

THE GRAVEL-HILL PRAIRIES OF ROCK RIVER VALLEY IN ILLINOIS

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The prairies of the Midwest have been written about for more than a century. Hill prairies, especially loess and sand prairies such as cover the slopes and tops of the bluffs along the Mississippi River and its tributaries, have been discussed by Vestal (1918), Steyermark (1940), Shimek (1949) and Hopkins (1951). Recently, Evers (1955) has written an excellent article giving in greater detail the occurrence and relative frequency of characteristic species on various Illinois prairies. We are not aware that much has been said about glacial, gravel-hill prairies such as occur in Winnebago County.

GEOLOGICAL AND PHYSICAL FEATURES

Paralleling Rock River on the east at roughly the edge of glacial Rock River Valley, as shown by the dolomite spurs (Fig. 1), is an interrupted row of gravel hills extending from the Wisconsin line to the mouth of the Kishwaukee River at the south border of Winnebago County. The crest of the hills is at the 800- to 850-foot level. The Rock River is at the 700-foot level. The river has a relatively narrow bottomland, most of the valley being occupied by a gravel terrace which is 50 feet above the river. The bluffs of the terrace are near to or far from the hills, de-

pending upon the bends of the river which determine the width of the terrace. This width varies from a few hundred feet to four miles. It is with the crests of the hills and of the terrace bluffs (Fig. 1) that we are particularly concerned.

The gravel outwash of the various glaciers has filled the old river bed to a depth of more than 250 feet and furnished the water-lain material which forms the terrace and its bluffs. The finer material was carried farther, and thus the terrace soil in the Camp Grant and New Milford area is a sandy rather than a gravelly loam. There is but little till on the terrace, and in many places it is entirely lacking. The hills are of till of pre-Wisconsin age on dolomite bedrock. The sheet of till that forms the hills is of considerable, though of markedly varying, thickness. There is no loess on the terrace and little or none on the hills.

CLIMATE

The climate of Winnebago County, the area under consideration, is continental, not influenced by the Gulf of Mexico and but little by the Great Lakes. The temperature range is to 136° F. (75° C.) from a low of -26° F. (-32° C.). Spring starts late and the season advances rapidly. The last frost is about May 5

