

The Big Clifty Prairie, a Remnant Outlier of the Prairie Peninsula, Grayson County, Kentucky

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ABSTRACT

The Big Clifty Prairie, an outlier of the Prairie Peninsula, contains 118 species of plants representing 44 families. *Andropogon scoparius* and *A. gerardi* are the dominant grasses, while forbs include members of the Compositae, Leguminosae, Labiatae, and Cyperaceae. Woody plants are confined to the prairie edge. Minor disturbances to the prairie have occurred as evidenced by numerous weedy species. The overall prairie community is maintaining itself within a forested region, partially because of local soil conditions.

INTRODUCTION

In Kentucky, a vegetational type that has received little scientific attention is the prairie. That prairies once occupied a significant area of land in the state is well documented. Transeau (1935) in his map of the Prairie Peninsula, showed prairies as occurring in a narrow band across western and west-central Kentucky (Fig. 1). McInteer (1946) estimated that the Big Barrens prairies ranged from 8,000 to 9,600 km². Garman (1925) stated that the great meadows (prairies) in Kentucky had largely disappeared with tall grasses being replaced by weeds. Today, only small, scattered remnants of the original prairie remain.

Previous workers in the Kentucky prairies, Garman (1925), Sauer (1927), Dicken (1935), McInteer (1942, 1946), and Braun (1950) described certain aspects of the prairies, however, much of those works centered on the possible origins of the grasslands. Except for Garman (1925), who discussed the resemblance of the Kentucky prairies to those in Illinois, and McInteer (1946), who gave a brief list of tree species, no thorough vegetational descriptions have been given.

The present paper is an attempt to describe the vegetational and floral composition of one small prairie outlier of the Prairie Peninsula in Kentucky. Neither Transeau (1935) nor McInteer (1946) showed prairies in Grayson County, but they did show extensive prairie tracts in

Hardin County. The Big Clifty Prairie lies a few hundred meters west of the Hardin County line.

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DESCRIPTION OF STUDY AREA

The Big Clifty Prairie is on a nearly level plain, approximately 4.0 km (2.5 miles) east of the village of Big Clifty, Grayson County. The prairie, less than 1 ha in extent, occurs as a narrow strip within the rights-of-way of US Highway 62 and the Illinois Central Railroad. Because of that protected location, the prairie has not been broken by the plow.

The northeastern section of Grayson County, in which Big Clifty Prairie lies, is in the Pennyroyal physiographic area. The underlying rock is Big Clifty Sandstone, a member of the Golconda Formation. The soil is Sadler Silt Loam, a loess soil underlain with a slowly permeable fragipan (Whitaker et al. 1972).

The climate of Grayson County is temperate; the average annual temperature is 14.4 C, and the annual precipitation is 122.7 cm (Whitaker et al. 1972).

METHODS

Twenty-five 1×1-m quadrats, spaced at 10-m intervals, were established along a straight-line transect through the center



FIG. 1. Map of Kentucky showing the approximate location of the Prairie Peninsula. The location of the Big Clifty Prairie, an outlier, is indicated by an X. (Modified from Transeau 1935.)

of the prairie. The presence of plant species in each quadrat was recorded. Frequencies of occurrence were then determined.

Plants were collected on numerous occasions from 1968 to 1976. Voucher specimens of many of the plants are held in my personal collection.

PLANTS OF BIG CLIFTY PRAIRIE

A total of 118 species of plants representing 44 families was collected from the prairie and identified. The dominant families were the Compositae with 24 species; Gramineae, 13; Leguminosae, 12; Cyperaceae, 8; and Labiatae, 5 (Table 1).

Andropogon scoparius and *A. gerardi*, with frequencies of 100 and 44, respectively, were the dominant prairie grasses (Table 2). Native forbs *Strophostyles umbellata* (68), *Solidago missouriensis* (48), *Aster* sp. (48), *A. patens* (28), *Potentilla simplex* (28), *Pycnanthemum flexuosum* (20), *Cassia fasciculata* (12), and *Parthenium integrifolium* (12) were abundant. Members of various genera of sedges and rushes, *Carex*, *Scleria*, *Cyperus*, and *Eleocharis*, also were abundant. Invader species, *Smilax rotundifolia*, *Achillea millefolium*, *Chrysanthemum leucanthemum*, and *Poa pratensis*, indicated some degree of disturbance as having occurred. Native

species and noninvaders outnumbered the invaders.

