counted in 1993 and 79 in 2004. *Trifolium pratense* (red clover) and *Melilotus* spp. had similar numbers in 1993 and 2004, while *Medicago lupulina* (black medick) decreased from 39 to 4.

The results for all species on the restoration transects ranked by IV appear in Table 2. In 1998, there were 67 species encountered along the transects, of which 71.6% were natives. The 2004 survey identified 63 species with 75.8% being natives. These compare to 66.2% natives in 1993.

On the restoration areas, *Andropogon gerardii* (big bluestem) ranked highest in relative density and relative frequency in all three years. Its IV ranged from 51.4 (1993) to 73.8 (1998) to 68.2 (2004). In 1993, *Sporobolus heterolepis* (prairie dropseed) was sparsely established on the field and no individuals were encountered at stations along the transects. However, in 1998, it had moved to 17th position in IV rank and in 2004 it showed further increase to sixth ranking with an IV of 7.7.

Certain spring flora have shown consistent increases in IV ranking throughout the time period of the three surveys. *Dodecatheon meadia* (shooting star) advanced from an IV of 0.3 (1993) to 2.7 (1998) to 4.8 (2004). Similarly, *Pedicularis canadensis* (lousewort) has gone from 2.7 to 7.3 to 15.2 over the same period.

Baptisia alba (white wild indigo) showed population decline, a result that is not confirmed by personal

Table 2: Comparisons of importance values of species encountered on the *restoration area* in each of the sampling years using point-intercept method.

	1993	1998	2004		1993	1998	2004
Andropogon gerardii	51.4	73.8	68.2	*Erigeron annuus*	0.5	0.7	0.6
Aster pilosus	16.5	2.9	1.6	*Oligoneuron rigidum*	0.5	1.4	5.3
*Daucus carota**	11.7	0.3	0.2	*Dactylis glomerata**	0.3	1.0	2.7
*Achillea millefolium**	11.5	9.0	3.5	*Dodecatheon meadia*	0.3	2.7	4.8
Sorghastrum nutans	10.6	10.2	11.1	*Eupatorium altissimum*	0.3	0.0	0.2
Schizachyrium scoparium	9.8	5.9	3.2	*Oenothera biennis*	0.3	0.0	0.0
Poa spp.*	6.8	10.4	4.4	*Rudbeckia hirta*	0.3	0.8	1.2
Ambrosia artemisiifolia	6.0	0.6	1.1	*Solanum carolinense**	0.3	0.1	0.0
*Trifolium pratense**	5.7	5.7	5.5	*Ambrosia trifida*	0.2	0.4	0.6
*Potentilla recta**	4.6	0.2	0.0	*Asclepias syriaca*	0.2	0.0	0.2
Ratibida pinnata	4.6	6.4	3.8	*Asparagus officinalis**	0.2	0.0	0.0
*Medicago lupulina**	4.4	0.0	0.5	*Carex vulpinoidea*	0.2	0.1	0.0
Monarda fistulosa	3.9	2.6	0.0	*Coreopsis palmata*	0.2	0.9	0.5
*Phleum pratense**	3.8	0.8	0.5	*Echinacea purpurea*	0.2	0.3	0.0
Aster ericoides	3.5	2.9	0.0	*Oxalis stricta*	0.2	0.0	0.1
Helianthus pauciflorus	2.8	1.6	2.6	*Sonchus oleraceus**	0.2	0.0	0.0
Melilotus spp.*	2.7	7.8	3.0	*Trifolium repens**	0.2	0.0	0.0
Pedicularis canadensis	2.7	7.3	15.2	*Viola pratincola*	0.2	0.0	0.2
*Bromus inermis**	2.6	9.6	8.2	*Aster novae-angliae*	0.1	0.3	0.8
Juncus interior	2.0	1.6	0.6	*Lespedeza capitata*	0.1	0.4	0.7
Elymus canadensis	1.9	0.6	0.4	*Liatris pycnostachya*	0.1	0.0	1.1
*Carex hirta**	1.8	0.0	0.0	*Oenothera pilosella*	0.1	0.0	0.0
*Elytrigia repens**	1.8	1.6	0.0	*Physostegia virginiana*	0.1	0.0	0.8
Fragaria virginiana	1.8	6.5	1.6	*Potentilla simplex*	0.1	0.1	0.0
Amorpha canescens	1.5	1.6	2.1	*Veronicastrum virginicum*	0.1	0.1	0.5
Carex brevior	1.5	2.4	1.1	*Anemone cylindrica*	0.0	0.0	0.5
Zizia aurea	1.5	8.1	18.2	*Brassica rapa**	0.0	0.1	0.0
Baptisia alba	1.4	0.5	0.4	*Carex bebbii*	0.0	0.0	0.5
*Taraxacum officinale**	1.4	0.4	0.4	*Carex molesta*	0.0	0.2	0.0
*Pastinaca sativa**	1.3	0.1	0.2	*Carex muhlenbergii*	0.0	0.2	0.0
Calystegia sepium	1.0	0.2	0.0	*Coreopsis tripteris*	0.0	0.2	0.2
Dalea candida	0.9	0.8	2.9	*Eleocharis verrucosa*	0.0	0.6	0.6
Echinacea pallida	0.9	0.5	1.1	*Fraxinus* sp.	0.0	0.1	0.0
*Leucanthemum vulgare**	0.9	0.1	0.4	*Lactuca canadensis*	0.0	0.0	0.1
*Plantago lanceolata**	0.9	0.0	0.0	*Phlox pilosa*	0.0	0.2	0.0
*Agrostis gigantea**	0.8	0.1	0.0	*Pycnanthemum virginianum*	0.0	0.1	0.0
Eryngium yuccifolium	0.8	1.0	2.1	*Rosa multiflora**	0.0	0.1	0.0
Parthenium integrifolium	0.8	0.3	1.9	*Rumex crispus**	0.0	0.0	0.1
Silphium laciniatum	0.7	1.1	1.0	*Silphium integrifolium*	0.0	0.0	0.4
Dalea purpurea	0.6	0.4	1.9	*Sisyrinchium albidum*	0.0	0.1	0.2
Plantago rugelii	0.6	0.3	0.0	*Solidago altissima*	0.0	0.0	0.4
Prunella vulgaris	0.6	0.0	0.1	*Sporobolis heterolepis*	0.0	2.4	7.7
Asclepias tuberosa	0.5	0.1	0.2				
Asclepias verticillata	0.5	0.1	0.0	Native species	66.2%	71.6%	75.8%

* Non-native species

observation. It is slow to emerge in the spring. In 1993 data collection was not completed until 2 July. In 1998 and 2004, it was completed earlier, on 22 June and 4 June, respectively.

A native species that has increased is *Zizia aurea* (golden Alexanders), which increased in IV from 1.5 (1993) to 8.1 (1998) to 18.2 (2004). Another native that is showing increase is *Oligoneuron rigidum*. The IV for

this species has gone from 0.5 (1993) to 1.4 (1998) to 5.3 (2004).

Among the exotics, *Melilotus officinalis* and *M. alba* had a combined IV of 2.7 in 1993. In 1998, they had moved up in ranking with an IV of 7.8. In 2004, the IV dropped to 3.0. Another non-native legume on the site is *Trifolium pratense*. As noted above, over the twelve-year time period of these surveys, its absolute numbers have not changed to any large extent. Its IV has been 5.7, 5.7, and 5.5.

Control transect

The IV rankings in the control area appear in Table 3. Along with the remainder of the field, the control area had been permanent pasture with no history of cultivation. After 1974, it received annual burning, but there was no introduction of additional species. However, as the adjacent restoration developed, there was encroachment of native species into the control area. During the time span encompassed by the study, the percentage of native species encountered has risen from 48.5% (1993) to 58.6% (1998) and 67.9% (2004).

Poa spp. ranked highest in IV at 35.4 in 1993. They dropped to sixth ranking at IV 9.7 in 2004. During the same period, *Andropogon gerardii* has increased from IV 4.4 to IV 27.6 and *Sorghastrum nutans* (Indian grass) from IV 3.8 to IV 50.4.

Populations of somewhat weedy native species, such as *Aster pilosus*, have been in steady decline on the control area, with IV of 16.4 (1993), 5.7 (1998), and 3.3 (2004). This reflects the similar development on the restoration portion of the field, where *A. pilosus* populations declined when additional native species became established.

One of the earlier successional species, *Ratibida pinnata* (yellow coneflower), is probably indicative of the volatile successional changes underway on the control unit. It has shown an increase from IV 3.8 (1993) to IV 14.1 (2004).

Antennaria neglecta (cat's-foot), a species that was present on the control area when it was a pasture, has steadily increased from IV 7.7 (1993) to 34.2 (2004).

DISCUSSION

Periodic vegetation sampling of a restoration project provides an objective means of evaluation. It can confirm general observations, draw attention to overlooked changes, and contradict subjective empirical judgement. It indicates the successional changes that are an essential component of prairie development.

One assumption that might be drawn from this study is that, although *Andropogon gerardii* held the highest level of IV on the restoration throughout the twelve years, there was no apparent inhibition of establishment of other species. Such high values would suggest that this warm-season grass dominates the field, possibly to the exclusion of other species. However, from 1993 to 2004, the total number of native species on the field as recorded in floristic surveys has increased from 138 to about 154 and the percentage of native species encountered on this point-intercept survey has increased. There were overall increases in the percentage of native species encountered both on the restoration and the control area (Fig. 1). During that time, native species, including *Dodecatheon meadia, Pedicularis canadensis, Dalea* spp., and *Sporobolus heterolepis*, demonstrated population increases. Populations of non-natives such as *Daucus carota, Poa* spp., and *Achillea millefolium* were in decline. It has been observed that spring burning decreases species richness and favors the dominance of warm-season grasses (Steinauer and Collins 1996). The annual late February or March burns on this site did not appear to decrease species richness.

The increase in *Sporobolus heterolepis* is likely due to the low amount or absence of that seed applied during the early years of the restoration project. That species was increased yearly by plant division in a nursery plot in order to increase seed production. Thus, by the late 1980s, greater amounts of seed were applied to newly established restoration plots (Gardner 1995a). Results of these heavier seedings were becoming apparent in the 1998 and 2004 surveys.

In spite of its increase in IV, *Zizia aurea* is not found in large populations throughout the field, as suggested by the relative density of 10.0% and the relative frequency of 8.2%. However, in an area through which one of the transects passes, there are increasingly larger numbers of the species. Only a small amount of the tall native grasses were included in the seeding of this area in 1988 and 1989. The absence of that competition may have permitted *Z. aurea* to become established in greater numbers than in other parts of the field.

Although never having been included in seed mixes, *Oligoneuron rigidum* shows increases in IV on both the restoration and the control. This may prove to be of some concern, but in the author's experience, this goldenrod has not been considered a problem species, as is sometimes the case with *Solidago altissima* (tall goldenrod).

From the increase in IV for *Melilotus* spp. in 1998 and from general field observation, it became apparent that natives were not displacing these alien species. The annual burning of the field may have contributed to the problem, since populations of *Melilotus* spp. have shown increases following burning (Randa & Yunger 2000). There were unsuccessful eradication efforts using different weed wipers with glyphosate herbicide. In 2002, an intensive effort was started and continues

Table 3: Importance value comparisons of species intercepted on the control area in each of the sampling years.

	1993	1998	2004
Poa spp.*	35.4	23.8	9.7
*Daucus carota**	29.5	0.0	0.0
*Phleum pratense**	16.9	4.0	0.0
Aster pilosus	16.4	5.7	3.3
*Achillea millefolium**	10.9	10.7	5.2
Dichanthelium acuminatum	10.9	2.9	0.0
*Brassica rapa**	8.7	2.0	3.7
Antemaria neglecta	7.7	20.5	34.2
Ambrosia artemisiifolia	6.6	0.7	0.0
*Potentilla recta**	5.5	0.0	0.0
*Plantago lanceolata**	4.9	0.0	0.0
Andropogon gerardii	4.4	64.0	27.6
Fragaria virginiana	4.4	2.7	0.0
*Elytrigia repens**	3.8	0.9	4.8
Ratibida pinnata	3.8	7.7	14.1
Sorghastrum nutans	3.8	15.7	50.4
Carex brevior	3.3	3.6	3.7
*Pastinaca sativa**	3.3	1.3	0.7
Aster ericoides	2.2	0.0	0.0
*Bromus inermis**	2.2	7.7	0.0
Carex vulpinoidea	2.2	0.0	0.0
Elymus canadensis	2.2	1.3	0.7
*Medicago lupulina**	2.2	0.0	0.7
*Amaranthus hybridus**	1.1	0.0	0.0
Asclepias syriaca	1.1	0.0	3.7
*Chenopodium album**	1.1	0.0	0.0
Eupatorium altissimum	1.1	1.3	0.0
Juncus interior	1.1	0.0	5.2
Melilotus spp.*	1.1	1.6	0.0
*Persicaria vulgaris**	1.1	2.0	0.7
Prunella vulgaris	1.1	0.7	0.0
*Rumex crispus**	1.1	0.0	0.0
Ambrosia trifida	0.0	11.2	13.6
Anemone cylindrica	0.0	0.9	0.0
Anemone virginiana	0.0	0.0	3.0
Asclepias verticillata	0.0	2.9	0.7
Carex bebbii	0.0	0.0	3.0
Chamaechrista fasciculata	0.0	2.7	1.5
Echinacea pallida	0.0	0.0	1.5
Geum laciniatum	0.0	0.9	0.7
*Leucanthemum vulgare**	0.0	0.7	0.0
Oligoneuron rigidum	0.0	0.0	3.0
Rosa carolina	0.0	0.0	2.2
Schizachyrium scoparium	0.0	0.0	0.7
*Taraxacum officinale**	0.0	0.0	0.7
Native species	48.5%	58.6%	67.9%

* Non-native species

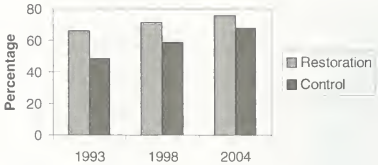

Figure 1: Comparison of percentage changes of native species encountered on the restoration and control areas from 1993 to 2004.

annually with spot spraying and hand pulling from mid April to late July. This has likely contributed to the drop in IV from 7.8 in 1998 to 3.0 in 2004. However, this is a similar IV to that recorded in 1993 when that population was poised to expand. Thus, continued long-term commitment to this effort is necessary.

The slow response to the *Melilotus* problem may have been partly a result of the favorable displacement of the pervasive *Daucus carota* (wild carrot). General distribution of this species on the field before start of the project in 1974 caused concern that this would present a major problem. Ineffectual efforts were made at removal. However, as the native warm season grasses became established, the *D. carota* started to be displaced (Gardner 1995a). General observation suggested that *D. carota* populations were already in decline at the time of the 1993 survey. It then had an IV of 11.7. It dropped in 1998 and, by 2004, it was 0.2. That experience encouraged the false hope that the same would eventually happen with *M. alba* and *M. officinalis*.

The population of the alien legume *Trifolium pratense* is not increasing, but neither is the species being displaced. The numbers of individual plants encountered and the IV remain essentially unchanged. If the *Melilotus* spp. problem can be curtailed, thus providing more available time, it would be advisable to attempt eradication of *T. pratense*.

A factor that may play a role in the continued high populations of some non-native Poaceae is the perimeter effect. The margin of a prairie is an area of conflict for dominance between native and non-native species. It may have higher populations of non-natives than the interior (Christiansen 1990, Taft 2005). As an example, this appears to be true for *B. inermis*. On transects where that species was recorded, the contacts in 2004 were 0.26/m in the interior of the field, while in the 12 m periphery, there were 0.96/m. That represents a 369% greater population in the periphery than the interior.