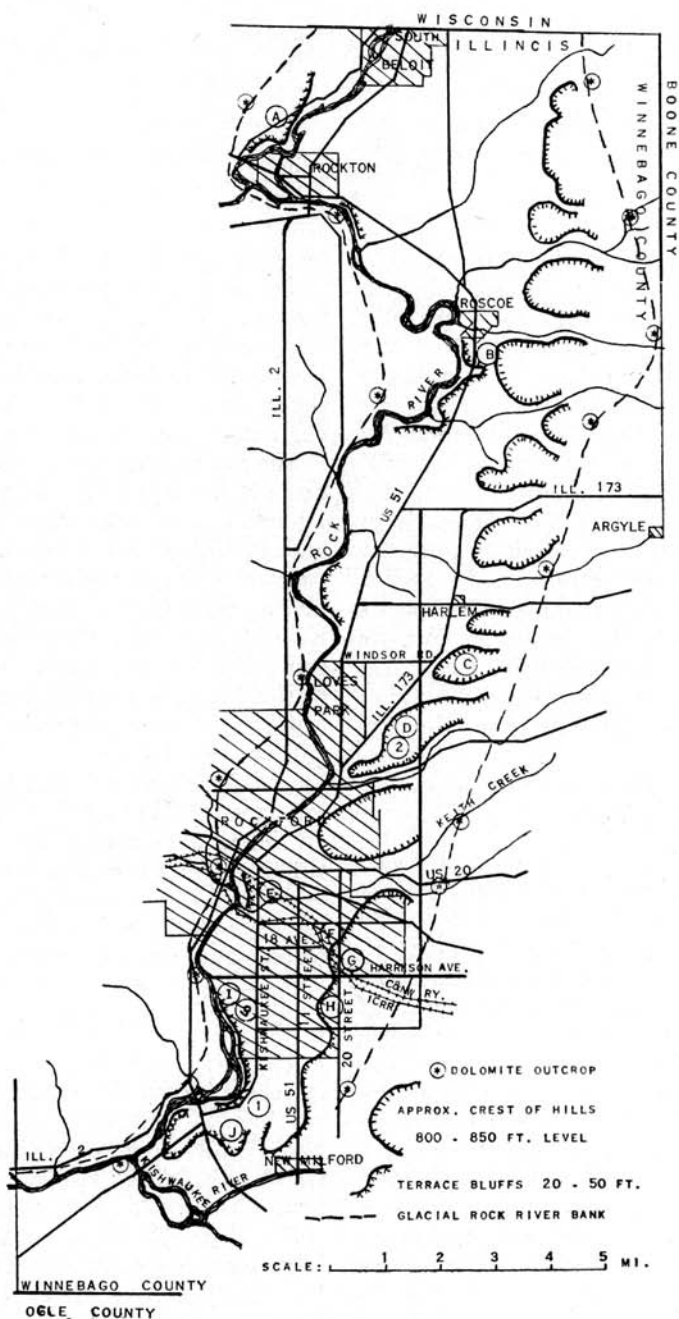


FIG. 1.—Rock River Valley in Illinois: A to J, prairie patches; 1, Camp Grant; 2, Forest Hills Country Club; 3, Sanitary District plant.

and the first can be expected about September 14. The average precipitation is 34 inches per year of which one-tenth is in the form of about 35 inches of snow. Winds are from the west, more north in winter and more south and strong, frequent and dry in summer.

VEGETATION

On Vestal's (1931) vegetational map of Illinois the hills are parallel to the edge of the forest that marks the east border of the Freeport District of the Western Division. The Rock River terrace and the hills, as well as most of the rest of Winnebago County, are prairie. For the most part the floodplain and terrace are treeless, as are also the hills from the Wisconsin line to the junction of Illinois highway 173 with U.S. 51 at the north edge of Rockford. From this point south to the Kishwaukee River the hills and bluffs that are close to Rock River are covered with mixed oaks and hickory. The terrace vegetation, except that of the crest of the bluffs is such as is usually found on sandy prairies, the sand plants being more noticeable in the Camp Grant area. The hills to the east, back of the crests, have a high-prairie vegetation. Near the Boone County line is a transition belt with an oak-opening vegetation indicating the trend to forest, which is apparent in all of northern Illinois. Eastern mesophytes and prairie species mix to form the flora of this belt and of the wooded hills. Southern plants, except for some of the panicums, are not numerous.

On the west side of the river there is only one place, opposite Rockton (area A, Fig. 1), where this forma-

tion of terrace bluff and hill is evident. At this point a large ox-bow bend produces a river bluff that faces southwest much as is normally the case on the east bank. The other prairies west of the river are of the low or of the high, flat or rolling type except for a few small "limestone prairies" where the dolomite is very near the surface.

The plants of the crests of the hills and bluffs differ materially from those of such places as high or low, flat prairies, the Mississippi "goat prairies" in Pike County, the St. Peter sandstone hills around Castle Rock in Ogle County, the dune bluffs of Mason County, and the loess hills that border the Mississippi River above Rock Island and the Sangamon River in Cass County. Published descriptions by Gleason (1910) and others and our own personal observations of all these areas show the difference, which is defined here, very clearly. The flora of the crest of the bluffs is the same as that of the crest of the hills. These two situations are similar as to exposure to wind and sun and as to porosity of soil. They are both without loess and, though different as to the origin of the soil, they both have a coarse gravel that is so similar as to suggest a possible correlation with the similar plant species of the two crests.

THE DOMINANT SPECIES

The constant grasses on the crests are the mid-height grasses, little bluestem, prairie dropseed, and side-oats grama, which are found on all true prairies. June grass, a common mid-height, dry-prairie grass, is abundant only on the bluffs opposite

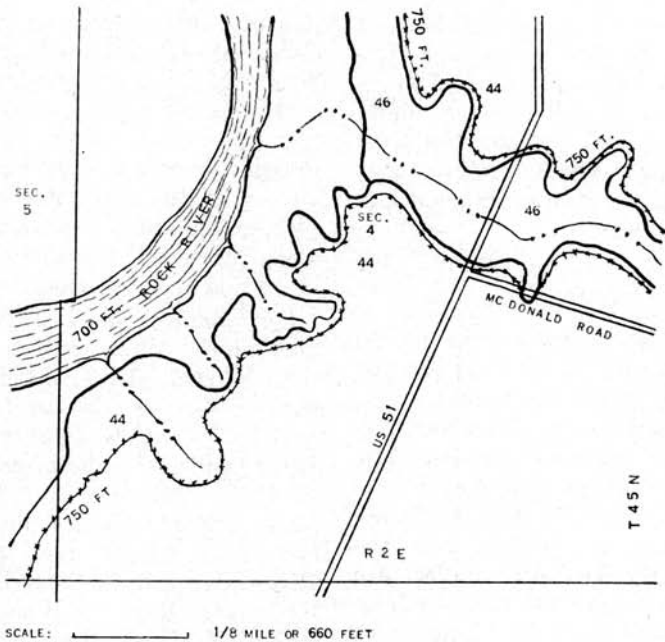


FIG. 2.—Soils of Roscoe terrace bluff: soil 44, O'Neill sandy loam; soil 46, Hickory gravelly loam.

