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The Cayler Prairie: An Ecologic and Taxonomic Study of a Northwest Iowa Prairie

By J. M. AIKMAN AND ROBERT F. THORNE

The largest, most varied, and most intensively studied remnant of rolling prairie in northwestern Iowa is the Cayler tract in Dickinson County. This unplowed, ungrazed prairie acreage, located just west of a branch of the Little Sioux River, is undisturbed except for the annual late August cutting for wild hay and the activities of biologists in the summer and hunters in the fall.

The proximity of this beautiful prairie to the Iowa Lakeside Laboratory, about $4\frac{1}{2}$ miles away by good roads, has made it the subject of numerous investigations by plant taxonomists, ecologists, entomologists, mammalogists, and other specialists. Several of the field courses at the Laboratory use the prairie regularly as an outdoor classroom to acquaint the students with prairie plants and animals in their natural environment. Often several trips are made by a class during the summer sessions to study the seasonal aspects of the prairie and its varied flora and fauna. This was done in 1955 by classes in ecology and taxonomy.

Interest centered in the tract at this time as a possible purchase unit for a third prairie reserve by the Iowa State Conservation Commission (1, 2, 10). Added to the interest of conducting an investigation of a virgin prairie community in the study of the general nature, floristics, structure and behavior of plant communities, was that of attempting to determine whether or not the tract was suitable for selection as a representative prairie reserve for northwest Iowa. To preserve and make available for other biologists a public record of the taxonomy and ecology of the vascular plants of the Cayler tract, the authors have brought together here the data from these and other studies of the area.

ECOLOGY

The organization of the report on the community study of the Cayler prairie will follow as nearly as possible that of the suggested course outline the senior author provided for use in investigating prairie communities of northwest Iowa as a class project.

Reconnaissance survey

The portion of the tract remaining in a relatively virgin condition lies within the N. W. $\frac{1}{4}$ of section 17 of Lakeville Township, Dickinson County. As a result of the survey, the boundaries of

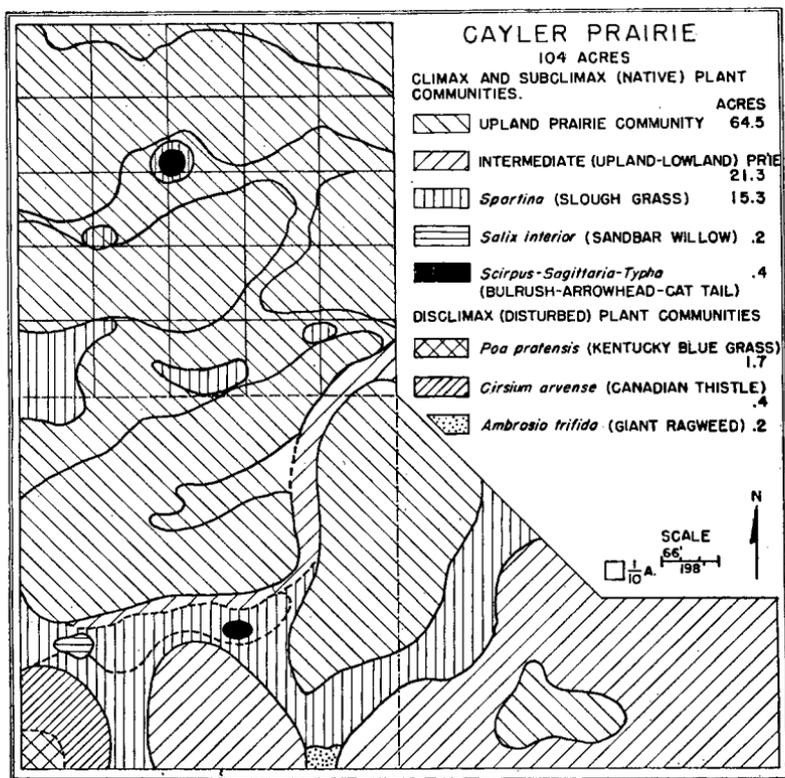


Figure 1. Boundaries of Cayler Prairie.

the tract were mapped as shown in Figure 1. The area is approximately 104 acres. It lies within the Wisconsin drift area of northwestern Iowa but very close to its western boundary (14). It is representative of the hilly, morainal areas of Dickinson County. Each includes a number of soil types (drift and terrace) and because of the rough and varied topography which modifies the water factor, these prairies have a rich and varied flora (10). The soils of the rolling hills and high ridges are chiefly Clarion and Storden, depending on the degree of slope. High points of the ridges are made up of Lakeville sandy loam. The soils of the intermittent drainage ways are mostly Webster with Glencoe and related soils in the lower, poorly drained areas. The deeper pot holes are characterized by peat deposits (10, 14).

The vegetation of the tract showed such a high degree of variation that it was considered advisable to stratify or classify it into different categories instead of attempting to sample and evaluate it as a unit (8, 15). It was possible by this means to map the tract, delineating eight plant community types. The basis for this preliminary mapping was physiognomy, floristics, and general habitat

characteristics. The map (Figure 1) was made on cross-section paper on the scale of $\frac{1}{4}$ inch to one chain (66 feet); a square, $\frac{1}{4}$ inch by $\frac{1}{4}$ inch, being equal to $\frac{1}{10}$ acre. By counting squares and fractions of squares, it was possible to determine with reasonable accuracy the relative acreages of the different plant community types. These values are given in Figure 1.

Quantitative investigations of the upland prairie community

Emphasis was placed on the investigation of the upland prairie community because it is representative not only of the tract but of the entire morainal region of Dickinson and adjacent counties. The forty acre area at the north end of the tract was selected for special study of this community because it is predominantly upland prairie (Figures 1, 2, 3).



Figure 2. View eastward from near the southwest corner of the 40-acre upland prairie area at the north end of the tract. The two crews at work. Late June, 1955.

Previous study and reconnaissance of this area had given indications of a very rich and varied flora, surpassing in this respect virgin prairie tracts previously investigated by the authors in Iowa and adjacent states. It seemed necessary, therefore, in attempting to learn as much as possible about the structure of so rich a vegetation in limited time that not only the relative frequency, but also the frequency \times abundance of the species should be determined (9, 12). The purpose was to separate the dominant and important sub-dominants of the upland prairie community from the many less important and casual species collected.

First, the size of quadrat to use was determined by counting the number of species in increasing areas from approximately $\frac{1}{4}$ square meter to 2 square meters. Instead of the meter and frac-



Figure 3. View northeastward from near the center of the 40-acre upland prairie area at the north end of the tract. Crews working on frequency-abundance quadrats. Early July, 1955.

tions and multiples of the meter, the $\frac{1}{4}$ milacre quadrat size was used (12). This quadrat frame is 3.3 feet on a side; 39.6 inches instead of 39.37 inches. The sizes investigated in this study were $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$, and $\frac{1}{2}$ milacre. By means of the species area curve (3, 13), the minimal area determined was $\frac{1}{8}$ milacre which was obtained by the use of a $\frac{1}{16}$ milacre quadrat frame used twice for adjacent areas.

Because of shortage of time, 50 rather than 100 or more quadrats were used as the sample of the 40 acre area. A later check by plotting number of species on number of quadrats (3, 13) showed that, in spite of the high degree of heterogeneity of the vegetation, the last 10 per cent increase in number of quadrats resulted in not more than 5 per cent increase in number of species. The quadrats were located two to a block of 1.6 acres. They were arranged systematically on lines for ease of location but were located on the lines within one half or the other of the block by means of random numbers.

The method employed in evaluating the several species in the quadrats as to abundance was a weight estimate reading in percentage of the total estimated dry weight yield of the quadrat (12). Previous checks were made from dry weight yields of sample quadrats to assure as high a degree of accuracy in the workers as possible. The difference between the high-yielding and low-

yielding species in a quadrat may be so great (40 per cent as compared to .1 per cent or less) that a possible 10 per cent error would make little difference in the final computation.