The control area within the restoration field has evolved from an old field with predominant populations of cool season alien grasses and weedy forbs at the time the restoration project started in 1974 to one with increasing numbers of native prairie species. It appears to demonstrate the vigorous nature of those prairie species when provided with the appropriate conditions of periodic fire, absence of tillage, and a generous adjacent seed source.

Sampling such as this can also draw attention to the slow process of prairie establishment. In 1993, when the project was in its twentieth year, five of the ten species ranking highest in IV were non-natives. By 2004, three non-natives persisted among the top ten species.

Prairie restoration or reconstruction is necessarily a long term commitment. Over a period of years memory can be faulty. Vegetation analysis by this or other popular methods is a means of documenting changes and providing guidance. It should be an essential component of work with prairies.

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Vegetation Inventory of the Emiquon Preserve, Fulton County, Illinois

Loy R. Phillippe[1], Daniel T. Busemeyer[1,2], Paul B. Marcum[1], James L. Ellis[1], Mary Ann Feist[1], Richard L. Larimore[1], and John E. Ebinger[1]

Abstract: The vegetation and plant communities of the Emiquon Preserve, Fulton County, Illinois, were studied during the 2003–2004 growing seasons. A total of 395 vascular plant taxa were found; 8 fern and fern-allies, 1 gymnosperm, 99 monocots, and 287 dicots. Overstory and ground layer composition and structure were examined in three second growth forest communities. In the willow zone of the floodplain, tree densities averaged 1192 stems/ha with a basal area of 27.486 m^2/ha, *Salix nigra* Marsh. (black willow) being the leading dominant. In the maple zone of the floodplain, tree densities averaged 506 stems/ha with a basal area of 49.191 m^2/ha, *Acer saccharinum* Marsh. (silver maple) being the leading dominant. In the upland forest, *Robinia pseudoacacia* L. (black locust) dominated with an IV of 112 (possible 200), followed by *Gleditsia triacanthos* L. (honey locust), and *Fraxinus lanceolata* Borkh. (green ash). In this forest, tree densities averaged 672 stems/ha with a basal area of 33.628 m^2/ha.

Introduction

The Emiquon Preserve, Fulton County, Illinois, is located on the west side of the Illinois River, just north of its confluence with the Spoon River and about 4 km north of Havana. Presently owned by The Nature Conservancy, this site is located mostly in the Illinois River floodplain and, in the early 1900s, contained two large oxbow lakes, Thompson and Flag. Thompson Lake was the largest and best known bottomland lake in the Illinois River valley (Havera et al. 2003). These inland lakes were considered the jewels of the Illinois River as sites for harvesting fish and waterfowl. Legal squabbles over fishing and hunting, however, convinced the owners that the lakes would be more valuable as farmland (Clancy 2001).

Presently, these lowlands are composed primarily of cultural communities (croplands, levees, ditches, and developed lands), with small amounts of floodplain forest communities between the levees and the river. The adjacent uplands are composed primarily of the cultural communities (pasture and developed lands) along with a few small, poor quality, second growth forests. The present study was undertaken to determine the structure and composition of the overstory and ground layer of the forest communities and the overall vascular plant species diversity of the Emiquon Preserve.

Description of the Study Area

Located in the extreme southeastern corner of Fulton County, the 2833 ha Emiquon Preserve has been extensively altered by human activities. In early settlement times, the lowlands were dominated by two large oxbow lakes surrounded by floodplain forest communities and marshes. These lowlands are mostly cultivated; the extensive levees and ditches, along with the pumping of excess water into the river, prevents flooding. The slopes to the west and north of the floodplain were primarily forested though small inclusions of prairie probably existed (Schwegman 1973). These uplands and slopes have been logged, and most are in pasture dominated by cool-season Eurasian grasses. During the Illinois Natural Areas Inventory, no high-quality plant communities were found within the boundaries of the preserve (White 1978).

The lowlands of the Emiquon Preserve are located in the Illinois River Section of the Upper Mississippi River and Illinois Rivers Bottomland Natural Division, and the surrounding uplands are part of the Galesburg Section of the Western Forest-Prairie

[1] Section for Biodiversity, Illinois Natural History Survey, 1816 South Oak Street, Champaign, Illinois 61820.
[2] Present address: Ghost Pine Environmental Services, Ltd., Calgary, Alberta, Canada T2Z 1M9.

Natural Division (Schwegman 1973). Elevation at the preserve varies from 130 m in the south center portion of the floodplain to 177 m in the northwest part of the uplands. The soils of the floodplain are of the Titus-Darwin Association near the Illinois River channel and the Titus-Beaucoup Association closer to the uplands. Both soils are heavy-textured alluvium with high concentrations of clay and silt (Fehrenbacher et al. 1977). The upland soils are more complex with Stronghurst-Rozetta and Fayette-Rosetta associations being formed from thick loess that developed under forest vegetation, and the Fayette-Hickory-Gosport Association that formed from varying amounts of loess, glacial till and shale, and developed under forest vegetation (Fehrenbacher et al. 1977). Also, small intrusions of Littleton-Coffeen and Worthen-Littleton-Raddle associations are present. These soils developed from silty colluvium and alluvium on stream terraces under grassy vegetation.

The climate of central Illinois is continental with hot summers and cool winters and little or no water deficit in any season of the year (Page 1949). Based on weather data from Havana, 4 km to the south, 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 (mean of 24.6 C), and the coldest being January (mean of −5.0 C). Frost-free days range from 140 to 206, with the average being 173 day per year (Midwestern Regional Climate Center 2004).

MATERIALS AND METHODS

Trips were made to the Emiquon Preserve at various times during the 2003 and 2004 growing seasons. During each visit, voucher specimens were collected, habitat for each species determined, and the plant communities delineated. The specimens collected were identified and deposited in the herbarium of the Illinois Natural History Survey, Champaign, Illinois (ILLS). Designation of non-native status followed Gleason and Cronquist (1991) and Mohlenbrock (2002). Nomenclature followed Mohlenbrock (2002).

In mid-September of 2002, woody overstory surveys were undertaken on three sites, two floodplain forests (willow zone and maple zone) and one upland forest of the Emiquon Preserve. Ten circular plots

Table 1: Densities (stems/ha), diameter classes, basal areas (m^2/ha), relative values, importance values and average diameters of the woody species in three forest communities examined at Emiquon Preserve, Fulton County, Illinois.

Species	Diameter classes (cm) 10–19	20–29	30–39	40–50	50+	Total #/ha	Basal area m^2/ha	Rel. den.	Rel. dom.	I.V.	Av. diam. cm
Floodplain Forest—Willow Zone											
Salix nigra	932.4	179.8	33.3	–	–	1145.5	25.861	96.1	94.1	190.2	16.0
Salix amygdaloides	20.0	6.7	6.7	–	–	33.4	1.512	2.8	5.5	8.3	22.1
Salix interior	13.3	–	–	–	–	13.3	0.113	1.1	0.4	1.5	10.5
Totals	965.7	186.5	40.0	–	–	1192.2	27.486	100.0	100.0	200.0	
Floodplain Forest—Silver Maple Zone											
Acer saccharinum	26.6	166.5	193.1	100.0	13.3	499.5	45.994	98.7	93.5	192.2	33.1
Populus deltoides	–	–	–	–	6.7	6.7	3.197	1.3	6.5	7.8	78.2
Totals	26.6	166.5	193.1	100.0	20.0	506.2	49.191	100.0	100.0	200.0	
Upland Forest											
Robinia pseudoacacia	146.5	133.2	46.6	26.6	6.7	359.6	19.714	53.4	58.6	112.0	24.4
Gleditsia triacanthos	–	13.3	20.0	13.3	–	46.6	4.649	6.9	13.8	20.7	34.7
Fraxinus lanceolata	59.9	6.7	–	–	–	66.6	3.157	9.9	9.4	19.3	13.2
Ulmus rubra	53.3	6.7	–	6.7	–	66.7	2.105	9.9	6.3	16.2	17.4
Morus tatarica	20.0	26.6	6.7	–	–	53.3	2.331	7.9	6.9	14.8	23.0
Celtis occidentalis	26.6	–	–	–	–	26.6	0.333	4.0	1.0	5.0	12.5
Quercus rubra	6.7	6.7	–	–	–	13.4	0.506	2.0	1.5	3.5	20.9
Prunus serotina	6.7	6.7	–	–	–	13.4	0.466	2.0	1.4	3.4	19.9
Acer saccharum	13.3	–	–	–	–	13.3	0.160	2.0	0.5	2.5	12.3
Acer saccharinum	6.7	–	–	–	–	6.7	0.140	1.0	0.4	1.4	16.2
Juglans nigra	6.7	–	–	–	–	6.7	0.067	1.0	0.2	1.2	11.2
Totals	346.4	199.9	73.3	46.6	6.7	672.9	33.628	100.0	100.0	200.0	

0.03 ha in size were located at 25 m intervals along randomly placed transects in each of the three forests (10 plots/forest). In each plot, all living woody individuals ≥10.0 cm dbh were identified and diameters recorded. From these data, the living-stem density (stems/ha), basal area (m^2/ha), relative density, relative dominance, importance value (IV), and average diameter (cm) were calculated for each species. As used here, the IV is the sum of the relative density and relative dominance (McIntosh 1957). Density (stems/ha) of wood understory species was determined using nested circular plots 0.0001, 0.001, and 0.01 ha in size located at the center point of the 0.03 ha plots. Four additional 0.0001 ha circular plots were located 6 m from the center points along cardinal compass directions. In the 0.0001 ha plots, woody seedlings (≤50 cm tall) were counted (50 plots/forest); in the 0.001 ha circular plots, small saplings (>50 cm tall and <2.5 cm dbh) were recorded (10 plots/forest); and in the 0.01 ha circular plots, large saplings (2.5–9.9 cm dbh) were tallied (10 plots/forest).

At the time of the overstory surveys, a ground layer survey was also undertaken in each of the three forests, using the transect lines established for sampling the woody overstory. Along each transect, 1 m^2 quadrates were located at 1 m intervals (n=50/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) (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.

Results and Discussion

Vascular flora

The vascular flora of the Emiquon Preserve consisted of 395 taxa within 249 genera and 89 families. Probably due to the disturbed nature of the site, non-native species were common, with 102 taxa (25% of the flora), while the fern and fern-allies and gymnosperms were poorly represented, accounting for only 9 taxa (Appendix I). Among the angiosperms, monocots accounted for 99 taxa in 51 genera and 13 families (25%), while dicots were represented by 287 taxa in 92 genera and 71 families (73%). Common families included the Poaceae with 48 species, followed by Asteraceae (44), Cyperaceae (31), and Brassicaceae (19).

Willow zone of the floodplain forest

Located between the Illinois River and levee, this early successional forest was dominated by *Salix nigra* (black willow) with a few other willow species rarely encountered (Table 1). No individuals exceeded 39 cm dbh and most were less than 20 cm dbh. Tree density averaged 1192 stems/ha while basal area was 27.486 m^2/ha. Few woody understory species were encountered (Table 2). The herbaceous vine *Sicyos angulata* (bur cucumber) was the dominant ground layer species followed by *Persicaria pensylvanica*

Table 2: Density (#/ha) of shrubs, seedlings, and small and large saplings in the forest communities studied at Emiquon Preserve, Fulton County, Illinois.

Species	Seedlings	Small saplings	Large saplings
Floodplain—Willow Zone			
Forestiera acuminata	500	600	–
Acer saccharinum	500	150	–
Salix interior	–	500	–
Salix nigra	–	200	240
Morus tatarica	–	50	–
Fraxinus lanceolata	–	50	–
Totals	1000	1550	240
Floodplain—Silver Maple Zone			
Acer saccharinum	18500	–	20
Fraxinus lanceolata	6500	–	–
Forestiera acuminata	4000	–	–
Cephalanthus occidentalis	3500	–	–
Morus tatarica	1000	–	–
Totals	33500	–	20
Disturbed Upland Woods			
Ulmus rubra	1000	500	360
Fraxinus lanceolata	500	150	300
Celtis occidentalis	–	500	80
Carya cordiformis	–	100	40
Acer saccharum	–	50	40
Prunus serotina	–	50	40
Quercus rubra	–	50	–
Jugland nigra	–	–	100
Crataegus mollis	–	–	20
Morus tatarica	–	–	20
Quercus alba	–	–	20
Ribes missouriense	–	1050	–
Rosa multiflora	–	850	–
Cornus drummondii	–	750	
Sambucus canadensis	–	300	–
Ptelea trifoliata	–	150	–
Rubus occidentalis	–	100	–
Totals	1500	4600	1020

Table 3: Frequency (%), average cover, relative frequency, relative cover, and importance value of the ground layer species encountered in the willow zone at Emiquon Preserve, Fulton County, Illinois.

Species	Freq. %	Average cover	Rel. freq.	Rel. cover	I.V.
Sicyos angulatus	100	16.26	23.8	45.3	69.1
Persicaria pensylvanica	96	9.60	22.8	26.8	49.6
Ipomoea lacunosa	76	2.26	18.0	6.3	24.3
Xanthium strumarium	52	0.66	12.4	1.8	14.2
Persicaria amphibium	24	1.58	5.7	4.4	10.1
Commelina diffusa	16	1.92	3.8	5.4	9.2
Aster lanceolatus	12	1.22	2.8	3.4	6.2
Spermacoce glabra	16	0.86	3.8	2.4	6.2
Leersia lenticularis	8	0.62	1.9	1.7	3.6
Fraxinus lanceolata	4	0.60	1.0	1.7	2.7
Forestiera acuminata	4	0.12	1.0	0.3	1.3
Leersia virginica	4	0.12	1.0	0.3	1.3
Pilea pumila	4	0.02	1.0	0.1	1.1
Salix interior	4	0.02	1.0	0.1	1.1
Totals		35.86	100.0	100.0	200.0
Average bare ground and litter		67.80			

(pinkweed) and *Ipomoea lacunosa* (small white morning-glory)(Table 3). Bare ground averaged 68%, probably the result of excessive shading and the length of time water covers the site.

Maple zone of the floodplain forest

The mature second growth floodplain forest studied is located at the southwest edge of the Emiquon Preserve on property owned by the Illinois Department of Natural Resources. *Acer saccharinum* (silver maple) accounted for nearly all of the importance value (IV of 192 out of 200) (Table 1). The only other trees present were a few individuals of *Populus deltoides* (cottonwood). At this site, the sapling and shrub layer was very open with few individuals present, the only common woody plants encountered being seedlings (Table 2). The ground layer was very sparse with bare ground averaging 80%, again the result of flooding (Table 4). Dominant

Table 4: Frequency (%), average cover, relative frequency, relative cover, and importance value of the ground layer species encountered in the silver maple zone at Emiquon Preserve, Fulton County, Illinois.

Species	Freq. %	Average cover	Rel. freq.	Rel. cover	I.V.
Leersia virginica	56	13.72	19.4	67.0	86.4
Persicaria pensylvanica	40	2.54	13.9	12.4	26.3
Boehmeria cylindica	36	1.84	12.5	9.0	21.5
Acer saccharinum	44	0.62	15.3	3.0	18.3
Fraxinus lanceolata	32	0.36	11.1	1.8	12.9
Forestiera acuminata	20	0.30	6.9	1.5	8.4
Cephalanthus occidentalis	16	0.38	5.6	1.9	7.5
Leersia lenticularis	12	0.26	4.2	1.2	5.4
Sicyos angulatus	12	0.26	4.2	1.2	5.4
Morus tatarica	12	0.16	4.1	0.8	4.9
Stachys tenuifolia	4	0.02	1.4	0.1	1.5
Vitis riparia	4	0.02	1.4	0.1	1.5
Totals		20.48	100.0	100.0	200.0
Average bare ground and litter		80.30			

Table 5: Frequency (%), average cover, relative frequency, relative cover, and importance value of the ground layer species encountered in the disturbed upland woods at Emiquon Preserve, Fulton County, Illinois.