Rockton and in the Camp Grant area where there is a large sand content in the soil. There is not enough moisture for turkey-foot and Indian grass except in draws and damp spots. Switch grass is limited to the more sandy places, and poreupine grass is very irregularly distributed. Cord grass does not occur. The understorey is of *Aristida* spp., low panicums, *Leptoloma cognatum* and *Eragrostis spectabilis*, the short plains grasses being absent.

The most important constant forb is the pasque flower which grows on all the hills, often abundantly, and, being usually absent from other prairies, can be considered an indicator of this type in much the same way that *Oenothera rhombipetala* indicates sand, *Valeriana edulis*, wet,

and *Silphium laciniatum*, high prairie. Other constant forbs that are not so strictly limited to gravel hills are: *Carex umbellata*; *Ranunculus rhomboideus*; *Linum sulcatum*; *Amorpha canescens*; *Androsace occidentalis*; *Acerates lanuginosa*; *Penstemon pallidus*; *Synthyris bullii*; *Campanula intercedens*; and *Liatris cylindracea*. These are all noteworthy plants, but it is the kind and frequency of the secondary species that give the hills their distinctive character. These secondary plants vary from place to place. To get a clear picture, the series of hills and bluffs must be considered a unit, since many of the unusual plants are now so rare as to be found only in one or, at the most, a few small areas. Examples are western species

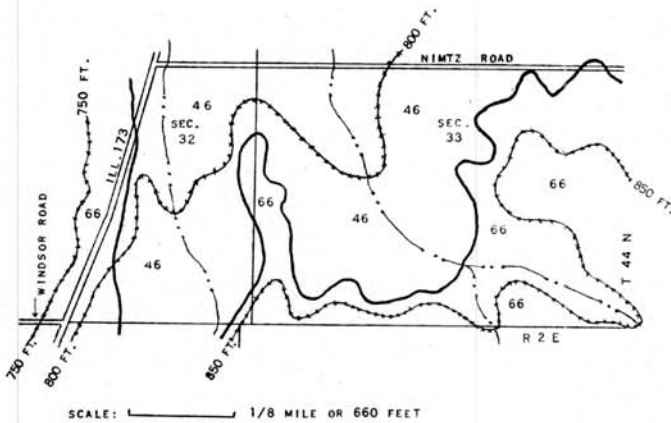


FIG. 3.—Soils of Byron Easton hill: soil 46, Hickory gravelly loam; soil 66, Durand sandy loam.

such as *Gentiana quinquefolia* var. *occidentalis*, *Gerardia gattingeri*, *Lactuca ludoviciana*, *Castilleja sessiliflora*, some artemisias, and northern or northwestern species such as *Panicum wilcoxianum*, *Carex richardsonii*, *Geum triflorum*, *Gentiana puberula*, *Gerardia aspera*, *Aster ptarmicoides*, and *Agoseris cuspidata*. None of these is constant on all the hills but all are rare or absent elsewhere in the area.

THE SOILS

Our thanks are due Lyle B. Palmer and Glen D. Greek of the Winnebago County Soil Conservation District for the following data on soils. The maps are adapted from Soil Service Aerial Maps.

Figure 2 is a soil map of the terrace bluff south of Roscoe (area B, Fig. 1), selected because of its comparatively undisturbed condition. Figure 3 is a similar map of the Byron Easton hill (area C, Fig. 1), a considerable part of which has

never been plowed or excessively grazed. These maps show the crests to have the same soil, Hickory gravelly loam (Wascher, *et al.*, 1950), the gravel being more dominant on the Roscoe bluff, where it is water-lain (Fig. 6), than on the Easton hill, where it is glacial till (Fig. 4). Both these areas have a prairie vegetation of the type described here. Back from the crest of the bluff, O'Neill sandy loam, a water-lain soil, supports a dry, sandy - prairie vegetation, whereas back of the hill crest is a high-prairie growth on Durand sandy loam, till on dolomite bedrock, which, to the east, grades into the transition belt mentioned above.