Shrubs and small trees, *Corylus americana*, *Salix humilis*, *S. nigra*, *Nyssa sylvatica*, *Diospyros virginiana*, and *Rhus copallina*, were abundant in a ditch at the edge of the railroad. Oaks, *Quercus stellata*, *Q. velutina*, and *Q. marilandica*, were represented by a few individuals.

No analysis of soil was attempted, however, a thorough analysis of the Sadler Silt Loam was presented by Whitaker et al. (1972).

DISCUSSION

In his discussion of the xerothermic period, Gleason (1923) pointed to one of its effects as being the extension of the prairie flora to the east. He cited as evidence of this the relict prairie colonies in the eastern deciduous forest region. Transeau (1935) stated that distinctive prairie flora and isolated typical prairie communities occur as far south as Kentucky and Tennessee. McInteer (1946) noted that the prairies in Kentucky were once extensive, but those once extensive tracts have all but disappeared (Meijer 1970).

The location and subsequent ecological study of those relicts is of utmost importance since prairies have not been well defined in Kentucky. In Wisconsin, Curtis

TABLE 1.—A PRELIMINARY LIST OF VASCULAR PLANTS COLLECTED AT BIG CLIFTY PRAIRIE, GRAYSON COUNTY, KENTUCKY. NOMENCLATURE FOLLOWS FERNALD (1950)

ANACARDIACEAE	EBENACEAE	LILIACEAE
<i>Rhus copallina</i>	<i>Diospyros virginiana</i>	<i>Hemerocallis fulva</i>
APOCYNACEAE	EUPHORBIACEAE	<i>Smilax rotundifolia</i>
<i>Apocynum cannabinum</i>	<i>Euphorbia corollata</i>	LINACEAE
ASCLEPIDACEAE	<i>E. supina</i>	<i>Linum virginianum</i>
<i>Asclepias incarnata</i>	FAGACEAE	LOBELIACEAE
<i>A. syriaca</i>	<i>Quercus marilandica</i>	<i>Lobelia puberula</i>
<i>A. verticillata</i>	<i>Q. stellata</i>	<i>L. spicata</i>
BETULACEAE	<i>Q. velutina</i>	ONOGRACEAE
<i>Corylus americana</i>	GENTIANACEAE	<i>Ludwigia alternifolia</i>
CALLITRICHACEAE	<i>Sabatia angularis</i>	ORCHIDACEAE
<i>Callitriche deflexa</i>	GERANIACEAE	<i>Spiranthes vernalis</i>
CAMPANULACEAE	<i>Geranium carolinianum</i>	OXALIDACEAE
<i>Specularia perfoliata</i>	POACEAE	<i>Oxalis stricta</i>
CAPRIFOLIACEAE	<i>Andropogon gerardi</i>	PLANTAGINACEAE
<i>Lonicera japonica</i>	<i>A. scoparius</i>	<i>Plantago aristata</i>
CARYOPHYLLACEAE	<i>Bromus tectorum</i>	<i>P. lanceolata</i>
<i>Dianthus armeria</i>	<i>Elymus virginicus</i>	PLATANACEAE
<i>Saponaria officinalis</i>	<i>Festuca elatior</i>	<i>Platanus occidentalis</i>
ASTERACEAE	<i>Panicum nitidum</i>	POLAMONIACEAE
<i>Achillea millefolium</i>	<i>Paspalum</i> sp.	<i>Phlox maculata</i>
<i>Aster patens</i>	<i>Phleum pratensis</i>	POLYGALACEAE
<i>Aster</i> sp.	<i>Poa compressa</i>	<i>Polygala sanguinea</i>
<i>Bidens</i> sp.	<i>P. pratensis</i>	<i>P. verticillata</i>
<i>Chrysanthemum leucanthemum</i>	<i>Secale cereale</i>	POLYGONACEAE
<i>Coreopsis tripteris</i>	<i>Setaria lutescens</i>	<i>Rumex acetosella</i>
<i>Erigeron annuus</i>	<i>Sorghastrum nutans</i>	<i>R. conglomeratus</i>
<i>Eupatorium altissimum</i>	HYPERICACEAE	RANUNCULACEAE
<i>E. serotinum</i>	<i>Ascyrum hypericoides</i>	<i>Anemone virginiana</i>
<i>Gnaphalium purpureum</i>	<i>Hypericum</i>	RHAMNACEAE
<i>Helenium flexuosum</i>	<i>sphaerocarpum</i>	<i>Ceanothus americanus</i>
<i>Helianthus hirsutus</i>	JUNCACEAE	ROSACEAE
<i>Helianthus mollis</i>	<i>Juncus</i> sp.	<i>Potentilla simplex</i>
<i>Lactuca canadensis</i>	LAMIACEAE	<i>Rosa setigera</i>
<i>Parthenium integrifolium</i>	<i>Lycopus virginicus</i>	<i>Rubus flagellaris</i>
<i>Ratibida pinnata</i>	<i>Prunella vulgaris</i>	RUBIACEAE
<i>Rudbeckia hirta</i>	<i>Pycnanthemum flexuosum</i>	<i>Diodia teres</i>
<i>Seriocarpus asteroides</i>	<i>Salvia lyrata</i>	<i>Galium pilosum</i>
<i>Silphium integrifolium</i>	<i>Scutellaria parvula</i>	SALICACEAE
<i>S. perfoliatum</i>	LAURACEAE	<i>Salix humilis</i>
<i>Solidago missouriensis</i>	<i>Sassafras albidum</i>	<i>S. nigra</i>
<i>S. juncea</i>	LEGUMINOSAE	SCROPHULARIACEAE
<i>Tragopogon dubius</i>	<i>Cassia fasciculata</i>	<i>Chaenorrhinum minus</i>
<i>Vernonia missurica</i>	<i>Desmanthus illinoensis</i>	<i>Verbascum thapsus</i>
CORNACEAE	<i>Desmodium ciliare</i>	SOLANACEAE
<i>Nyssa sylvatica</i>	<i>D. laevigatum</i>	<i>Physalis</i> sp.
CYPERACEAE	<i>D. sessilifolium</i>	ULMACEAE
<i>Carex complanata</i>	<i>Lespedeza virginica</i>	<i>Ulmus alata</i>
<i>C. frankii</i>	<i>Medicago lupulina</i>	VERBENACEAE
<i>C. vulpinoidea</i>	<i>Melilotus alba</i>	<i>Verbena simplex</i>
<i>Cyperus ovularis</i>	<i>Psoralea psoraloides</i>	VIOLACEAE
<i>Cyperus</i> sp.	<i>Strophostyles umbellata</i>	<i>Viola sagittata</i>
<i>Eleocharis tenuis</i>	<i>Tephrosia virginiana</i>	VITACEAE
<i>Scirpus atrovirens</i>	<i>Trifolium procumbens</i>	<i>Vitis cinerea</i>
<i>Scleria pauciflora</i>		