Species	Freq. %	Average cover	Rel. freq.	Rel. cover	I.V.
Poa sylvestris	72	10.86	9.3	21.5	30.8
Alliaria petiolata	100	4.32	13.0	8.5	21.5
Antenoron virginianum	48	6.66	6.2	13.2	19.4
Parthenocissus quinquefolia	52	3.96	6.7	7.8	14.5
Ageratina altissima	40	4.20	5.2	8.3	13.5
Geum canadense	44	3.62	5.7	7.1	12.8
Elymus hystrix	40	2.24	5.2	4.4	9.6
Toxicodendron radicans	28	2.56	3.6	5.0	8.6
Urtica gracilis	28	1.88	3.6	3.7	7.3
Viola pratincola	20	1.56	2.6	3.1	5.7
Aster lateriflorus	20	1.46	2.6	2.9	5.5
Carex blanda	24	1.10	3.1	2.2	5.3
Celtis occidentalis	24	0.32	3.1	0.6	3.7
Ulmus rubra	20	0.50	2.6	1.0	3.6
Pilea pumila	20	0.40	2.6	0.8	3.4
Hackelia virginiana	20	0.30	2.6	0.6	3.2
Teucrium canadense	12	0.84	1.5	1.7	3.2
Carex jamesii	12	0.74	1.5	1.5	3.0
Aster drummondii	16	0.38	2.1	0.7	2.8
Elymus villosus	16	0.38	2.1	0.7	2.8
Acalypha deamii	16	0.08	2.1	0.2	2.3
Sanicula canadensis	12	0.36	1.5	0.7	2.2
Solidago ulmifolia	12	0.16	1.5	0.3	1.8
Fraxinus lanceolata	4	0.60	0.5	1.2	1.7
Aster lanceolatus	8	0.14	1.0	0.3	1.3
Phryma leptostachya	8	0.14	1.0	0.3	1.3
Phytolacca americana	8	0.14	1.0	0.3	1.3
Rosa multiflora	8	0.14	1.0	0.3	1.3
Smilax tamnoides	8	0.14	1.0	0.3	1.3
Acer saccharum	4	0.12	0.5	0.2	0.7
Festuca subverticillata	4	0.12	0.5	0.2	0.7
Lactuca floridana	4	0.12	0.5	0.2	0.7
Sambucus canadensis	4	0.12	0.5	0.2	0.7
Chenopodium album	4	0.02	0.5	–	0.5
Phlox divaricata	4	0.02	0.5	–	0.5
Prunus serotina	4	0.02	0.5	–	0.5
Ribes missouriense	4	0.02	0.5	–	0.5
Smilacina racemosa	4	0.02	0.5	–	0.5
Totals		50.76	100.0	100.0	200.0
Average bare ground and litter		57.04			

herbaceous species included *Leersia virginica* (white grass), *Persicaria pensylvanica*, and *Boehmeria cylindrica* (false nettle).

Upland forest

The few upland forests present on the preserve were disturbed, heavily grazed in the past, and of extremely poor quality with many exotic species. The best quality forest encountered was associated with the uplands, slopes, and ravines at the northern edge of the preserve. At this site, *Robinia pseudoacacia* (black locust) was the dominant overstory species (IV of 112), followed by *Gleditsia triacanthos* (honey locust), *Fraxinus lanceolata* (green ash), *Ulmus rubra* (slippery elm), and *Morus tatarica* (Russian mulberry). Tree density averaged 672 stems/ha while basal area averaged 33.628 m2/ha (Table 1). In this woodlot, numerous

shrubs and saplings were encountered with an overall density of 5620 stems/ha (Table 2). The ground layer was relatively open, bare ground being 57% (Table 5). With 38 species recorded in the plots, *Poa sylvestris* (woodland blue grass), *Antenoron virginianum* (Virginia knotweed), and *Parthenocissus quinquefolia* (Virginia creeper) were the dominant native species. The non-native *Alliaria petiolata* was the second most important herbaceous species found.

Though many disturbance communities were present on the preserve, native species were still common. In the lowlands, members of the Cyperaceae were found along drainage ditches and in a few small marshes scattered throughout the lowlands. However, only a few submersed or emergent aquatic species were found (Appendix I). The lowland forests contained many common native species and relatively few exotics. The upland plant communities, in contrast, were heavily disturbed, but native species were relatively common, particularly upland forest species associated with steep-sided wooded ravines (Appendix I). No endangered or threatened species were encountered. *Acalypha deanii* (large-seeded mercury), a species recently de-listed from threatened in Illinois, was found in both the upland forest and the maple zone of the floodplain forest in the preserve (Herkert and Ebinger 2002).

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APPENDIX I. Vascular species encountered at The Emiquon Preserve, Fulton County, Illinois, listed alphabetically by family under the major plant groups. An asterisk indicates non-native (exotic) species (*). After the binomial and authority, the communities where the species was observed is given (1 = cultural, 2 = upland forest, 3 = floodplain forest, 4 = riparian). Following the community number(s), collecting numbers preceded by the initial of the collector's name are given (B) Daniel T. Busemeyer, (E) James Ellis, (M) Paul B. Marcum, and (P) Loy R. Phillippe.

PTERIDOPHYTES

Aspleniaceae

Asplenium platyneuron (L.) Oakes: 2, 4; M 2079

Dryopteridaceae

Cystopteris protrusa (Weatherby) Blasdell: 2, 4; P 35554

Dryopteris carthusiana (Villars) H.P. Fuchs: 4; M 2081, P 35560

Polystichum acrostichoides (Michx.) Schott: 2, 4; P 35608

Equisetaceae

Equisetum arvense L.: 1, 4; P 35559

Equisetum hyemale L. ssp. *affine* (Engelm.) Calder & Roy L. Taylor: 4; M 2086

Ophioglossaceae
Botrychium dissectum Spreng.: 2, 4; M 2159
Botrychium virginianum (L.)Sw.: 2; P 35577

SPERMATOPHYTES: GYMNOSPERMS

Cupressaceae
Juniperus virginiana L.: 1; M 2089

SPERMATOPHYTES: ANGIOSPERMS

DICOTS
Aceraceae
Acer negundo L.: 1, 2, 3, 4; B 1242
Acer saccharinum L.: 1, 3, 4;B 1286
Acer saccharum Marsh.: 1, 2, 4; B 1249

Amaranthaceae
**Amaranthus retroflexus* L.: 1; E 22
**Amaranthus spinosus* L.: 1; P 35935

Anacardiaceae
Rhus glabra L.: 1; P 35968
Toxicodendron radicans (L.) Kuntze: 1, 2, 3, 4; B 1302

Apiaceae
Chaerophyllum procumbens (L.) Crantz: 1, 3, 4; B 1269
**Conium maculatum* L.: 1, 4; B 1292
Cryptotaenia canadensis (L.) DC.: 1, 2, 3, 4; M 2070
**Daucus carota* L.: 1; M 2055
Heracleum maximum Bartr.: 1; M 2050
Osmorhiza longistylis (Torr.) DC.: 2, 4; P 35549
**Pastinaca sativa* L.: 1; B 1293
Sanicula canadensis L.: 1, 2, 4; M 2080
Sanicula odorata (Raf.) Pryer & Phillippe: 1, 2, 4; P 35550

Apocynaceae
Apocynum cannabinum L.: 1; M 2017, P 35940, P 35966
Apocynum sibiricum Jacq.: 1; M 2141

Aristolochiaceae
Asarum canadense L.: 2, 4; B 1270

Asclepiadaceae
Ampelamus albidus (Nutt.) Britt.: 1; M 2047
Asclepias incarnata L.: 1; M 2133
Asclepias syriaca L.: 1; M 2012
Asclepias verticillata L.: 1; M 2041

Asteraceae
**Achillea millefolium* L.: 1; P 35630
Ageratina altissima (L.) R.M. King & H. Robins: 2; M 2154
Ambrosia artemisiifolia L.: 1, 3, 4; P 36102
Ambrosia trifida L.: 1, 4, 5; M 2151
**Arctium minus* Schk.: 1, 2, 4; P 35952
**Artemisia annua* L.: 1; E 20
Aster lanceolatus Willd.: 1, 2, 3, 4; Observed
Aster lateriflorus (L.) Britt.: 1, 3, 4; E 36, E 43, E 44
Aster pilosus Willd.: 1; E 12
Aster racemosus L.: 1, 3, 4; E 45
Aster shortii Lindl.: 2; E34, E 35
Bidens cernua L.: 1, 3, 4; M 2022
Bidens frondosa L.: 1, 3, 4; P 36103
**Carduus nutans* L.: 1; P 35618
**Cirsium arvense* (L.) Scop.: 1; M 2027
Cirsium discolor (Muhl.) Spreng.: 1; Observed
**Cirsium vulgare* (Savi) Tenore: 1; P 35934
Conyza canadensis (L.) Cronq.: 1, 2, 3, 4; E 21
Erigeron annuus (L.) Pers.: 1, 2, 3, 4; B 1291
Erigeron philadelphicus L.: 2, 4; P 35587
Erigeron strigosus Muhl.: 1; M 2035
Eupatorium altissimum L.: 1; E 11
Eupatorium perfoliatum L.: 1, 4; P 35926
Eupatorium serotinum Michx.: 1, 3, 4; P 36106
**Helianthus annuus* L.: 1; P 35962
Helianthus hirsutus Raf.: 4; E 42
Helianthus tuberosus L.: 4; P 36108
Lactuca canadensis L.: 1, 2, 4; P 35948
Lactuca floridana (L.) Gaertn. : 2; M 2153
**Lactuca saligna* L.: 1; P 35941
**Lactuca serriola* L.: 1; M 2109
**Matricaria discoidea* DC.: 1; M 2032, P 35619
Rudbeckia laciniata L.: 4; Observed
Rudbeckia triloba L.: 4; M 2069
Silphium perfoliatum L.: 4; M 2059
Solidago canadensis L.: 1, 3, 4; P 36116
Solidago ulmifolia Muhl.: 2, 4; E 37
**Sonchus asper* (L.) Hill: 1; B 1312
**Taraxacum officinale* Weber: 1, 3, 4; B 1274
**Tragopogon pratensis* L.: 1; P 35631
Verbesina alternifolia (L.) Britt.: 4; P 36109
Vernonia fasciculata Michx.: 1; P 35953
Vernonia gigantea (Walt.) Trel.: 1; P 35939
Xanthium strumarium L.: 1, 3, 4; E 13

Balsaminaceae
Impatiens capensis Meerb.: 4; P 35927

Berberidaceae
Podophyllum peltatum L.: 2; P 35574

Bignoniaceae
Campsis radicans (L.) Seem.: 1, 3, 4; M 2136

Boraginaceae
Hackelia virginiana (L.) I.M. Johnston: 1, 2, 4; M 2082
Myosotis verna Nutt.: 1, 2; B 1301

Brassicaceae
**Alliaria petiolata* (Bieb.) Cavara & Grande: 1, 2; B 1272
Arabis laevigata (Willd.) Poir.: 2; P 35558
Arabis shortii (Fern.) Gl.: 2; B 1287
**Barbarea vulgaris* R. Br.: 1, 4; B 1278
**Brassica juncea* (L.) Czern.: 1; M 2034
**Capsella bursa-pastoris* (L.) Medik.: 1, 3, 4; B 1279
Cardamine parviflora L.: 3, 4; P 35597
**Cardaria draba* (L.) Desv.: 1; B 1315
Dentaria laciniata Muhl.: 2; B 1253, E 75
**Erysimum repandum* L.: 1; B 1289
**Lepidium densiflorum* Schrader: 1; P 35600
Lepidium virginicum L.: 1; M 2033, P 35563
Nasturtium officinale R. Br.: 1; P 35636
Rorippa palustris (L.) Besser var. *fernaldiana* (Butters & Abbe) Stuckey: 1, 3, 4; B 1324
Rorippa sessiliflora (Nutt.) A. Hitchc.: B 1326
**Sisymbrium loeselii* L.: 1; E 47, M 2039, P 35586.1
**Sisymbrium officinale* (L.) Scop. var. *officinale*: 1; B 1298
**Sisymbrium officinale* (L.) Scop. var. *leiocarpum* DC.: 1; M 2057
**Thlaspi arvense* L.: 1; B 1281

Casesalipinaceae
Cercis canadensis L.: 2, 4; B 1245
Gleditsia triacanthos L.: 2, 4; P 35570
Gymnocladus dioicus (L.) K. Koch: 2, 4; M 2101

Campanulaceae
Campanulastrum americanum (L.) Small: 4; M 2060
Lobelia inflata L.: 1, 4; P 36113
Lobelia siphilitica L.: 4; P 35959; P 36112
Triodanis perfoliata (L.) Nieuw.: 1; M 2038

Cannabinaceae
**Cannabis sativa* L.: 1; Observed

Capparaceae
Polanisia dodecandra (L.) DC.: 1; M 2142

Caprifoliaceae
**Lonicera maackii* (Rupr.) Maxim.: 1, 2, 4; P 35590
Sambucus canadensis L.: 1, 3, 4; M 2019

Caryophyllaceae
**Arenaria serpyllifolia* L.: 1; P 35627
Cerastium nutans Raf.: 1; B 1277
**Cerastium pumilum* Curtis: 1; P 35627.2
**Dianthus armeria* L.: 1; B 1299
**Holosteum umbellatum* L.: 1; E 81
**Saponaria officinalis* L.: 1; M 2031
Silene antirrhina L.: 1; B 1299, P 35562
**Stellaria media* (L.) Cyrillo: 1; B 1247

Celastraceae
**Euonymus alatus* (Thunb.) Sieb.: 1, 2; P 35582
Euonymus atropurpureus Jacq.: 2; M 2073

Ceratophyllaceae
Ceratophyllum demersum L.: 1; E 18

Chenopodiaceae
**Chenopodium album* L.: 1; E 15
Chenopodium simplex (Torr.) Raf.: 1; M 2145

Convolvulaceae
Calystegia sepium (L.) R. Br.: 1, 4; M 2048
**Convolvulus arvensis* L.: 1; B 1327, M 2049
**Ipomoea hederacea* (L.) Jacq.: 1; P 35957
Ipomoea lacunosa L.: 1; M 2147

Cornaceae
Cornus drummondii C.A. Mey.: 1, 2; B 1310, P 35946, P 35947

Corylaceae
Ostrya virginiana (Miller) K. Koch: 2; B 1255

Cucurbitaceae
Sicyos angulatus L.: 4; B 1314

Elaeagnaceae
**Elaeagnus umbellata* Thunb.: 1, 2; B 1266

Euphorbiaceae
Acalypha deamii (Weatherby) Ahles: 2, 3; M 2146, M 2152, M 2155
Acalypha ostryifolia Riddell: 1; P 35969
Acalypha rhomboidea Raf.: 3, 4; M 2149
Chamaesyce humistrata (Engelm.) Small: 1, 4; E 27
Chamaesyce maculata (L.) Small: 1; P 36105
Chamaesyce nutans (Lag.) Small: 1; M 2116
Poinsettia dentata (Michx.) Kl. & Garcke: 1; P 35965

