

SPECIES COMPOSITION OF OLD SETTLER SAVANNA AND SAND PRAIRIE CEMETERIES IN NORTHERN ILLINOIS AND NORTHWESTERN INDIANA

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Abstract. Over the course of a decade, studies were conducted throughout northern Illinois and northeastern Indiana to locate old settler cemeteries containing prairie vegetation and to determine their species composition. These studies were part of an effort to determine the presettlement vegetation of these areas. Forty-five cemeteries identified as having 30 or more prairie species were considered of sufficient quality to warrant further study. This paper reports on 16 cemeteries not reported in an earlier paper. Of these, eight were silt-loam savanna prairies, six were sand savanna prairies, one was a silt-loam-sand-gravel savanna prairie, and one was a sand prairie. A total of 238 prairie and savanna species, belonging to 55 families, were found in them. The *Compositae* had the most representatives with 61 species (26%), followed by the *Gramineae* with 24 (10%), the *Leguminosae* with 20 (8%), and the *Cyperaceae* with 11 (5%). With the exception of the sand prairie, the soils present in these cemeteries had relatively shallow A horizons, and all showed no evidence of ever having been plowed. The difference in soil type (silt-loam, sand, gravel) influenced species composition and relative abundance. Most of the savanna cemeteries were associated with various oaks (*Quercus*) and hickories (*Carya*).

INTRODUCTION

In an effort to gain insight into the species composition of the presettlement Illinois-Indiana prairies, extensive searches were conducted during the 1970s throughout northern Illinois and northwestern Indiana to find old settler prairie cemeteries and to study their species composition. During the course of these studies, it became apparent that in 15 cemeteries, prairie species were found in association with native woody vegetation (trees or shrubs) characteristic of savannas (Curtis 1959; Bray 1960). Because these savanna cemeteries proved to be sufficiently different from the 29 silt-loam prairie cemeteries reported earlier (Betz and Lamp 1989), it was decided to report on these savanna cemeteries separately.

One other prairie cemetery was also sufficiently different to warrant separation from the silt-loam prairie cemeteries. This was the sand prairie cemetery included in this study (Cemetery 10, see Table 1).

The vegetation of these 16 cemeteries is compared to that of the 29 silt-loam prairie cemeteries. In addition, the relationship of these savanna cemeteries to presettlement groves and barrens and the savannas described by Curtis (1959) and Bray (1960) are also discussed.

Even though many ecological texts mention that remnant prairies are to be found in old settler cemeteries, they are actually described in relatively few papers. Lantz (1969) and Morrissey (1956) reported on the species composition of two different cemetery prairies in Iowa, and cemetery prairies were used in studies by Fay (1953) in Iowa and by Penalosa (1963) in California. Wright and Wright (1948) used old settler cemeteries as a source of data to study the ecological relationships existing between the Palouse and mixed-grass prairies in south-central Montana.

Although the Illinois-Indiana tallgrass prairie and savanna are known through historical accounts, their species compositions are not well documented. Most of the early reports (Short 1845) were of a general nature, with such vague names as goldenrods, asters, etc. Some information about the prairies' composition can be gleaned from the annotated plant lists of Mead (1846) and Brendel (1887). In this century, species composition studies include 1) the

Illinois sand prairies (Gleason 1910), 2) the sand prairie of the beach area in northeastern Illinois (Gates 1912), 3) the hill prairies along the Mississippi (Evers 1955), and 4) the hill prairies along the Rock River in northern Illinois (Fell and Fell 1956). In addition, both Vestal (1914) and Sampson (1921) reported on the heavier silt-loam prairies of northern Illinois, and Betz and Cole (1969) recorded the vegetational changes that occurred on a black-soil prairie originally studied by Paintin (1928).

There are few studies on Illinois savannas. Packard (1988) reported on the restoration of tallgrass savanna and listed some characteristic savanna species. Both Kilbourn (1959) and Moran (1978) used land survey records to determine the presettlement distribution of savannas and their woody composition in two counties of northern Illinois. The species composition of oak savannas and barrens in southern Wisconsin has been studied by Curtis (1959) and Bray (1960).

The focus of this study was not the trees and other woody vegetation associated with the savanna cemeteries but rather the herbaceous vegetation. This paper lists only trees present. We feel, however, that a fuller understanding of the original presettlement woody vegetation for these savanna cemeteries may be gained from original land survey records. Such a study is planned and will be reported in a later paper.

METHODS

Using general highway maps, prepared by the Illinois Department of Public Works and Buildings, that cover individual counties and show the locations of cemeteries, visits were made to all cemeteries within selected areas. However, it soon became evident that many of the cemeteries had originally been wooded areas and did not have the potential to contain surviving prairie vegetation. Based on this consideration, it was decided to restrict exploratory visits to cemeteries on original prairie or prairie-forest transition areas as determined by the soil types found for the cemeteries. Accordingly, soil reports and maps prepared by the Agricultural Experiment Station of the University of Illinois in cooperation with the Soil Conservation Service of the U.S. Department of Agriculture were used for this purpose. Only cemeteries having soil types characteristic of prairie or prairie-forest transition were selected for examination, and thus, the number of cemeteries designated for study was reduced substantially.