The growths on O'Neill sandy loam (Fig. 7) and on Durand sandy loam (Fig. 5) are similar. Both have thick stands of mid-height and some taller grasses, and the understory is well developed. The ground is completely covered, the grass bunches and the forb stems being close together. The species differ somewhat,

apparently because of the finer sand content of O'Neill. *Sporobolus corymbosus* and *S. vaginiflorus* on O'Neill take the place of *S. asper* and *S. neglecta* on Durand. *Panicum virgatum* is expected on O'Neill, but *Stipa* is more likely on Durand. *Potentilla recta* is common on O'Neill and *P. arguta* on Durand. We have noted many such differences in the tabulation of species. The similarities and differences in the plants found on O'Neill and on Durand sandy loam are interesting but not well enough marked to constitute a unique characteristic; it is likely that such relationships are quite common.

On the soil called Hickory the lines are much more defined. There is some difference in this soil in the two situations but not enough to justify a division into two types or, apparently, to make a difference in the species which inhabit the two areas. The species are surprisingly similar in spite of the finer sand and coarser gravel of the Roscoe bluff. We are not able to place any significance on the fact that *Houstonia* is absent from the Easton hill or upon the abundance of *Polanisia*, *Penstemon pallidus*, and *Carex heliophila* on the Roscoe bluff.

On Hickory gravelly loam (Figs. 4 and 6) there are no tall grasses; the cover of mid-height grasses and the understory of panicums and *Aristida* is sparse, and the interspaces are large. The forbs are low-growing, deep-rooted perennials like pasque flower, *Castilleja*, *Liatris cylindracea*, and *Agoseris cuspidata*. Taller species such as *Brauneria*, little bluestem, *Aster cordifolius*, and *Artemisia caudata* (here often perennial), when growing on Hick-

ory soil are depauperate. Interstitials like *Festuca octoflora*, *Polygonum tenue*, and *Linum sulcatum* are few, their place being taken by low mat-formers like *Carex* spp., *Arenaria stricta*, *Geum triflorum*, *Potentilla argentea*, *Androsace occidentalis*, *Antennaria* spp., and others. There is a scant growth of mosses and lichens on the bare interspaces which, because of the porous soil, are not greatly eroded. Flowering of the forbs comes early on Hickory soil, apparently not to avoid the threat of shade from the developing grasses, but to complete the blooming cycle while moisture is available. It is particularly here that the pasque flower grows, and it is only here that *Castilleja sessiliflora*, *Gerardia gattingeri*, *Agoseris cuspidata*, and some of the other secondary dominants are found.

It cannot be doubted that this combination of gravel soil and exposed location forms the optimum habitat for the pasque flower and its associates, but whether the relationship is one of soil, of microclimate, or of both is not so clear. Some of the species occur, in our experience, only on this soil, but others, notably *Carex umbellata*, pasque flower, *Ranunculus rhomboideus*, *Synthyris bullii*, and *Gerardia aspera*, are found at times on high, rolling or sand prairies in Winnebago, Boone and Ogle counties, where the climatic conditions, but not the soil, are like those of our gravel prairies. On the other hand many species, such as *Campanula intercedens*, *Arenaria stricta*, *Arabis pycnocarpa*, and *Houstonia lanceolata*, do not require an exposed location but do need a gravel or rocky soil or a rock outcrop to take its

place. This is apparent on some of the "limestone prairies" that are not exposed and some of which have an abundance of pasque flowers and many of the other species.

SEASONAL CHANGES

About April 1, though the ground is still frozen in protected spots and there is still some snow and ice in the draws, the pasque flower blooms



FIG. 4.—Byron Easton hill (area C, Fig. 1); Hickory gravelly loam (soil 46, Fig. 3).



FIG. 5.—Byron Easton hill (area C, Fig. 1); Durand sandy loam (soil 66, Fig. 3).

and is followed very soon by the red patches of *Geum triflorum* and the new growth of *Arenaria stricta*. Then three sedges begin to flower, *Carex pennsylvanica*, *C. umbellata*, and *C. richardsonii*, the latter being very conspicuous during the short time it is in bloom. Then come *Draba reptans*, *Androsace occidentalis*, the

two early buttercups, *Ranunculus fascicularis* and *R. rhomboideus*, and *Carex meadii*. The rosettes of *Solidago nemoralis* and *Artemisia caudata* are distinguishable. The prairie willow blooms before the earliest violets, *Viola pedata* and *V. pedatifida*, begin to flower.