A total of only 78 species occurred in one or more of the 50 quadrats distributed generally over the 40 acre area. An estimated 210 species have been collected from or observed on this same area. This indicates that a large proportion of the species collected have a very low frequency, less than 2 per cent. Many of these collections were from pot holes and such areas not sampled in the frequency study and many were ruderals from fence-row borders. However, many of them were extremely infrequent species found in very few locations throughout the 40-acre area. An individual species of such low frequency does not constitute an important component of the prairie vegetation.

Table 1

Frequency and frequency x abundance of species of grasses of some degree of importance as components of the upland prairie community. The species are ranked in order of frequency x abundance. Early July, 1955.

Species of grasses	Frequency per cent	Frequency x abundance per cent
1. <i>Andropogon gerardii</i> — big bluestem	86.0	37.8
2. <i>A. scoparius</i> — little bluestem	70.0	17.5
3. <i>Sporobolus heterolepis</i> — prairie dropseed	44.0	12.8
4. <i>Poa pratensis</i> — Kentucky bluegrass	90.0	8.1
5. <i>Sorghastrum nutans</i> — Indian grass	16.0	7.0±
6. <i>Spartina pectinata</i> — slough grass	8.0	2.6
7. <i>Bouteloua curtipendula</i> — side-oats grama	14.0	2.4
8. <i>Stipa spartea</i> — porcupine grass	26.0	2.3
9. <i>Carex meadii</i> — sedge	8.0	2.3
10. <i>Panicum scribnerianum</i> — Scribner's panicum	62.0	1.9
11. <i>Koeleria cristata</i> — June grass	26.0	1.3
12. <i>Carex bicknellii</i> — sedge	18.0	1.1
13. <i>Phelum pratense</i> — timothy	12.0	1.0
14. <i>Agropyron trachycaulum</i>	20.0	.5
15. <i>A. smithii</i> — western wheat grass	4.0	.2

Of the 15 species of grasses and sedges listed in order of frequency x abundance in Table 1, those ranking below a FXA value of 1.0 would not seem to have sufficient frequency and abundance to be important components of the upland prairie. For the most part, those species with FXA values greater than 2 rank as dominants of this upland prairie area. In the case of Kentucky bluegrass which has very high frequency but very low abundance, this role of dominance is probably only a temporary one since the species will be greatly reduced or eliminated under proper management. The prairie has been mowed too often and possibly too closely (2,11). Slough grass is another grass that is

out of place as a dominant in this upland prairie community. The plants found in the quadrats were invaders by rhizomes from adjacent poorly drained slough grass communities. The relative low frequency x abundance of the five native grasses which usually rank as the upland prairie dominants (little bluestem, prairie dropseed, porcupine grass, side-oats grama, and June grass) is further indication of a disturbed condition. Their order of frequency x abundance is about the same as usually found but the values should be approximately twice as great.

The position of big bluestem at the head of the list, found in 86 percent of the quadrats and making up 44 per cent of the entire vegetative cover of the prairie for a frequency x abundance of 37.8 per cent, is somewhat unusual. Although generally considered to be a lowland prairie dominant it is an important component of most upland prairies in Iowa, especially if soil moisture conditions are favorable. Under more favorable cultural conditions for growth, increased vigor of the five typical prairie dominants would materially reduce the yield of big bluestem and to some extent its frequency. Bisect trenches made in prairies of the hilly morainal areas in this vicinity show that under average rainfall, conditions for adequate root growth of the deep rooted big bluestem are extremely favorable. Once the big bluestem is well established in this hilly morainal area, with its root system extending throughout the lower levels of root penetration, it seems to have an advantage in total yield and persistence over the five typical upland prairie dominants. This is true even in dry periods, one of which seems to have reached a peak in 1955. The unusually high frequency x abundance of Scribner's panicum, seemingly at the expense of the five prairie dominants, is further proof that these grasses were greatly suppressed and retarded by too frequent and close mowing. A year or two without mowing would be extremely advantageous to these typical prairie dominants in the building up of adequate food reserves to a point where the dominants would more nearly occupy the area against such sub-dominants as Scribner's panicum and exotic invaders as Kentucky bluegrass and timothy.

Presented in Table 2 is a list of forbs of the upland prairie arranged in FXA order. Approximately the first 16 of these have sufficient frequency x abundance to rate as important components of the upland prairie community. Forbs are native plants of the prairie other than grasses. Three plants in this list do not rank as forbs; two cultivated legumes introduced and naturalized from Europe, white clover and yellow sweet-clover and an invading ruderal or weed, the common dandelion. The frequency x abundance of forbs is lower in the upland prairie here than is usual. Several of these are late maturing plants, chiefly of the composite family, which would constitute a larger proportion of

Table 2

Frequency and frequency x abundance values of forbs of some degree of importance as components of the upland prairie community. The species are ranked in order of frequency x abundance. Early July, 1955

Species of forbs	Frequency per cent	Frequency x abundance per cent
1. <i>Amorpha canescens</i> — leadplant	18	4.20
2. <i>Liatris punctata</i> — blazing star	6	2.27
3. <i>Rosa arkansana suffulta</i> — prairie rose	12	1.70
4. <i>Solidago nemoralis</i> — goldenrod	34	1.33
5. <i>Petalostemon purpureus</i> — purple prairie-clover	26	1.24
6. <i>Achillea lanulosa</i> — yarrow	48	1.20
7. <i>Equisetum laevigatum</i> — prairie scouring-rush	20	1.14
8. <i>Artemisia ludoviciana</i> — mugwort	20	1.00
9. <i>Anemone patens wolfgangiana</i> — pasque-flower	66	1.00
10. <i>Psoralea argophylla</i> — silver-leaf	16	.91
11. <i>Solidago rigida</i> — stiff goldenrod	8	.88
12. <i>Cirsium canescens</i> — prairie thistle	12	.79
13. <i>Trifolium repens</i> — white clover	42	.672
14. <i>Lathyrus venosus</i> — wild pea	16	.46
15. <i>Ratibida pinnata</i> — yellow coneflower	6	.42
16. <i>Lactuca ludoviciana</i> — prairie lettuce	2	.40
17. <i>Physalis heterophylla</i> — ground-cherry	4	.38
18. <i>Erigeron strigosus</i> — daisy-fleabane	8	.38
19. <i>Taraxacum officinale</i> — dandelion	48	.36
20. <i>Coreopsis palmata</i> — tickseed	2	.30
21. <i>Melilotus officinalis</i> — yellow sweet-clover	30	.27
22. <i>Onosmodium occidentale</i> — false-gromwell	2	.25
23. <i>Viola pedatifida</i> — prairie violet	18	.22

the total yield of vegetation in late August and early September. The use of smaller quadrats than has been used in most frequency studies accounts for some reduction in the frequency values. However, these two considerations would not seem to account for the greater part of the increase in ratio of grasses to forbs which, computed for the 40-acre area on an estimated dry weight basis, was found to be approximately 84:16. Removal of a hay crop every year, regardless of lack of rainfall and reduced food reserves in the plants, has been more advantageous to the grasses, than to the forbs. This is to be expected toward the westward limits of the prairie because the lower precipitation-evaporation ratio there favors the growth of grasses over broad-leaf, dicotyledonous plants (2, 11).

Within this list of forbs are two shrubby species, leadplant and prairie rose, which seem to be well adapted to this habitat, especially on the higher ridges of this hilly morainic area. However,

the greater weight of their woody stems accounts, for the most part, for their relatively high abundance. The herbaceous plants in the list may be divided into three classes: those species of relatively high frequency and more than average size, those of high frequency and small size, and those of low frequency and large size. The species of the first class would seem to be of greatest significance as components of the upland prairie. The relatively high frequency x abundance rank of the prairie scouring-rush indicates low vegetation density probably attributable to frequent, close mowing. This leafless plant is well adapted to growth in vegetation in which there is adequate space for such invaders to reproduce at intervals from underground stems. The high frequency of the low-growing pasque flower is further indication of the high degree of suppression of the dominants and important subdominants and the sparsity of the vegetative growth.

