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# EXTENT OF COMMUNITIES AND ABUNDANCE OF THE MOST COMMON GRASSES IN PRAIRIE

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## Introduction

The area in which True Prairie has been most intensively studied lies wholly within the central Missouri Valley. True Prairie is the characteristic vegetation of the western third of Iowa, the eastern third of Nebraska, and adjacent areas in Kansas, Missouri, South Dakota, and Minnesota. The chief communities (consociations) or types have been ascertained and fully described (**13**). The *Andropogon scoparius* type (names of grasses from HITCHCOCK [**5**]) was the most extensive of those of uplands and probably exceeded in area all the other grassland types combined. The *Sporobolus heterolepis* community was of small extent. *Stipa spartea* was dominant in the remaining upland type, which was somewhat more extensive than the *Sporobolus* type. The *Andropogon gerardi* community occupied moist lower slopes and well-aerated lowlands. Elsewhere it was sometimes abundant over limited areas of well-watered, nearly level uplands. The *Spartina pectinata* community occupied extensive areas of wet, poorly aerated soils such as occur on flood plains. The remaining lowland type, *Panicum virgatum–Elymus canadensis*, of much less extent, occurred on soils intermediate in water content and aeration between the two preceding types. Since plant communities of flood plains, such as most of those in northwestern Missouri, have recently been fully described (**9**), they are not included in this study.

Distribution of the major grasses in the *Andropogon* types was uniform throughout the area. Hill crests and drier slopes were dominated by *Andropogon scoparius*, which usually furnished 60–90% of the basal area. Chief accompanying species were *Stipa spartea*, *Sporobolus heterolepis*, and *Andropogon gerardi*. On lower slopes and in ravines *A. gerardi* was dominant, and on well-drained lowlands it alone furnished 80–98% of the cover. Chief accompanying species were *Sorghastrum nutans*, *Panicum virgatum*, and *Elymus canadensis*.

Transition between the two types was usually through a narrow ecotone at the beginning of gentler slopes on steep south and southwestern exposures but often occurred on the mid-slopes facing northward or northeastward. Usually the transition was accomplished within a few yards but otherwise within a distance of 3 or 4 rods. The shade produced by the taller, dense stands of *Andropogon gerardi* usually excluded nearly all of *A. scoparius*, but *A. gerardi* was nearly everywhere a minor constituent of the *A. scoparius* community.

The present study is concerned with the relative extent of the grassland types in relation to topography, soil, and other environmental conditions. Since similar studies cannot now be made, because of extensive breaking and pasturing of the native grassland, this report has both present and historical value.

## Material and methods

Extensive data were obtained in 1928–1932, inclusive, and the work has been continued intermittently, especially on the remaining eastern prairies which were only slightly injured by the great drought of the 1930's. Knowledge of the Missouri Valley soils and an understanding of soil-root relationships have increased considerably in the past 30 years and have aided greatly in an understanding of the distribution of vegetation.

The wide extent of the region is shown in figure 1.