In each cemetery, certain prairie indicator species were sought, especially the warm-season grasses, such as big bluestem (*Andropogon gerardii* Vitman) and Indian grass (*Sorghastrum nutans* (L.) Nash). These grasses often persisted around tombstones and in fence rows, even in those cemeteries which had been heavily mowed. In many cases, the entire cemetery was still prairie. In others, prairie vegetation was to be found only in relatively undisturbed sections, such as areas along the perimeter. Cemeteries that were being regularly mowed were checked for depauperate prairie plants, such as lead plant (*Amorpha canescens* Pursh), wild bergamot (*Monarda fistulosa* L.), and yellow coneflower (*Ratibida pinnata* (Vent) Barnh.). These were sometimes found surviving mowing within the Kentucky bluegrass (*Poa pratensis* L.) turf. For

most cemeteries, efforts were made to urge the cemetery boards to cease mowing, so that enhanced growth would better permit the determination of the species composition of the remnant prairies. Agreement was reached in many instances.

Vascular plants present were recorded at the time the cemeteries were initially visited. If the cemetery had at least 30 prairie species, a more extensive study was conducted. This necessitated revisiting the cemetery prairie at various times throughout the growing season for two or more years. Several prairie cemeteries were visited more than a dozen times in order to catalog all the species. Nomenclature follows that of Fernald (1950) and conforms with Swink and Wilhelm (1979). In addition to recording the species present, soil samples were taken to determine the depth of the A horizon and to note other soil characteristics, such as the soil type.

Of the 825 cemeteries surveyed in 42 counties of northern Illinois and in 20 counties of northwestern Indiana, 150 contained some prairie species. Of these, there were 16 sand prairie and savanna cemeteries that had more than 30 prairie species and were deemed worthy of further study.

Each of these 16 cemeteries is designated in the text and tables by number (1-16). Each cemetery was also identified by the county in which it occurred, followed by a number indicating the order in which the cemetery was visited in that county (Table 1). If a name for the cemetery was known, it was placed in parenthesis following the number. For example, Cemetery 5 is Livingston 3 (Campbell). That is, the Campbell Cemetery was the third cemetery prairie observed in Livingston County in northeastern Illinois.

Table 1. Total number of species and size in Illinois-Indiana sand prairie and savanna cemeteries.

Cemetery name and number	No. of species	Hectares
Silt-loam savannas*		
Cem 1-Bureau 2 (North Princeton)	33	0.4
Cem 2-Bureau 3 (Tiskilwa)	41	0.4
Cem 3-Carroll 1 (Brookville) ¹	38	0.4
Cem 4-Knox 1 (Copely)	75	0.8
Cem 5-Livingston 3 (Campbell)	50	0.4
Cem 6-Will 3 (Monee)	33	0.2
Cem 7-Will 4 (Scheer)	52	0.4
Cem 8-Warren-Ind 1 (Brisco) ²	30	0.4
Silt-loam/sand/gravel/savanna		
Cem 9-Tazewell 1 (Bequaith)	45	0.4
Sand prairie		
Cem 10-Whiteside 3 (Springhill)	53	0.8
Sand savannas		
Cem 11-Grundy 1 (Short) ¹	45	0.4
Cem 12-Henderson 1 (no known name)	47	0.4
Cem 13-Kankakee 1 (Essex)	56	0.4
Cem 14-Ogle 2 (no known name)	45	0.4
Cem 15-LaPorte-Ind 1 (Morgan)	28	0.8
Cem 16-Will 2 (Braidwood-Oakwood)	105	0.8

¹Illinois Nature Preserve.

²Indiana Nature Preserve.

RESULTS

Of the 16 cemeteries reported on in this paper, one was a sand prairie, eight were silt-loam savannas, six were sand savannas and one was a silt-loam-sand-gravel complex savanna. These cemeteries varied in size from 0.4 to 0.8 ha (Table 1).

The 238 prairie or savanna species found in these cemeteries represent 55 families (Table 2). The *Compositae* had the most representatives with 61 species (26%), followed by the *Gramineae* with 24 (10%), the *Leguminosae* with 20 (8%), and the *Cyperaceae* with 11 (5%). There were 133 species of plants observed in the eight silt-loam savanna prairies (Cemeteries 1-8) and 157 species in the six sand savanna prairies (Cemeteries 11-16). Some species, such as the dominant prairie grasses, big bluestem (*Andropogon gerardii* Vitman), little bluestem (*A. scoparius* Michx.), and Indian grass (*Sorghastrum nutans* (L.) Nash), were found in most of the cemeteries regardless of the soil type. Others were more restricted. For example, the smooth blue aster (*Aster laevis* L.), which is characteristically found on silt-loam soils, was only in one silt-loam savanna cemetery. The slender bush clover (*Lespedeza virginica* (L.) Britt.) was found only in one sand savanna prairie cemetery.