Fabaceae
Amorpha fruticosa L.: 1, 4; P 35642
Amphicarpaea bracteata (L.) Fern.: 1, 2, 4; P 36114
Apios americana Medic.: 1; P 35960
**Lotus corniculatus* L.: 1; M 2129
**Medicago lupulina* L.: 1; P 35599
**Medicago sativa* L.: 1; B 1295
**Melilotus alba* Medic.: 1; M 2028
**Melilotus officinalis* (L.) Pallas: 1; P 35622
**Robinia pseudoacacia* L.: 1, 2; P 35591
**Securigera varia* (L.) Lassen: 1; B 1318, M 2020
Strophostyles helvula (L.) Ell.: 1; M 2087
**Trifolium campestre* Schreb.: 1; B 1309
**Trifolium pratense* L.: 1; B 1294

Trifolium repens L.: 1; P 35620.2

Fagaceae
Quercus alba L.: 2; E 39
Quercus imbricaria Michx.: 2; P 35594
Quercus macrocarpa Michx.: 2; P 35588
Quercus muhlenbergii Engelm.: 2; P 35584
Quercus palustris Muench.: 1; Observed
Quercus rubra L.: 2; P 35593
Quercus velutina Lam.: 1, 2; E 40

Fumariaceae
Dicentra cucullaria (L.) Bernh.: 2, 4; B 1244

Geraniaceae
Geranium carolinianum L.: 1, 4; P 35624

Grossulariaceae
Ribes missouriense Nutt.: 1, 2, 4; B 1263

Hippocastanaceae
Aesculus glabra Willd.: 2, 4; B 1267

Hydrophyllaceae
Ellisia nyctelea L.: 1, 2, 3, 4; B 1264
Hydrophyllum appendiculatum Michx.: 2; P 35604
Hydrophyllum virginianum L.: 2, 4; P 35557

Hypericaceae
Hypericum perforatum L.: 1; M 2051
Hypericum prolificum L.: 1; M 2140

Juglandaceae
Carya cordiformis (Wangenh.) K. Koch: 2; P 35589
Carya illinoiensis (Wangenh.) K. Koch: 1; P 35950
Carya ovalis (Wangenh.) Sarg.: 2; M 2091A
Carya ovata (Mill.) K. Koch: 2; P 35595
Juglans cinerea L.: 4; P 36111
Juglans nigra L.: 1, 2, 4; P 35612

Lamiaceae
Agastache nepetoides (L.) Ktze.: 4; P 36107
Glechoma hederacea L.: 12, 3, 4; E 79
Lamium amplexicaule L.: 1; B 1251
Lamium purpureum L.: 1, 4; B 1271
Leonurus cardiaca L.: 1, 4; B 1305
Lycopus americanus Muhl.: 1; P 35930
Mentha arvensis L.: 1; P 35929
Monarda fistulosa L.: 1, 4; M 2076
Nepeta cataria L.: 1, 4; P 35949
Physostegia virginiana (L.) Benth.: 1, 3; P 35964
Prunella vulgaris L.: 1; M 2094
Scutellaria lateriflora L.: 1; P 35954
Stachys tenuifolia Willd.: 1; M 2098
Teucrium canadense L.: 1, 4; M 2023

Lauraceae
Sassafras albidum (Nutt.) Nees: 1, 2; B 1283

Malvaceae
Abutilon theophrastii Medic.: 1; M 2042
Hibiscus laevis All.: 4; P 35931
Hibiscus trionum L.: 1; M 2120
Malva neglecta Wallr.: 1; E 10
Sida spinosa L.: 1; M 2119, P 35937

Menispermaceae
Menispermum canadense L.: 4; P 36115

Mimosaceae
Desmanthus illinoensis (Michx.) MacM.: 1; M 2114

Molluginaceae
Mollugo verticillata L.: 1, 3, 4; E 23

Moraceae
Maclura pomifera (Raf.) Schneider: 1, 4; B 1306
Morus rubra L.: 2; P 35581.2
Morus tatarica L.: 1; B 1268

Nyctaginaceae
Mirabilis nyctaginea (Michx.) MacM.: 1; B 1321

Oleaceae
Forestiera acuminata (Michx.) Poir.: 3, 4; B 1325, M 2043
Fraxinus americana L.: 2; E 38
Fraxinus lanceolata Borkh.: 1, 3, 4; B 1322
Syringa vulgaris L.: 1; E 80

Onagraceae
Oenothera biennis L.: 1, 4; M 2112

Oxalidaceae
Oxalis stricta L.: 1, 2, 3, 4; P 35586

Phrymaceae
Phryma leptostachya L.: 4; M 2075

Phytolaccaceae
Phytolacca americana L.: 1, 2, 4; M 2030

Plantaginaceae
Plantago aristata Michx.: 1; M 2077
Plantago lanceolata L.: 1; P 35625
Plantago rugelii Decne.: 1, 2, 3, 4; M 2015, M 2083
Plantago virginica L.: 1; P 35564

Platanaceae
Platanus occidentalis L.: 4; E 41

Polemoniaceae
Phlox divaricata L.: 2; B 1260

Polygonaceae
Antenoron virginianum (L.) Roberty & Vautier: 2; M 2156
Fallopia scandens (L.) Holub: 1, 4; P 36110
Persicaria amphibium (L.) S.F. Gray: 1, 4; P 35963
Persicaria hydropiperoides (Michx.) Small: 1, 4; P 35941
Persicaria lapathifolia (L.) S.F. Gray: 1, 4; M 2108
Persicaria pensylvanica (L.) Small: 1, 3, 4; P 36101
Persicaria punctata (Ell.) Small: 1, 3, 4; P 35933
Persicaria vulgaris Webb & Moq.: 1: M 2013, M 2046
**Polygonum arenastrum* Boreau: 1; M 2058
Polygonum erectum L.: 1; E 46
**Reynoutria japonica* Houtt.: 1; M 2061
**Rumex acetosella* L.: 1, 2; P 35567
Rumex altissimus Wood: 1, 4: P 35569
**Rumex crispus* L.: 1; P 35616
**Rumex patientia* L.: 1, 4; M 2066

Portulacaceae
Claytonia virginica L.: 2, 4; B 1243
**Portulaca oleracea* L.: 1; P 36104

Ranunculaceae
Anemone virginiana L.: 1; M 2097
Enemion biternatum Raf.: 2; B 1252, E 74
Ranunculus abortivus L.: 2, 3, 4; B 1259, B 1280
Ranunculus sceleratus L.: 1; P 35637
Ranunculus septentrionalis Poir. var. *septentrionalis*: 3, 4; B 1282

Rosaceae
Agrimonia pubescens Wallr.: 2; M 2095, M 2158
Crataegus mollis (Torr. & Gray) Scheele: 3, 4; B 1286
Geum canadense Jacq.: 1, 2, 4; M 2064
Potentilla norvegica L.: 1, 3, 4; M 2014
**Potentilla recta* L.: 1, 2; M 2016
Prunus hortulana Bailey: 1; B 1258, B 1311
Prunus serotina Ehr.: 1, 2, 4; M 2026, P 35571
**Rosa multiflora* Thunb.: 1, 2, 4; P 35605
Rubus allegheniensis Porter: 1, 2; P 35581.1
Rubus flagellaris Willd.: 1; P 35602
Rubus occidentalis L.: 1, 2, 3; P 35572
Rubus pensilvanicus Poir.: 1, 2; P 35598

Rubiaceae
Cephalanthus occidentalis L.: 1, 3, 4; M 2045
Galium aparine L.: 1, 2, 4; P 35551
Galium circaezans Michx. var. *hyponalacum* Fernald: 2, 4; M 2093
Spermacoce glabra Michx.: 4; M 2044, M 2118

Rutaceae
Ptelea trifoliata L.: 1, 2; M 2131, P 35609

Salicaceae
Populus deltoides Marsh.: 1, 3, 4; B 1250, B 1254
Salix amygdaloides Anderss.: 1, 4; M 2139
Salix interior Rowlee: 1, 4; B 1256
Salix nigra Marsh.: 1, 3, 4; B 1284, P 35601

Scrophulariaceae
Leucospora multifida (Michx.) Nutt.: 1, 4; M 2121
Mimulus ringens L.: 1; M 2132
**Verbascum blattaria* L.: 1; B 1290, M 2053
**Verbascum thapsus* L.: 1; M 2088
**Veronica arvensis* L.: 1; M 2037, P 35626
Veronica peregrina L.: 1; P 35603

Solanaceae
Datura stramonium L. var. *tatula* (L.) Torr.: 1; M 2135
Physalis subglabrata MacK. & Bush: 1, 4; B 1323, M 2115
Physalis virginiana Miller: 1; M 2025
Solanum carolinense L.: 1; M 2024
Solanum ptychanthum Dunal.: 1, 2, 3, 4; M 2040

Staphyleaceae
Staphylea trifolia L.: 2, 4; P 35607

Tiliaceae
Tilia americana L.: 1, 4; P 35580

Ulmaceae
Celtis occidentalis L.: 1, 2, 4; M 2072
Ulmus americana L.: 1, 2, 3, 4; B 1240
**Ulmus pumila* L.: 1; B 1248
Ulmus rubra Muhl.: 2, 3, 4; B 1265

Urticaceae
Boehmeria cylindrica (L.) Sw.: 1, 3, 4; M 2078
Laportea canadensis (L.) Wedd.: 3, 4; M 2148
Parietaria pensylvanica Muhl.: 1, 2, 4; M 2099
Pilea pumila (L.) Gray: 3, 4; E 29
Urtica gracilis Ait.: 1, 3, 4; M 2062

Verbenaceae
Phyla lanceolata (Michx.) Greene: 1, 4; M 2117
Verbena hastata L.: 1; M 2122
Verbena stricta Vent.: 1; M 2054
Verbena urticifolia L.: 1, 2, 3; M 2065

Violaceae
Viola bicolor Pursh: 1; B 1275

Viola pratincola Greene: 1, 4; B 1276
Viola pubescens Ait. var. *eriocarpa* (Schwein.) Russell: 2, 4; B 1261
Viola sororia Willd.: 2, 3, 4; B 1262

Vitaceae
Ampelopsis cordata Michx.: 4; M 2068
Parthenocissus quinquefolia (L.) Planch.: 1, 2, 4; Observed
Vitis cinerea (Engelm.) Engelm.: 1, 2, 3, 4; M 2084
Vitis riparia Michx.: 1, 2, 3, 4; P 35596
Vitis vulpina L.: 1, 3, 4; P 35615

Zygophyllaceae
Tribulus terrestris L.: 1; P 35958

MONOCOTS
Alismataceae
Sagittaria latifolia Willd.: 1; Observed

Araceae
Arisaema triphyllum (L.) Schott: 2; B 1289

Commelinaceae
Commelina communis L.: 1, 3; M 2157
Commelina diffusa Burm. f.: 3; M 2138

Cyperaceae
Bolboschoenus fluviatilis (Torr.) Sojak.: 1; Observed
Carex aggregata Mack.: 1; P 35568
Carex albicans Willd.: 2; P 35579
Carex albursina Sheldon: 2; P 35606
Carex blanda Dewey: 2; P 35553
Carex brevior (Dewey) Mack.: 1; P 35629
Carex conjuncta Boott: 2; P 35614
Carex davisii Schwein. & Torr.: 1, 4; B 1304
Carex digitalis Willd.: 2; P 35575
Carex festucacea Schkuhr: 1; M 2018
Carex frankii Kunth: 1; M 2125
Carex granularis Muhl.: 1; P 35632
Carex gravida Bailey: 1; P 35641
Carex grisea Wahl: 2; P 35555
Carex hirsutella Mack.: 2; B 1303
Carex hirtifolia Mack.: 2; P 35578
Carex jamesii Schwein.: 2, 4; P 35552
Carex laeviconica Dewey: 1; B 1316, P 35634
Carex leavenworthii Dewey: 2; P 35561, P 35566
Carex lurida Wahl: 1; P 35639
Carex molesta Mack. ex Bright: 1; M 2090, P 35640
Carex normalis Mack.: 1, 2; B 1319
Carex radiata (Wahl.) Small: 2, 4; P 35576
Carex sparganioides Muhl.: 2; P 35611
Carex stipata Muhl.: 1, 2; P 35638
Carex vulpinioidea Michx.: 1; B 1320
Cyperus erythrorhizos Muhl.: 1; M 2107
Schoenoplectus acutus (Muhl.) A. Love & D. Love: 1; P 35635
Schoenoplectus pungens (Vahl) Palla: 1; M 2134
Shoenoplectus tabernaemontani (K.C. Gmel.) Palla: 1; M 2021
Scirpus atrovirens Willd.: 1; M 2113

Hydrocharitaceae
Elodea nuttallii (Planch.) St. John: 1, 2, 4; E 17

Iridaceae
**Belamcanda chinensis* (L.) DC.: 1; M 2091B

Juncaceae
Juncus tenuis Willd.: 1, 2; M 2056, M 2092
Juncus torreyi Coville: 1; M 2126, P 35932

Lemnaceae
Lemna minor L.: 1; M 2111, P 35956
Wolffia columbiana Karst.: 4; M 2071

Liliaceae
Erythronium albidum Nutt.: 2; B 1246
**Hemerocallis fulva* (L.) L.: 1; M 2052
**Ornithogalum umbellatum* L.: 1, 4; P 35585
Polygonatum commutatum (Schult.) A. Dietr.: 1; M 2130
Smilacina racemosa (L.) Desf.: 2; Observed
Trillium recurvatum Beck: 2, 4; B 1273

Poaceae
Agrostis gigantea Roth: 1, 4; M 2063
Andropogon gerardii Vitman: 1; P 35944
Andropogon virginicus L.: 1; Observed
Bouteloua curtipendula (Michx.) Torr.: 1; M 2128
**Bromus inermis* Leyss.: 1; P 35628
**Bromus tectorum* L.: 1; P 35617
Buchloë dactyloides (Nutt.) Engelm.: 1; P 35951
**Chloris verticillata* Nutt.: 1; P 35942
**Dactylis glomerata* L.: 1; P 35623
Dichanthelium acuminatum (Sw.) Gould & Clark var. *fasciculatum* (Torr.) Freckm.: 1; B 1300
**Digitaria ischaemum* (Schreb.) Schreb.: 1; E 32
**Digitaria sanguinalis* (L.) Scop.: 1; E 24, M 2110
Echinochloa muricata (Michx.) Fern. var. *muricata*: 1; M 2085
Echinochloa muricata (Michx.) Fern. var. *wiegandii* (Fassett) Mohlenbr.: 1; P 35936
**Eleusine indica* (L.) Gaertn.: 1; M 2104, P 35938
Elymus canadensis L.: 1; M 2123
Elymus hystrix L.: 2; B 1313
Elymus villosus Muhl.: 3, 4; M 2074
Elymus virginicus L.: 1, 3, 4; M 2067
**Eragrostis ciliianensis* (All.) Vign.: 1; E 26, M 2102
Eragrostis pectinacea (Michx.) Nees: 1; E 33, M 2103
**Festuca pratensis* Huds.: 1; P 35621

Festuca subverticillata (Pers.) E.B. Alexeev.: 2, 4; P 35583
Glyceria striata (Lam.) Hitchc.: 1, 3, 4; P 35967
Hordeum jubatum L.: 1; B 1307
Hordeum pusillum Nutt.: 1; P 35565
Leersia lenticularis Michx.: 3; M 2143
Leersia oryzoides (L.) Swartz: 1, 4; Observed
Leersia virginica Willd.: 1, 4; M 2144
Leptochloa fascicularis (Lam.) Gray: 1; M 2106
**Lolium multiflorum* Lam.: 1; B 1297
Muhlenbergia schreberi J.F. Gmel.: 1; E 31
Panicum capillare L.: 1; E 25
Panicum dichotomiflorum Michx.: 1; E 14
Panicum virgatum L.: 1; P 35943
**Phalaris arundinacea* L.: 1, 3, 4; B 1296
**Phleum pratense* L.: 1; M 2100
**Poa compressa* L.: 1, 2; M 2096
**Poa pratensis* L.: 1, 2; P 35620.1
Poa sylvestris Gray: 2; P 35556
**Setaria faberi* F. Herrm.: 1; M 2105
Setaria glauca (L.) P. Beauv.: 1; P 35925
**Setaria italica* (L.) P. Beauv.: 1; M 2150
**Setaria viridis* (L.) P. Beauv.: 1; M 2036
Sphenopholis intermedia (Rydb.) Rydb.: 2; P 35610
Sporobolus cryptandrus (Torr.) Gray: 1; E 28
Sporobolus neglectus Nash: 1; E 16
Tridens flavus (L.) Hitchc.: 1, 2; P 35961

Potamogetonaceae
**Potamogeton crispus* L.: 1; P 35633
Potamogeton foliosus Raf.: 1; P 35955

Smilicaceae
Smilax tamnoides L. var. *hispida* (Muhl.) Fern.: 1, 2, 4; P 35573

Sparganiaceae
Sparganium eurycarpum Engelm.: 1; P 35928

Typhaceae
Typha latifolia L.: 1; M 2124

Erigenia, Number 21, November 2006, pp 22–24

Savanna Blazing Star, *Liatris scariosa* (L.) Willd. var. *nieuwlandii* Lunell, A New Record For DuPage County, Illinois

Paul Bollinger[1]

Abstract: Savanna blazing star (*Liatris scariosa* var. *nieuwlandii*) is an Illinois state threatened plant species which was recently identified in DuPage County, Illinois. One individual was observed in a wetland mitigation area adjacent to a remnant prairie within an undeveloped portion of an industrial park. The individual appears to be naturally occurring and not transplanted as part of restoration efforts for the wetland mitigation area.

