A BROAD ANALYSIS OF FIFTEEN SITES IN THE TALL-GRASS PRAIRIE OF OKLAHOMA

Jan Tarr*, Greg Botkin*, E. L. Rice*, Ellen Carpenter†, and Mark Hart†
*Department of Botany and Microbiology, University of Oklahoma, Norman, Oklahoma 73019
†School of Biological Sciences, Oklahoma State University, Stillwater, Oklahoma 74078

Tall-grass prairie vegetation was analyzed in 15 Oklahoma counties. *Andropogon scoparius* Michx. was the most important grass in all geographic regions, but its percent composition was inversely related to the amount of precipitation. The percent composition of *Andropogon Gerardi* Vitman differed little between the western and central sections but increased markedly in the eastern section. *Sorghastrum nutans* (L.) Nash and *Panicum virgatum* L. had their highest percent composition in the central region with an intermediate amount of precipitation. Diversity and basal cover did not change from west to east.

INTRODUCTION

Little (1) listed the prairie dominants of Muskogee county as *Andropogon Gerardi, A. scoparius,* and *Koeleria cristata*.* Nease (3) listed four dominants in a tall-grass prairie in south-central Oklahoma, *A. scoparius, A. Hallii, Panicum virgatum,* and *Sorghastrum nutans.* Kelting (4) described the dominants in a virgin prairie in McClain county as *A. scoparius, P. virgatum, and S. nutans.* Rice (5) listed the dominants in a tall-grass community in Marshall county as *S. nutans, P. virgatum,* and *A. Gerardi.*

Quantitative analyses of isolated tall-grass prairie stands have been reported for most geographic regions of Oklahoma, but no uniform procedures were followed and no accurate comparisons could be made of diversity, basal area, and percent composition (4, 5, 6, 7, 8, 9). In June, 1978, research was undertaken, therefore, to investigate the vegetative composition of 15 tall-grass prairie stands distributed throughout the tall-grass prairie region of Oklahoma (10).

MATERIALS AND METHODS

Tall-grass prairie stands which varied in size from 3 to 80 acres were located in 15

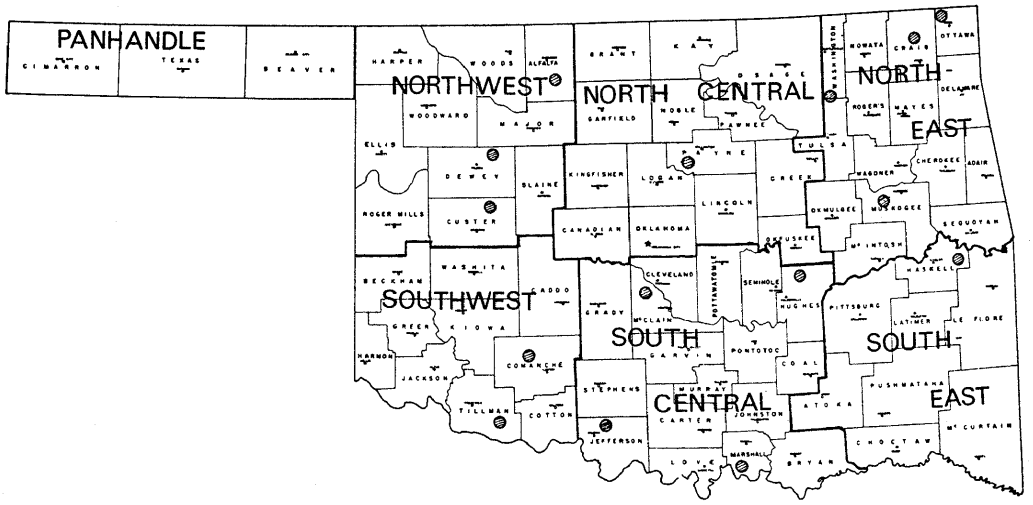

FIGURE 1. Map of Oklahoma showing the geographic regions and locations of stands, indicated by the hatched circles.