TABLE 2.—FREQUENCY OCCURRENCE OF PLANT SPECIES AT BIG CLIFTY PRAIRIE, GRAYSON COUNTY, KENTUCKY, BASED ON 25 1×1-M QUADRATS

Species	Frequency
<i>Andropogon scoparius</i>	100
<i>Smilax rotundifolia</i>	72
<i>Strophostyles umbellata</i>	68
<i>Chrysanthemum leucanthemum</i>	56
<i>Achillea millefolium</i>	56
<i>Solidago missouriensis</i>	48
<i>Aster</i> sp.	48
<i>Andropogon gerardi</i>	44
<i>Panicum nitidum</i>	36
<i>Aster patens</i>	32
<i>Scleria pauciflora</i>	28
<i>Potentilla simplex</i>	28
<i>Carex complanata</i>	24
<i>Pycnanthemum flexuosum</i>	20
<i>Poa pratensis</i>	16
<i>Salix humilis</i>	16
<i>Cassia fasciculata</i>	12
<i>Eleocharis tenuis</i>	12
<i>Parthenium integrifolium</i>	12
<i>Rubus flagellaris</i>	12
<i>Anemone virginiana</i>	12
<i>Carex</i> sp.	12
<i>Scutellaria parvula</i>	12
<i>Prunella vulgaris</i>	12
<i>Apocynum cannibidum</i>	8
<i>Polygala sanguinea</i>	8
<i>Lactuca canadensis</i>	8
<i>Cyperus ocularis</i>	8
<i>Linum virginianum</i>	8
<i>Euphorbia corollata</i>	8
<i>Polygala verticillata</i>	8
<i>Desmodium sessilifolium</i>	8
<i>Elymus virginicus</i>	8
<i>Festuca elatior</i>	8
<i>Gnaphalium purpureum</i>	4
<i>Rhus copallina</i>	4
<i>Oxalis stricta</i>	4
<i>Asclepias verticillata</i>	4
<i>Vitis cinerea</i>	4
<i>Melilotus alba</i>	4
<i>Lobelia puberula</i>	4
<i>Sassafras albidum</i>	4
<i>Salvia lyrata</i>	4
<i>Dianthus armeria</i>	4
<i>Sabatia angularis</i>	4
<i>Nyssa sylvatica</i>	4
<i>Vernonia missurica</i>	4
<i>Cyperus</i> sp.	4