The number of species found in the silt-loam savannas varied from 30 in Cemetery 8 (Brisco Cemetery, Warren County, Indiana) to 75 in Cemetery 4 (Copely Cemetery, Knox County, Illinois) (Table 1). The number of species found in the sand savannas varied from 28 in Cemetery 15 (the Morgan Cemetery, LaPorte County, Indiana) to 105 in Cemetery 16 (Braidwood-Oakwood Cemetery, Will County, Illinois) (Table 1). In addition to these 238 prairie or savanna species, there were 22 species of woody plants, including black oak (*Quercus velutina* L.), bur oak (*Q. macrocarpa* Michx.), shagbark hickory (*Carya ovata* (Mill.) E.Koch), and hazelnut (*Corylus americana* Walt.).

There were 54 species of weedy native or non-native herbaceous plants. These included Kentucky bluegrass (*Poa pratensis* L.), common peppergrass (*Lepidium virginicum* L.), old-field sorrel (*Rumex acetosella* L.), horseweed (*Erigeron canadensis* L.), and yarrow (*Achillea millefolium* L.). Further, there were 14 species of cultivated forbs, such as live forever (*Sedum purpureum* (L.) Link), orange day lily (*Hemerocallis fulva* L.), cypress spurge (*Euphorbia cyparissias* L.), and star of Bethlehem (*Ornithogalum umbellatum* L.). The number and kind of these non-prairie, non-savanna species were dependent in part on the past management of the cemetery (mowing, grazing, trampling, or having decorative plants put on the graves). Non-prairie species were generally absent in cemetery prairies that had never been mowed, or had not been mowed for many years, and had been burned annually on a rather consistent basis.

DISCUSSION

Silt-loam Savannas (Cemeteries 1-8)

A comparison of these silt-loam savanna cemeteries with silt-loam prairie cemeteries (Betz & Lamp 1989) suggests four major differences. First, all of these savanna cemeteries had trees either scattered in the cemetery itself or along fences or adjacent to the cemetery. Bur oak (*Quercus macrocarpa* Michx.) was especially prominent, but other species of oak, such as white oak (*Q. alba* L.), red oak (*Q. rubra* L.), and black oak (*Q. velutina* Lam.), were also present. Other woody plants occasionally present were shagbark hickory (*Carya ovata* (Mill.) Sarg.), bitternut hickory (*C. cordiformis* (Wang) K.Koch), big shellbark hickory (*C. laciniosa* (Michx.) Loud), basswood (*Tilia americana* L.), red cedar (*Juniperus virginiana creber* Fern. & Grisc.), hazelnut (*Corylus americana* Walt.), wafer ash (*Ptelea trifoliata* L.), and smooth sumac (*Rhus glabra* L.).

Second, savanna cemeteries had a much shallower A horizon than prairie cemeteries. The depths of the A horizon in these savanna cemeteries ranged from 10 to 23 cm (Table 3) and were approximately half of the 12-45 cm observed for silt-loam prairie cemeteries. The savanna cemeteries on prairie/forest transition soils may have been the result of prairie vegetation invading formerly wooded tracts. The fact that these savanna cemeteries were usually adjacent to oak-hickory woodlands found along streams or

