FLORISTIC AND VEGETATIONAL SURVEY OF THE W. PEARL KING PRAIRIE GROVE, A PRAIRIE REMNANT IN MADISON COUNTY, OHIO

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Abstract. A 5.6 hectare prairie, the W. Pearl King Prairie Grove, near Mechanicsburg, Ohio, is co-dominated by *Andropogon scoparius* and *Sorghastrum nutans* and contains more than 25 additional prairie species. The vegetation was sampled by the use of 424 1-m² quadrats through which percent cover, frequency, and commonness values were determined. A grid system was utilized in producing a map of the extant vegetation. Six distinct vegetation communities occur there. One area is dominated by *Sporobolus heterolepis*, an endangered species in Ohio. Diversity and percent cover of prairie indicator forbs are low, while frequency and density of the grasses are high. Past land uses such as grazing and annual burning may be partially responsible for the present species composition. Woody species include *Quercus macrocarpa*, *Q. stellata*, and *Q. alba*, some specimens of which exceed 300 years in age. From evidence gathered within the study area, i.e., soil characteristics, antiquity of trees, and presence of *Sporobolus heterolepis*, the site appears to be original prairie that has never been cultivated. The significance of this endangered prairie type makes it well worthy of inclusion in Ohio's system of state preserves.

INTRODUCTION

The W. Pearl King Prairie Grove appears on the map of the Prairie Peninsula prepared by Transeau (1935) which depicts an eastward extension of tallgrass prairie into the deciduous forest of west-central Ohio. This geographical region, with a prairie-hardwood forest mosaic, was given the folk name "Darby Plains" by early pioneers. Over the past 100 years, the Darby Plains, with an area of approximately 1,000 square kilometers (385 square miles), have undergone great transition from prairie and forest to an area dominated by corn, wheat, and soybean fields. Interspersed throughout this "new" vegetational cover are widely scattered remnants of original vegetation, primarily tallgrass prairie and mixed-oak woodlots. Because of the presence of numerous disappearing tallgrass prairie species, most notably *Sporobolus heterolepis*, which has been designated an endangered species in Ohio by Cooperrider (1982) and a threatened species in Ohio by McCance and Burns (1984), this study has been undertaken to assess its ecological significance. The primary purposes of this study are: 1) to describe the vascular flora through a systematic survey, and 2) to construct a map of the extant vegetation. The initial proposal and subsequent autumnal study were the efforts of Patti Raley during the fall of 1981. I have since incorporated a substantial amount of additional data into the work of Raley, and developed the following insights on the ecology of the area.

W. Pearl King Prairie Grove is a privately owned mixed-oak, tallgrass prairie community and represents one of the largest (5.6 hectares) prairie remnants in the state. Despite certain disturbances, primarily grazing and annual burning, the prairie species have fared quite well and the site still retains the aspect of high quality tallgrass prairie. The site is located seven kilometers southeast of Mechanicsburg in the northwestern corner of Monroe Township, Madison County, Ohio, immediately west of the intersection of David Brown Road (Madison County Road 119) and Mechanicsburg-Sanford Road (Madison County Road 27). The elevation is approximately 336 meters with a latitude of 40° 02′30″N and a longitude of 83° 28′W. The study area lies within the glaciated section of the Central Lowland Province with the underlying bedrock composed of Upper Silurian dolomites of the Bass Islands group (Foley 1973). The overall topography of the region is a nearly level to slightly undulating ground moraine. Soil series are of the Kokomo-Crosby-Lewisburg association consisting of nearly level to gently sloping, poorly drained to moderately well-drained soils that developed in late Wisconsinan-age clay loam till (Gerken and Scherzinger 1981). Specifically, the site has been mapped (Gerken and Scherzinger 1981, Sheet nos. 6 and 10) with equal amounts of Kokomo silty clay loam and Crosby-Lewisburg silt loam. The climate classification is humid-continental with an average temperature of 10° C and an annual precipitation of approximately 95 centimeters (Ruffner and Bair 1977). The original or potential natural vegetation cover has been mapped as a mosaic of mixed tallgrass prairie and oak-hickory forest by Kuchler (1966), and as prairie grassland by Gordon (1966).

MATERIALS AND METHODS

Methods originally used by Raley were slightly modified, and selected to display statistically the floristic composition of the area. Specimens of vascular plants are on deposit in The Ohio State University Herbarium.