Introduction

The Endangered Species Protection Board (2004) considers *Liatris scariosa* var. *nieuwlandii* an Illinois threatened plant species. According to Herkert (1991), Swink and Wilhelm (1994), Herkert and Ebinger (2002), and Mohlenbrock (2002), there are no known populations in DuPage County, with Cook and Will being the only northeastern Illinois Counties where it is found. According to Bowles et al (1988), most populations range in size from 1 to over 100 flowering individuals. According to Bell et al (1999), this species is restricted to current or former savanna habitats and is both spatially and temporally isolated from other populations of *Liatris scariosa* var. *nieuwlandii*. In addition, it appears to favor areas with relatively high amounts of bare ground. It grows either in partial shade of undisturbed savanna remnants or, which is the usual case in northeastern Illinois, in full sun of open disturbed habitat without tallgrass cover (Bowles et al 1988; Gleason & Cronquist 1991; Swink & Wilhelm 1994).

The purpose of this paper is to document the occurrence of savanna blazing star *Liatris scariosa* (L.) Willd. var. *nieuwlandii* Lunell, in DuPage County, Illinois. The plant was first identified in DuPage County, Illinois, by the author on September 9, 2003. It was observed the following year on July 20 and August 4, 2004. On September 8, 2004, Scott Kobal, Plant Ecologist with the Forest Preserve District of DuPage County, confirmed the occurrence. A specimen was not collected, as only one flowering individual was observed.

Species Description

The following description of *Liatris scariosa* comes from Britton and Brown (1970).

> "Finely pubescent, at least above, 1–6 feet high. Lower leaves oblanceolate, spatulate or oblong-lanceolate, narrowed in a margined petiole, acute or obtusish at the apex, often 1 foot long and 1 ½ inch wide: upper leaves linear or linear-lanceolate, acute, or sometimes very obtuse, much smaller, all densely punctate: heads hemispheric, ½ inch–1 inch broad, 15–45- flowered, on stout peduncles 1/3 inch–2 inches long, or sometimes sessile: bracts of the involucre imbricated in 5 or 6 series, spatulate-linear, oblanceolate or obovate, rounded at the apex, appressed, their tips dry and scarious, often colored: flowers bluish purple; pappus barbellate."

According to Herkert (1991), this species was misidentified and treated as a hybrid in Illinois; now it is recognized at the varietal level. Therefore, we have included Swink and Wilhelm's (1994) description of *Liatris scariosa* var. *nieuwlandii* starting at the genus level.

> "Heads few to numerous, sessile to pedunculate, each with more than 15 flowers. Stems pubescent or glabrate; involucral bracts spreading or reflexed at the rounded tips; heads usually more than 20; corolla lobes glabrous; pappus merely barbellate. Middle involucral bracts non-bullate, glabrous, hirsutulous, or cinereous abaxially, uniformly narrow, with entire,

[1] Bollinger, Lach & Associates, 1010 Jorie Boulevard, Oak Brook, Illinois 60523.

Photos taken by Paul Bollinger.

slightly erose, or ciliate scarious margins; heads sessile to very often on peduncles as long as or longer than the involucres."

DESCRIPTION OF SPECIES LOCATION AND HABITAT

Geographically, the site is located in Section 5, Township 39 North, Range 9, East of the Third Principal Meridian. It is east of Kress Road and north of Downs Road in West Chicago, DuPage County, Illinois. The site is in an undeveloped portion of an industrial park about 1 km west of West Chicago Prairie, operated by the Forest Preserve District of DuPage County. The majority of the undeveloped area remains undisturbed and supports conservative prairie remnant species with large amounts of bare ground. Recently a portion of the site was disturbed and a wetland mitigation area with associated prairie buffer was created. The individual *Liatris scariosa* var. *nieuwlandii* was found on the fringe of the prairie buffer and the undisturbed prairie remnant. Associates included Indian grass (*Sorghastrum nutans*), switch grass (*Panicum virgatum*), ox-eyed daisy (*Chrysanthemum leucanthemum* var. *pinnatifidum*), yellow coneflower (*Ratibida pinnata*) and side-oats grama (*Bouteloua curtipendula*). Some of these species represent tallgrass species, which were planted and not usually associated with *Liatris scariosa* var. *nieuwlandii*. Prairie vegetation with high amounts of bare soil dominated the undisturbed area immediately to the east, which appears to be ideal habitat for this species.

The on-site individual of *Liatris scariosa* var. *nieuwlandii* appears to be naturally occurring and not accidentally introduced. The closest related species planted within the wetland mitigation prairie buffer was prairie blazing star (*Liatris pycnostachya*) and its inflorescences are distinct (see photos). In addition, the site was planted within one year of the author's first observation of the flowering individual of *Liatris scariosa* var. *nieuwlandii*, and *Liatris* spp. normally take more than one year to flower from seed. And lastly, the individual is growing less than 1 m from a habitat type that favors this species. Therefore, this individual appears to have always occurred on the site with recent native plantings occurring adjacent to it.

ACKNOWLEDGMENTS

I would like to thank Scott Kobal, Plant Ecologist with the Forest Preserve District of DuPage County, for confirming the species in the field and for comments on the manuscript.

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The Black Snakeroot Species (*Sanicula* L., Apiaceae) of Illinois

Loy R. Phillippe[1], Daniel T. Busemeyer[1,2], and John E. Ebinger[1]

Abstract: A principal components analysis of 104 herbarium specimens representing the morphological and geographical range of *Sanicula* L. in Illinois revealed that the six native taxa are distinct (five species, one with two varieties). Of these taxa, *Sanicula canadensis* L. var. *canadensis* and *S. odorata* (Raf.) Pryer & Phillippe (*S. gregaria* Bickn.) are very common, being reported from most Illinois counties. Of the remaining taxa, *S. canadensis* L. var. *grandis* Fern. and *S. marilandica* L. are mostly restricted to the northern half of the state, *S. trifoliata* Bickn. is uncommon, but scattered throughout the state (found in 13 counties), while the extremely rare *S. smallii* Bickn. is known from only Hardin County in extreme southern Illinois.

Introduction

Sanicula (Apiaceae), commonly known as black snakeroot or sanicle, is distributed primarily in the north temperate zone of both the Old World and New World. In eastern United States, this genus of mostly perennial herbs is found in mesic woodlands where it is commonly a major component of the flora. Approximately 40 species are found worldwide, with five species occurring in eastern North America (Gleason and Cronquist 1991). Members of *Sanicula* are readily distinguished from other genera of the Apiaceae by their swollen fruits that have hooked bristles, and the fruits in three flowered umbellets.

The genus is characterized by the following morphological features: herbaceous perennials from a cluster of fibrous to fleshy-fibrous roots; basal leaves with the petioles longer than the palmately compound blades with variously lobed leaflets; the cauline leaves similar, but smaller with shorter petiole, and progressively reduced upward; flowers small, 5-merous, epigynous, gamosepalous, polypetalous with the petals apically inflexed, and grouped into an umbellet; the simple to compound umbels bearing a mixture of hemaphrodite and staminate flowers; and fruits which have four prominent and persistent calyx lobes, numerous hooked bristles over the entire outer surface, and two persistent styles.

The genus *Sanicula* is commonly placed in the tribe Saniculeae of the subfamily Saniculoideae, which also includes the closely related genus *Eryngium* L. (Plunkett et al. 1996, Downie et al. 1998). Shan and Constance (1951) recognized five sections within the genus *Sanicula*, each with its distinct morphological characteristics and distinctive geographical range. Only one section (*Sanicula*) occurs in eastern North America. Phillippe (1978a) distinguished seven New World taxa within section *Sanicula*. Six of these occur in eastern North America, and one is known from the mountains of Mexico and Central and South America (Pryer and Phillippe 1989). Of these taxa, both Jones (1963) and Mohlenbrock (1986) recognized that four taxa occur in Illinois. Recent evaluation of the Illinois specimens, however, indicates that six taxa are present in Illinois (Mohlenbrock 2002). The present study was undertaken to examine the relationships among the *Sanicula* species found in Illinois, to determine their geographical distribution in the state, and to distinguish any subspecific taxa.

Materials and Methods

More than 1,000 herbarium specimens were examined from many of the state herbaria (DEK, EIU, F, ILL, ILLS, MOR, MWI, SIU). Habitat observations also were made for most species, and specimens were collected. From this material, dot maps were prepared. Each dot on the resulting maps represents a specimen seen by the authors (Figures 2,3). The specimens were sorted into groups based on similarity of morphological characteristics. After removal of duplicate specimens and specimens without adequate diagnostic

[1] Section for Biodiversity, Illinois Natural History Survey, 1816 South Oak Street, Champaign, Illinois 61820.
[2] Present address: Ghost Pine Environmental Services, Ltd., Calgary, Alberta, Canada T2Z 1M9.

Table 1: Characters scored for the principal components analysis of the *Sanicula* taxa of Eastern North America.

FrL	1.	Fruit length, including stipe and calyx (mm);
FrC	2.	Fruit calyx length (mm);
FrS	3.	Fruit stipe length (1 = present and mostly more than 0.5 mm long, 2 = fruit sessile to subsessile);
FrA	4.	Fruit calyx-lobe shape (1 = subulate, 2 = acute to obtuse);
StL	5.	Fruit style length (1 = shorter than calyx, 2 = up to twice as long as calyx, 3 = more than twice as long as calyx);
Com	6.	Commissural scar shape (1 = narrowly elliptical to oblong, 2 = broadly oval);
ScL	7.	Staminate flower calyx length (mm);
ScS	8.	Staminate flower calyx-lobe shape (1 = subulate, 2 = acute to obtuse);
StN	9.	Number of staminate flowers per umbellet (1 = 8 or less, 2 = more than 8, and usually 15 or more);
StP	10.	Staminate flower pedicel length (mm);
Rot	11.	Root shape (1 = fibrous, 2 = thickened and cord-like).

features, a group of specimens representing the range in morphological characteristics and the geographical distribution of each taxon in Illinois was selected for further study. From this group, a total of 104 specimens were scored for 1 vegetative and 10 floral and fruit characters (Table 1). For the common Illinois taxa, *Sanicula canadensis* var. *canadensis* and *S. odorata* (*S. gregaria*), only 33 specimens were selected for each taxon. For the other taxa, all available, good quality specimens were used. For *S. smallii*, two out-

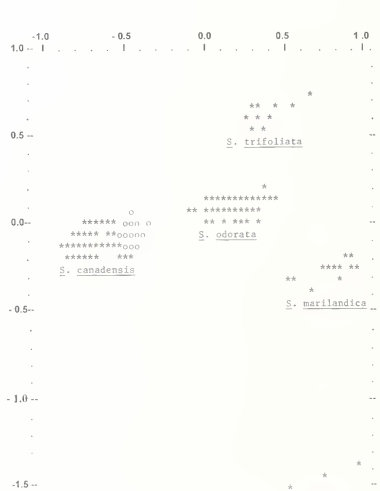


Figure 1. A two-dimensional plot (axis 2 vs. axis 3) of a principal component analysis using 11 variables for 33 specimens of *Sanicula canadensis* var. *canadensis* (*), 13 specimens of *S. canadensis* var. *grandis* (o), 12 specimens of *S. marilandica*, 33 specimens of *S. odorata*, 10 specimens of *S. trifoliata*, and 3 specimens of *S. smallii*.

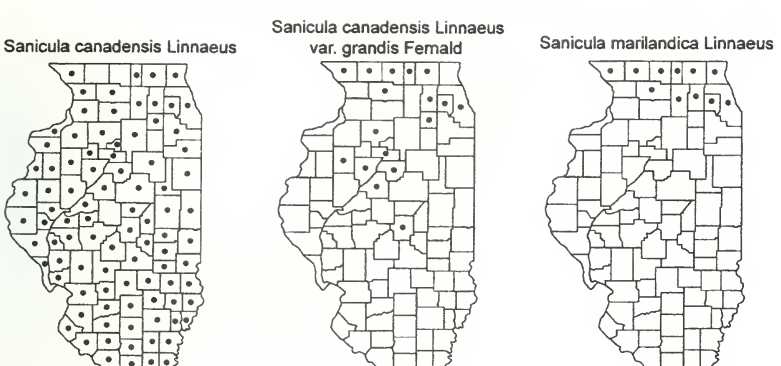


Figure 2. Illinois distribution of *Sanicula canadensis* var. *canadensis*, *S. canadensis* var. *grandis*, and *S. marilandica*.

of-state specimens were included in the analysis. All characters were measured (three or more measurements for each specimen) and plotted to insure that gaps exist to enable the use of scored characters. Such differences were observed in all cases. The data were then analyzed by principal-components analysis (PCA) using NTSYS-pc (Rohlf 1990).

RESULTS AND DISCUSSION

When the PCA of the entire data set for the 104 specimens was run, the first three principal components accounted for 53%, 24%, and 11%, respectively, or 88% of the total variance. Fruit calyx length, fruit length, and staminate flower calyx-lobe length (characters 2, 1, and 8) were the most important in determining the score of the first component. The number of staminate flowers per umbellet, fruit style length, and the staminate flower pedicel length (characters 9, 5, and 10) were the most important in determining the score of the second component. Root shape and commissural scar shape (characters 11 and 6) were the most important in distinguishing the third component.

Three two dimensional plots (axis 1 vs. 2, 2 vs. 3, and 1 vs. 3) were obtained from the PCA, with the plot using axis 2 vs. axis 3 giving the best resolution (Figure 1). On this PCA plot, five distinct clusters can be recognized that correspond to the five native Illinois species (Figure 1). The clusters are well separated from each other. Also, the dots representing the specimens in each group are mostly closely spaced, indicating that the species are fairly homogeneous, and that gene flow between these species is probably not occurring.

The cluster in Figure 1 that represents *Sanicula canadensis* includes individuals of both variety *canadensis* and variety *grandis*. Most of the individuals on the left side represent variety *canadensis*; those on the right, variety *grandis*. These taxa are very similar morphologically, but the length of the fruiting style can be used for consistent separation, the styles in variety *canadensis* being shorter than the fruiting calyx, those of variety *grandis* being about twice as long as the fruiting calyx.