During May the spring flowers



FIG. 6.—Roscoe terrace bluff (area B, Fig. 1); Hickory gravelly loam (soil 46, Fig. 2).



FIG. 7.—Roscoe terrace bluff (area B, Fig. 1); O'Neill sandy loam (Soil 44, Fig. 2).

complete their blooming cycle. Some of the less common are *Castilleja sessiliflora*, *Houstonia lanceolata*, *Acerates lanuginosa*, and *Campanula intercedens*. *Ceanothus ovatus*, very rare, flowers before June 1 when the grasses begin to take over. The low panicums, some of which are not found elsewhere in the county, are on all the hills. They and *Koeleria cristata*, which is plentiful on some hills, are in flower at the same time as *Carex brevior*, *C. tenera*, and *C. normalis*. None of these is tall enough to interfere with the many early forbes which cover the hills at this time. As the season advances and the grasses cause more shade the forbes are those species which are taller and more robust.

The first of the typical summer grasses is *Stipa spartea*, which, though not always present on the hills, is abundant in places. The tall grasses, turkeyfoot and Indian grass, are absent from some of the hills and on many others occur only in draws and damp spots, particularly in disturbed areas. The quack grasses are not abundant. Blue grasses, particularly *Poa compressa*, invade some draws to the exclusion of other growth. The annual panicums, *P. capillare* and *P. dichotomiflorum*, appear as invaders from contiguous fields. *Elymus* is not plentiful. *Setaria* spp., *Agrostis hyemalis*, *Hordeum jubatum*, and some introduced bromes are all of minor importance, though conspicuous in some spots. The same is true of *Eragrostis*, except the perennial, *E. spectabilis*, and the annual, *E. pectinacea*, which are abundant in places. Important in late summer are *Sporobolus asper*, *S. drummondii*, and *S. heterolepis*, *Leptoloma cog-*

natum, and *Aristida basiraema*, and *A. oligantha*.

Important summer forbs are: *Potentilla arguta*; *Asclepias verticillata* which is in weedy abundance on some hills that were formerly grazed; *Asclepias amplexicaulis* which is less frequent than on sand; *Acerates viridiflora* which is uncommon; *Verbena stricta*; *V. simplex*; *Liatris aspera*; several goldenrods; and *Coreopsis palmata*. All these are tall enough to compete with the grasses. The small interstitials which will stand some shade are: *Polygonum tenue*, *Mollugo*, *Chamaesyce* spp., *Linum sulcatum*, *Lechea stricta*, *Physalis heterophylla*, *Gerardia aspera*, *G. gattingeri*, and *Ruellia humilis*. Other common summer plants are *Heuchera richardsonii*, *Petalostemum purpureum*, *P. candidum*, *Lespedeza capitata*, *L. hirta* abundant opposite Rockton and in the Camp Grant area, and *Kuhnia eupatorioides* which is less common than on many prairie roadsides. *Hypericum punctatum* is an occasional vigorous invader. As the grasses mature in late summer a number of asters and several species of *Artemisia* become conspicuous. *Heliopsis*, *Ratibida pinnata*, *Helianthus occidentalis*, *H. rigidus*, and *H. grosseserratus* are all less common than on other types of dry prairie as are also the silphiums and the prairie eupatoriums.

Woody plants beside those mentioned include: occasional small junipers, Iowa crab in small clumps, and infrequent blackberry patches, *Rosa humilis*; all are less frequent than on high prairies. *Rhus glabra*, *Symphoricarpos occidentalis*, and *S. orbiculatus* are uncommon.

The autumnal aspect is of matured

grasses and of taller forbs going to seed. The asters are disappearing and the only additional plant of consequence is the prairie gentian which is irregularly distributed.

Winter presents only windswept hills covered with old grass stems most of which can still be identified next spring.

INDIVIDUAL PATCHES

The following small tracts are of particular interest. Some are worth preserving in their natural condition. This is something that deserves immediate attention (Fig. 1).

A. The bluff west of Rockton has such unusual plants as *Gerardia gattingeri*, *Symphoricarpos orbiculatus*, *Artemisia dracunculoides*, and *Agoseris cuspidata*.

B. The flora of the bluffs that closely border Rock River for about two miles from the south edge of Roscoe is well preserved. Here on the crest, *Houstonia lanceolata* grows abundantly as do *Ranunculus rhomboideus*, *Synthyris bullii*, *Penstemon pallidus*, *Polanisia graveolens*, *Arenaria stricta*, and *Carex heliophila*. *Geum triflorum* is uncommon and *Gentiana puberula* apparently absent.