Other structural characteristics of the upland prairie are presented in Table 3. Two $\frac{1}{8}$ milacre quadrats were laid out, one with north-south orientation and one with east-west orientation. The results show the relationship of various structural characteristics determined by different methods from the same area as well as the degree of heterogeneity of the vegetation in an unselected area. The top-cover density of 24 to 31 per cent as noted above is relatively low for virgin prairie even in the western part of the state and determined as it was near mid-season. The relatively low variation indicates low heterogeneity as to top-cover density values. However, density of the top-cover does not correspond too closely to the density of vegetation at ground level. Density of top-cover may well show a closer relationship to yearly variation in habitat and to time of measurement within the growing season (9, 12, 13).

Basal area measurements were taken by means of plotting rulers read direct in square inches. The values expressed in per cent of total area of the quadrat, show a high degree of heterogeneity within a small area. The variation among the four half-quadrats is attributable mostly to the difference in habit of growth of the grasses. The upland prairie dominants form crowns at ground level but the taller, lowland prairie dominants do not. In quadrat 2 there was a greater proportion of upland prairie dominants, especially the larger crown-formers, little bluestem and prairie dropseed, than there was in quadrat 1. Since a well developed upland prairie may have a basal area of 9-14 per cent and a yield of two tons per acre as compared to a well developed big bluestem prairie with a basal area of 3-5 per cent and a yield in excess of three tons per acre (12), there may well be a negative correlation between basal area and yield in this instance where big bluestem is an important component of the upland prairie.

Table 3.

Percentage density, yield of grasses and forbs and percentage yield of grasses and forbs of individual halves of two $\frac{1}{8}$ milacre quadrats in the 40-acre upland prairie area. Late June, 1955.

	Density, per cent		Yield							
	Top cover	Basal area	Total		Grasses		Forbs		Per cent	
			Green	Dry	Green	Dry	Green	Dry	Grasses	Forbs
Quadrat 1										
North half	24	2.4	95.9	43.7	78.7	39.0	17.2	4.7	89	11.0
South half	31	3.4	138.9	50.0	131.6	48.0	7.3	2.0	96	4.0
Quadrat 2										
East half	26	6.4	105.2	40.4	96.5	37.0	8.7	3.4	91.6	8.4
West half	27	8.2	102.8	46.8	91.2	43.5	11.6	3.3	93	7.0
Average	27	5.1							92.4	7.6
Total			442.8	180.9	398.0	167.5	44.8	13.4		
Tons per acre				0.8						

Within either true upland or of lowland prairie, there is usually positive correlation between basal area and yield (8, 16).

Computation of percentage dry weight of the grass and forb fractions in Table 3 shows a very high degree of variation in these values probably because of the wide differences in degree of maturity of the component plant species in mid-season. Generally these values were lower in the forbs than in the grasses because of the greater succulence of the former at this time. There is also a high degree of variation in the dry weight yields of the forbs in each of the four half-quadrats largely because of the structural differences in species and the variation in their degree of development.

Brief descriptive sketch of the plant communities of the Cayler Prairie.

This prairie tract, representative of the vegetation of the hilly morainal areas distributed across the top of the Wisconsin drift lobe in the upper tier of counties in Iowa (10), is of especial interest for its rich, varied flora and for the number and diversity of its plant communities. These two characteristics would seem to be attributable chiefly to the wide variations in the soils (their parent material, topography and degree of development, especially relating to water) and to the location and climatic conditions of the tract. The plant communities are distinctly different in physiognomy, and dominant plant species, with the exception of the two largest communities in the tract. Many of the subdominants of the several plant communities, mostly those of a low degree of frequency and abundance and very many of the casual species, are growing in several communities in varied degrees of frequency and abundance.

1. The upland prairie community (mesic to dry prairie), occupying nearly two-thirds of the area of the tract (Figure 1) is characterized by the presence of big bluestem as the most frequent and abundant dominant and by the presence of the five true upland prairie dominants in their usual relationship of frequency and abundance as related to each other but reduced in frequency and abundance by approximately one-half. These relationships and those of the subdominants are presented and discussed above.

2. The intermediate upland-lowland prairie community (mesic to moist prairie) (Figure 1), as stated above, does not exhibit as great a degree of difference from the upland prairie community in physiognomy and dominants as is evident among the other communities. Although the difference in physiognomy appears to be less than the difference in dominants, it was sufficiently evident by mid-June, before any flower stalks were present, to use this difference as the chief basis for mapping. In relation to dominant species, it was possible at this early date, by the use

of vegetative characteristics, to verify the presence of four lowland prairie grass species of sufficient frequency and abundance to rank as dominants. They are, in order of frequency and abundance: big bluestem, Indian grass, wild-rye and switch grass. Big bluestem was most frequent and abundant. The other three were about equal in frequency and abundance, with the exception of the switch grass which was equally abundant but less frequent, occurring typically in massed units in the more poorly drained situations. The total of these three species was approximately equal to the big bluestem in frequency and abundance. Slough grass was also present in poorly drained situations where it had invaded by rhizomes from adjacent slough grass areas. Two upland prairie dominants, little bluestem and prairie dropseed, were sufficiently frequent and abundant in this community to rank with the four lowland prairie dominants, making a total of six. Another upland prairie dominant, porcupine grass, was sufficiently frequent to class as a minor dominant but the typical clumps (bunches) were small and seemingly suppressed. Two other upland prairie grasses, sideoats grama and June grass were distributed quite generally in this community but had very low abundance values.

The subdominant forbs of this community are chiefly large plants of well watered areas as *Thalictrum dasycarpum*—meadow-rue, *Desmodium canadense*—tick trefoil, *Veronicastrum virginicum*—Culver's-root, *Heliopsis helianthoides scabra*—ox-eye, *Delphinium virescens*—larkspur and *Zizia aurea*—golden Alexanders. Also represented here but not in great abundance are most of the larger forbs listed as of high frequency and abundance in the upland prairie community.

3. The slough grass community (moist prairie) occupies the intermittent drainage ways which have had little or no standing water during the last few summers (Figure 1). Slough grass, which makes up about 90 per cent of the vegetative cover of these swales, is the only dominant. Several of the larger sedges and rushes have become established in this community. Forbs, well adapted to wet, poorly acerated soils as *Cicuta macutata*—water-hemlock, *Lobelia spicata*—pale-spike lobelia, *Helianthus grosseserratus*, *H. maximiliani*—sunflower are subdominants in this community.

4. A sandbar willow community occupies a small area of about .2 acre in the tract (Figure 1). *Urtica dioica*—nettle, *Nepeta cataria*—catnip and *Cirsium altissimum* are the only plants which have invaded this community to any extent because of the dense shrub-like growth of the small trees. Although prairie willow and pussy willow grow in well-watered situations in the Hayden prairie this is definitely an anomolous community in a prairie tract.

5. The bulrush — arrowhead — cattail community occupies marsh and pond areas of about .4 acre in the tract (Figure 1).

In years of normal rainfall these areas may be considered to be in the emergent hydrophyte stage of community development. Under present drought conditions, the emergent hydrophytes are growing under very unfavorable conditions. The rich and varied flora, of this community augments materially the number of plants collected from the Cayler tract. In the annotated list the plants of these areas are indicated. This community, as well as numbers 3 and 4 are generally classified as subclimax native communities.

Each of the three disclimax (disturbed) communities is characterized by a single dominant: bluegrass, Canadian thistle and giant ragweed. Under proper management these communities will be replaced by the original native community of each disturbed area. The plants of these three and other smaller disturbed areas in the tract are so indicated in the annotated list.

TAXONOMY

The following annotated list of the vascular plants found on the 104 acres of the Cayler Prairie is based upon 360 collections made mostly on twenty trips to the prairie since 1953 in the months of June, July, and August. Specimens were collected of all but five species, for which inadvertently no vouchers were preserved. The numbers following the scientific and popular names of the listed species represent the collection numbers, unless otherwise specified, of Robert F. Thorne. These vouchers will be deposited in the herbaria of the State University of Iowa and the Iowa Lakeside Laboratory.