Table 2. Continued

Species	Cemetery prairie number																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<i>Helianthus laetiflorus</i>	X		X	X		X										X	5
<i>Helianthus mollis</i>																X	1
<i>Helianthus occidentalis</i>				X	X		X			X	X	X	X	X	X	X	10
<i>Helianthus strumosus</i>		X															1
<i>Heliopsis helianthoides</i>			X	X					X								3
<i>Heuchera richardsonii</i>			X	X	X		X	X									5
<i>Hieracium longipilum</i>					X												1
<i>Hypericum sphaerocarpum</i>				X					X								2
<i>Hypoxis hirsuta</i>		X	X	X		X											4
<i>Koeleria cristata</i>							X					X		X		X	4
<i>Krigia biflora</i>			X	X													2
<i>Krigia virginica</i>												X					1
<i>Kuhnia eupatoriodes</i>										X				X			2
<i>Lactuca canadensis</i>			X						X				X	X			4
<i>Lathyrus palustris</i>																X	1
<i>Lechea tenuifolia</i>												X					1
<i>Leptoloma cognatum</i>									X	X	X	X	X		X	X	5
<i>Lespedeza capitata</i>	X	X	X	X	X		X	X	X	X	X	X	X	X		X	14
<i>Lespedeza violacea</i>								X									1
<i>Lespedeza virginica</i>												X					1
<i>Liatris aspera</i>						X				X				X	X		4
<i>Liatris cylindracea</i>					X												1
<i>Liatris spicata</i>																X	1
<i>Lilium michiganense</i>																X	1
<i>Linaria canadensis</i>												X		X			2
<i>Lithospermum canescens</i>				X		X	X	X		X							5
<i>Lithospermum croceum</i>										X	X	X	X	X			5
<i>Lithospermum incisum</i>											X						1
<i>Lobelia spicata</i>	X		X	X	X		X	X									6
<i>Ludwigia alternifolia</i>																X	1
<i>Lycopus americanus</i>				X													1
<i>Lysimachia lanceolata</i>							X										1
<i>Lysimachia quadriflora</i>						X											1
<i>Lythrum alatum</i>																X	1
<i>Melica nitens</i>									X								1
<i>Monarda fistulosa</i>	X	X	X	X	X	X	X	X	X		X					X	11
<i>Monarda punctata</i>										X							1
<i>Myosotis verna</i>					X												
<i>Oenothera laciniata</i>													X				1
<i>Oenothera rhombioides</i>												X	X	X		X	4
<i>Onoclea sensibilis</i>																X	1
<i>Osmunda regalis</i>																X	1
<i>Opuntia humifusa</i>											X	X	X		X	X	5
<i>Oxalis violacea</i>	X	X	X	X	X		X										6
<i>Oxypolis rigidior</i>																X	1
<i>Panicum depauperatum</i>														X			1
<i>Panicum implicatum</i>			X	X	X		X			X	X		X				7
<i>Panicum leibergii</i>				X		X											2
<i>Panicum oligosanthos scr</i>									X	X	X	X	X	X	X	X	8
<i>Panicum villosissimum</i>												X		X		X	3
<i>Panicum virgatum</i>									X					X		X	3
<i>Parthenium integrifolium</i>	X				X	X	X								X	X	6
<i>Paspalum ciliatifolium</i>													X				1

Table 2. Continued

Species	Cemetery prairie number																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<i>Pedicularis canadensis</i>				X													1
<i>Penstemon pallidus</i>										X		X		X			3
<i>Pentstemon sedoides</i>																X	1
<i>Petalostemum candidum</i>					X					X						X	3
<i>Petalostemum purpureum</i>				X	X		X						X				4
<i>Phlox bifida</i>										X	X		X				3
<i>Phlox glaberrima inter</i>																X	1
<i>Phlox pilosa</i>				X													1
<i>Physalis heterophylla</i>	X		X				X		X	X	X		X	X		X	9
<i>Physalis virginiana</i>							X			X		X	X		X		5
<i>Plantago purshii</i>											X			X			2
<i>Polygala polygama</i>										X				X			2
<i>Polygala senega</i>				X													1
<i>Polygonatum canaliculatum</i>						X			X		X						3
<i>Polygonum coccineum</i>																X	1
<i>Polygonum tenue</i>														X			1
<i>Polytaenia nuttallii</i>		X															1
<i>Potentilla arguta</i>					X		X			X			X	X			5
<i>Potentilla simplex</i>							X									X	2
<i>Prenanthes aspera</i>				X		X	X										3
<i>Prenanthes racemosa</i>																X	1
<i>Prunella vulgaris lan.</i>			X														1
<i>Pteridium aquilinum la</i>		X						X							X		3
<i>Pycnanthemum tenuifolium</i>				X													1
<i>Pycnanthemum virginianum</i>	X	X	X			X	X	X				X		X		X	9
<i>Ranunculus fascicularis</i>			X		X												2
<i>Ratibida pinnata</i>		X	X	X		X			X								5
<i>Rosa carolina</i>		X	X	X	X	X	X	X	X	X	X		X	X	X	X	14
<i>Rudbeckia hirta</i>	X	X		X	X		X	X	X	X			X	X	X	X	12
<i>Ruellia humilis</i>					X						X		X			X	4
<i>Salix humilis</i>		X	X	X				X							X	X	6
<i>Saxifraga pensylvanica</i>																X	1
<i>Scirpus lineatus</i>																X	1
<i>Scrophularia lanceolata</i>									X		X						2
<i>Scrophularia marilandica</i>																X	1
<i>Scutellaria parvula leon</i>							X										1
<i>Senecio plattensis</i>	X									X	X	X		X			5
<i>Silene stellata</i>									X							X	2
<i>Silphium integrifolium</i>	X	X	X	X		X	X	X							X		8
<i>Silphium laciniatum</i>				X													1
<i>Silphium terebinthinaceum</i>	X	X			X	X	X										5
<i>Sisyrinchium albidum</i>	X		X	X	X	X	X			X						X	8
<i>Smilacina racemosa</i>								X									1
<i>Smilacina stellata</i>			X								X					X	3
<i>Smilax lasioneura</i>									X								1
<i>Solidago altissima</i>		X	X													X	3
<i>Solidago gigantea</i>		X		X										X			3
<i>Solidago graminifolia</i>						X										X	2
<i>Solidago gymnospermoides</i>																X	1
<i>Solidago juncea</i>	X			X			X	X								X	5
<i>Solidago nemoralis</i>					X			X		X	X	X			X	X	7
<i>Solidago rigida</i>		X	X	X	X	X	X								X		7
<i>Solidago speciosa</i>						X				X				X			3