Key to the Illinois species of *Sanicula*.

1. Styles much longer than the calyx lobes (1.5–3× longer) and longer than the bristles of the fruit, strongly recurved; staminate flowers 10 to 25 or more in some umbellets.
   2. Calyx lobes on the mature fruit 0.9–2.0 mm long; sepals of the staminate flowers acuminate to subulate, sharp-pointed, 0.7–1.5 mm long.
      3. Fruits with short, but distinct, pedicels 0.8–1.5 mm long; staminate flowers 3 to

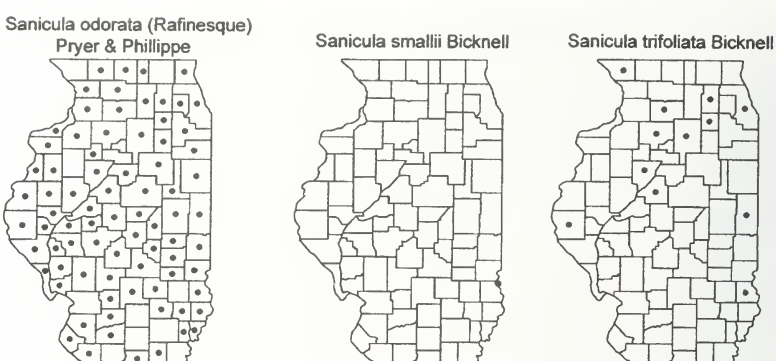


Figure 3. Illinois distribution of *Sanicula odorata*, *S. smallii*, and *S. trifoliata*.

15, many not persisting, shorter than the fruits . . . . . 1b. *Sanicula canadensis* var. *grandis*

3. Fruits sessile to subsessile; staminate flowers commonly 12 to 25 or more in each umbellet, many persistent and surpassing the fruits . . . . . 2. *Sanicula marilandica*

2. Calyx lobes on the mature fruit 0.3–0.7 mm long; sepals of the staminate flower deltoid, the apices obtuse to acute, not sharp-pointed, less than 0.5 mm long . . . . . 3. *Sanicula odorata*

1. Styles shorter to slightly longer than the calyx lobes and shorter than the bristles of the fruit, not recurved; staminate flowers 2–11 per umbellet.

4. Calyx of fruit connivent, beak-like, exceeding the bristles of the fruits; pedicels of the staminate flowers 3–6 mm long . . . . . 5. *Sanicula trifoliata*

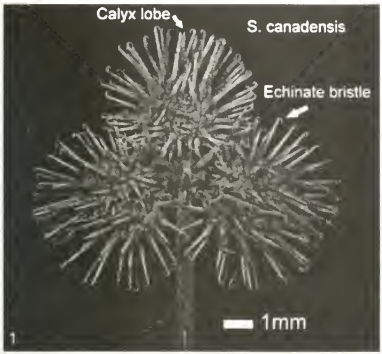
4. Calyx of fruit not connivent, somewhat spreading in fruit, not exceeding the bristles of the fruit; pedicels of the staminate flowers mostly less than 3 mm long.

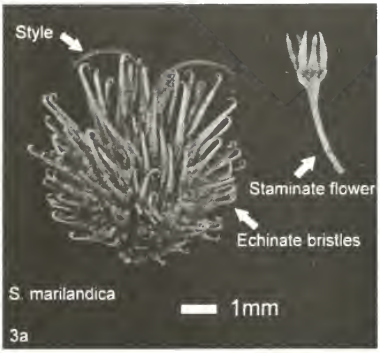
5. Roots mostly thickened and cord-like; fruits sessile or subsessile; styles equaling or slightly exceeding the fruiting calyx (Hardin Co.) . . . . 4. *Sanicula smallii*

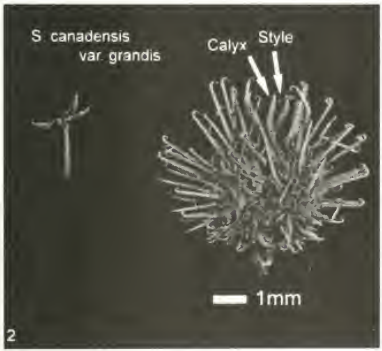
5. Roots fibrous; fruits with a short, but distinct pedicel 0.8–1.5 mm; styles shorter than the fruiting calyx . . . . . 1a. *Sanicula canadensis* var. *canadensis*

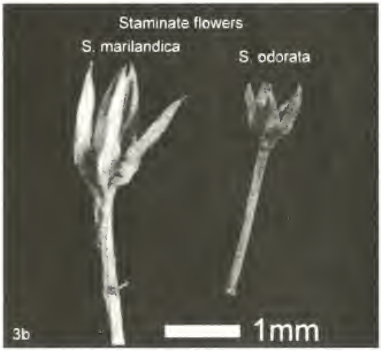
1a. *Sanicula canadensis* L. var. *canadensis* (short-styled Canadian black snakeroot) (Plate 1)

In Illinois, this taxon is extremely common, being reported from all but four counties, and undoubtedly occurs in those (Figure 2). This taxon is abundant in Illinois, occurring in such varied habitats as dry to mesic upland woods, wet lowland woods, thickets and sometimes disturbed habitats. Not uncommonly, it occurs with other *Sanicula* species, particularly *S. odorata* (*S. gregaria*). Specimens of this taxon are occasionally misidentified as *S. odorata*, as they are superficially similar and commonly occur in the same habitat. The larger staminate flowers of *S. canadensis* that have acuminate, sharp-pointed sepals allow for consistent separation from *S. odorata*, in which the smaller staminate flowers have deltoid sepals with obtuse apices. Also, in *S. canadensis* var. *canadensis*, the styles are shorter than the bristles on the fruit, while in *S. odorata*, the styles are much longer than the bristles. In North America, this species ranges from the Great Lakes to southern Vermont and Massachusetts south to central Florida and west to South Dakota and central Texas (Pryer and Phillippe 1989).





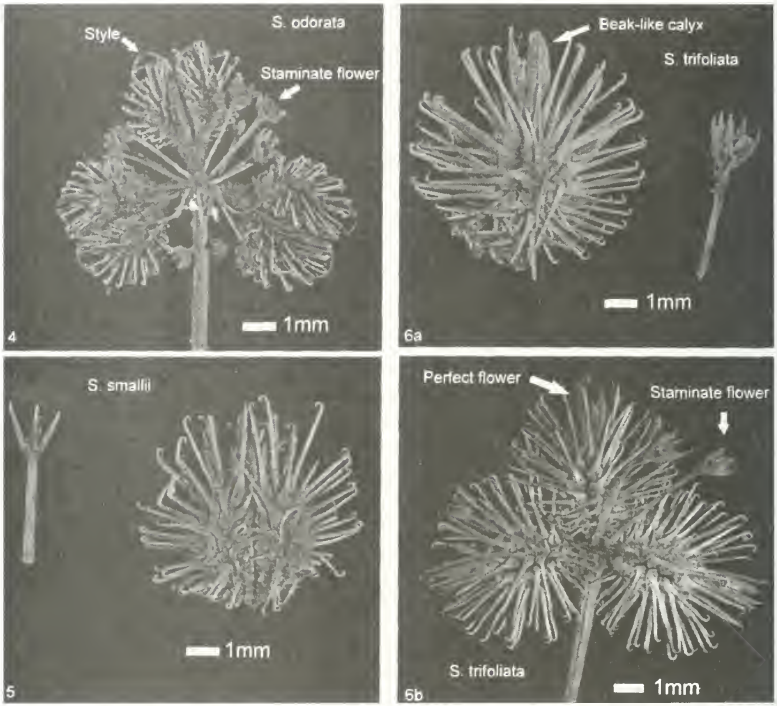




Plates 1, 2, 3a and 3b.

1b. *Sanicula canadensis* L. var. *grandis* Fern. (long-styled Canadian black snakeroot) (Plate 2)

This taxon is scattered and local in Illinois, usually being found in moist, rich woods. Fairly common in the northern one-third of Illinois where numerous specimens were collected, this taxon is occasionally found as far south as Macon and Tazewell counties (Figure 2). Fernald (1940) described *S. canadensis* var. *grandis* on the basis of plants with leaves larger than in var. *canadensis*. However, the fruit length, fruit width, and the style length are significantly larger in var. *grandis* than in var. *canadensis* (Pryer and Phillippe 1989). Jones (1963), Mohlenbrock (1986) and Gleason and Cronquist (1991) did not recognize this taxon. However, the reliable morphological characteristics, particularly the elongated styles, indicate that this is a valid variety. Mohlenbrock (2002) recognized this variety in his recent Illinois flora. This entity has a distinct geographical range, extending from Vermont south to northern Kentucky and west and north to Iowa, Minnesota and Wisconsin (Pryer and Phillippe (1989). Phillippe (1978a) determined that this taxon does not have a hybrid origin, since interspecific cross-pollination experiments between the possible parents did not result in seed development, and pollen stainability was very high (98%) in var. *grandis*.



Plates 4, 5, 6a and 6b.

2. *Sanicula marilandica* L. (black snakeroot) (Plates 3a, 3b)

A fairly common species of northern Illinois, this taxon is found in dense mesic woods, wooded ravines and hazel thickets, occasional in more open, disturbed sites and rarely in prairies. Of the numerous specimens examined that were labeled *S. marilandica*, the authors found no collections of this taxon farther south than DeKalb and DuPage counties (Figure 2). The central and southern Illinois occurrences of this taxon reported by Mohlenbrock and Ladd (1990) are probably based on specimens of *S. canadensis* and *S. odorata*. The sessile to subsessile fruits, the subulate, sharp-pointed sepals, and the large number of staminate flowers in the umbellets (12 to 25), separates *S. marilandica* from the other sanicles of Illinois. This wide-ranging species occurs from Maine to Florida, west to Washington, south in the mountains to New Mexico, and throughout most of southern Canada (Pryer and Phillippe 1989).

3. *Sanicula odorata* (Raf.) Pryer & Phillippe (common black snakeroot) (Plates 3b, 4)

This is probably the most commonly encountered species of sanicle in Illinois, being abundant in moist upland and lowland woods and thickets, and commonly associated with streams and seepage areas. It is known from most Illinois counties (Figure 3) and

undoubtedly occurs in all of them. From the herbarium records examined by the authors, only 14 counties have not been recorded for this species. It is most often confused with *S. marilandica*, from which it may be distinguished by the smaller deltoid calyx lobes (0.3–0.7 mm long) of *S. odorata* compared to the larger, sharp-pointed calyx lobes (0.7–1.5 mm long) of *S. marilandica*. In the past, this taxon has been referred to as *S. gregaria* Bicknell, and most modern authors have used that name for this entity. Phillippe (1978a, 1978b) and later Pryer and Phillippe (1989) recognized that an earlier name, *Triclinum odoratus*, was used by Rafinesque (1817) for this taxon. The combination, *Sanicula odorata* (Raf.) Pryer and Phillippe, was officially made in 1989. In North America, this taxon is found from Maine, south to northern Florida, west to central Texas and eastern North Dakota, its northern boundary being the Great Lakes region (Pryer and Phillippe 1989).

4. *Sanicula smallii* Bickn. (southern black snakeroot) (Plate 5)

Extremely rare in Illinois, this taxon is known in the state from only one collection; it was found in a dry-mesic upland forest in Hardin County (Basinger 11370, ILLS) (Figure 3). First collected in Illinois in 1998, this species occurs primarily in the southeastern United States, and is not known to occur farther north than Kentucky, southern West Virginia, and southern Illinois. Most similar to *S. canadensis*, this taxon is easily separated from that species by its thickened cord-like roots, sessile to subsessile fruits, and styles that are slightly longer than the calyx.

5. *Sanicula trifoliata* Bickn. (large-fruited black snakeroot) (Plates 6a, 6b)

Scattered and rare in Illinois, *S. trifoliata* has only rarely been collected in the state. The authors have seen fewer than 15 collections. Usually associated with mesic, rich woods, *S. trifoliata* is only known from 13 Illinois counties (Figure 3). The authors have seen only one collection from most of these counties. It is a very distinctive species. The large fruits in which the beak-like connivent calyx lobes exceed the fruiting bristles and the long pedicelled staminate flowers make identification easy. It is found throughout north-central North America from the Great Lakes region and New Hampshire, west to southeastern Minnesota, and south to northern Alabama and Georgia in the Appalachians (Pryer and Phillippe 1989).

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Survey of the Illinois Endangered Kankakee Mallow, *Iliamna remota* (Greene), in Kankakee County

April L. McDonnell[1,3], Henry R. Owen[2,3], Sean C. Jones[3], Vincent P. Gutowski[3], and John E. Ebinger[4]

Abstract: *Iliamna remota* Greene (Malvaceae), endemic only to Langham Island in the Kankakee River, Kankakee County, Illinois, is a state endangered species. During the present study, the size of the population was determined, the habitat structure in and around the individual colonies analyzed, and management recommendation made to potentially increase the size of the population. During the summer of 2005, the *I. remota* population consisted of 1,074 stems in 12 colonies, located along the northwest side of the island. In late June, flowering appeared to be prolific, where means and standard deviations of floral buds and open flowers were 1.6 ± 1.2 and 2.1 ± 1.7 per stem, respectively. By late July, however, flowering was sporadic, but many flowering stems had set seed with the mean number of fruits being 1.2 ± 0.9 per stem. Forty percent of sampled seeds germinated after being treated in hot water (80 C) for 10 seconds. Common species associated with *I. remota* colonies were the cool-season Eurasian grass, *Poa pratensis*, and the East Asian shrub *Lonicera maackii*, along with 22 native species and a few other exotics. Previous management included cutting and burning of the shrubby vegetation in and around the *I. remota* colonies. A return to these management practices is suggested.

Introduction

Iliamna remota Greene (Malvaceae) is an endangered species that is endemic to Langham Island in the Kankakee River, Kankakee County, Illinois (Herkert and Ebinger, 2002). This island, owned by the Illinois Department of Natural Resources, was dedicated as the Kankakee River Nature Preserve in 1966 to preserve the only known native population of *I. remota* (McFall and Karnes, 1995). In 1980, the Illinois Endangered Species Protection Board declared *I. remota* as endangered in Illinois because of its limited range (Schwegman, 1984). Some taxonomical debates exist about this species classification. However, Edward Lee Greene classified *I. remota* as specifically distinct from *I. rivularis* in 1906, based upon morphological differences of the calyx-lobes and carpels (Rydberg, 1913; Strausbaugh and Core, 1932; Wiggins, 1936). More recently, a study resolving the phylogeny of *Iliamna* species found *I. remota* to be genetically distinct from *I. rivularis* at the internal transcribed spacer region in the nuclear ribosomal RNA subunits (Bodo Slotta, 2000). Another taxonomical debate exists over whether *I. remota* is the same species as its closely related eastern occurring species, *I. corei* (Sherff) Sherff (Sherff, 1949). Resolution with regards to *I. remota* and *I. corei* species classification was attempted using the internal transcribed spacer regions in the nuclear ribosomal RNA subunits of both species, without clear results (Bodo Slotta, 2000). The name *Iliamna remota* is recognized in this study from *I. rivularis* and *I. corei* in response to different morphological characters documented by Greene (Strausbaugh and Core, 1932) and Sherff (Sherff, 1949).