C. On the Byron Easton hill at the east end of Windsor road on Illinois highway 173 are about 20 acres constituting the best preserved of the series of prairie patches. Here grow: *Castilleja sessiliflora*; *Carex richardsonii*; *C. abdita*; *C. umbellata*; *Panicum wilcoxianum*; *P. perlongum*; *Aster ptarmicoides*; *Cirsium hillii*; and many others. *Carex meadii* is abundant on one ridge.

D. On the hill north of the Forest Hills Country Club a few years

ago, pasque flowers were in almost pure stands over areas of several square rods. Though much of the hill has been built upon there is still an abundance of the plants which characterize the gravel-hill prairies.

E. The persistence of prairie plants in adverse situations is shown on the 40-foot bluff north of the mouth of Keith Creek near where Rockford College was built in 1847. The following prairie species are still in evidence here after more than a century of urbanization: *Sorghastrum nutans*; *Bouteloua curtipendula*; *Elymus canadensis*; *Sporobolus asper*; *Panicum scribnerianum*; *Mirabilis nyctaginea*; *Draba reptans*; *Poinsettia heterophylla*; *Androsace occidentalis*; *Oenothera laciniata*; *Solidago glaberrima*; *Aster oblongifolius*; *Aster ericoides*; and *Aster pilosus*.

F. The hill at 18th avenue and the Chicago and Northwestern railway in East Rockford has *Ceanothus ovatus*, *Acerates lanuginosa*, *Liatris cylindracea*, several asters, and *Brauneria pallida*.

G. The hill at 20th street and the Illinois Central railroad in East Rockford has an unusual amount of *Stipa spartea* and other high prairie plants.

H. Silver Hill, south of Harrison avenue and east of 11th street in Rockford, has, for the most part, been disturbed by building activities, but many out-of-the-way places have kept the original gravel-hill flora. *Lespedeza capitata*, *L. hirta*, *Liatris aspera*, and *Brauneria pallida* thickly cover large areas.

I. The bluff flora at the Sanitary District Plant has been greatly disturbed but two small areas are still in good condition. One north of the

plant has prairie and sand dropseed, the bluestems, Indian grass, and side-oats grama forming a thick mat over the steep hillside. On the wooded part of the bluff south of the plant is *Carex X fulleri* H. E. Ahles, found in 1949 and which is not known elsewhere.

J. A gravel-bluff prairie in Camp Grant where sandy flat prairies are the rule has *Panicum virgatum* in large clumps and an abundance of *Oenothera rhombipetala*. *Anemone caroliniana* and *Agoseris cuspidata* grow here.

TABULATION OF THE SPECIES

The following species are important on gravel-hill prairies. Many introduced plants and very common natives are not mentioned in the list, but specimens of all plants of the area have been collected and are deposited either in Rockford College Herbarium or in the Illinois State

Museum. We did not attempt to collect each plant from every hill because to do so would require much labor of little value. Quadrat counts were not made because the selection of quadrats in these small, widely separated patches would be so subjective as to preclude the formulation of any objective conclusions.

SYMBOLS USED IN TABULATION

Column 1: 1, rare; 2, uncommon; 3, common; 4, abundant.

Column 2: M, mat; P, patch; I, interstitial; B, bunch; S, single stem.

Column 3: V, spring; S, summer; A, fall.

Column 4: T, more than one foot; L, less than one foot.

Column 5: 1, only on Hickory soil and there rare; 2, common on Hickory soil, less common on O'Neill and Durand; 3, all prairies, more often on Hickory soil but also on O'Neill and Durand; 4, all, but most often on sand prairies; 5, all, but most often on high flat or rolling prairies; 6, all, but most often on low prairies or in damp places on other prairies; 7, adventive or with no apparent soil preference.

TABLE 1.—List of Species.