Table 2. Continued

Species	Cemetery prairie number																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<i>Sorghastrum nutans</i>	X	X	X	X	X	X	X	X	X	X		X	X			X	13
<i>Spartina pectinata</i>																X	1
<i>Specularia perfoliata</i>					X			X				X		X			4
<i>Spiraea alba</i>																X	1
<i>Spiranthes cernua</i>							X										1
<i>Sporobolus cryptandrus</i>													X				1
<i>Sporobolus heterolepis</i>						X				X							2
<i>Stachys tenuifolia</i>																X	1
<i>Stipa spartea</i>			X		X	X	X		X	X	X	X	X			X	10
<i>Strophostyles leiosperma</i>													X				1
<i>Strophostyles helvola</i>																X	1
<i>Taenidia integerrima</i>				X											X		2
<i>Talinum rugospermum</i>												X					1
<i>Tephrosia virginiana</i>										X	X	X	X	X		X	6
<i>Thalictrum dasycarpum</i>																X	1
<i>Thalictrum dioicum</i>					X												1
<i>Thalictrum revolutum</i>		X	X	X												X	4
<i>Tradescantia ohiensis</i>	X	X	X	X		X	X		X	X	X	X	X	X		X	13
<i>Trillium recurvatum</i>									X								1
<i>Verbena hastata</i>																X	1
<i>Verbena stricta</i>	X	X							X	X	X	X	X	X		X	9
<i>Vernonia fasciculata</i>																X	1
<i>Veronicastrum virginicum</i>		X		X					X							X	4
<i>Viola papilionacea</i>	X	X		X	X		X		X				X			X	8
<i>Viola pedata</i>					X		X									X	3
<i>Viola pedatifida</i>	X		X	X	X		X			X		X					7
<i>Viola sagittata</i>	X				X	X							X				4
<i>Vulpia octoflora ten</i>												X					1
<i>Zizia aptera</i>			X														1
<i>Zizia aurea</i>															X		1
Total	(odd #)	33	43	52	52	34	30	45	53	48	47	56	46	28	110		793
	(even #)	41	75	34	52	30	45	53	47	56	46	28	110				

¹The same number is used in both Tables 2 and 3 to designate a specific cemetery.

²Nomenclature follows Fernald (1950).

³The total number of cemeteries in which the species was found.

in isolated groves would tend to support this hypothesis. The persistence of prairie fires, whether natural or caused by Indians, may have opened the canopy of such woods by injuring or killing the trees. This in turn would have allowed the prairie to invade the woodlands. Observations made on the reestablished Fermilab Prairie, Batavia, Illinois, (Betz 1984) showed that older oaks could be killed and often toppled when prairie fires were allowed to burn into and through adjacent oak woodlands. This was especially true if the old trees had been previously injured by lightning, fungi, or carpenter ants. Under these conditions, the first prairie invader was usually Indian grass.

Third, although the range in number of species, both prairie and savanna, found in the savanna cemeteries (30-75) was approximately the same as that for prairie cemeteries (30-89), the mean numbers were quite different. The mean for the savanna cemeteries

was 44; whereas, it was 59 for the true prairie cemeteries (Betz and Lamp 1989). In addition, only 109 prairie species were recorded for the savanna cemeteries. This was 60.6% of the 180 total prairie species recorded for prairie cemeteries.

Fourth, not only were these savanna cemeteries more limited in number of prairie species, but there were differences in species composition. White wild indigo (*Baptisia leucantha* T. & G.) was found in 6 of the 8 savannas (Table 2), while it was found in only 2 of the 29 prairie cemeteries (Betz and Lamp 1989). On the other hand, cream wild indigo (*B. leucophaea* Nutt.), which is usually associated with prairies, was found in 12 of the 29 prairie cemeteries (Betz and Lamp 1989), but in only one of the savanna cemeteries studied (Table 2). A few notable species of savannas and woodland edges associated with savanna cemeteries were spreading dogbane (*Apocynum androsaemifolium* L.), Drummond's aster (*Aster*

Table 3. Soils of savanna and sand prairie old settler cemeteries.