Iliamna remota is an herbaceous, perennial species that typically grows in sunny, open habitats near the shore along the northwestern portion of Langham Island (Glass et al., 2003; Schwegman, 1984). Plants are 1.0 to 2.5 m tall, with coarse hairs covering the stems and leaves. The palmately-lobed leaves are alternate along the stem, and the flowers occur in terminal racemes. Roots of *I. remota* are shallow and densely fibrous, and vegetative reproduction readily occurs from root crowns of older plants. Two to eight stems may arise from one root crown. Flowers range

[1] (217) 581–3126, april_mcdonnell@yahoo.com
[2] (217) 581–6238, hrowen@eiu.edu
[3] Eastern Illinois University, 600 Lincoln Avenue, Charleston, Illinois 61920.
[4] Section for Biodiversity, Illinois Natural History Survey, 1816 South Oak Street, Charleston, Illinois 61820.

from white to lavender. Fruits are capsules that usually release seeds by the end of September. Previous reports indicate that seedling establishment occurs in March and flowering occurs from July through August (Glass et al., 2003; Schwegman, 1984).

Iliamna remota was first documented from Altorf (Langham) Island by E. J. Hill on June 29, 1872, which he noted was close to the small village of Altorf (Strausbaugh and Core, 1932; Sherff, 1946; Jones, 1952). Hill reported that most of the *I. remota* plants grew in habitats such as "gravelly" and "dry banks" (Schwegman, 1988). According to Schwegman (1984), an unpublished class report, written by B. Peyton of Westview High School in Kankakee, Illinois in 1973, measured and plotted all major colonies of *I. remota* on Langham Island. The population was more or less continuous for approximately 200 m along the northwest edge of the island, where plants were observed to occur from halfway up the slope from the shore of the island to 7 m inland. In 1981, about 109 flowering stems were counted in one colony. In 1983, the number of flowering stems declined to 49 in the same colony, and the population consisted of a total of 180 stems concentrated in five colonies (Schwegman, 1984).

Schwegman (1984) prepared a recovery plan to ensure that the *Iliamna remota* population would not become extinct at its only native location. The recovery plan recommendations included: mechanical and chemical eradication of invasive, woody shrubs, namely *Lonicera maackii*, to reduce shading; controlled burns to maintain the open environment optimal for *I. remota* growth and development, and a yearly survey of plants including direct counts of flowering and vegetative stems and seedlings. Since 1984, the portion of the island where *I. remota* occurred was managed according to the recovery plan and the population was monitored for the next 19 years. During this time, *Lonicera maackii* was chemically treated with foliar sprays of Roundup® (2-[phosphonomethylamino] acetic acid), while dense stands were mechanically removed and stems were treated with Garlon 4 herbicide (3,5,6-trichloro-2-pyridinoxyacetic acid; Glass et al., 2003). In April 2001, many shrubs and small trees were mechanically removed and stacked into brush piles in eighteen areas within the *I. remota* population (Figure 1). Seedlings were counted at every brush pile position two months after the piles were burned. Table 1 illustrates where brush pile positions occurred (using a Trimble GeoExplorer III unit) and correlating seedling number. Seedling number reached 3,500 in one area after brush was burned, indicating the effectiveness of burning on seedling development. Data from this 19-year study showed that there was an overall increase in population size from 180 stems in 1983 to 1,646 stems in 2002, with the largest number of stems (5,364) occurring in 2001, when the brush piles were burned (Glass et al., 2003).

The recent lack of management poses a potential threat to the *Iliamna remota* population. The last controlled burn was conducted in 2003, and the interior of the island did not burn well due to high moisture levels (Kirk, pers. comm.). Since 2003, burns and invasive species control have not been conducted on the island. The objectives of this study were to estimate the current population size and status of *I. remota* on Langham Island, and to obtain data useful for the continued management of this species.

DESCRIPTION OF STUDY AREA

Kankakee River Nature Preserve is located in the Kankakee River about 10 km northwestern of downtown Kankakee, Kankakee County, Illinois (N1/2 S9 T31N R11E). The preserve consists of approximately 56 ha in three separate tracts, Langham Island, and forested shorelines on both sides of the river at the western most edge of Kankakee River State Park (McFall and Karnes, 1995). The island is about 700 m long by 195 m wide, and about 10.1 ha in size (Schwegman, 1991). The interior of the island is very flat with little variation in elevation, while steep slopes 2–4 m high separate the upland from the narrow shoreline.

The earliest known report on the vegetation of Langham Island was in 1834 when a government surveyor described the south shore as being "high level rich prairie" with scattered trees of bur oak (*Quercus macrocarpa*), white oak (*Q. alba*) and hickories (*Carya* spp.). By 1912, the elevated, flat portion of the island was cleared and used for row crops. At that time, *Iliamna remota* plants were noted to be "numerous" on the island and located from the edges of the crop field down the slopes of the island leading to the river. In 1945, cultivation ceased and the *I. remota* population consisted of "hundreds of plants," with most plants inhabiting the island's "marginal rocky, grassy slope[s]" (Sherff, 1946). Soon exotic grasses, such as *Poa pratensis* and *P. compressa*, dominated where the cultivated field had been (Glass et al., 2003; Schwegman, 1984, 1991). Other herbaceous species observed in the old field were *Melilotus albus* and *Solidago canadensis*. Woody species such as *Quercus macrocarpa*, *Fraxinus quadrangulata*, and *Toxicodendron radicans* were observed along the south slope of the island (Schwegman, 1988, 1991).

Both Sogan and Rockton Loam soils occur on the island (Paschke, 1979). The Sogan Loam occurs along the steep slopes (18–30%) around the edge of the island where *Iliamna remota* is common. This well-drained, loamy soil commonly contains gravel deposits that increase drainage. The soils of the nearly flat uplands are Rockton Loam. This soil is typically 22.5 cm thick

Figure 1: Colony positions and stem numbers of *I. remota* in 2005 and brushfire pile positions in 2001. Stem numbers classified on a Jenks scale. Colony and brushfire pile positions based on the Illinois State Plane East Zone (FIPS 1201) coordinate system and map (NAD 1983) courtesy of Kankakee County GIS specialist, Roger Diercks.

Table 1: *Illamna remota* brushfire pile positions and correlating seedling number determined from a previous study headed by W. Glass (Glass et al., 2003).

2001

Colony #	Latitude	Longitude	Seedling number
1	41°11′21.371″N	87°57′58.436″W	51
2	41°11′21.861″N	87°57′58.547″W	11
3	41°11′22.719″N	87°57′59.275″W	20
4	41°11′22.890″N	87°57′59.387″W	15
5	41°11′23.661″N	87°57′59.446″W	15
6	41°11′23.939″N	87°57′59.839″W	20
7	41°11′21.243″N	87°57′58.495″W	160
8	41°11′21.040″N	87°57′58.495″W	20
9	41°11′20.721″N	87°57′57.980″W	91
10	41°11′20.598″N	87°57′57.518″W	58
11	41°11′19.660″N	87°57′57.460″W	245
12	41°11′19.124″N	87°57′57.264″W	128
13	41°11′18.469″N	87°57′57.061″W	187
14	41°11′17.748″N	87°57′56.448″W	10
15	41°11′17.210″N	87°57′55.749″W	222
16	41°11′17.059″N	87°57′55.806″W	3500
17	41°11′16.327″N	87°57′55.342″W	70
18	41°11′16.420″N	87°57′56.715″W	2
			Total: 4825

over the dolomite bedrock, and has a moderate water-holding capacity. *Illamna remota* also occurs in this uplands soil, which has a 0–2% slope (Schwegman, 1984).

MATERIALS AND METHODS

The *Illamna remota* population on Langham Island was surveyed during early summer of 2005 and the number of stems determined for the colonies encountered (Table 2). A GPS unit (Trimble Pro XRS) was used to mark the position of each colony. The population extent was defined as the northernmost and southernmost *I. remota* positions. Twelve colonies of *I. remota* were located along the northwest edge of the island and colony positions were overlaid onto a high-resolution aerial photograph of Langham

Table 2: *Illamna remota* colony positions and stem numbers found during this survey. Coordinates based on the Illinois State Plane East Zone (FIPS 1201).

2005

Colony #	X coordinates	Y coordinates	Stem number
1	1085596.24188	1646751.65769	8
2	1085511.18926	1646810.69330	13
3	1085481.68734	1646935.01594	75
4	1085405.33189	1647100.66349	12
5	1085309.74929	1647318.07209	12
6	1085283.67252	1647338.38232	231
7	1085292.66288	1647371.17920	78
8	1085283.99328	1647388.56829	68
9	1085278.51029	1647420.42367	26
10	1085224.79993	1647497.58760	450
11	1085212.73024	1647530.60695	100
12	1085114.54694	1647796.01309	1
			Total: 1074

Island (Figure 1). In Figure 1, the colony position points were formatted to increase in size to illustrate the stem numbers for each colony. Also, the position of the brush piles burned in 2001 is shown on this map (Glass et al., 2003). Position coordinates were based on the Illinois State Plane East Zone (FIPS 1201) global positioning coordinate system. In late July of 2005, the plant species encountered in and at the edge of colonies 2 through 11 was recorded. Nomenclature follows Mohlenbrock (2002).

Means and standard deviations of flower buds and open flowers were determined from ten colonies that were observed in June. Mean and standard deviation of fruits per stem were calculated based on a random choice of three stems from six colonies observed in July. Fruits were randomly collected in six colonies for germination experiments, and stored at room temperature (approx. 22 C) until tested for viability. Twenty-five seeds from four stems from one of the colonies were treated with a 10 second hot water dip (80 C) to break dormancy (Hilscher and Preece, 1994) and planted in cell packs containing Jiffy® soilless potting mix to test for viability based on the number of seeds germinated.

RESULTS

The *Ilianna remota* population extended as almost a straight line 350 m long on the slope and adjacent upland on the northwest side of Langham Island (Figure 1). The population was nearly continuous within this area with concentrated areas recorded as colonies in order to estimate population size. The larger colonies were estimated to be 5×7 m and up to 9×10 m, with most of the colonies much smaller. The number of stems ranged from 1 to 450 per colony, while the total number of individual stems encountered was 1,074. The position coordinates with the stem numbers for each colony are shown in Table 2.

In late June 2005, abundant open flowers and flower buds were observed in all colonies. The mean numbers and standard deviations of flower buds and open flowers were 1.6 ± 1.2 and 2.1 ± 1.7 per stems, respectively. By late July, flowering was sporadic throughout the population, and many flowers had set seed with mean numbers of fruits being 1.2 ± 0.9 per stem. The number of seeds per fruit ranged from 21 to 55 with an average of 44.2. After seeds were treated with hot water, germination occurred in seven days. True leaves were first observed on seedlings after 15 days. Ten of the 25 seeds (40%) germinated after 34 days.

Twenty-eight vascular plant species were observed growing in and at the edge of the *Ilianna remota* colonies. Of these, 78% were native species, and 25% were woody species (Table 3). The common native herbaceous species were *Carex* spp., *Elymus villosus*, *Oxalis stricta*, and *Solidago canadensis*, occurring in at least 60% of the colonies. Among the herbaceous non-native species, only *Poa pratensis* was common, being associated with all colonies, while the introduced woody shrub, *Lonicera maackii*, was common throughout the island and found in 90% of the colonies. Two native woody species, *Cercis canadensis* and *Toxicodendron radicans*, were common, being found in 80% of the colonies (Table 3). Overall, 15 species occurred in three or fewer colonies, and eight species were found in eight or more colonies.

DISCUSSION

During past and present surveys, the *Ilianna remota* plants were mostly restricted to open areas along the northwest portion of Langham Island, especially on the slopes (Sherff, 1946; Schwegman, 1984). When the population was severely limited (less than 100 plants), the range was reduced to the midwest portion of the island (Schwegman, 1984). After a controlled burn in 1986, the population re-established its original range as described by Sherff (1946) (Schwegman and Glass, 1986).

The species' range may be limited to the middle to northwestern portion of the island on the southwest-facing slope due to the more open habitat (Glass et al., 2003). Presently, the population appeared to contain concentrated colonies with isolated individuals scattered in between. The population appears to be more like the population observed in 1973, where stems were more or less continuous within the population (Schwegman, 1984). The population still appears to occur mostly on and near the peripheral slopes of the island. More plants were observed in full sun, whereas plants in shaded or partially shaded areas were shorter and tended to lack flowers and fruits.

The total length of the population (350 m) found in this study was close to the population length (366 m) observed in 1984. The number of stems (1,074) found in this survey exceeded that of the total number of stems (180) found in 1984. However, the stem number determined in this study was a low estimate because the estimated number of plants was derived from the more "concentrated" *Ilianna remota* colonies, whereas there were some isolated individuals scattered in between colonies, thus the population was more or less continuous, as noted in 1973. Therefore, the number of total stems found in this study is conservative.

The results of a controlled burn conducted on March 25, 1986, showed that burning was effective in seedling establishment and development. At that time, the controlled burn was conducted on nine of the ten known colonies of *Ilianna remota*. One colony remained unburned at the request of the Endangered

Table 3: Vascular plant species found within and at the edge of colonies of *Iliamna remota*.

	Colonies										% of colonies where species occurs
	2	3	4	5	6	7	8	9	10	11	
Herbaceous species											
Native											
Ageratina altissima (L.) R. M. King & H. Robins.				X	X	X					30
Asclepias syriaca L.								X			10
Carex L. spp.			X	X	X	X	X	X	X	X	80
Elymus villosus Muhl.		X	X	X	X	X	X	X	X	X	90
Elymus virginicus L.									X		10
Erigeron annuus (L.) Pers.						X				X	20
Geum canadense Jacq.				X	X	X					30
Hypericum sphaerocarpum Michx.	X			X							20
Muhlenbergia frondosa (Poir.) Fern.	X		X			X					30
Oxalis stricta L.			X	X	X	X	X	X	X	X	80
Penstemon digitalis Nutt.				X		X					20
Phalaris arundinacea L.		X	X			X				X	40
Solidago canadensis L.			X	X	X	X	X	X	X	X	80
Teucrium canadense L.		X							X	X	30
Verbesina helianthoides Michx.				X	X	X				X	40
Viola pratincola Greene			X								10
Non-native											
Achillea millefolium L.	X										10
Asparagus officinalis L.								X			10
Melilotus albus Medic.							X	X		X	30
Poa pratensis L.	X	X	X	X	X	X	X	X	X	X	100
Torilis japonica (Houtt.) DC.						X					10
Woody species											
Native											
Cercis canadensis L.			X	X	X	X	X	X	X	X	80
Parthenocissus quinquefolia (L.) Planch.							X			X	20
Ptelea trifoliata L.	X				X	X				X	40
Rubus occidentalis L.			X			X	X	X	X	X	50
Smilax tamnoides L.		X		X	X	X	X	X		X	70
Toxicodendron radicans (L.) Kuntze.			X	X	X	X	X	X	X	X	80
Non-native											
Lonicera maackii (Rupr.) Maxim.	X	X	X		X	X	X	X	X	X	90

Species Protection Board. The number of mature plants per colony increased from 27 in 1985 to 38 in 1986, whereas the number in the unburned colony decreased from 51 in 1985 to 33, suggesting that *I. remota* benefits from controlled burning (Schwegman and Glass, 1986). Although stem number dramatically increased after canopy removal and controlled burns during 19 years of study, the greatest number of seedlings emerged after the brush piles were burned. This suggests that burning brush is an effective technique to promote seedling development, probably because the hot fire kills nearly all living vegetation in the area of the brush pile.

In late June of 2005, flower buds and open flowers were observed in abundance. Mean number of flower buds and open flowers calculated in this study, however, were low with overall number less than 2 flowers or flower buds per plant. The low numbers resulted since many stems were vegetative. According to Schwegman (1984), flowering in this species typically occurred throughout July and most of August. We observed almost no flowers in a second

visit to the site in late July. Flowers may have opened and fallen earlier due to the dry summer in 2005.