A total of 265 species and three putative hybrids of 153 genera and 53 families of vascular plants were found on the Cayler Prairie. Of these 219 species are apparently indigenous on the tract; whereas, 46 species seem to be foreign to the grasslands, prairie marshes, and pothole ponds. Families represented on the prairie by the most species are the Compositae (55 species), Gramineae (45), Leguminosae (25), and Cyperaceae (20). The genera best represented are *Carex* (13), *Polygonum* (10), *Aster* (8), *Asclepias* (7), *Solidago* (6), and *Panicum* (6). (See Grant (1950 and 1953) for a comparison with the largest families and genera in the Dickinson County flora (3, 4).

The species naturalized on the tract are limited mostly to disturbed patches on the prairie, such as haystack sites, dirt mounds made by burrowing woodchucks, badgers, or other mammals, fence-rows, and a hard-packed roadway along the north border. A few hardy immigrants appear to be established residents of the prairie, and include species of *Agrostis*, *Phleum*, *Poa*, *Melilotus*, *Trifolium*, *Taraxacum*, and *Tragopogon*. The weed flora is not stable and probably changes from year to year depending upon annual disturbance by man and upon other factors. Some weed species reported from the tract in earlier years were not seen in 1955 and were excluded from the catalogue.

A few of the rarer and less conspicuous prairie species have perhaps been overlooked. A systematic search for several other large, showy herbs and woody species, relatively frequent on prairie remnants a few miles away, was fruitless. Such conspicuous plants as *Lilium philadelphicum*, *Salix humilis*, *Desmodium illinoense*, *Ceanothus americanus*, *Asclepias sullivantii*, *Cacalia tuberosa*, *Lactuca pulchella*, *Liatriis pycnostachya*, *Rudbeckia serotina*, *Silphium laciniatum*, and *Solidago graminifolia* should have been found if present on the tract. Other species expected but not found are *Panicum wilcoxianum*, *Sporobolus asper*, *Lomatium orientale*, *Scutellaria leonardii*, *Gerardia aspera*, *Pedicularis canadensis*, and *Happlopappus spinulosus*. Several species that were found were surprisingly rare on the prairie, such as *Eryngium yuccifolium*, *Zizia aptera*, *Asclepias tuberosa*, *Castilleja sessiliflora*, *Lygodesmia juncea*, and *Silphium perfoliatum*. The explanation for the absence or rarity of these prairie plants is not known. Possibly the annual haying has militated against the survival on the tract of some of these species.

To make the catalogue more useful the habitats occupied by the various species on the Cayler Prairie have been included. The terms pond, marsh, drainageway, and moist, mesic, and dry prairie represent the principal natural habitats on the tract in increasing degree of dryness. The three shallow ponds dried up completely by July in 1955, yet they provided a habitat for aquatics of such genera as *Sparganium*, *Typha*, *Potamogeton*, *Glyceria*, *Carex*, *Eleocharis*, *Scirpus*, *Lemna*, *Iris*, *Polygonum*, and *Utricularia*. These, of course, are not prairie species. The dividing lines between pond and marsh and between marsh and drainageway, swale, or moist prairie are hard to draw. Some species with wide habitat amplitude span the range from pond to moist prairie. Mesic prairie is found mostly on the slopes of the morainic knobs, moist prairie in the low ground between the knobs, and dry prairie on the tops of the morainic hills and knobs. Thus drainage, as determined by the glacially constructed topography, affects the distribution of the prairie species in the area.

Also included in the catalogue is the degree of frequency of each species on the tract. Since frequency terms are relative, they are interpreted in the catalogue to mean: abundant—in large numbers over most of the tract; common—many but scattered specimens; frequent—scattered in 10-20 locations; infrequent—in 3-9 different locations; rare—seen only once or twice; local—often abundant in one or several small areas.

For those interested in the seasonal aspects of the prairie flora, the months in which the species normally bloom in the area are indicated by the abbreviations Mr, Ap, My, Je, Jy, Au, S, and O for the months of the growing season. This information is derived partly from field experience in northwestern Iowa and partly

from herbarium specimens collected by others during those early and late months of the growing season when it was not possible for these field studies to be made.

The nomenclature of the species and the arrangement of the families are largely according to *Gray's Manual of Botany, 8th Ed.* (1), and the *New Britton and Brown Illustrated Flora* (2). The species in the genera and the genera in the families are arranged alphabetically. The naturalized plants, where recognized as such, are indicated by an asterisk.

ANNOTATED LIST OF VASCULAR PLANTS
COLLECTED ON CAYLER PRAIRIE

EQUISETACEAE (Horsetail Family)

Equisetum arvense L. Common Horsetail. 16005. Moist to mesic prairie; infrequent; My.

Equisetum laevigatum A. Br. (*E. kansanum* Schaffn.) Prairie Scouring-rush. 16044. Mesic to dry prairie; common; My-Jy.

TYPHACEAE (Cattail Family)

Sparganium eurycarpum Engelm. Burhead. 16029. Ponds and marshes; locally abundant; Je-Jy.

Typha latifolia L. Cattail. 16071. Ponds and marshes; locally abundant; Je-Jy.

POTAMOGETONACEAE (Pondweed Family)

Potamogeton gramineus L. Pondweed. 14423. Abundant in shallow Pond; Je-Jy.

ALISMATACEAE (Water-plantain Family)

Alisma subcordatum Raf. Water-plantain. 16142. Marshes and drainage-way; infrequent; Jy-Au.

Sagittaria engelmanniana J. G. Smith (*S. brevirostra* Mack. & Bush) Arrowhead. 14692, 16169; ponds; locally abundant; Jy-Au.

GRAMINEAE (Grass Family)

**Agropyron repens* (L.) Beauv. Quack Grass. 12993. Disturbed ground; abundant weed; Je-Jy.

Agropyron smithii Rydb. Wheat Grass. 13069. Moist to dry prairie; common; Je-Jy.

Agropyron trachycavulum (Link) Steud. (*A. subsecundum* (Link) Hitchc.) 16098. Dry prairie; common; Je-Au.

**Agrostis alba* L. Redtop. Not collected. Marshes and moist prairie; frequent; Je-Jy.

Agrostis scabra Willd. Tickle Grass. 13074. Mesic to dry prairie; frequent; My-Au.

Alopecurus aequalis Sobol. Short-awn Foxtail. Fabius, 1955. Desiccated margin of small pond; rare; Jy-Au.

Andropogon gerardii Vitm. Big Bluestem. 13513. Moist to dry prairie, but most abundant on mesic slopes; Au.

Andropogon scoparius Michx. Little Bluestem. 16190. Mesic to dry prairie; abundant; Au-S.

Beckmannia syzigachne (Steud.) Fern. Slough Grass. 16021. Marshes; rare; Je-Au.

Bouteloua curtipendula (Michx.) Torr. Side-oats Grama. 16136. Mesic to dry prairie; abundant; Jy-S.

Bouteloua gracilis (HBK.) Lag. Blue Grama. 16124. Dry prairie; frequent; Jy-Au.

Bouteloua hirsuta Lag. Hairy Grama. 16137. Dry prairie; infrequent; Jy-Au.