	Depth of A horizon (cm)	Thickness of loess
<i>Silt-loam cemeteries</i>		
Down-silt-loam		
Cem 1-Bureau 2 (North Princeton)	18-20	over 152.4 cm
Cem 2-Bureau 3 (Tiskilwa)	13-15	"
Cem 3-Carroll 1 (Brookville)	15-18	"
Cem 4-Knox 1 (Copely)	10-18	"
Blount Silt-loam		
Cem 5-Livingston 3 (Campbell)	10-18	45.5-91 cm
Beecher silt-loam		
Cem 6-Will 3 (Monee)	10-18	45.5-91 cm
Cem 7-Will 4 (Scheer)	18-23	"
Soil not determined		
Cem 8-Warren-Ind 1 (Brisco)	—	—
<i>Intermediate silt-loam/sand cemeteries</i>		
Burkhart-saude sand-gravel complex		
Cem 9-Tazewell 1 (Bequaith)	10-13	under 45.7 cm
<i>Sand cemeteries</i>		
Sparta sand (Prairie)		
Cem 10-Whiteside 3 (Springhill)	23-25	—
Plainfield sand (Savanna)		
Cem 11-Grundy 1 (Short)	5-10	—
Cem 12-Henderson 1 (no known name)	"	—
Cem 13-Kankakee 1 (Essex)	"	—
Cem 14-Ogle 2 (no known name)	"	—
Cem 15-LaPorte-Ind 1 (Morgan)	"	—
Cem 16-Will 2 (Braidwood-Oakwood)	"	—

sagittifolius drummondii (Lindl.) Shinners), pale Indian plantain (*Cacalia atriplicifolia* L.), wild hyacinth (*Camassia scilloides* (Raf.) Cory), spring beauty (*Claytonia virginica* L.), violet bush clover (*Lespedeza violacea* (L.) Pers.), early buttercup (*Ranunculus fascicularis* Muhl.), and starry campion (*Silene stellata* (L.) Ait). These were not found in prairie cemeteries (Betz and Lamp 1989).

It is interesting to note that savannas were not mentioned in the early papers of Mead (1846) and Brendel (1887). These silt-loam savanna cemeteries are not the barrens of Mead since they contain only 18 species of the 77 non-woody species (23%) listed by Mead. Neither are they the copses of Brendel because these savanna cemeteries contain only 30 of the 97 non-woody species (30%) listed by him as occurring in copses. However, allowing for differences in geographical location, soil, and moisture relations, these savanna cemeteries appear to be similar to the oak savannas (oak openings) described by Curtis (1959) and Bray (1960).

Many of the prairie species found in these savanna cemeteries are the same ones characteristic of the "prairie matrix" used at Fermilab to restore prairie. These species are aggressive and able to invade and successfully dominate weedy communities in the early stages of prairie restoration (Betz 1984).

Sand/gravel Complex Savanna (Cemetery 9)

Cemetery 9 (Bequaith Cemetery, Tazewell County, Illinois) was an unusual savanna cemetery. It was 0.4 ha (Table 1) with a soil designated as a Burkhart-Saude Sand/Gravel Complex (Table 3). The woody cover included bitternut hickory (*Carya cordiformis* (Wang) K.Koch) and black oak (*Quercus velutina* Lam.). It was neither a silt-loam nor a sand savanna. Rather, it appeared to be a combination of both. In addition to the dominant prairie grasses, such as big and little bluestems (*A. gerardii* Vitman, *A. scoparius* Michx.), Indian grass (*S. nutans* (L.) Nash), switch grass (*P. virgatum* L.), Scribner's panic grass (*P. oligoanthus scribnerianum* (Nash) Fern.), and porcupine grass (*Stipa spartea* Trin.), there were grasses more characteristic of open woods and savannas. These included Canadian wild rye (*Elymus canadensis* L.) and tall melic grass (*Melica nitens* Nutt.). Further, characteristic silt-loam prairie species, such as Bicknell's sedge (*Carex bicknellii* Britt.) and purple cone flower (*Echinacea pallida* Nutt.), grew together with a characteristic sand prairie species—clustered poppy mallow (*Callirhoe triangulata* (T. & G.) Gray). In addition, there were typical open woods and savanna species, such as pale Indian plantain (*Cacalia atriplicifolia* L.) and woodland sunflower (*Helianthus divaricatus* L.).

Sand Prairie (Cemetery 10)