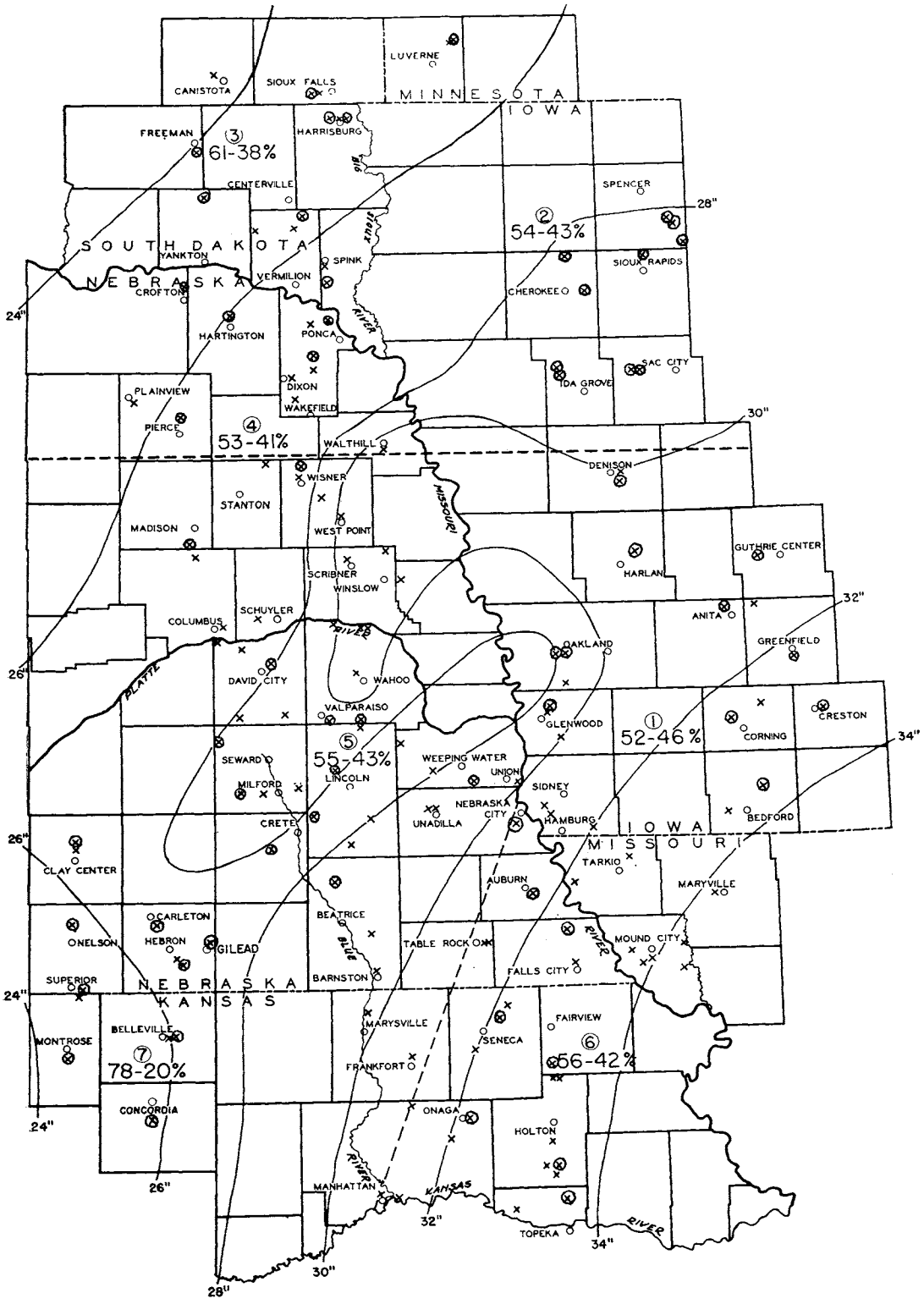



FIG. 1.—Outline map of portions of six states where prairies (marked ⊗) were studied. County lines are shown, and circles indicate towns and cities. Isohyetal lines show the average annual precipitation from the beginning of official Weather Bureau records to 1932. The seven sections, each with its average percentage area of *Andropogon scoparius* and *A. gerardi* communities, are indicated, the dividing lines between shown by rivers or dashed lines.

The prairies studied were rather uniformly distributed within this area of 60,000 square miles. They were entirely representative, as regards topography and soils, of the general region in which they occurred. The relative area occupied by each grassland community in each of the 63 prairies, designated by × in figure 1, was ascertained to the nearest 5% only after much study, numerous measurements, and considerable pacing. The region has been divided into three eastern and four western sections, each of which will be considered separately. An example of the data collected is given in table 1, where percentage of area occupied by communities of the southwestern section is shown.

These prairies varied in size from 30 to 60 acres. Assuming that each was representative of its surrounding area, the *Andropogon scoparius* type covered 78% of this section and the *A. gerardi* type 20%. Communities of *Stipa spartea*, *Panicum virgatum*, or *Spartina pectinata* occupied 2%.

### Observations

TOPOGRAPHY AND CLIMATE.—The eastern three-fifths of this region, the Drift-Loess Hills, has been glaciated and then deeply covered with loess. The western two-fifths, the Loess Plains, was unglaciated, but it also was covered with a mantle of loess. In southern Nebraska (fig. 1) the two areas are separated by the Big Blue River which flows south through a portion of the Kansas Flint Hills to join the Kansas River. The Flint Hills separate the two areas in northern Kansas. North of the Platte River the boundary is less definite but continues northward to the vicinity of Yankton, South Dakota.

On both sides of the Missouri River very steep loess bluffs, less than a mile wide, occur at the edge of the flood plain, which is 5–17 miles wide. Extensive loess deposits were laid down on a rolling to hilly glacial drift plain, extending many miles away from the Missouri.