In order to facilitate the sampling procedures and expedite the mapping process, a grid system was established in the study area. The grid lines (transects) extend parallel to the two longest sides, i.e., the northwest and the northeast sides (Fig. 1). A handheld compass was used for the directional orientation and a one-meter pace was used for measurements.

Using the intersecting transect lines as reference points, the 1-m² quadrats were spaced equally along these lines, i.e., wherever two lines intersected, a quadrat was placed. Within each quadrat all vascular plants were noted. Species names and number of stems, or approximate percent cover, were also determined. A total of 424 1-m² quadrats, representing approximately three percent of the total study area, were sampled. From quadrat information, percent cover, frequency, and commonness values were determined using methods adopted from Curtis (1959).

The grid system was also used in constructing a map of the major cover types occurring at the site. Sampling along the transect lines made it possible to discern one major cover type from the next. These major changes of cover type were approximately marked on a field map which was subsequently used in production of the final map (Fig. 1).

The study area was observed an average of two times per month, starting in early June and terminating late October. Community sampling procedures were initiated in early June, and continued into September. During each visit, the area was carefully examined for plant species not previously seen in the study site. Identifications of plants were determined using Gleason and Cronquist (1963) and Weishaupt (1971). Nomenclature follows Fernald (1950).

Ten trees with diameters of 50 centimeters or greater were randomly selected by use of the field map which depicted their location within the study area. Subsequently, these trees were located within the study area. Heights, diameters and cores were obtained from each specimen.

RESULTS

Sixty-five species representing 28 families were encountered in the 424 quadrats. Table 1 separates the quadrat sampling plots