*Nomenclature according to Waterfall (2).

counties (Figure 1). The physiographic provinces, average annual temperature, and average annual precipitation for each stand are listed in Table 1.

Areas for analysis were chosen after reconnaissance across the state. Information from landowners was used when available to select climax prairie stands; otherwise sites were chosen if they appeared to have climax tall-grass prairie vegetation, were unfenced, and showed no evidence of grazing damage. Nine of the 15 stands had been hay meadows, or had never been disturbed. The rest of the sites appeared to have climax tall-grass prairie vegetation, but past histories were not available. All sites had level to gently sloping topography. Parent materials and soil types varied considerably as is characteristic of the wide-ranging tall-grass prairie in Oklahoma (11).

The point contact method (12) was chosen as an appropriate method for grassland sampling because of its statistical reliability (13). A rectangular area of equal size was paced off in each prairie stand, and 30 point frames were analyzed along each of five equally spaced, parallel compass lines, running lengthwise inside the plot. Thus, a total of 1500 points was taken at each site, and a hit was recorded if a pin touched the lower one-half inch of any plant. Additionally, a list of plant species present in each stand was recorded. Crockett (7) found that 1500 points gave reliable and reproducible quantitative results in his sampling of the tall-grass prairie in the Wichita Mountains Wildlife Refuge, Oklahoma. One of us (E.L.R.) found that 1500 points gave reliable data when tested against weight-list determinations in several grassland areas in Oklahoma.

The basal area, determined by dividing the number of hits for each species by 1500 (the number of points), and the percent composition, determined by dividing the number of hits for each species by the total number of hits, were then calculated for each prairie stand. Diversity (number of species per unit area) was calculated by region, and similarity indices (14) were calculated between regions. Species with a percent composition of 20 or above were considered dominants.

RESULTS

Andropogon scoparius was the leading dominant in 11 of the 15 stands (Table 2). Hughes and Marshall counties, in south-central Oklahoma, had a sedge species and *Sorghastrum nutans* as leading dominants, respectively, Muskogee county had *Andropogon virginicus* as the leading dominant, and Haskell county had *A. Gerardi* as the leading dominant. According to our cri-

TABLE 1. *Location of stands, physiography, and climate.*

County	Physiographic province[a]	Avg. Annual Temp (°F)[b]	Avg. Annual Precip. (in.)[b]
West			
Alfalfa	Western Sand Dune Belts	60-61	26-28
Comanche	Granite Mountain Region of the Wichita Mountain Province	60-61	28-30
Custer	Western Sandstone Hills	60-61	24-26
Dewey	Western Sandstone Hills	60-61	24-26
Tillman	Central Redbed Plains	63-64	26-28
Central			
Hughes	Eastern Sandstone Cuesta Plains	62-63	40-42
Jefferson	Central Redbed Plains	63-64	30-32
McClain	Central Redbed Plains	61-62	32-34
Marshall	Dissected Coastal Plain	63-64	38-40
Payne	Central Redbed Plains	60-61	32-34
East			
Craig	Claremore Cuesta Plains	60-61	40-42
Haskell	Arkansas Hill and Valley Belt	62-63	44-46
Muskogee	Claremore Cuesta Plains	61-62	40-42
Ottawa	Neosho Lowland	59-60	40-42
Washington	Claremore Cuesta Plains	60-61	36-38

[a]*Goode's World Atlas,* 15th ed., Rand McNally & Company, Chicago, Illinois, 1978
[b]*Kearne Brothers Official Earth Science Map of Oklahoma,* Detroit, Michigan, 1977

terion, four counties had two dominants and eleven counties had only one dominant.

The percent composition of *A. scoparius* declined from west to east (Table 3). *Andropogon Gerardi* differed little between the west and central regions, but increased greatly in importance in the east. *Sorghastrum nutans* and *P. virgatum* were most prominent in the central part of the state.