From a depth of more than 100 feet on the river bluffs, the loess gradually decreases in depth eastward. There are outcrops of glacial till 40–50 miles from the river. In southwestern Iowa, beyond the very hilly area which extends eastward 3–25 miles from the flood plain, the larger hills are about 100 feet above the adjacent valleys but the smaller ones only 10–50 feet. The area presents some level upland, rounded hilltops, gentle to steep upper slopes, and more gradual lower ones. Ravines spread downward between the hills to a limited amount of nearly level lowland (fig. 2).

In eastern Nebraska and northeastern Kansas a similar topography of rolling to hilly land continues over the area of the Drift-Loess Hills, where, in general, the loessial cover is not so deep as that in Iowa. Westward the topography grades into the gently rolling and flat lands of the unglaciated Loess Plains. There is more flat land in the Loess Plains south of the Platte River in Nebraska and adjacent Kansas than north of the river. South of the river the land consists primarily of level divides with rolling land adjacent to narrow valleys. North of the river, high hills and rolling land prevail. Beyond the Missouri River in South Dakota the topography, like that in adjacent portions of Minnesota and Iowa, is mostly level to rolling.

Average annual precipitation from the beginning of official Weather Bureau records to 1932 (before the great drought) is shown in figure 1. Precipitation varied from about 24 inches in the driest portions to 34 in the wettest. Its distribution is of the Great Plains type; at Lincoln, Nebraska, between 76 and 79% of the precipitation occurs between April 1 and September 30. Thus the seasonal distribution of moisture is very favorable to the growth of grasses. Many years of soil sampling have shown that the available water content of soil is always higher under stands of *Andropogon gerardi* than under stands of *A. scoparius*.