Seed germination rates of 40% were obtained after hot water treatment, indicating that fresh *Iliamna remota* seeds have a lower germination rate than older seeds (Schwegman, 1984). *Iliamna remota* seeds have been documented to survive in soil for at least 10 years, suggesting a significant seed bank for this species (Schwegman, 1990). Additional comparative studies, including seeds of differing age, would render more accurate information regarding seed longevity and germination percentages, which ultimately may be useful for conservation efforts for *I. remota*.

The associated woody vegetation appeared to overwhelm the *Iliamna remota* plants. Extensive woody encroachment resulted in excessive shading and decreased flower and fruit production. *Lonicera maackii* appears to be the most aggressive species, and is responsible for much of the shading. According to Schwegman (1984), *L. maackii* was introduced on the island in 1960, and he observed its rapid spread in 1983, where it was the most frequently occurring tall shrub on the island. This exotic, invasive species was found to be common throughout the island in 1991. A previous study has shown the adverse effect of this species on herbaceous species diversity (McDonnell et al., 2005). This study showed the effectiveness of concentrated glyphosate treatment on mechanically removed *L. maackii* shrubs, which may be a useful management tool for controlling *L. maackii* on Langham Island.

It is possible that *Poa pratensis* may adversely affect the germination and seedling establishment of *Iliamna remota*. This cool-season, Eurasian species forms a tight sod that may limit the resources available to *I. remota*. Further studies to determine the effects of this species on the growth and development of *I. remota* would be very useful. Presently, the use of early spring fire as a management tool would probably reduce the abundance of this exotic species on the island.

Overall, the *Iliamna remota* population appears to be surviving on Langham Island, and previous management practices have been effective in increasing stem numbers. Presently, the *I. remota* population has declined from the last survey in 2002. An increase in shading by the exotic shrub *Lonicera maackii*, and the tight sod of the exotic *Poa pratensis* appear to be responsible for this decline. The increase in abundance of these exotic species is the result of the lack of management. Therefore, the management plan outlined by Schwegman (1984) should be continued to ensure the survival of *Iliamna remota* on Langham Island.

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Echinodorus berteroi var. *lanceolatus*: A Species New to Northeastern Illinois

Robert Van Lonkhuyzen[1], Kenneth Dritz[2], and Kenneth Johnson[3]

Abstract: *Echinodorus berteroi* var. *lanceolatus* is an obligate wetland species with scattered populations throughout the southern three-fourths of Illinois, as well as Carroll County and Bureau County in northwest Illinois. Until its recent discovery in Will and Kane Counties, however, this species was unknown from the northeast part of the state. The wetland communities in which *E. berteroi* was found include species of *Potamogeton*, *Eleocharis*, *Alisma*, and *Scirpus*.

New distribution records of species occurring in Illinois are not uncommon. In recent years, the distributions of many non-native species in Illinois have increased dramatically, and new county records of native species also are established regularly.

Echinodorus berteroi (Spreng.) Fassett var. *lanceolatus* (Engelm. ex Wats. & Coult.) Fassett, commonly known as bur-head, in the family Alismataceae, is a native Illinois species that was unknown in the northeastern part of Illinois (Swink and Wilhelm 1994) until recently. This paper describes two new population records for this species in the state of Illinois, particularly in northeast Illinois. The species was discovered in Will County on September 9, 1995 (*Johnson 2561*, MOR), and in Kane County on September 5, 2003 (*Dritz 1542*, MOR). Both locations are situated a considerable distance from the nearest known populations.

Upon casual observation, *Echinodorus berteroi* var. *lanceolatus* bears a superficial resemblance to *Alisma*, *Lophotocarpus*, and *Sagittaria*, other members of Alismataceae. Similarities include the general aspect of the plants, their leaf forms and their flowers, which bear three white petals. A technical description of *E. berteroi* var. *lanceolatus*, synthesized from Fernald (1950), Hickman (1993), Yatskievych (1999), Mohlenbrock (1970 and 2002), Gleason (1952), and Gleason and Cronquist (1991), follows.

> Fibrous-rooted, emergent aquatic annual or short-lived perennial; leaves basal, sheathing, the blade broadly ovate, obtuse, cordate or truncate at the base, about 15 cm long and 10 cm broad (ranging from 2–60 cm long and from 0.5–12 cm broad), sometimes lanceolate and with the base more tapering in smaller plants, glabrous, the angled petiole longer than the blade, with 5–7 primary veins palmately arching from the base of the midrib and rejoining near the apex, these connected by finer transverse veins; scape erect, 1–6 dm high, longer than the leaves; inflorescence a raceme of whorled flowers, sometimes branched at the base or from the lower verticils (then appearing paniculate), the (1–) several verticils with many bracteoles in addition to the 3 lanceolate or linear 3–6 mm bracts; flowers 3–8 in each verticil, perfect, 8–10 mm broad, on stiffly ascending angled pedicels to 20 mm long; receptacle convex; sepals 3, dark green, ovate, acute, 4–5 mm long, persistent, reflexed in fruit; petals 3, white, broadly ovate to suborbicular, acute, 5–10 mm long, deciduous; stamens 12, the anthers 0.5–0.8 mm long, versatile, shorter than the filaments; pistils more than 40, arranged in several series on the expanded receptacle, the styles longer than the ovaries; fruiting head 3–7 mm thick, echinate in profile; achenes turgid, not winged, 2.5–3.5 mm long, brown, each side with 5 arching ribs, 2 of them wing-like and alternating with the others, the keel entire, the straight beak 0.5–0.8(–1.0) mm long and attached obliquely; embryo pitted; $2n = 22$.

Echinodorus differs from *Alisma* in that it has several series of pistils on a large, convex receptacle (rather than a single whorl on a small, flat receptacle).

[1] Environmental Science Division, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439.
[2] Decision and Information Sciences Division, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439.
[3] Conservation Design Forum, 375 West First Street, Elmhurst, Illinois 60126.
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It differs from *Lophotocarpus* and *Sagittaria* in that it has turgid, unwinged achenes (rather than flattened, winged achenes) and bracteoles (in addition to bracts), subtending the verticils. In Illinois, *E. berteroi* flowers from July to September (Mohlenbrock 2002).

The taxon was named by Fassett (1955). Synonyms, as given in Mohlenbrock (1970), are as follows.

Alisma rostratum Nutt. Trans. Am. Phil. Soc. 5:159. 1837.
Echinodorus rostratus (Nutt.) Engelm. in Gray, Man. 460. 1848.
Echinodorus rostratus var. *lanceolatus* Engelm. ex Wats. & Coult. in Gray, Man. 556. 1891.
Echinodorus cordifolius (L.) Griseb. var. *lanceolatus* (Wats. & Coult.) Mack. & Bush, Man. Fl. Jackson Co. Mo.10.1902.
Echinodorus cordifolius f. *lanceolatus* (Wats. & Coult.) Fern. Rhodora 38:73. 1936.
Echinodorus rostratus f. *lanceolatus* (Wats. & Coult.) Fern. Rhodora 49:108. 1947.

The last of these synonyms is the name by which the plant is known in *Gray's Manual* (Fernald 1950).

Echinodorus berteroi is widespread across much of North America. The range of the species extends from Mexico and the West Indies to Texas and California (Hickman 1993), north in the Mississippi River drainage to South Dakota, Wisconsin, and Ohio; populations also exist from Ontario to Florida. It occurs as an exotic species in Hawaii (Wagner et al. 1999). Plants in the northeast and midwest United States are var. *lanceolatus*. Typical var. *berteroi* is from the southwest United States, Central America (Wiggins 1980), and the West Indies.

Populations near Illinois are known from Wisconsin, Iowa, Missouri, Kentucky, and Indiana. In Wisconsin, *E. berteroi* is designated as a species of special concern and is known only from Sauk County (WBIS 2004, WDNR 2004), where it was collected in 1968, more than 130 km from the nearest known Illinois population and nearly 200 km from the Kane County location. It is known from five counties in extreme western Iowa, 11 counties in Missouri, and three counties in Kentucky, where it is listed as a threatened species (USDA 2004). *E. berteroi* historically occurred in Indiana, but is now presumed extirpated from that state (IDNR 2002), although *E. parvulus* (= *E. tenellus*) was discovered in Newton County in 1994.

In the early 1960s, *Echinodorus berteroi* was considered rare in Illinois (Jones 1963). Currently, this species is local and scattered throughout the southern three-fourths of the state, and it is also known from Carroll County and Bureau County in northwest Illinois (Mohlenbrock 1970, 2002, USDA 2004). Bureau County is 70 km from the Kane County site and 75 km from the Will County site, while Carroll County is more than 100 km from each. The apparent absence of *E. berteroi* from northeastern Illinois until recently may raise questions regarding its status as a native species in that area.

E. berteroi is classified as an obligate wetland species in all regions in which it occurs; such species occur almost always (estimated probability > 99%) under natural conditions in wetlands (Reed 1988). The habitats in which *E. berteroi* is found are variously described as swamps and ditches, often on sandy soil (Gleason and Cronquist 1991); muddy shores and bottoms (Fernald 1950); wet ditches and edges of swamps (Mohlenbrock 1970 and 2002); shores of ponds (Jones 1963); and shallow ponds, marshes, and ditches (Wunderlin 1982).

The Kane County site is a recently restored pothole wetland located in the NE¼ SE¼ of Sec. 24, T39N, R7E (Sugar Grove quad, 1993). The site is approximately 0.5 km northeast of Nelson Lake Marsh (Dick Young Forest Preserve). The Will County site is an artificial pond surrounded by cultivated and formerly cultivated fields in the NW¼ SE¼ of Sec. 30, T34N, R9E (Channahon quad, 1993), in the northern part of McKinley Woods Forest Preserve, about 3 km south of Channahon, Illinois.

The Kane County wetland is oval-shaped and ca. 1 ha in size, lying in a shallow depression. The plant communities form somewhat concentric zones, with a large, relatively flat, central area at the lowest elevation. The site was visited in September 2003 and again in August 2004. The entire wetland was dry during the 2003 visit, but had been inundated until mid-August of that year. It was inundated to a water depth of approximately 0.6 m during the 2004 visit. In 2003, the central zone supported primarily *Echinochloa crusgalli* and *Cyperus esculentus*, with *Abutilon theophrasti* and *Xanthium strumarium* also present. In 2004, this zone was composed nearly entirely of *Alisma subcordatum* and *Alisma triviale*, with *Potamogeton nodosus*, *Lemna minor*, and *Spirodela polyrhiza*.

At this location, *Echinodorus berteroi* occurs within a zone immediately surrounding the central community. In August 2004, this zone was shallowly inundated up to 0.4 m in depth. *E. berteroi* occurs frequently within this zone, in areas with a somewhat open vegetation structure, primarily in the lower portion of the zone. Associates within this zone include *Acnida altissima*, *Alisma subcordatum*, *Alisma triviale*, *Ammannia robusta*, *Bidens cernua*, *Bidens coronata*, *Eleocharis obtusa*, *Eleocharis smallii*, *Leersia oryzoides*, *Lemna minor*, *Lindernia dubia*, *Polygonum coccineum*, *Potamogeton natans*, *Potamogeton pectinatus*, *Proserpinaca palustris*, *Scirpus fluviatilis*, *Scirpus validus* var. *creber*, *Sparganium* sp., *Spirodela polyrhiza*, *Typha*

angustifolia, *Typha latifolia*, and *Typha* × *glauca*. Five rare species previously unknown from Kane County also occur within this zone: *Eleocharis engelmannii*, *Eleocharis macrostachya*, *Lophotocarpus calycinus*, *Najas guadalupensis*, and *Nelumbo lutea*. Currently, most of this community consists of a dense growth of *Scirpus fluviatilis*, with some areas in the middle and upper portions supporting dense growths of *Typha* spp. The lower portion of this zone is less densely vegetated and supports a greater diversity of species. The most common species there are *Alisma* spp., and only scattered stems of *Scirpus fluviatilis* are present.

An outer wetland community, at slightly higher elevations, is composed of *Aster simplex*, *Bidens comosa*, *Boltonia latisquama recognita*, *Carex vulpinoidea*, *Echinochloa walteri*, *Eleocharis smallii*, *Lycopus americanus*, *Mentha arvensis* var. *villosa*, *Polygonum erectum*, *Polygonum pensylvanicum*, and *Scirpus atrovirens*. *Spartina pectinata* has been planted in the lower portion of this community.

This location had previously been drained for agricultural use and was farmed until 1999. It then lay fallow until the Kane County Forest Preserve District removed a system of agricultural drainage tiles from the wetland in January 2002, restoring the hydrologic regime. The wetland has since become inundated annually, and it attracts numerous water birds. Mallard ducks and sandhill cranes, as well as other species, feed in the wetland each year. Management activities since tile removal have included control of the *Typha* spp. to allow for the development of a more diverse plant community.

Echinodorus berteroi was unknown from the site in 2002. It increased in this wetland from 2003 to 2004. It occurred sporadically in the mid-elevation zone in 2003, but it has since become distributed around more of the wetland. However, *Scirpus fluviatilis* has also increased each year since 2002, and that may, over time, result in a decrease of the population of *E. berteroi* as light penetration decreases.[4]

The Will County wetland is ca. 0.1 ha in size. It is positioned within a shallow swale, situated at the head of a ravine. The northern portion of the wetland frequently contains a small pond, created by an earthen dam across the swale. The site was visited in September 1995, September 1996, and again in August and September 2004. During the 1995 and 1996 visits, the northern area was shallowly inundated, up to approximately 0.4 m in depth. However, it was inundated to a depth of greater than 0.6 m during the 2004 visit. This low-elevation area is dominated by *Echinochloa crusgalli*.

In 1995 and 1996, *Echinodorus berteroi* occurred on the exposed muddy bank of the pond. A small number of individuals (fewer than 10) were present both years, all located in fairly close proximity. The vegetation community immediately around the pond had an open structure, with areas of exposed substrate. Associated species in this community in 1995 were *Eclipta protrusa*, *Xanthium strumarium*, *Lippia lanceolata*, *Echinochloa crusgalli*, and *Penthorum sedoides*. In 1996, the community was composed of *Acnida altissima*, *Bidens frondosa*, *Echinochloa crusgalli*, *Eclipta protrusa*, *Eleocharis acicularis*, *Eragrostis hypnoides*, *Leersia oryzoides*, *Lindernia dubia*, *Lippia lanceolata*, and *Ludwigia palustris americana*.

Echinodorus berteroi was not found during visits in August and September 2004 and is apparently extirpated from this site. The area in which *E. berteroi* had occurred is now densely vegetated, primarily with *Echinochloa crusgalli* and *Polygonum punctatum*. This community becomes inundated intermittently during high water levels, as was observed during the August 2004 visit but not in the September visit, two weeks later.

Although *Echinodorus berteroi* has not been documented from other areas in northeast Illinois, we speculate that it may occur in other wetlands in the area, such as Nelson Lake Marsh. *E. berteroi* and the other species present at the Kane County site may represent historic populations that have returned following restoration of the wetland. It is also possible that waterfowl may transport seeds of *E. berteroi* to new locations, such as those in Kane and Will Counties. It is our expectation that additional populations will be discovered in other northeast Illinois counties in coming years, perhaps in newly developing wetlands with exposed substrates, as are often present on new wetland restoration sites. At both the Kane and Will County sites, *E. berteroi* occurred in open vegetation communities where there were low levels of competition.

[4] *Lophotocarpus calycinus* increased greatly from 2002 to 2003, and perhaps again in 2004, but it, too, is in danger of being shaded out by *Scirpus fluviatilis*. *Eleocharis macrostachya*, which has not been abundant in any of the years in which the site has been under observation, already appears to be losing ground to the *Scirpus*. *Nelumbo lutea* has not been observed since 2002 and may already be extirpated from this site.

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