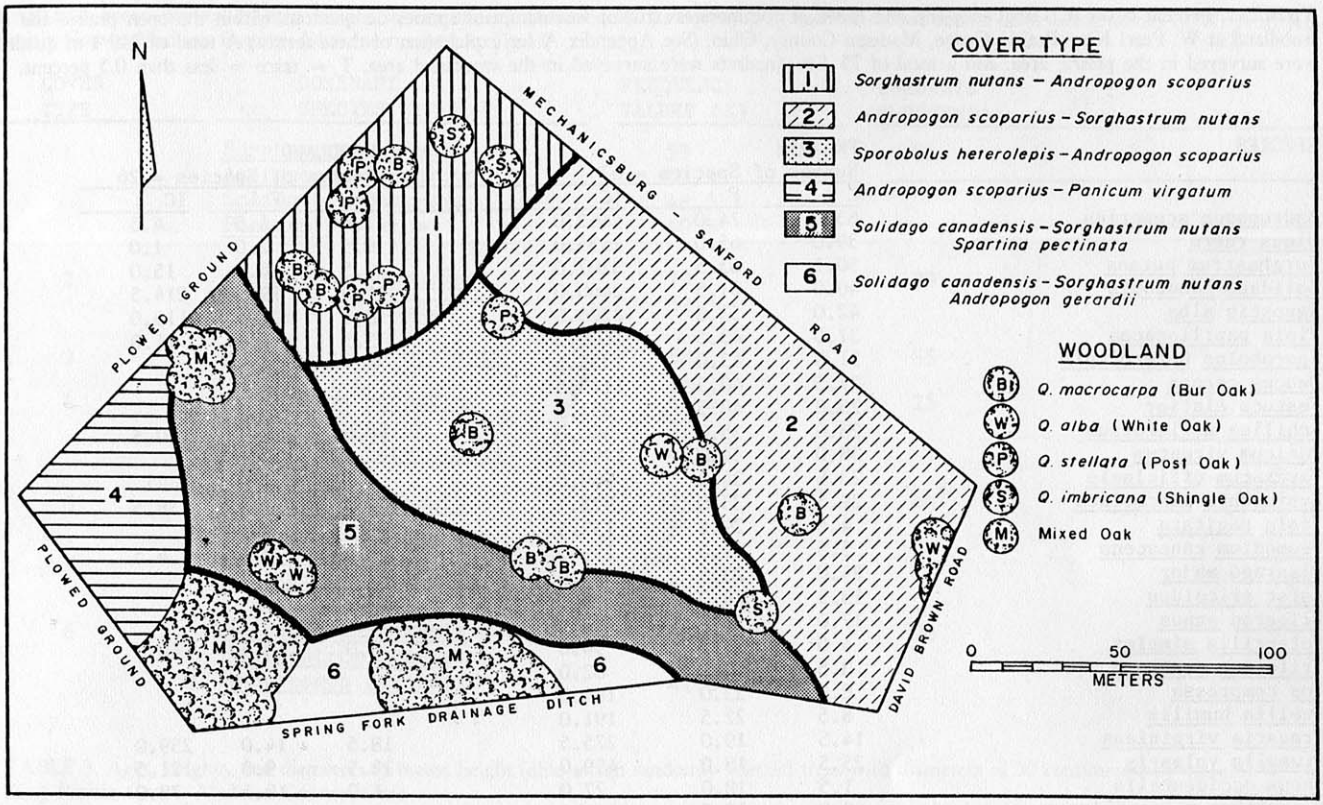

FIG. 1. Major cover types and locations of woody species at W. Pearl King Prairie Grove, Madison County, Ohio.

into two distinct zones. One is the open prairie. The second represents the woodland quadrats, or those quadrats located at least in part within a tree's drip line in case of a single specimen. The change from open prairie to woodland is abrupt and quite distinct. *Andropogon scoparius* is the dominant species in the open prairie with a frequency of 71 percent. This species is almost non-existent in the semi-shaded to totally shaded woodland areas, with a frequency of 4.5 percent. On the other hand, *Rubus allegheniensis* is the most frequent woodland species with a frequency of 44 percent (open prairie frequency 2.5 percent). *Agrostis alba* is the most frequent woodland grass with a frequency value of 13.5 percent. *Solidago canadensis* is the most represented forb in both the open prairie and woodland communities, with frequencies of 44 percent and 32 percent, respectively.

Throughout the duration of this survey, a total, of 113 species representing 36 families was recorded. Thirty-one prairie indicator species are represented there. A diverse array of seven prairie indicator grasses is also present at the site. *Sporobolus heterolepis* occurs in healthy, vigorous stands with a frequency of 31.5 percent. Of a total of 24 prairie indicator forbs, *Pycnanthemum virginianum* has the highest frequency, 17.5 percent.

Of the 113 species, 27 are classified as "naturalized" or "adventive" species, meaning they are non-native. Several of these species, *Poa compressa* and *Daucus carota*, for example, are major components of the study area with frequency values of 23 percent and 40.5 percent, respectively.

Six major vegetational cover types are represented within the study area. Fig. 1 displays these cover types and their dominant plant species. A species is considered dominant if the frequency value within that particular community exceeds 50 percent. Table 2 separates each cover type into the frequency values for individual dominants. For example, the largest cover type, area two, is dominated by an *Andropogon scoparius-Sorghastrum nutans* association with frequency values of 79 percent and 52 percent, respectively. The core of the area is dominated by an impressive stand of *Sporobolus heterolepis* with a value of 88 percent.

Ten trees with diameters of 50 centimeters or more were randomly selected from the field map and located within the study area. The selected specimens are listed in Table 3 with their ages, heights, and diameters at breast height (dbh). The ten chosen specimens all belong to the genus *Quercus*. The oldest of the ten trees is a 340-year-old bur oak (*Q. macrocarpa*) with a height of 21.4 meters and a dbh of 1.43 meters.

DISCUSSION

One of the most notable aspects of this prairie remnant is the lack of prairie indicator forbs commonly occurring on other relict prairies in the Darby Plains. The site has apparently never been cultivated (Tomko and Hall 1982). However, according to Chester Clime (personal communication 1982), owner of the grove, the area was grazed for a number of years. Nyboer (1981) has compiled extensive data in reference to the impact of grazing on Illinois hill prairies. He has concluded that prolonged grazing has a tendency to reduce native species frequency and diversity. At the same time, alien grasses and forbs readily replace the native species. Being highly competitive, the alien species invade and are able to compete well in grazed situations. A similar situation is evident at the King site. The lack of prairie forbs in terms of diversity and frequency, and the abundance of alien and common old field species in the study area tend to parallel Nyboer's findings. Similar results have been reported in other grazed prairie communities by a number of researchers, including Drew (1947) and Evers (1955).

In contrast to the low forb frequency is the diverse assemblage of prairie grasses. Clime (personal communication 1982) reports

TABLE 1. Percent cover (C), frequency (F), and index of commonness (IC) of vascular plant species on quadrats within the open prairie and the woodland at W. Pearl King Prairie Grove, Madison County, Ohio. (See Appendix A for explanation of these terms.) A total of 349 1-m quadrats were surveyed in the prairie area, and a total of 75 1-m quadrats were surveyed in the woodland area. T = trace = less than 0.5 percent.