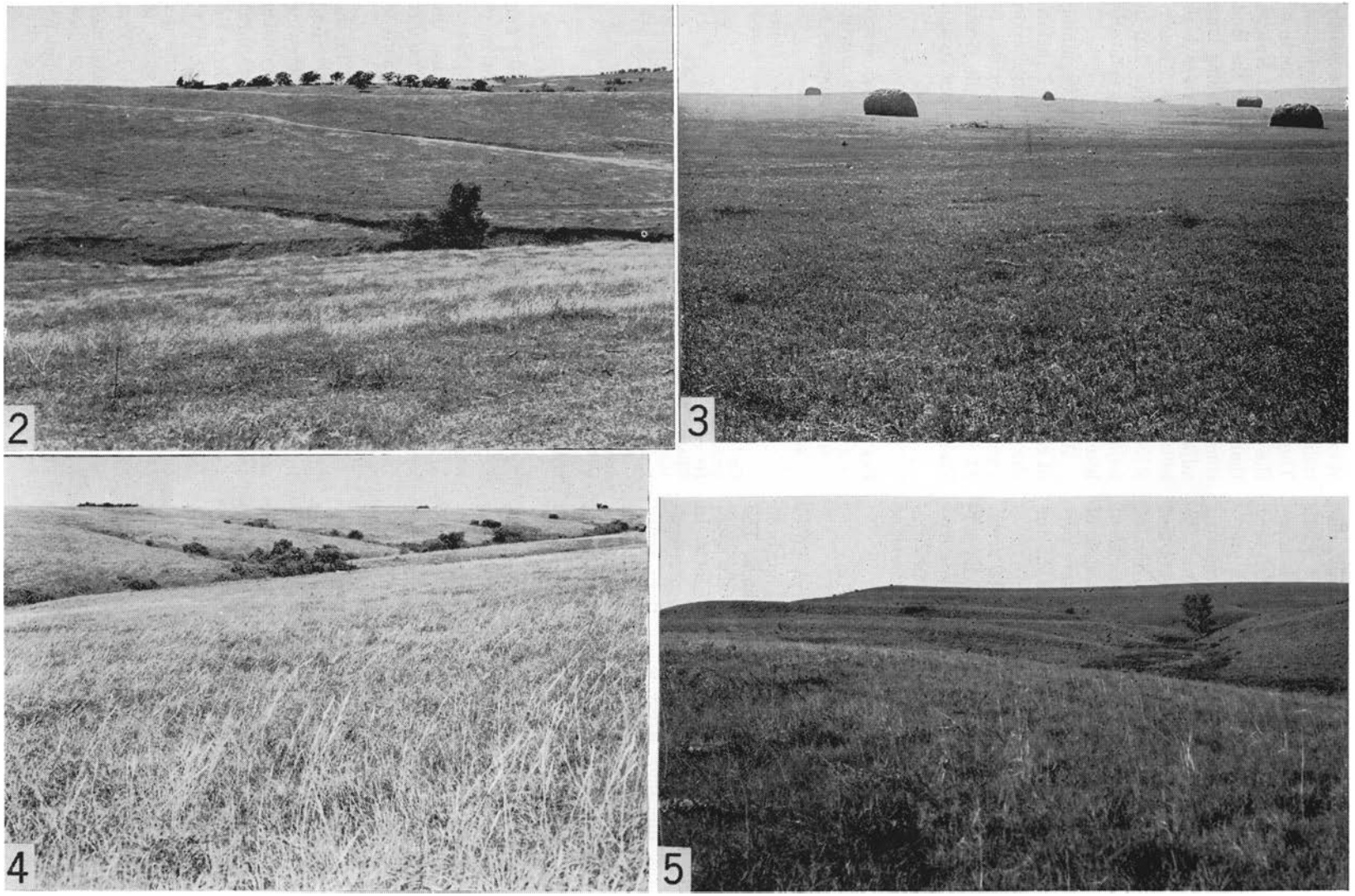
TABLE 1

PERCENTAGE OF AREA OCCUPIED BY ANDROPOGON SCOPARIUS (ASC), A. GERARDI (AGE), OR OTHER COMMUNITIES IN NINE KANSAS OR NEBRASKA PRAIRIES IN SOUTHWESTERN SECTION OF AREA STUDIED

| Station | Topography | Asc type | Age type | Other types |
|---|---|---|---|---|
| Carleton..... | Level | 80 | 20 | .. |
| Belleville..... | Rolling to hilly | 65 | 30 | 5 |
| Hebron..... | Rolling to hilly | 75 | 23 | 2 |
| Gilead..... | Rolling | 85 | 15 | .. |
| Montrose..... | Rolling | 70 | 27 | 3 |
| Nelson..... | Rolling to hilly | 84 | 15 | 1 |
| Clay Center.... | Level | 85 | 15 | .. |
| Superior..... | Rolling to hilly | 80 | 15 | 5 |
| Concordia..... | Rolling to hilly | 78 | 20 | 2 |
| Average..... | ..... | 78 | 20 | 2 |

The portion of the prairie reported on in the present paper grows under a climate characterized by moderately long, cold winters and a long growing season with hot summers. Length of the growing season varies from 165 to 190 days in the southern sections to 147–152 in the northern ones, where the frost-free season begins about May 7 and extends to October 5. Average maximum monthly temperatures (June–September) were 85°, 91°, 90°, and 81° F. at Concordia, Kansas, but only 80°, 88°, 85°, and 75° at Sioux Falls, South Dakota. The highest maximum temperatures of any year were (June–September) 110°, 114°, 116°, and 112° F. at Concordia, but 6°–13° lower in Sioux Falls.

Dry summer winds, although often high, are less




FIGS. 2–5.—Views of prairies. Fig. 2, native grassland near Corning, Iowa, heavily pastured by sheep, clothing hilly topography. Fig. 3, prairie near Pierce, Nebraska, on September 15, 1932, after mowing and stacking hay. Much hillier land occurs eastward. Fig. 4, portion of a large prairie near Lincoln, Nebraska, in June, 1959. *Stipa spartea* is scattered lightly through the *Andropogon scoparius* community in the foreground. Fig. 5, native grassland in eastern Kansas, showing rough topography.

frequent and of lower velocities in the eastern prairies than on the Loess Plains. According to THORNTHWAITE's (7) P-E index, precipitation effectiveness (1921 through 1950) was 44–48 in the southwest (district 7), 44–51 in the northwest (district 3), 56–59 in northwestern Iowa, and 62–72 in southwestern Iowa. Data on rainfall and P-E index were compiled by W. C. JOHNSON, Soil Survey Investigations. Soils will be discussed in connection with grasses of each of the several districts.

SOUTHWESTERN IOWA.—In section 1 a series of eleven prariries was studied. They ranged from Denison on the north to Bedford near the Iowa–Missouri boundary. The vegetation in this section has recently been described (8).