**Bromus inermis* Leyss. Smooth Brome. 16081. One patch near extreme southeast corner; Je.

- Calamagrostis canadensis* (Michx.) Nutt. Bluejoint. 16143. Marsh; locally abundant; Je-Jy.
- **Echinochloa crus-galli* (L.) Beauv. Barnyard Grass. 16279, 16366. Desiccated bottom of shallow pond; rare; Jy-S.
- Elymus canadensis* L. Wild-rye. 13068, 16216. Moist to mesic prairie; common; Jy-Au.
- Elymus x macounii* Vasey (possibly a hybrid between *Agropyron trachycalum* and *Hordeum jubatum*). Locally abundant on old haystack site; apparently sterile; Je-Jy.
- Elymus virginicus* L. 16212. Drainageways and disturbed places; infrequent; Je-Au.
- **Eragrostis cilianensis* (All.) Lutati. Stink Grass. 16362. Weed on hard-packed roadway; rare; Je-S.
- Glyceria borealis* (Nash) Batchelder. Manna Grass. 16019. Ponds and marshes; infrequent; My.
- Glyceria grandis* S. Wats. 16020. Ponds and marshes; frequent to locally abundant; My-Je.
- Glyceria striata* (Lam.) Hitchc. 16065. Marshes; infrequent; My-Je.
- Hordeum jubatum* L. Squirrel-tail Grass. 16064. Moist prairie and pond margins; common; My-Jy.
- Koeleria cristata* (L.) Pers. June Grass. 15965. Mesic to dry prairie; common; My-Jy.
- Leersia oryzoides* (L.) Sw. Rice Cut-grass. 16280. Ponds and marshes; infrequent; Au-S.
- Muhlenbergia cuspidata* (Nutt.) Rydb. 16281. Dry prairie; frequent; Au-S.
- Muhlenbergia mexicana* (L.) Trin. 16226, 16282. Pond margins and moist prairie; infrequent; Jy-O.
- Muhlenbergia racemosa* (Michx.) BSP. 16374. Moist to mesic prairie; frequent; Au-S.
- **Panicum capillare* L. Witch Grass. 16361. Weed of disturbed places; infrequent; Au-S.
- Panicum leibergii* (Vasey) Scribn. 15968. Mesic to dry prairie; infrequent; My-Au.
- Panicum perlongum* Nash. 15970, 16099. Dry prairie; rare; Je.
- Panicum implicatum* Scribn. (*P. praecocius* H. & C.) 12985, 14432, 15967. Dry prairie; frequent; My-Jy.
- Panicum scribnerianum* Nash. 12987, 14433, 15969. Mesic to dry prairie; frequent; My-Jy, O.
- Panicum virgatum* L. Switch Grass. 13071. Moist to mesic prairie; common; Au-S.
- Phalaris arundinacea* L. Reed Canary-grass. 16066. Marshes; rare; Je-Au.
- **Phleum pratense* L. Timothy. 16042. Moist to dry prairie; abundant; Je-Jy, O.
- **Poa compressa* L. Canada Bluegrass. 12994. Common weed on prairie; Je-Jy.
- Poa palustris* L. 16041. Moist prairie; infrequent; Je-Jy.
- **Poa pratensis* L. Kentucky Bluegrass. 16009. Common and locally abundant, especially near fences; My-Je, S.
- **Setaria lutescens* (Weigel) F. T. Hubb. Yellow Foxtail. 16178. Weed of disturbed areas; infrequent; Jy-S.
- **Setaria viridis* (L.) Beauv. Green Foxtail. 16363. Weed of disturbed areas; rare; Je-S.
- Sorghastrum nutans* (L.) Nash. Indian Grass. 16283. Moist to dry prairie; common; Au-S.
- Spartina pectinata* Link. Slough Grass. 16144. Marshes to mesic prairie; abundant; Jy-Au.
- Sphenopholis obtusata* (Michx.) Scribn. Wedge Grass. 16148. Marshes; infrequent; Je-Jy.
- Sporobolus heterolepis* Gray. Prairie Dropseed. 16138. Mesic to dry prairie; common; Jy-Au.
- Stipa spartea* Trin. Porcupine Grass. 15966. Mesic to dry prairie; abundant; My.

CYPERACEAE Sedge Family)

- Carex annectens* (Bickn.) Bickn. (var. *xanthocarpa* (Bickn.) Wieg.) Sedge. 16035, 16146. Moist prairie; infrequent; My.
Carex atherodes Spreng. (*C. laeviconica* Dew.) 16024. Ponds and marshes; locally abundant; My.
Carex bicknellii Britt. 12990, 14294, 16000. Mesic to dry prairie; frequent; My.
Carex brevior (Dew.) Mack. 13070, 15963, 16114. Moist to dry prairie; frequent; My.
Carex eleocharis Bailey. 15962, 16053. Dryest prairie knobs; rare; My.
Carex gravida Bailey. 15999. Moist to mesic prairie; frequent; My.
Carex lacustris Willd. 16070. Marsh; locally abundant; My-Je.
Carex lanuginosa Michx. 16022. Marshes and moist prairie; infrequent; My-Je.
Carex meadii Dew. 14293, 15964, 16015. Moist to dry prairie; common; My-Je.
Carex praegracilis Boott. 13000, 16016, 16034, 16147. Moist prairie; frequent; My-Je.
Carex rostrata Stokes. 16145. Locally abundant in south pond; My.
Carex sartwellii Dew. 16069. Moist prairie; rare; My.
Carex stricta Lam. 16023, 16033. Ponds and marshes; rare; My.
Eleocharis acicularis (L.) R. & S. Spike-rush. 16031. Bottom mud and margins of pond; locally abundant; My-Au.
Eleocharis palustris L. (*E. calva* Torr., *E. smallii* Britt.) 16026, 16113. Ponds, marshes, drainageways, and moist prairie; frequent; My-Jy.
Eleocharis tenuis (Willd.) Schultes. (*E. elliptica* Kunth). 16067, 16149, 16170. Moist prairie; infrequent; My-Je.
Scirpus atrovirens Willd. Bulrush. 16068. Moist prairie; common; Je-Jy.
Scirpus fluviatilis (Torr.) Gray. 16030. Ponds; locally abundant; Je.
Scirpus heterochaetus Chase. 14424, 16025. Ponds and marshes; locally abundant; Je.
Scirpus validus Vahl. 12986, 12991. Ponds and marshes; locally abundant; Je-Au.

LEMNACEAE (Duckweed Family)

- Lemna minor* L. Duckweed. Not collected. Abundant in shallow pond; Je.
Lemna trisulca L. Not collected. Abundant in shallow pond; Je.

COMMELINACEAE (Spiderwort Family)

- Tradescantia bracteata* Small (approaching and perhaps not specifically distinct from *T. occidentalis* (Britt.) Smyth). Spiderwort. 16012, 16116. Moist to mesic prairie; infrequent; Je.

JUNCACEAE (Rush Family)

- Juncus dudleyi* Wieg. Rush. 16018. Moist prairie; common; Je-Jy.
Juncus interior Wieg. 16036. Moist prairie; rare; Je-Jy.

LILIACEAE (Lily Family)

- Zigadenus elegans* Pursh. Camas. 16010. Moist prairie; infrequent; Je.

AMARYLLIDACEAE (Amaryllis Family)

- Allium canadense* L. Wild Onion. 16011. Moist prairie; infrequent; Je.
Allium stellatum Fras. Prairie Onion. 16309. Mesic to dry prairie; frequent; Au.

HYPOXIDACEAE (Star-grass Family)

- Hypoxis hirsuta* (L.) Cov. Yellow Star-grass. 16001. Moist to mesic prairie; infrequent; My-Je.

IRIDACEAE (Iris Family)

- Iris virginica* L. (var. *shrevei* (Small.) E. Anders.) Blue Flag. 16028. Ponds and marshes; infrequent; Je.
Sisyrinchium campestre Bickn. Blue-eyed-grass. 15971. Mesic to dry prairie; frequent; My-Je

ORCHIDACEAE (Orchid Family)

Habenaria leucophaea (Nutt.) Gray. Prairie Fringed Orchis. 12999. Moist prairie; infrequent.

SALICACEAE (Willow Family)

**Salix interior* Rowlee. Sandbar Willow. 16072. Forming willow thicket in marsh; My-Je.

URTICACEAE (Nettle Family)

**Urtica dioica* L. (var. *procera* Wedd.) Nettle. 16150. Weed in willow thicket; rare; Jy-Au.

SANTALACEAE (Sandlewood Family)

Comandra richardsiana Fern. Bastard Toad-flax. 15975. Dry prairie; frequent; My.