SPECIES	PRAIRIE Number of Species = 67			WOODLAND Number of Species = 26		
	C	F	IC	C	F	IC
Andropogon scoparius	63.0	74.0	4662.0	1.0	4.5	4.5
Ulmus rubra	39.0	65.0	2535.0	0.5	2.0	1.0
Sorghastrum nutans	50.5	63.5	3207.0	2.5	6.0	15.0
Solidago candensis	40.0	61.5	2460.0	11.0	19.5	214.5
Agrostis alba	42.0	53.0	2226.0	8.5	13.5	115.0
Viola papilionacea	37.0	43.5	1609.5	3.5	4.0	14.0
Sporobolus heterolepis	31.5	43.0	1355.5			
Daucus carota	27.5	40.5	1113.5			
Festuca elatior	23.0	40.5	931.5			
Achillea millefolium	28.0	35.0	980.0	11.0	14.5	159.5
Panicum virgatum	38.0	34.0	1292.0			
Taraxacum officinale	23.5	34.0	799.0			
Lysimachia lanceolata	29.5	33.0	973.5	5.5	7.0	38.5
Viola sagitata	4.5	29.5	132.5			
Desmodium canescens	5.5	29.0	159.5	1.5	3.0	4.5
Plantago major	24.0	28.5	684.0			
Aster ericoides	13.5	28.0	378.0			
Erigeron annus	17.0	26.5	450.5			
Potentilla simplex	4.0	23.5	94.0	3.0	13.5	40.5
Trifolium pratense	3.5	23.5	82.0			
Poa compressa	8.0	23.0	184.0			
Ruellia humilis	8.5	22.5	191.0			
Fragaria virginiana	14.5	19.0	275.5	18.5	14.0	259.0
Prunella vulgaris	25.5	18.0	459.0	13.5	9.0	121.5
Rubus occidentalis	1.5	18.0	27.0	4.0	19.5	78.0
Pycnanthemum virginianum	8.0	17.5	140.0			
Ambrosia tritida	1.5	17.0	25.5	1.0	8.5	8.5
Apocynum cannabinum	9.5	16.0	152.0	4.5	12.0	54.0
Lobelia spicata	2.5	15.0	37.5			
Spartina pectinata	5.5	14.5	79.5			
Setaria glauca	0.5	14.5	7.0			
Vernonia gigantea	1.5	14.0	21.0			
Plantago lanceolata	2.0	13.5	27.0			
Lactuca canadensis	0.5	13.5	7.0			
Ambrosia artemissiifolia	0.5	13.0	6.5			
Solidago graminifolia	1.5	12.5	19.0			
Cirsium discolor	3.5	12.0	42.0			
Sanicula canadensis	9.0	11.5	103.5	17.0	14.5	246.5
Geum canadensis	17.0	11.0	187.0			
Medicago lupulina	1.0	11.0	11.0			
Phleum pratense	17.0	9.5	161.5	15.0	8.0	120.0
Poa pratensis	1.5	9.5	14.0	3.0	6.5	19.5
Andropogon gerardi	5.0	8.0	40.0			
Agrimonia pubescens	2.5	7.0	17.5	4.0	12.5	50.0
Panicum languginosum	0.5	7.0	3.5			
Sambucus canadensis	0.5	7.0	3.5	1.5	10.0	15.0
Carex scoparia	1.5	6.5	10.0			
Rosa multiflora	0.5	6.5	3.0	1.0	9.0	9.0
Carya ovata	1.0	4.0	4.0			
Rubus allegheniensis	0.5	3.0	1.5			
Lycopus virginicus	0.5	2.5	1.0			
Trifolium procumbens	0.5	2.5	1.0			
Galium concinnum	0.5	2.5	1.0	1.0	7.5	7.5
Hypericum punctatum	0.5	1.5	1.0			
Cirsium arvense				13.0	21.5	279.5
Cirsium vulgare	T	0.5		1.5	10.0	15.0
Panicum boscii	T	0.5				
Elymus canadensis	T	0.5				
Quercus imbricaria	T	0.5				
Oxalis stricta	T	0.5				
Lezpedeza violacea	T	0.5				
Galium boreale	T	0.5				
Oenothera biennis	T	0.5				
Aster lowrieanus	T	0.5				
Arctium minus	T	0.5				
Aster novae-angliae	T	0.5				
Carex sp.	T	0.5				
Antennaria plantaginifolia	T	0.5				

TABLE 2. Frequency values of dominant species and number of quadrats surveyed in each of the six major plant communities of W. Pearl King Prairie Grove, Madison County, Ohio, as mapped in Fig. 4.