	Frequency	Growth form	Flowering season	Height	Soil preference
<i>Equisetum arvense</i> , horsetail	3	S	V	L	6
<i>hyemale</i> , scouring rush	2	P	S	T	5
<i>Juniperus virginiana</i> , red cedar	2	S	S	T	5
<i>Bromus</i> (introd. spp.), brome grass	2	I	V	L	7
<i>Festuca octoflora</i> , slender fescue	3	I	S	L	4
<i>Poa compressa</i> , Canada bluegrass	3	M	V	L	6
<i>pratensis</i> , Kentucky bluegrass	4	M	V	L	6
<i>Eragrostis cilianensis</i> , stink-grass	2	I	S	L	7
<i>pectinacea</i> , love-grass	3	I	S	L	5
<i>spectabilis</i> , tumble-grass	3	B	S	L	5
<i>Agropyron repens</i> , quackgrass	2	P	S	T	5
<i>smithii</i> , western quackgrass	2	P	S	T	5
<i>Elymus canadensis</i> , wild rye	2	S	S	T	5
<i>virginicus</i> , wild rye	2	S	S	T	6
<i>Hordeum jubatum</i> , squirrel-tail	3	I	S	L	5
<i>Koeleria cristata</i> , June-grass	2	B	V	T	4
<i>Agrostis alba</i> , redtop	2	M	S	L	7
<i>hyemalis</i> , ticklegrass	3	I	S	L	5
<i>Sporobolus asper</i> , dropseed	3	B	S	T	5
<i>cryptandrus</i> , sand dropseed	2	B	S	T	4
<i>heterolepis</i> , prairie dropseed	3	B	S	T	3
<i>neglectus</i> , annual dropseed	2	I	S	L	5
<i>vaginiflorus</i> , annual dropseed	3	I	S	L	4
<i>Stipa spartea</i> , porcupine-grass	2	S	V	T	4
<i>Aristida basiramea</i> , three-awn grass	3	I	S	L	5
<i>oligantha</i> , three-awn grass	3	I	S	L	5
<i>Bouteloua curtipendula</i> , side-oats grama	3	B	S	T	5
<i>Leptoloma cognatum</i> , fall witch-grass	3	B	S	L	5
<i>Panicum capillare</i> , witch-grass	3	I	S	L	7
<i>depauperatum</i>	2	B	S	L	5
<i>dichotomoflorum</i>	2	I	S	L	7
<i>implicatum</i>	3	I	S	L	5
<i>meridionale</i>	2	M	S	L	5
<i>oligosanthes</i>	1	S	S	L	5
<i>perlongum</i>	3	B	S	L	5
<i>pseudo-pubescens</i>	3	M	S	L	4
<i>scribnerianum</i>	3	S	S	L	3
<i>virgatum</i> , switch-grass	2	B	S	T	4
<i>wilcozianum</i>	1	M	S	L	1
<i>Setaria lutescens</i> , fox-tail	3	S	S	T	5
<i>viridis</i> , fox-tail	3	S	S	T	5
<i>Andropogon gerardi</i> , big bluestem	3	B	S	T	6
<i>scoparius</i> , little bluestem	4	B	S	T	5
<i>Sorghastrum nutans</i> , Indian grass	2	B	S	T	6
<i>Cyperus filiculmis</i>	2	S	S	L	4
<i>schweinitzii</i>	2	S	S	L	4
<i>Carex abdita</i>	1	M	V	L	3
<i>brevior</i>	2	B	S	L	5
<i>gravida</i>	3	B	S	L	5
<i>heliophila</i>	1	M	V	L	3

TABLE 1.—List of Species—Continued.