The Shelby-Sharpsburg-Winters Soil Association Area of southwestern Iowa is a loess-mantled drift plain cut by stream valleys. Shelby and Sharpsburg are the Brunizem soils series which formed on the gently sloping to hilly uplands. They both have a dark-brown or very dark-brown surface horizon, which is high in organic matter. The color becomes lighter with depth. Shelby soils, formed from glacial till, are on the steeper slopes. The Sharpsburg soils, formed from loess, are on the gentle to rolling slopes. The Winterset soils are Humic-Gley and occupy the flat ridge divides. They have a darker and thicker $A_1$ horizon than the Shelby and Sharpsburg soils. The Winterset soils formed under tall and mid grasses in the loess that mantles the ridges. All these soils are medium to moderately fine-textured, ranging from silt to clay loam. When covered with a good grass vegetation, they absorb water readily, and they also have a good water-holding capacity (6).

The *Andropogon scoparius* community was the largest in five prairies, sometimes covering 70% of their area. It equaled that of *A. gerardi* in two, and its average for the total section was 52%. The *A. gerardi* community, sometimes occupying 60–70% of a prairie, was largest at four stations, and it covered 46% of the entire area. Communities of *Stipa spartea*, *Sporobolus heterolepis*, and *Spartina pectinata* together occupied the remaining 2%.

This section of grassland is the most favorably located as regards climate and has excellent soils. It had the largest proportion of *Andropogon gerardi* of any section and the most flourishing *A. scoparius*. Foliage of these grasses averaged 6–12 and 5–8 inches higher, respectively, than the average in most sections west of the Missouri River. Bunches and sods were better filled with stems. Flower stalks were more abundant, taller, and were produced abundantly even during dry years. As a group they represented our finest prairies, a fact confirmed by the great abundance and variety of mesic forbs.

NORTHWESTERN IOWA.—The relative areas occupied by the *Andropogon* communities in section 2 were ascertained in eleven prairies varying in size from 20 to more than 80 acres. They ranged from Ida Grove and Sac City northward to Luverne, Minnesota. A few occupied nearly level land, but mostly the topography was rolling to hilly.

FIG. 6.—*Andropogon scoparius* prairie near Belleville, Kansas, that has been pastured for a few years

The soils have been formed largely from a blanket of loess, sometimes only a few feet thick. They differ from those southward in their calcareous C horizon. These soils, the Galva-Primghar-Sac Association Area (6), are deep, fertile, and productive.

The *Andropogon scoparius* community was the most extensive in all but three prairies. Its area in six ranged as high as 65–80%. The *A. gerardi* community occupied 65–80% of three prairies, but in seven others only 20–35%. Average percentages for the two types were 54 and 43, respectively. In the remaining 3%, either *Spartina pectinata* or *Stipa spartea* was dominant.

As regards the less hilly topography and excellent soils, this district seems quite as favorable for grasses as the preceding. But the rainfall, 26–29 inches, is much lower, and the vegetation is less mesic. A beginning of the Great Plains aspect appears in northwestern Iowa and southwestern Minnesota.

SOUTHEASTERN SOUTH DAKOTA.—In section 3 the topography in all but one of the seven prairies studied was level to rolling. The exception occurred north of Yankton, where a 40 acre tract had broad, gentle slopes and wide, flat ravines or washes from a low hill with a steep crest. Other tracts varied in size from 20 to 120 acres. They were on a till plain, partially dissected by shallow drains, in the Trent-Barnes Soil Association Area. Trent soils occupy a nearly level to gently undulating glacial till plain that has been covered with a blanket of loess. Both A and B soil horizons consist of silty clay loam. Barnes soil occupies a similar topography, but it is without a cover of loess. The A horizon is loam and the B horizon clay loam. These deep soils are dark in color, rich in organic matter, and moderately permeable. Lime accumulations occur in the B horizon of these Chernozems (2).

In this group of prairies the *Andropogon scoparius* community occupied only 5% of one, 50% of three, but 85–95% of the remaining three. The *A. gerardi* type was absent in one, composed 5–15% in two, 48–50% in three, but 95% in one. The average for this district was 61 and 38%, respectively; the remaining 1% was dominated by *Stipa spartea*.

Grassland in this section expressed the lower rainfall, shorter growing season, and generally more arid conditions, despite a productive soil, in several ways. There was 23% more of the xeric *Andropogon scoparius* than of the *A. gerardi* type. All grasses were of much lower stature than those in districts 1 and 2, and the bunch habit was far more pronounced. Forbs also were fewer in both number and species, despite the occurrence of numerous species from the Great Plains.