COVER TYPE	DOMINANT SPECIES	FREQUENCY VALUES (%)	QUADRATS SURVEYED
1	Sorghastrum nutans	59	66
	Andropogon scoparius	53.5	
	Solidago canadensis	48.5	
	Panicum virgatum	40.5	
2	Andropogon scoparius	79	129
	Sorghastrum nutans	52.5	
3	Sporobolus heterolepis	88	85
4	Andropogon scoparius	64.5	25
	Panicum virgatum	47	
	Sporobolus heterolepis	40.5	
5	Solidago canadensis	75.5	99
	Sorghastrum nutans	58	
	Spartina pectinata	43	
	Panicum virgatum	40.5	
6	Solidago canadensis	63.5	20
	Sorghastrum nutans	52	
	Andropogon gerardii	41.5	

TABLE 3. Ages, heights, and diameters at breast height (dbh) of ten randomly selected trees with diameters of 50 centimeters or more in W. Pearl King Prairie Grove, Madison County, Ohio.

	SPECIES	AGE (years)	HEIGHT (meters)	DIAMETER (meters)
1.	Quercus macrocarpa	221	22.1	1.30
2.	Quercus macrocarpa	183	18.2	1.15
3.	Quercus alba	195	20.0	1.70
4.	Quercus stellata	289	18.7	1.35
5.	Quercus macrocarpa	275	14.7	.95
6.	Quercus macrocarpa	245	17.3	1.05
7.	Quercus macrocarpa	225	18.9	1.21
8.	Quercus stellata	325	18.4	.97
9.	Quercus macrocarpa	340	21.4	1.43
10.	Quercus alba	195	16.3	.79
	Average	249	18.6	1.19
	Mean	261	18.4	1.11

that the site has been burned every year for at least the past eight years to eliminate unwanted species, i.e., *Rubus* spp. and *Rosa multiflora*. This inadvertent prairie management technique has undoubtedly been beneficial to the outstanding expression of prairie grasses. Huston (1981), in his study on the effects of burning native prairie, reported that annual burning tends to benefit grass species while depressing the occurrence of certain forbs, especially the annual forbs. Other studies dealing with both native and planted prairies further substantiate the concept that annual burning tends to favor the grasses over the less competitive forbs (Moeller 1973).

The index of commonness is a mathematical measurement which shows the importance of a species to the overall community. As discussed earlier, *Andropogon scoparius* with an I.C. value of 4662 is the most abundant species at the site. Three other grassland species falling within the 10 most frequent species include *Sorghastrum nutans* (I.C. 3207), *Sporobolus heterolepis* (I.C. 1355) and *Panicum virgatum* (I.C. 1292). No tallgrass prairie indicator forbs fall within the 10 most frequent species. However, two alien species fall within the top ten. These are *Daucus carota* (I.C. 1113) and *Achillea millefolium* (I.C. 980). These species, however, are generally non-aggressive and probably pose no major threat to the native species at this time.

Although some of the alien grasses and forbs are fairly abundant, they appear to offer no immediate threat to the native flora. However, one species that should be carefully watched is *Festuca elatior*. This alien grass, with a rather high I.C. value of 932, is commonly used as a hay crop and, from my observations, responds favorably to annual burning. With this aspect in mind, continued annual burning could eventually pose a problem in reference to alien plant aggression. This situation needs to be carefully monitored on a yearly basis and management measures taken if warranted.

Tomko and Hall (1982) have compiled extensive data on the soil characteristics of the site. Their endeavors include a soil comparison of samples taken within the study area and from an adjacent cultivated field. They report a distinct difference in the physical and chemical characteristics between the two sets of samples. For example, within the cultivated field bulk densities due to compaction, shows an increase while organic matter levels demonstrate a substantial decline. Chemical changes in the cultivated field include lower amounts of magnesium and increased levels of calcium and potassium due to chemical fertilizer application.