POLYGONACEAE (Smartweed Family)

Polygonum amphibium L. (var. *stipulaceum* (Colem.) Fern.) Water Smartweed. 16152. Prairie ponds and marshes; infrequent; Jy-O.

**Polygonum aviculare* L. Knotweed. 16359. Weed on hard-packed roadway; rare; Je-S.

Polygonum coccineum Muhl. 16151. Marshes and moist prairie; frequent; Jy-S.

**Polygonum convolvulus* L. Black Bindweed. 16122. Weed of disturbed areas; infrequent; Je-S.

**Polygonum erectum* L. Knotweed. 16360. Weed on hard-packed roadway; rare; Je-S.

Polygonum lapathifolium L. 16285. Pond margins and drainageways; infrequent; Jy-S.

Polygonum pennsylvanicum L. Pinkweed. 16286. Pond-margins and drainageways; infrequent; Jy-S.

**Polygonum persicaria* L. Lady's Thumb. 16154. Drainageway; rare; Je-S.

Polygonum punctatum Ell. Water Smartweed. 14426, 16287. Pond margins and drainageways; common; Jy-S.

Polygonum ramosissimum Michx. No specimen collected. Dry prairie; rare; Au-S.

Rumex altissimus Wood. Pale Dock. 14429, 16037. Marshes and drainageways; frequent; My-Jy, S.

**Rumex crispus* L. Yellow Dock. 16073. Frequent weed in drainageways; Je-S.

AMARANTHACEAE (Amaranth Family)

Amaranthus tamaricinus Nutt. Pigweed. 16284, 16367. Desiccated outlet of pond; rare; Jy-S.

CHENOPODIACEAE (Goosefoot Family)

**Chenopodium album* L. Lamb's-quarters. 16189, 16357. Weed of disturbed places; infrequent; Jy-S.

**Kochia scoparia* (L.) Roth. Summer-cypress. 16364. Weed of hardpacked roadway; rare; Au-S.

NYCTAGINACEAE (Four-o'clock Family)

Mirabilis albida (Walt.) Heimerl. 16140, 16182. Dry prairie; rare; Jy-Au.

Mirabilis hirsuta (Pursh) MacM. 13510, 15976, 16181. Dry prairie and disturbed ground; frequent; Je-S.

CARYOPHYLLACEAE (Pink Family)

Silene antirrhina L. Sleepy Catchfly. 16123, 16288. Gravelly knobs and disturbed places; infrequent; My-Jy.

RANUNCULACEAE (Buttercup Family)

- Anemone canadensis* L. Anemone. 16043. Moist prairie; common; My-Jy.
Anemone cylindrica Gray. Thimbleweed. 15973. Mesic to dry prairie; common; Je-Jy.
Anemone patens L. (var. *wolfgangiana* (Bess.) Koch). Pasque-flower. 12988, 15972. Dry prairie; common; Ap-My.
Delphinium virescens Nutt. Larkspur. 16008, 16100. Moist to dry prairie; common; Je-Jy.
Ranunculus pennsylvanicus L. f. Bristly Crowfoot. 14425, 16174. Pond margins and moist prairie; infrequent; Jy-Au.
Ranunculus rhomboideus Goldie. Prairie Buttercup. 15974, 16101. Dry prairie; frequent; Ap-My.
Thalictrum dasycarpum Fisch. & Lall. Purple Meadow-rue. 16045. Moist to dry prairie; common; My-Jy.

CRUCIFERAE (Mustard Family)

- Arabis hirsuta* (L.) Scop. (var. *pycnocarpa* (M. Hopkins) Rollins). Rock Cress. 9792, 16102, 16188. Dry prairie; frequent; My-Je.
 **Brassica kaber* (DC.) Wheeler. Charlock. 16075, 16119. Infrequent weed of disturbed places; My-Jy.
 **Descurainia sophia* (L.) Webb. Tansy Mustard. 13005, 16077. Locally abundant weed on old haystack site; Je-Jy.
 **Lepidium densiflorum* Schrad. Peppergrass. 16078. Infrequent weed on disturbed patches; My-Au.
Rorippa islandica (Oeder) Borbas. Yellow Cress. 16155. Drainage way and pond margins; infrequent; My-O.
 **Sisymbrium altissimum* L. Tumble Mustard. 16076. Locally abundant weed in disturbed places; My-Jy.

SAXIFRAGACEAE (Saxifrage Family)

- Heuchera richardsonii* R. Br. (var. *grayana* RBL.) Prairie Alumroot. 15997. Mesic to dry prairie; frequent; My-Jy.

ROSACEAE (Rose Family)

- Agrimonia striata* Michx. Agrimony. 16062, 16156, 16371. Willow thicket and weedy drainage way; infrequent; Je-Au.
Geum triflorum Pursh. Prairie Avens. 16118. Dry gravelly knob; rare; My-Je.
Potentilla arguta Pursh. Tall Cinquefoil. 16046. Mesic to dry prairie; frequent; Je-Jy.
Potentilla norvegica L. Cinquefoil. 16040, 16177. Marshes and disturbed ground; infrequent; Jy-S.
Rosa arkansana Porter (var. *suffulta* (Greene) Cockerell). Prairie Rose. 15994. Mesic to dry prairie; common; Je-Jy.

LEGUMINOSAE (Legume Family)

- Amorpha canescens* Pursh. Leadplant. 12997. Mesic to dry prairie; common; Jy-Au.
Amphicarpa bracteata (L.) Fern (var. *comosa* (L.) Fern.) Hog-peanut. 16179. Moist to mesic prairie; frequent; Au-S.
Astragalus canadensis L. Milk-vetch. 16139. Mesic prairie; frequent; Jy-Au.
Astragalus caryocarpus Ker. Ground-plum. 15978. Dry prairie; frequent; My.
Astragalus goniatus Nutt. 11033a, 14290, 15979, 16104. Dry prairie; infrequent; My-Je.
Astragalus striatus Nutt. 14289, 15977. Dry prairie; infrequent but locally abundant; Je.
Desmodium canadense (L.) DC. Tick Trefoil. 12989, 13076, 14292. Moist to mesic prairie; frequent; Jy-Au.
Glycyrrhiza lepidota (Nutt.) Pursh. Wild Licorice. 12992. Marsh; infrequent; Je-Jy.
Lathyrus palustris L. Vetchling. 16063, 16157. Marshes, moist prairie, and willow thicket; infrequent; Je-Jy.

- Lathyrus venosus* Muhl. 16047. Moist to dry prairie; infrequent; Je-Jy.
Lespedeza capitata Michx. Bush-clover. 16289. Mesic to dry prairie; common; Au-S.
Lespedeza leptostachya Englem. 9791, 11034, 13514. Mesic to dry prairie; infrequent; Au-S.
 **Medicago lupulina* L. Black Medick. 16003, 16365. Weed of disturbed places; infrequent; Je-Au.
 **Medicago sativa* L. Alfalfa. 16080. Infrequent near fence along south border of tract; Je-Au.
 **Melilotus alba* Desr. White Sweet-clover. 14690. Common on prairie; My-S.
 **Melilotus officinalis* (L.) Lam. Yellow Sweet-clover. 14691. Common on prairie; My-S.
Oxytropis lambertii Pursh. Locoweed, Crazyweed. 14287, 15980. Dry prairie; frequent; My-Jy.
Petalostemon candidus (Willd.) Michx. White Prairie-clover. 12996. Mesic to dry prairie; abundant; Je-Au.
Petalostemon purpureus (Vent.) Rydb. Purple Prairie-clover. 12995. Mesic to dry prairie; common; Jy-S.
Psoralea argophylla Pursh. Silver-leaf. 16055. Moist to dry prairie; common and locally abundant; Je-Au.
Psoralea esculenta Pursh. Breadroot. 16048, 16103. Dry prairie; frequent; My-Je.
 **Trifolium pratense* L. Red Clover. 15995. Common on prairie; My-S.
 **Trifolium procumbens* L. Low Hop Clover. 16172. Disturbed ground; infrequent; Je-Au.
 **Trifolium repens* L. White Clover. 15996. Common on prairie; My-S.
Vicia americana Muhl. Vetch. 16004. Moist to mesic prairie; infrequent; My-Jy.