There were no significant differences between regions in basal area or in diversity (Table 4). The total number of species in each region, however, increased slightly from east to west. The similarity indices were about the same for the west vs. central and central vs. east regions, but the index was much lower between the west and east regions (Table 4).

DISCUSSION

Rainfall apparently affects the percent composition of the prairie dominants in Oklahoma, as the composition of *A. scoparius* was inversely related to the amount of precipitation (Tables 1, 3), and *A. Gerardi* was most important in the eastern region, which has the highest precipitation. *Sorghastrum nutans* and *P. virgatum* had their highest percent composition in the central region, which has an intermediate amount of precipitation. This variation in species composition from east to west was reflected in the lowered similarity index between the east and west regions.

Apparently the varying climatic factors have little effect on diversity or basal cover of plants in our tall-grass prairie, since they did not differ from east to west. This is noteworthy in view of the fact that diversity in our upland forests increases greatly from west to east (15).

Andropogon scoparius was by far the most important grass in all geographic regions. This agreed with Bruner (16),

TABLE 2. *Percent composition of four most important species in each stand.*

Species	Prairie Stand				
	West Counties				
	Alfalfa	Custer	Dewey	Comanche	Tillman
Andropogon scoparius	47.6	93.6	43.7	41.3	57.1
A. Gerardi	25.0	1.0		14.6	7.9
Bouteloua curtipendula	9.8		37.9		6.3
Sorghastrum nutans	8.4		13.6	8.5	
Sporobolus asper		1.5			7.1
B. hirsuta			1.5		
Elymus canadensis		.5			
Leptoloma cognatum				7.3	
	Central Counties				
	Jefferson	McClain	Hughes	Marshall	Payne
A. scoparius	74.3	36.2	13.1	8.8	43.2
S. nutans	8.6	15.3	20.1	58.0	14.3
P. virgatum		11.2			
A. Gerardi	2.7	10.7		5.4	10.4
B. hirsuta	3.0				
Sedge			27.1	10.2	7.7
Manisurus cylindrica			9.6		
	East Counties				
	Craig	Muskogee	Ottawa	Washington	Haskell
A. scoparius	53.0	16.0	31.3	37.9	18.6
A. Gerardi		13.5	18.1	37.5	21.0
S. nutans			14.2	8.7	14.4
P. virgatum	1.1			6.4	
A. virginicus	12.1	27.8	12.1		
Sedge	17.0	14.4			6.0

TABLE 3. *Average percent composition by region of four grasses generally considered dominants in the tall-grass prairie.*

Species	REGION		
	West	Central	East
Andropogon scoparius	56.7	35.1	31.4
Andropogon Gerardi	9.7	6.2	19.5
Sorghastrum nutans	6.3	23.3	9.1
Panicum virgatum	1.9	4.6	2.5

TABLE 4. *Average basal area, diversity, and total numbers of species by region and similarity indices between regions.*

Region	Basal area[a]	Diversity-avg. no. species per sample plot[a]	Total no. species in region	Similarity index
West (W)	16.1 ± 2.5	24.2	57	W-C, 0.62
Central (C)	16.8 ± 5.1	24.8	56	C-E, 0.64
East (E)	17.5 ± 5.5	24.6	50	W-E, 0.48

[a]No significant differences between regions (Student's *t*-test).

who stated that the dominant grass species in the true prairie of Oklahoma is *A. scoparius*. He stated further that *A. scoparius* is the leading dominant in the drier, more exposed portions even of the "subclimax prairie" in eastern Oklahoma, but that *A. Gerardi* is the most "characteristic dominant" in the eastern subclimax prairie occupying slight depressions or moist slopes. The high percent composition of *S. nutans* in Marshall county agreed with the results of Rice (5). The average percent composition of *P. virgatum* in each region was consistently lower than that of *A. scoparius*, *A. Gerardi*, or *S. nutans*. It never had an average composition over 5%.

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