NORTHEASTERN NEBRASKA.—In eastern Nebraska north of the Platte River the Drift-Loess Hills are quite as high as those in southwestern Iowa. The crests of the ridges are mostly rounded, but some are broad and flat. The whole area is covered with loess, mostly 10–15 feet deep, and only rarely is the glacial till exposed. This is in the Moody-Crofton Soil Association Area. Moody soil is a deep, very dark grayish-brown Chernozem. It is a moderately permeable silty clay loam. The solum is 3–4 feet thick over a substratum of pale brown loess. This soil occurs mostly on gentle (6–8%) slopes but sometimes on steeper ones. Crofton is an immature soil (Regosol). The solum is 20 inches or less in thickness. It occurs on the steep slopes, often of 20–30%, on narrow rounded ridges and on similar slopes adjacent to drainage ways. It is a silty clay loam formed on loess. Crofton soil is widespread only in areas with rough topography and covers perhaps only half as much area as the Moody soil (3). Both soils have moderately fine texture, good pore space, and are moderately permeable to water.

In northeastern Nebraska (sec. 4) five prairies ranging from 40 to more than 80 acres in size were grouped because of the abundance of *Stipa spartea* on this very hilly land. Figure 3 shows one of the flatter prairies in this section. The *Andropogon scoparius* community ranked highest (50–65%) in all but one prairie, where the *A. gerardi* type occupied 63%. An average area of 53% was attained by the first type, 41% by the *A. gerardi* community, and 6% by that of *Stipa spartea*. At Hartington the *Stipa spartea* community occupied 10% of the land The relative abundance of this community and more of the *A. gerardi* type on the lower slopes of this hilly land, as compared with section 3, resulted in less area occupied by *A. scoparius*. The abundance of *Stipa spartea* on steep slopes and narrow ridges, as well as on some steep slopes adjacent to drainage ways, correlated in part with the presence of the relatively thin Crofton soil on these drier sites.

EAST-CENTRAL NEBRASKA.—Section 5 occupies the Drift-Loess Hills both north and south of the Platte River in east-central Nebraska. South of the Platte River, both topography and soils are similar to those described in southwestern Iowa. Twelve prairies were selected as representative of this section (fig. 4). All but five that included either some sandy ridges or considerable lowland with run in water contained 60–80% of the *Andropogon scoparius* type. Elsewhere it ranged in amount from 30 to 40%. The *A. gerardi* type occupied only 20–35% of six prairies and never exceeded 65%. The average for the two communities, respectively, was 55 and 43%; the remainder was composed of the *Stipa spartea* type.

Conditions for growth in the eastern part of section 5 are almost the same as in the best Iowa grasslands. But westward the rainfall decreases to an ex-

tent that, combined with other less favorable climatic conditions, reduces the average of the *Andropogon gerardi* type and at the same time increases that of *A. scoparius*. No station in this area is more than 125 miles east of the ecotone between True and Mixed Prairie.

NORTHEASTERN KANSAS.—Eight prairies, ranging in size from 60 to more than 80 acres, mostly on hilly but some on rolling land, were studied in northeastern Kansas and in the best-watered part of extreme southeastern Nebraska (sec. 6). They ranged from near Topeka, Kansas, to Nebraska City. Five were on hilly land; in three the land was rolling to hilly (fig. 5).

Soils previously developed over bedrock of limestone, sandstone, and shales, were covered by debris brought down by the Kansan glacier. In the southern part the till sheet was thin, before the glacial drift was capped by wind-blown loess. The loess decreased in depth westward from the Missouri River. The Kansas-Nebraska Drift-Loess Hills Region "has narrow, gently rolling divides with long, moderate to moderately steep slopes broken by rough, stony land, and bedrock outcrops just above the smooth broad valleys. The southern part is much more rolling and is hilly to rough and broken in places" (**4**).

The chief soil series are Grundy, Crete, Pawnee, Burchard, and Shelby. The first two are silty clay loam soils derived from loessial parent materials and occur on the nearly level divides. Pawnee, Burchard, and Shelby soils, derived from glacial till, occur mostly on undulating to rolling land. In general, the bedrock usually lies 5–25 feet or more below the soil surface. All the soils are very dark grayish or dark grayish brown. Permeability varies from moderate (Burchard) to very slow in Crete and Pawnee soils. Both soil and subsoil have high water holding capacity (**1**). There is no distinct layer of lime accumulation, although the lime is not completely leached from the subsoils. Under grass they are nearly neutral to somewhat acid in reaction. Productivity is moderately high.

In this group of prairies the *Andropogon scoparius* type covered 45–65% of the high hills and 35–50% of the rolling to low hilly land. Its total average was 56% and that of the *A. gerardi* type 42%. Over the remaining 2% of the area either the *Sporobolus heterolepis* community or that of *Spartina pectinata* prevailed.