OXALIDACEAE (Wood-sorrel Family)

- Oxalis europaea* Jordan. Lady's Sorrel. 16006. Moist to mesic prairie; infrequent; My-O.
Oxalis stricta L. 13075. Disturbed place; rare; My-O.
Oxalis violacea L. Violet Wood-sorrel. 16007. Moist to dry prairie; frequent; My.

LINACEAE (Flax Family)

- Linum sulcatum* Riddell. Wild Flax. 16049. Mesic to dry prairie; common; Je-Au.

POLYGALACEAE (Milkwort Family)

- Polygala verticillata* L. (var. *isocycla* Fern.) Milkwort. 16173. Moist to dry prairie; rare; Jy-O.

EUPHORBIACEAE (Spurge Family)

- Euphorbia glyptosperma* Engelm. Spurge. 16175, 16183, 16290. Disturbed, open ground; infrequent; Je-S.

ACERACEAE (Maple Family)

- **Acer saccharinum* L. Soft Maple. 16171. One seedling at edge of pond; rare; Mr.

MALVACEAE (Mallow Family)

- Callirhoë alcaeoides* (Michx.) Gray. Poppy Mallow. Anderson and DeKock. 1955. Mesic prairie; only one plant found; Je. The species was previously unreported from Iowa.

VIOLACEAE (Violet Family)

- Viola nephrophylla* Greene. Stemless Blue Violet. 14430, 16017, 16038. Moist prairie; frequent; My-Je.
Viola pedatifida G. Don. Prairie Violet. 15981, 16056, 16106. Mesic to dry prairie; common; My.

Viola pedatifida x *V. nephrophylla*. Hybrid Violet. 16039, 16107. Moist to dry prairie; infrequent; My.

LYTHRAGEAE (Loosestrife Family)

Lythrum dactyanum Nieuwl. (*L. alatum* of Gray's Manual). Loosestrife. 16176. Edge of desiccated pond; rare; Je-S.

ONAGRACEAE (Evening-Primrose Family)

Epilobium glandulosum Lehm. Willow Herb. 16372. Pond margin; rare; Jy-S.

Oenothera biennis L. (var. *hirsutissima* Gray). Evening-primrose. 14431, 16373. Moist to dry prairie; frequent; Jy-S.

Oenothera serrulata Nutt. 13072; 15982. Dry prairie; common; Je-Au.

UMBELLIFERAE (Parsley Family)

Cicuta maculata L. Water-hemlock. 16158. Marshes and moist prairie; common; Je-Au.

Eryngium yuccifolium Michx. Rattlesnake-master. 16185. Mesic prairie; rare; Jy-Au.

Sium suave Walt. Water-parsnip. 14434. Moist prairie; rare; Jy-S.

Zizia aptera (Gray) Fern. 14435, 16105. Locally abundant on one knob and slope; My-Je.

Zizia aurea (L.) Koch. Golden Alexanders. 16054. Moist to dry prairie; frequent; My-Je.

PRIMULACEAE (Primrose Family)

Lysimachia ciliata L. Fringed Loosestrife. 16217. Marsh and drainageway; infrequent; Je-Au.

Lysimachia hybrida Michx. 16291. Pond margin; rare; Je-Au.

Lysimachia quadriflora Sims. 16219. Marsh; rare; Jy-Au.

Lysimachia thyrsiflora L. Tufted Loosestrife. 16120. Marsh; rare; My-Je.

GENTIANACEAE (Gentian Family)

Gentiana puberula Michx. Prairie Gentian. 14291, 15983. Dry prairie; infrequent; Au-O.

APOCYNACEAE (Dogbane Family)

Apocynum sibiricum Jacq. Dogbane. 16013. Moist prairie; frequent; Je-Jy.

ASCLEPIADACEAE (Milkweed Family)

Asclepias incarnata L. Swamp Milkweed. 16159. Ponds, marshes and moist prairie; common; Jy-Au.

Asclepias nuttalliana Torr. (*A. lanuginosa* of Gray's Manual). 15985, 16058, 16108. Dry prairie; rare; Je-Jy.

Asclepias ovalifolia Dcne. 16097. Mesic prairie; rare; My-Je.

Asclepias syriaca L. Common Milkweed. 14288. Moist prairie and disturbed places; infrequent.

Asclepias tuberosa L. Butterfly Weed. 16059. Dry prairie; only one plant seen; Je-Au.

Asclepias verticillata L. Whorled Milkweed. 13511. Mesic to dry prairie; common; Je-Au.

Asclepias viridiflora Raf. (var. *lanceolata* (Ives) Torr. and var. *linearis* (Gray) Fern.) 15984, 16057. Dry prairie; frequent; Je-Jy.

CONVOLVULACEAE (Morning-glory Family)

**Convolvulus sepium* L. Hedge-bindweed. 16293. Disturbed dry prairie at south end of tract; there abundant; Je-S.

POLEMONIACEAE (Polemonium Family)

Phlox pilosa L. (var. *fulgida* Wherry). Prairie Phlox. 15998. Mesic prairie; locally abundant; My-Jy.

BORAGINACEAE (Borage Family)

- Lithospermum canescens* (Michx.) Lehm. Puccoon. 15993. Mesic prairie; frequent; My-Je.
Lithospermum incisum Lehm. Puccoon. 15986. Driest prairie knobs; infrequent; My-Je.
Onosmodium occidentale Mack. False-gromwell. 15987. Dry prairie; frequent; Je-Jy.

VERBENACEAE (Vervain Family)

- Verbena hastata* L. Blue Vervain. 16165. Marshes and moist prairie; infrequent; Jy-S.
Verbena stricta Vent. Hoary Vervain. 16079. Mesic to dry prairie; frequent; Je-S.

LABIATAE (Mint Family)

- Hedeoma hispida* Pursh. Mock-pennyroyal. 16060. Dry prairie; frequent; My-Je.
Lycopus americanus Muhl. Bugleweed. 16161. Marshes, pond margins, and moist prairie; frequent; Jy-S.
Lycopus asper Greene. 16220. Marsh; rare; Jy-S.
Mentha avensis L. Mint. 16160. Marshes and drainageways; common; Jy-S.
Monarda fistulosa L. (var. *mollis* (L.) Benth.) Wild Bergamot. 13077. Moist to dry prairie and drainageways; common; Jy-Au.
 **Nepeta cataria* L. Catnip. 16162. Weed in willow thicket; rare; Jy-Au.
Pycnanthemum virginianum (L.) Durand & Jackson. Mountain Mint; 13004; mesic to dry prairie; infrequent; Jy-S.
Scutellaria epilobiifolia Hamilton. Skullcap. 16163. Marshes and drainageways; frequent; Je-S.
Stachys palustris L. Woundwort. 14428, 16014, 16121. Marshes and moist prairie; common; Je-O.
Teucrium canadense L. (var. *occidentale* (Gray) McClintock & Epl.) Germander. 16164. Marshes; infrequent; Je-S.

SOLANACEAE (Nightshade Family)

- Physalis heterophylla* Nees. Ground-cheery. 16051, 16109. Mesic to dry prairie; frequent; Je-Au.
Physalis virginiana Mill. 13078, 16050. Mesic to dry prairie; common; Je-Au.

SCROPHULARIACEAE (Figwort Family)

- Castilleja sessiliflora* Pursh. Downy Painted-cup. Not collected. Dry gravel knob; rare; My-Je.
Pedicularis lanceolata Michx. Lousewort. 16292. Pond margins and marshes; locally abundant; Au-S.
Scrophularia lanceolata Pursh. Figwort. 16110. Moist prairie, rare; My-Je.
Veronicastrum virginicum (L.) Pennell. Culver's-root. 16166. Moist to mesic prairie; common; Je-Au.