and Greene (1949) found that prairie relicts were on atypical sites, so far as the great bulk of original prairie was concerned, and had persisted because of such locations. They found the relicts that most

nearly approached the typical condition on railroad rights-of-way where railroads were laid out on grade through large flat areas of high prairie. Garman (1925) stated that probably few prairies in Kentucky have been exterminated, but were still to be found in bits of waste ground and along railroads and highways. Whether typical or not for Kentucky, the Big Clifty Prairie fits those descriptions.

In their extensive study, Curtis and Greene (1949) found low prairies on poorly drained flat lands to support the highest numbers of species, 179. The Big Clifty Prairie also occupies a flat plain with poor internal drainage resulting from the shallow fragipan. The 118 plant species at Big Clifty Prairie, considering its small size, is quite remarkable. Of the 10 species listed as most likely in low prairies in Wisconsin, 4 were present here. The most characteristic grass at Big Clifty Prairie was *Andropogon scoparius*, but Curtis and Greene listed *A. gerardi* as most characteristic for Wisconsin. McInteer (1946) named the tall bluestem *A. gerardi* as the dominant grass of the Barrens. In southern Illinois, Voigt and Mohlenbrock (1964) found *A. scoparius* to be the most common grass. Since no quantitative studies were performed by the early workers in Kentucky's prairies, and dominance was determined by observation alone, perhaps the large size and conspicuousness of *A. gerardi*, as viewed by the early writers, overshadowed its true place in the prairie association of the Barrens.

In southern Illinois, the railroad and highway rights-of-way are dominated by Indian grass *Sorghastrum nutans* that usually indicates a mild disturbance such as frequent burning (Voigt and Mohlenbrock 1964). Only a few scattered individuals of *S. nutans* were present at Big Clifty Prairie, however, that does not rule out past burning as a type of disturbance. In fact, burning has often been mentioned as one of the primary factors in maintaining prairies. The main disturbance at Big Clifty Prairie is the periodic mowing by highway crews. The clippings are left on the

ground, and undoubtedly produce a smothering effect on some of the more fragile plants. Since no set schedule for mowing is followed from year to year, the plants have most likely been disturbed at most stages of their life cycles. Invader species, like *Smilax rotundifolia*, *Achillea millefolium*, *Chrysanthemum leucanthemum*, and *Poa pratensis*, take advantage of such disturbances. Weaver (1968) found that the removal of bluestem by mowing is distinctly advantageous for the growth of bluegrass, both in fall and spring.

The abundance of sedges and rushes was encouraged by the nature of the soil and fragipan. There is a tendency for water to collect in the level areas of the Sadler Silt Loam in both winter and early spring (Whitaker et al. 1972). Garman (1925) also noted that rushes and sedges occurred in wet areas of prairies.

Although several species of trees and shrubs were present near the edge of Big Clifty Prairie, no trees were established in the prairie proper. Garman (1925) and McInteer (1946) mentioned the presence of scattered trees including black jack oak *Quercus marilandica*, dwarf willows *Salix* spp., hazel *Corylus* sp., and sumac *Rhus* spp., as well as wild grapes *Vitis* spp. in the prairies of Kentucky. Those species were primarily near the edge of Big Clifty Prairie. Weaver (1968) reported *Corylus americana* to be an invader at the edge of many prairies in Nebraska. Seedlings of *Salix humilis* were recorded in quadrats, but there were no signs of further establishment after invasion by that species or other woody plants.

The persistence of prairie relicts, such as Big Clifty Prairie, in regions of high rainfall and forest vegetation is due largely to local soil and/or drainage conditions. Wistendahl (1975) stated that the Buffalo Beats Prairie in southeastern Ohio within forest vegetation appeared to be related to local soil characteristics. Garman (1925) also noted the establishment of turf that resisted the penetration of forests. At Big Clifty Prairie, water remains on the soil

surface where it is least available, and evaporates before it can be efficiently utilized by plants. Because of this condition and the prairie's protected location, the grasses and forbs have been able to maintain themselves with only minor disturbances since xerothermic times. Further research on Kentucky's prairies is needed before this important ecosystem is eliminated from the state. An all-out effort should be made to locate, preserve, and study the remaining prairie remnants.

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