Cemetery 10 (Springhill Cemetery, Whiteside County, Illinois) was the only sand prairie found during this study. It was approximately 0.8 ha and contained 53 species of prairie plants (Table 2). The soil was a Sparta sand (Table 3). Because it had a relatively deep A horizon (23-25 cm), it had a mixture of both silt-loam and sand prairie species. Some of the silt-loam prairie species were prairie dropseed grass (*Sporobolus heterolepis* Gray), cream wild indigo (*Baptisia leucophaea* Nutt.), Mead's sedge (*Carex meadii* Dew.), prairie coreopsis (*Coreopsis palmata* Nutt.), purple cone flower (*Echinacea pallida* Nutt.), hoary puccoon (*Lithospermum canescens* (Michx.) Lehm.), prairie cinquefoil (*Potentilla arguta* Pursh.), blue-eyed grass (*Sisyrinchium albidum* Raf.), and prairie violet (*Viola pedatifida* G. Don). Some of the sand prairie species were clustered poppy mallow (*Callirhoe triangulata* (T. & G.) Gray), hairy puccoon (*Lithospermum croceum* Fern), sand phlox (*Phlox pilosa* L.), purple milkwort (*Polygala polygama obtusata* Chodat), showy goldenrod (*Solidago speciosa* Nutt.), and hoary pea (*Tephrosia virginiana* (L.) Pers.). A few sand weeds, such as western ragweed (*Ambrosia psilostachya coronopifolia* (T. & G.) Farw.), sand sedge (*Cyperus filiculmis* Vahl), and horse mint (*Monarda punctata villicaulis* Pennell) were also present.

Sand Savanna Prairies (Cemeteries 11-16)

There are four major differences between the sand prairie and sand savanna cemeteries. First, the sand savanna cemeteries were associated with woody vegetation. Black oak (*Quercus velutina* Lam.) was the dominant tree; other woody species were black jack oak (*Q. marilandica* Muenchh.), red cedar (*Juniperus virginiana creber* Fern. & Grisc.), wafer ash (*Ptelea trifoliata* L.), fragrant sumac (*Rhus aromatica* Ait.), smooth sumac (*R. glabra* L.), and sassafras (*Sassafras albidum* (Nutt.) Nees). Most of the trees observed were even aged and about 150 to 200 years old. It is probable that in presettlement times many, if not most, of these oaks were bushy, due to the recurrent annual fires that gave the landscape a prairie appearance. With the cessation of fires, such oak scrub could have grown up into open woodland, becoming the so-called black-oak savanna of today.

Second, the sand savannas had much shallower A layers than the sand prairie. The depth of the A horizon in these sand savanna cemeteries ranged from 5 to 10 cm compared with 23-25 cm in the sand prairie cemetery (Table 3).

Third, the sand savanna cemeteries had many more weedy sand species than the sand cemetery, due in part to patches of open sand. Some of these weedy species were beach wormwood (*Artemisia caudata* Michx.), narrow-leaved goosefoot (*Chenopodium leptophyllum* Nutt.), purple love grass (*Eragrostis spectabilis* (Pursh) Steud.), large cottonweed (*Froelichia floridana campestris* (Small) Fern.), fall witch grass (*Leptoloma cognatum* (Schultes) Chase), sand primrose (*Oenothera rhombipetalata* Nutt.), prickly pear cactus (*Opuntia humifusa* Raf.), slender knotweed (*Polygonum tenue* Michx.), and sand dropseed (*Sporobolus cryptandrus* (Torr.) Gray) (Table 2).

Fourth, while the total number of species found were approximately the same, the sand savanna cemeteries had fewer silt loam prairie species than the sand prairie cemetery. These include cream wild indigo (*Baptisia leucophaea* Nutt.), Mead's sedge (*Carex meadii* Dew.), purple cone flower (*Echinacea pallida* Nutt.), hoary puccoon (*Lithospermum canescens* (Michx.) Lehm.), and prairie dropseed (*Sporobolus heterolepis* Gray). On the other hand, there were some sand species that were found in the sand savanna cemeteries and not in the sand prairie cemetery. Some of these restricted sand species were sand milkweed (*Asclepias amplexicaulis* Sm.), sand coreopsis (*Coreopsis lanceolata* L.), slender bush clover (*Lepedeza virginica* (L.) Britt.), and hairy puccoon (*Lithospermum croceum* Fern.).

The dominant grass on these sand savanna prairies was little bluestem (*Andropogon scoparius* Michx.). Other prairie grasses present included big bluestem (*A. gerardii* Vitman), and Indian grass (*Sorghastrum nutans* (L.) Nash), along with certain sand species, such as Scribner's panic grass (*Panicum oligosanthos scribnerianum* (Nash) Fern.) and *P. villosissimum pseudopubescens* (Nash) Fern.).

Cemetery 16 (Braidwood-Oakwood-Will 2) was a large cemetery with a low, marshy area that supported a number of wet-prairie and marsh species. Some of these species were swamp milkweed (*Asclepias incarnata* L.), flat-top aster (*Aster umbellatus* Mill.), marsh marigold (*Caltha palustris* L.), marsh shield fern (*Dryopteris thelypteris pubescens* (Lawson) Nakai), royal fern (*Osmunda regalis spectabilis* Willd. Gray), and swamp saxifrage (*Saxifraga pensylvanica* L.). Because this savanna cemetery had both dune and swale vegetation, it was the richest in species composition of the six sand savanna cemeteries studied and had a total of 105 species.