Tomko and Hall (1982) also offer insight to whether the soil

within the study area has ever been cultivated. The first, as discussed above, is the distinct physical and chemical differences between the two soil samples. Another is the presence of *Sporobolus heterolepis* which is highly susceptible to soil disturbance. Other reasons include the presence of large bur and post oak trees and a discussion with the owner who can recall of no disturbance other than grazing (Tomko and Hall 1982). With these factors in mind, they conclude that "there is no evidence that the uncultivated site (W. Pearl King Prairie Grove) has ever been disturbed."

Several species discovered at the site represent new vascular plant records for the Darby Plains. These include: 1) *Scutellaria parvula*, a low-growing mint which occurs as one small clump in the northeast section of the study area, and 2) *Polygala verticillata*, a small inconspicuous member of the Milkwort Family which occurs primarily within the *Sporobolus heterolepis* community among the thick grass clumps. Other infrequent species include *Lythrum alatum*, winged prairie loosestrife, a plant more common in wet than mesic prairies. It occurs in the road ditch adjacent to Mechanicsburg-Sanford Road. *Veronicastrum virginicum* is present in one impressive stand of approximately 40 flowering stems along the north side of the study area. *Galium boreale*, a plant of more northern affinity, grows in one large clump along the western border of the site. The scarcity of certain prairie indicator forbs in terms of total individuals is further evidence of past grazing activity.

Thirteen woody species have been recorded within the study area. Shrubs, except for *Cornus racemosa*, are non-existent. Annual burning has apparently repressed the growth of seedlings and young saplings of the larger woody species, such as *Carya ovata*, *Ulmus rubra*, and *Quercus* spp. *Ulmus rubra*, the most abundant woody species, has an extraordinary frequency of 65 percent and a I.C. value of 2535. However, these figures are misleading and actually over-represent the overall importance of this species. The high values have probably resulted from the annual burning that causes a yearly die back; hence, no specimen larger than one centimeter dbh is present. The widespread occurrence of *U. rubra* throughout the area is an enigma especially since no large parent trees are present within the general area.

The large trees are another important feature of the total prairie community. Eighty-five percent of the trees greater than 25 centimeters dbh are oaks (*Quercus* spp.). Approximately 50 percent of these are bur oaks. Although large oak tree frequency is high, reproduction of oaks is extremely low. During the sampling procedures only one oak seedling was recorded (*Quercus imbricaria*). The lack of young oak seedlings, in light of the high occurrence of parent trees, is not fully understood. Again, annual burning may be the single most important factor in reference to the low germination of oak seedlings.

In review of present conditions at the site, past disturbances, e.g., grazing and annual burning, apparently are the two primary factors responsible for the present floral composition. As stated earlier, the predominating vegetative cover at the site are five species of grasses. The highest ranked prairie indicator forb in terms of I.C. value was *Lysimachia lanceolata*, with a value of 973. The majority of remaining prairie indicator forbs are ranked very low on the list with many displaying I.C. values of less than 50.

This condition appears to be unique for the prairie remnants within the Darby Plains. Most of the major remnant prairie sites remaining in the Darby Plains (Bigelow Cemetery, Smith Cemetery, and Milford Center, see King 1981) have a higher diversity of prairie indicator forbs and also display a more even balance between the grasses and forbs in terms of the number of stems. In fact, the Milford Center site is generally dominated by forbs with grasses being less abundant. These three sites, however, were probably never subjected to the prolonged grazing disturbances which the W. Pearl King site has endured. At one time, the W. Pearl King Prairie Grove possibly resembled the other sites in the Darby Plains with a greater diversity of forbs. On the other hand, the study site could have always been dominated by grasses and may have naturally lacked a diverse array of forbs. However, a transition of floral composition from great diversity toward a domination by several grass species appears to be a subsequent result of past land usage.

SUMMARY

From evidence gathered within the study area, i.e., soil types, plant diversity, species composition, antiquity of the trees, and most importantly the occurrence and vitality of *Sporobolus heterolepis*, W. Pearl King Prairie Grove appears to be an original prairie remnant. Being one of the last remaining eastern outliers of Transeau's famous Prairie Peninsula, this botanical phenomenon is a living history book of natural heritage. It harbors historical, educational, and scientific values that can never again be recreated if the area were destroyed. Virtually all of this area's prairie ecosystems have been obliterated. The elimination of W. Pearl King Prairie Grove would be an irreplaceable loss to society and the renowned diversity associated with the greatness of the Ohio Country. It seems only fair and sensible that an area as significant as this be preserved for all its inherent values.