Section 6 has both climate and soils as favorable or nearly as favorable to grassland as those in section 1. The rich loess soil in both is deep, and the vegetation is deeply rooted accordingly. The most productive soils in Kansas occupy much of this area. But in its southern portion the soil formed from the glacial drift is thin and the thin cover of loess has been eroded away. Where rock outcrops of limestone occur or where glacial boulders fill the soil, the carpet of grasses is less well developed. This reduces the average area of the *Andropogon gerardi* community and increases that of *A. scoparius*. Northward the prairies (Fairview, Falls City, and Nebraska City) were nearer the Missouri River and apparently profited from the deeper layer of loess. Here the grasses were fully as well developed as those in southwestern Iowa.

SOUTHWESTERN PRAIRIES.—A final group of nine prairies (sec. 7), varying from 30 to 60 acres in area, extended from Clay Center, Nebraska, to Concordia, Kansas. This area is a part of the nearly level to gently rolling plain where the bedrock, consisting primarily of heavy shales and limestone, has been covered to a considerable depth by loess and loess-like materials. Silty clay loam soils prevail. Both Crete and Hastings soils are very dark grayish-brown. They developed from Peorian loess and occur on nearly level to rolling relief. The heavier Crete soils tend to occur on nearly level land. Nuckolls soil has developed in an older (Loveland) loess which outcrops on the slopes. The depth to bedrock ranges from 4 or 5 to 25 or more feet. These Chernozem soils are relatively fertile and have good water holding capacity, but the subsoils vary in permeability from moderate in Nuckolls to moderately slow in Hastings and very slow in Crete. The layer of lime accumulation is usually at a depth of 5–6 feet.

These prairies, as they appeared in 1930–1932, have been described and contrasted with those in section 6 (**10**). The extent of the communities in each is shown in table 1. The *Andropogon scoparius* community occupied 78% of the area and that of *A. gerardi* only 20%.

This reduction in the area of the tall-grass, *Andropogon gerardi*, community and a corresponding increase in the mid-grass type of *A. scoparius* resulted primarily from 6–7 inches decrease in rainfall below that of sections 6 and 1. Soils in the Chernozem Zone are not less productive than Brunizems because of lack of innate fertility but because of reduced precipitation. The length of the growing season is nearly the same as in section 6, but drying winds are more frequent and of greater velocity. Evaporation is also greatly increased westward, and periods of drought are more frequent and of longer duration. Transition from these western prairies to the Mixed Prairies of the Great Plains has been described (**11**).

ABUNDANCE OF OTHER GRASSES.—In the study of any prairie, much attention was given to the abundance of *Stipa spartea*, *Koeleria cristata*, and *Sporobolus heterolepis*. Ten of the ⊗ prairies (fig. 1) in each section, or all of these plus enough adjacent prairies to equal ten, were used in ascertaining the relative

abundances of these species. Absence (Abs) of a species in none of the prairies was indicated by zero (0). It was considered abundant (Abu) where it occurred in broad alternes or locally composed a third or more of the basal cover. Where it composed approximately 10% of the cover in numerous places, it was designated as common (Com), and smaller amounts are designated as 1–5%. Since any prairie was presumably representative of the general section in which it was located, it is given a value of 10% of the total area in table 2. Thus, *Stipa spartea* Abs, 0; Abu, 10; Com, 10; 1–5% 80, indicates that this grass was present in all prairies in a section, abundant in one, common in one, but composed only 1–5% in the remainder.

*Stipa spartea* was present in all prairies, except in two and six in sections 6 and 7, respectively. It was abundant in 30–90% of those in the three northern districts, in only 10% in southwestern Iowa, but in 40% in the Nebraska district to the west. In southwestern Iowa it was abundant only at Denison, the southwestern Iowa. In South Dakota and east-central Nebraska it occurred in small amounts in 30 and 50%, respectively. This bunch-former was always most abundant in the driest uplands, where it sometimes dominated locally, forming 80% or more of the cover. It held control of alternes and patches of a few acres to a few square yards in extent, and all degrees of mingling of this type with that of *Stipa spartea* and *Andropogon scoparius* occurred. Small communities of this species were sometimes found at the foot of slopes.

In a series of more than 400 square-meter quadrats throughout the prairie, *Stipa spartea* composed less than 3% of the basal area of the vegetation, *Koeleria cristata* about 0.5%, and *Sporobolus heterolepis* 1.5%.