These sand savannas were not mentioned either by Mead (1846) or Brendel (1887). However, they appear to be related to the oak barrens described by Curtis (1959).

Although these sand prairie and savanna cemeteries are small in size (Table 1), they are perhaps some of the best surviving remnants of presettlement sand prairies and savannas. Further, because these cemeteries still possess a valuable array of characteristic species, they can be used in evaluating the effectiveness of current restoration efforts for Illinois and Indiana savannas and prairies. In addition, the unplowed soils they possess provide a measure of the extent to which erosion has taken its toll in the surrounding fields. A number of these cemeteries, both in Illinois and in Indiana, have been designated as nature preserves. Further, these pioneer cemeteries give a small glimpse of what settlers viewed when they entered the wild Illinois-Indiana country in the early part of the nineteenth century.

LITERATURE CITED

Betz, R.F. 1986. One decade of research in prairie restoration at the Fermi National Accelerator Laboratory (Fermilab) Batavia,

- Illinois. Pages 179-185. In G.K. Clamby and R.H. Pemble (eds.). Proceedings of the Ninth North America Prairie Conference. Tri-College University, Moorhead, Minnesota.
- Betz, R.F., and M.H. Cole. 1969. The Peacock Prairie—a study of virgin Illinois mesic black-soil prairie forty years after initial study. Transactions of the Illinois Academy of Science 62:44-53.
- Betz, R.F., and H. F. Lamp. 1989. Species composition of old settler silt-loam cemetery prairies. Pages 33-39. In T.B. Bragg and J. Stubbendieck (eds.). Proceedings of the Eleventh North American Prairie Conference. Lincoln, Nebraska.
- Bray, J.R. 1960. The composition of savanna vegetation in Wisconsin. Ecology 41(4):721-732.
- Brendel, F. 1887. Flora Peoriana: the vegetation in the climate of the middle Illinois. Peoria, Illinois.
- Curtis, J.T. 1959. The vegetation of Wisconsin. University of Wisconsin Press, Madison, Wisconsin.
- Evers, R.A. 1955. Hill prairies of Illinois. Bulletin of the Illinois Natural History Survey 26:367-446.
- Fay, M.J., and R.F. Thorne. 1953. Additions to the flora of Cedar County, Iowa. Proceedings of the Iowa Academy of Science 60:122-130.
- Fell, E.W., and G.B. Fell. 1956. The gravel-hill prairies of the Rock River Valley in Illinois. Transactions of the Illinois Academy of Science 49:47-62.
- Fernald, M.L. 1950. Gray's manual of botany. Van Nostrand Company, New York.
- Gates, F.C. 1912. The vegetation of the Beach Area in northeastern Illinois and southeastern Wisconsin. Bulletin of the Illinois State Laboratory of Natural History. 9: 255-372.
- Gleason, H.A. 1910. The vegetation of the inland sand deposits of Illinois. Bulletin of the Illinois State Laboratory of Natural History 9: 23-174.
- Kilburn, P. D. 1959. The forest-prairie ecotone in northeastern Illinois. The American Midland Naturalist 62:206-217.
- Lantz, C.W. 1969. The Clay Prairie in Butler County, Iowa. Proceedings of the Iowa Academy of Science 76:109-112.
- Mead, S.B. 1846. Catalogue of plants growing spontaneously in the state of Illinois, the principal part near Augusta, Hancock County. Prairie Farmer 6:35-36, 60, 93, 119-122.
- Moran, R. C. 1978. Presettlement vegetation of Lake County, Illinois. Pages 13-18. In D.C. Glenn-Lewin and R.Q. Landers Jr. (eds.). Proceedings of the Fifth Midwest Prairie Conference, Ames, Iowa.
- Morrissey, T. 1956. The flora of the Pine Hill Prairie relict. Proceedings of the Iowa Academy of Science 63:201-213.
- Packard, S.. 1988. Chronicles of restoration. Just a few oddball species: restoration and the rediscovery of the tallgrass savanna. Restoration and Management Notes 6:13-22.
- Paintin, R.D. 1928. The morphology and nature of a prairie in Cook County, Illinois. Transactions of the Illinois Academy of Science 21:152-175.
- Penalosa, J. 1963. A flora of Tiburon Peninsula, Marin County, California. The Wasman Journal of Biology 21:1-74.
- Sampson, C.W. 1845. Observations on the botany of Illinois, more especially with reference to autumnal flora of the prairies. Western Journal of Medicine and Surgery, New Series 3:185-198.
- Swink, F., and G. Wilhelm. 1979. Plants of the Chicago region. The Morton Arboretum, Lisle, Illinois.
- Vestal, A.G. 1914. A black-soil prairie station in northeastern Illinois. Bulletin of the Torrey Botanical Club 41:351-363.
- Wright, J.C., and E.A. Wright. 1948. Grassland types of southcentral Montana. Ecology 29:449-460.