In retrospect, the Darby Plains in presettlement times contained over several hundred square kilometers of virgin tallgrass prairie. Today, little remains of this ecosystem. These extensive prairie pockets have been reduced to a handful of depauperate remnants, primarily along railroad tracks and in pioneer cemeteries, which more closely resemble museum displays than true prairie communities. The W. Pearl King Prairie Grove is an exception. This area is a coherent, inextricable part of the total landscape that induces a feeling of purity, wholeness, and continuity not found elsewhere in the Darby Plains. Here one can experience the true wonder of the prairie.

To preserve W. Pearl King Prairie Grove as a state nature preserve would be a tremendous stride in the continuing preservation of Ohio's natural heritage. This tract of land is the largest unspoiled and unplowed prairie known to exist in the Darby Plains. An urgent need exists in the intensively cultivated regions of western and central Ohio to preserve biological, genetic and edaphic diversity. Such areas are excellent biometers which scientists can use in measuring the health of the landscape. Generally, a diverse landscape is a healthy landscape. With these ideas in mind, W. Pearl King Prairie Grove is certainly worthy of preservation. If this area is destroyed, the loss to society and posterity would be substantial and irretrievable.

All forms of future management should revolve around maintaining the excellent stand of prairie dropseed which covers approximately one-fifth of the site. Although annual burning has probably enhanced the fine stand of prairie dropseed, the continuance of this practice may have detrimental effects on other species. For example, some of the forbs may be at a disadvantage because each year their seed source may be destroyed and their perpetuation annually thwarted. On the other hand, the grasses are at a distinct advantage because their growth can continue vegetatively by underground rhizomes.

With these factors in mind, it would be wise to discontinue the annual burning and establish a yearly management plan geared towards maintaining the highest possible diversity of species. Without a doubt, this will call for further studies and observations on the exact trends of certain species. The plant community map developed by this study would be instrumental in this respect. Experimental management plans might entail utilizing a diversity of prairie management techniques. Mowing or haying rotation, handcutting of invading woody speices, removal of certain alien species, and burning are some of the possible techniques. Any management program would have to be carefully reviewed and updated in anticipation that the ultimate management objectives are being met.

Public utilization of the area, be it an educational, scientific, or recreational aspect, is another factor that must be addressed.

If the area does become a nature preserve, the primary use of the area would probably be in the form of group visitation. From my observations, it is generally not the curious individual or the casual naturalist who does the damage. It is usually the large groups who mean well, but cause damage to sensitive environments due to their large numbers. In this case, it would be well advised to establish a designated walkway through the preserve. This walkway could be in the form of a simple footpath. Another possibility is the construction of a boardwalk through the site. Boardwalks are excellent management tools for they provide non-degrading access which is essential in preserving the prairie's integrity while at the same time allowing the visiting public freedom to enjoy the prairie experience.

Finally, the area harbors an excellent seed source for use in local restoration projects. It also offers numerous opportunities for further scientific study on the dynamics of native American prairie. My research has only begun to scratch the surface. Other studies might include further botanical research, zoological studies, edaphic surveys, microbiological studies, historical and cultural studies, artistic expressions and others.

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APPENDIX A

An Explanation of the Index of Commonness

The Index of Commonness is a product of two values, frequency and cover, which allows species to be ranked according to their relative importance to a community. The frequency value reflects the proportion of quadrats in which a given species occurred in a sampled area. The cover value is a reflection of how much of each species was present in each quadrat, and is reported as an average figure. The product of the frequency and average cover values is called the Index of Commonness, and is directly related to the chances of finding a particular species at any given location in a community. This Index of Commonness has a maximum value of 10,000 where a species is found in all quadrats in large numbers, and a minimum value approaching zero for a rare plant found solitarily in only one quadrat (see Curtis 1959, Chapter 4 for a detailed discussion).

$$\text{Frequency} = \frac{\text{number of quadrats in which a species is present} \times 100}{\text{total number of quadrats}}$$

Cover = percentage of quadrat which a species represents

$$\text{Average Cover} = \frac{\text{sum of cover values for a particular species}}{\text{number of quadrats in which species is present}}$$

Index of Commonness = Frequency x Average Cover