*Bouteloua curtipendula* and *Sorghastrum nutans* are also among the ten most abundant and widespread prairie grasses (**12**). The first ranged widely throughout the *Andropogon gerardi* community and all those of upland, but normally composed not more

TABLE 2

OCCURRENCE AND ABUNDANCE OF CERTAIN GRASSES IN EACH OF THE SEVEN SECTIONS OF TRUE PRAIRIE[a]

| | STIPA SPARTEA | | | | KOELERIA CRISTATA | | | | SPOROBOLUS HETEROLEPIS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTION | Abs | Abu | Com | 1–5% | Abs | Abu | Com | 1–5% | Abs | Abu | Com | 1–5% |
| 1. Southwestern Iowa | 0 | 10 | 10 | 80 | 0 | .. | .. | 100 | 20 | 10 | 20 | 50 |
| 2. Northwestern Iowa | 0 | 40 | 30 | 30 | 0 | .. | .. | 100 | 30 | 30 | 20 | 20 |
| 3. Southeastern South Dakota | 0 | 30 | 10 | 60 | 0 | .. | 10 | 90 | 70 | .. | .. | 30 |
| 4. Northeastern Nebraska | 0 | 90 | .. | 10 | 0 | .. | 10 | 90 | 100 | .. | .. | .. |
| 5. East-central Nebraska | 0 | 40 | 20 | 40 | 0 | .. | 10 | 90 | 40 | .. | 10 | 50 |
| 6. Northeastern Kansas | 20 | .. | .. | 80 | 0 | .. | .. | 100 | 0 | 30 | 20 | 50 |
| 7. Southwestern prairies | 60 | .. | .. | 40 | 0 | .. | 40 | 60 | 100 | .. | .. | .. |

[a] Ten representative prairies examined in each section. Figures represent percentage of total area. See text for meaning of column heads.

most northerly station, but westward in Nebraska it was abundant or common in more than half of the prairies. In sections 6 and 7, if present, it did not exceed 1–5% in amount. Thus this grass was most abundant in the northern areas. Its distribution in abundance was correlated with lighter types of soil. Its alternes, patches, and mixtures occurred mostly on steep, dry ridges and xeric slopes, especially where the soil was thin and perhaps sandy or gravelly. Elsewhere it was frequent on flat lands at the heads of draws and over broad washes on lower slopes.

*Koeleria cristata* occurred in all 70 prairies, but in only seven was it found commonly. An abundance greater than 5–10% has rarely been found except in locally disturbed places. It increases greatly following prairie fires. In most prairies this species was present in amounts of only 1–3%.

Distribution of *Sporobolus heterolepis* was variable. It was absent in northeastern Nebraska and in the southwestern prairies. It was common to abundant in half of the prairies in northwestern Iowa and northeastern Kansas, but in only 30% of those in than 1–3% of the vegetation. *Sorghastrum nutans* reached its greatest abundance in section 6, where amounts of 5–20% or even small, nearly pure stands occurred locally in ravines. It increases greatly under disturbance such as fire or flooding. The usual percentage over the prairie as a whole was 1–5, but in certain northern prairies it was almost or entirely absent (**12**).

## Summary

1. Sixty-three typical prairies scattered throughout an area of 60,000 square miles of the central Missouri Valley region were carefully analyzed. The *Andropogon scoparius* and *A. gerardi* communities, respectively, composed 58 and 39% of the grassland. Other communities—*Stipa spartea*, *Sporobolus heterolepis*, and *Spartina pectinata*—together occupied the remaining 3%. The *A. scoparius* community occupied 6–11% more area in western Iowa than *A. gerardi*, 23% more in southeastern South Dakota, 12% more in eastern Nebraska, 14% more in northeastern Kansas, and 58% more in north-central Kansas and adjacent Nebraska.

2. In the sections with 32–34 inches of rainfall, average percentages for the two types were 54 and 44; in those with 24–26 inches precipitation, percentages were 69 and 29. In the 63 prairies, the *Andropogon scoparius* community was the most extensive in 67% and the *A. gerardi* community in 25%. They were approximately equal in area in the remaining 8%.

3. As individual species, *Stipa spartea* was present in nearly all of 70 prairies but was most abundant in northern areas. *Koeleria cristata* occurred in all, mostly in amounts of 1–3%. *Sporobolus heterolepis* was absent from northeastern Nebraska and north-central Kansas. In many Iowa prairies and in northeastern Kansas it was common to abundant, but often it occurred only in amounts of 1–5%.

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