LENTIBULARIACEAE (Bladderwort Family)

- Utricularia vulgaris* L. Bladderwort. 16027. Shallow pond; rare; Je-Au.

PLANTAGINACEAE (Plantain Family)

- **Plantago major* L. Common Plantain. 16180, 16358. Weed of disturbed areas; infrequent; Je-Au.

RUBIACEAE (Madder Family)

- Galium boreale* L. Northern Bedstraw. 16002. Moist to mesic prairie; frequent; Je-Jy.
Galium obtusum Bigel. 16032. Moist prairie; frequent; Je-Jy.

CAMPANULACEAE (Bluebell Family)

- Lobelia siphilitica* L. Great Lobelia. 16221, 16385. Marsh; infrequent; Au-S.
Lobelia spicata Lam. Pale-spike Lobelia. 12998. Moist to mesic prairie; frequent; Je-S.

COMPOSITAE (Composite Family)

- Achillea millefolium* L. (subsp. *lanulosa* (Nutt.) Piper). Yarrow. 13003, 15991. Mesic to dry prairie; common; Je-Jy.
Agoseris glauca (Pursh) D. Dietr. False-dandelion. 15990. Dry prairie; rare; My.
 **Ambrosia artemisiifolia* L. Ragweed. 16225. Weed of disturbed places; common; Au-S.
 **Ambrosia trifida* L. Giant Ragweed. 16224. Weed of disturbed places; frequent; Au-S.
Antennaria neglecta Greene. Pussytoes. 16061. Dry prairie; infrequent; My.
Artemisia caudata Michx. Wormwood. 16382. Dry prairie; infrequent; Au-S.
Artemisia ludoviciana Nutt. Mugwort, White Sage. 16294. Mesic to dry prairie; abundant; S-O.
Aster ericoides L. Aster. 16167c. Moist to mesic prairie; frequent; Au-O.
Aster hesperius Gray. 16378. Moist prairie; infrequent; Au-O.
Aster laevis L. 16295a. Mesic to dry prairie; infrequent; Au-O.
Aster lucidulus (Gray) Wieg. 16167a. Moist prairie; infrequent; Au-O.
Aster novae-angliae L. New England Aster. 16167d. Moist prairie; frequent; Au-O.
Aster oblongifolius Nutt. 16295. Dry prairie; frequent; Au-O.
Aster ptarmicoides (Nees) T. & G. 16213. Dry prairie; frequent; Jy-S.
Aster sericeus Vent. Silky Aster. 16141. Dry prairie; frequent; Au-S.
Bidens cernua L. Stick-tight. 16297, 16384. Pond margins; infrequent; Au-S.
Bidens frondosa L. Beggar-ticks. 16375. Pond margins; infrequent; Jy-S.
Bidens vulgata Greene. 16296, 16383. Pond margins; infrequent; Au.
Boltonia asteroides (L.) L'Her. (*B. latisquama* Gray var. *recognita* Fern. & Grise.) Boltonia. 16298. Pond margins; infrequent; Au-S.
Cirsium altissimum (L.) Spreng. (incl. *C. iowense* (Pammel) Fern., *C. discolor* (Muhl.) Spreng. Thistle. 16223, 16299, 16386, 16387. Moist prairie; infrequent; Au-S.
 **Cirsium arvense* (L.) Scop. Canada Thistle. 16074. Abundant weed in extreme southwest corner of tract; Jy.
Cirsium canescens Nutt. (incl. *C. flodmanii* (Rydb.) Arthur.) Prairie Thistle. 13073, 16300. Mesic to dry prairie; frequent; Jy-Au.
 **Cirsium vulgare* (Savi) Airy-Shaw. Bull Thistle. 16368. Only one rosette found; Jy-S.
 **Conyza canadensis* (L.) Cron. Horseweed. 16211. Weed of disturbed places; infrequent; Jy-Au.
Coreopsis palmata Nutt. Tickseed. 13002. Mesic to dry prairie; common; Je-Jy.
Echinacea pallida Nutt. (var. *angustifolia* (DC.) Cron.) Purple Coneflower. 16052. Dry prairie; common; Je-Jy.
Erigeron strigosus Muhl. Daisy-fleabane. 15992, 16111. Moist to dry prairie; common; Je-S.
Helenium autumnale L. Sneezeweed. 16222. Moist prairie, marshes, and drainageways; frequent; Au-S.
Helianthus grosseserratus Martens. Sunflower. 16301, 16370. Moist prairie and pond margins; common; Jy-S.
Helianthus laetiflorus Pers. (var. *rigidus* (Cass.) Fern.) 13516. Mesic to dry prairie; common and locally abundant; Au-S.
Helianthus maxmiliani Schrad. 11031, 13512. Marsh and moist prairie; infrequent; Au-S.
Helianthus tuberosus L. x ?*H. grosseserratus* Martens. 11032. Moist prairie; rare; Au-S.

- Heliopsis helianthoides* (L.) Sweet (var. *scabra* (Dunal) Fern.) Ox-eye. 13001, 15989. Mesic prairie; frequent; Je-Au.
- **Iva xanthifolia* Nutt. 16302. Locally abundant weed of disturbed places, as haystack sites, Au-S.
- Kuhnia eupatorioides* L. (var. *corymbulosa* T. & G.) False-boneset. 16187. Mesic to dry prairie; common; Au-S.
- Lactuca ludoviciana* (Nutt.) Ridd. Prairie Lettuce. 11033. Mesic to dry prairie; frequent; Jy-S.
- **Lactuca scariola* L. Prickly Lettuce. 16210. Weed of disturbed places; locally abundant; Au-S.
- Liatris aspera* Michx. Blazing-star. 13515. Dry prairie; frequent; Au-S.
- Liatris punctata* Hook. 13509, 16303. Dry prairie; frequent; Au-S.
- Lygodesmia juncea* (Pursh) D. Don. Skeleton-weed. 16214. Dry prairie; rare; Je-S.
- Prenanthes aspera* Michx. Rattlesnake-root. 13508, 16381. Dry prairie; infrequent; Au-S.
- Prenanthes racemosa* Michx. 14689, 16380. Moist to mesic prairie; infrequent; S.
- Ratibida pinnata* (Vent.) Barnh. Yellow Coneflower. 16186. Mesic to dry prairie; frequent; Jy-Au.
- Senecio plattensis* Nutt. Ragwort. 16112. Dry prairie; apparently rare; My-Je.
- Silphium perfoliatum* L. Cup-plant. 16167, 16379. Moist prairie; rare; Jy-S.
- Solidago gigantea* Ait. Goldenrod. 16215. Marsh and moist prairie; infrequent; Au-S.
- Solidago missouriensis* Nutt. 16218. Mesic to dry prairie; frequent; Jy-S.
- Solidago nemoralis* Ait. 16304. Dry prairie; frequent; Au-S.
- Solidago pruinosa* Greene. 16307, 16376. Drainageways and moist prairie; frequent; Au-S.
- Solidago rigida* L. 16306, 16377. Mesic to dry prairie; common; Au-S.
- Solidago speciosa* Nutt. 16308. Dry prairie; infrequent; Au-O.
- **Taraxacum erythrospermum* Andz. Red-seeded Dandelion. 16115. Frequent weed on prairie; My-Je.
- **Taraxacum officinale* Weber. Common Dandelion. 16117, 16369. Weed of disturbed places; infrequent; My-Jy.
- **Tragopogon dubius* Scop. (T. *major* Jacq.) Goat's-beard 15988. Frequent weed on prairie; Je-Au.
- Vernonia fasciculata* Michx. Ironweed. 16305. Moist prairie; infrequent; Jy-S.
- **Xanthium strumarium* L. Cocklebur. 16082. Infrequent weed of disturbed places; Au-S.

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