<i>meadii</i>	2	S	V	L	5
<i>normalis</i>	2	B	S	L	5
<i>pennsylvanica</i>	2	M	V	L	5
<i>richardsonii</i>	1	M	V	L	1
<i>tenera</i>	2	B	S	L	6
<i>tetanica</i>	1	S	V	L	6
<i>umbellata</i>	1	M	V	L	3
<i>Commelina communis</i> , day-flower	2	M	V	L	7
<i>Tradescantia ohioensis</i> , widow's-tears	2	S	V	T	7
<i>Juncus interior</i> , rush	1	B	S	L	5
<i>tenuis</i> , common rush	2	M	S	L	7
<i>Polygonatum commutatum</i> , Solomon's seal	1	S	S	T	7
<i>Smilax hispida</i> , greenbrier	1	S	S	T	7
<i>lasioneuron</i> , carrion-flower	1	S	S	T	7
<i>Hypoxis hirsuta</i> , stargrass	1	I	V	L	6
<i>Sisyrinchium albidum</i> , blue-eyed grass	3	M	V	L	5
<i>montanum</i> , blue-eyed grass	2	M	V	L	6
<i>Populus tremuloides</i> , quaking aspen	2	S	V	T	6
<i>Salix humilis</i> , prairie willow	3	P	V	T	5
<i>Comandra umbellata</i> , toadflax	3	I	V	L	6
<i>Rumex acetosella</i> , sour-dock	2	M	S	L	7
<i>Polygonum tenue</i>	2	I	S	L	4
<i>Mirabilis nyctaginea</i> , wild four-o'clock	1	S	S	T	5
<i>Mollugo verticillata</i> , carpet-weed	3	I	S	L	7
<i>Stellaria media</i> , chickweed	2	M	S	L	7
<i>Arenaria lateriflora</i> , sandwort	2	M	V	L	7
<i>serpyllifolia</i> , sandwort	2	M	V	L	7
<i>stricta</i> , rock sandwort	2	M	V	L	3
<i>Silene antirrhina</i> , sleepy catchfly	3	S	V	L	5
<i>Saponaria officinalis</i> , bounding Bet	3	P	S	T	7
<i>Aquilegia canadensis</i> , columbine	2	S	S	T	6
<i>Ranunculus fascicularis</i> , buttercup	3	M	V	L	5
<i>rhomboideus</i> , buttercup	2	M	V	L	5
<i>Anemone caroliniana</i> , anemone	1	I	V	L	1
<i>cylindrica</i> , thimbleweed	2	S	S	T	5
<i>ludoviciana</i> , pasque flower	1	S	V	L	3
<i>virginiana</i> , thimbleweed	2	S	S	T	3
<i>Corydalis flavula</i> , pale corydalis	1	M	S	L	3
<i>Draba reptans</i>	3	I	V	L	5
<i>Arabis pycnocarpa</i> , rockcress	2	S	S	T	3
<i>Polanisia graveolens</i> , clammyweed	2	S	S	T	3
<i>Heuchera richardsonii</i> , alumroot	2	S	S	T	6
<i>Fragaria virginiana</i> , strawberry	2	M	V	L	6
<i>Potentilla argentea</i> , silvery cinquefoil	2	M	S	L	5
<i>arguta</i> , tall cinquefoil	2	S	S	T	5
<i>monspeliensis</i> , rough cinquefoil	2	S	S	T	5
<i>recta</i> , cinquefoil	2	S	S	T	4
<i>simplex</i> , cinquefoil	2	S	S	L	6
<i>Geum triflorum</i> , prairie smoke	2	M	V	L	3
<i>Rubus allegheniensis</i> , blackberry	1	P	S	T	7
<i>flagellaris</i> , dewberry	1	P	S	L	7
<i>occidentalis</i> , black raspberry	1	P	S	T	7
<i>Rosa carolina</i> , wild rose	1	P	S	T	5
<i>eglanteria</i> , sweetbrier	1	P	S	T	7
<i>suffulta</i> , prairie rose	2	P	S	L	5
<i>Malus ioensis</i> , Iowa crab	2	S	S	T	6
<i>Crataegus mollis</i> , redhaw	1	S	V	T	6
<i>Prunus americanus</i> , wild plum	2	P	V	T	6
<i>virginiana</i> , choke-cherry	1	P	S	T	5
<i>Baptisia leucantha</i> , wild indigo	2	S	S	T	5
<i>leucophaea</i> , wild indigo	2	S	S	T	5
<i>Trifolium arvense</i> , rabbit-foot clover	2	I	S	L	7

TABLE I.—List of Species—Continued.

<i>Amorpha canescens</i> , lead-plant.....	3	P	S	T	3
<i>Petalostemum candidum</i> , prairie clover.....	2	PP	S	T	5
<i>purpureum</i> , prairie clover.....	3	PP	S	T	5
<i>Desmodium canadense</i> , tick-clover.....	2	S	S	T	5
<i>canescens</i> , tick-clover.....	2	S	S	T	5
<i>illinoense</i> , tick-clover.....	1	S	S	T	4
<i>Lespedeza capitata</i> , bush-clover.....	3	S	S	T	5
<i>hirta</i> , bush-clover.....	3	S	S	T	5
<i>longifolia</i> , bush-clover.....	1	S	S	T	3
<i>Oxalis violacea</i> , wood-sorrel.....	2	I	S	L	3
<i>Linum sulcatum</i> , yellow flax.....	2	I	S	L	3
<i>Ptelea trifoliata</i> , wafer-ash.....	2	S	S	T	7
<i>Polygala verticillata</i> , milkwort.....	1	I	S	L	5
<i>Chamaesyce glyptosperma</i> , spurge.....	1	I	S	L	4
<i>maculata</i> , spurge.....	2	I	S	L	5
<i>supina</i> , spurge.....	3	I	S	L	5
<i>Euphorbia corollata</i> , flowering spurge.....	3	S	S	T	5
<i>dentata</i>	2	S	S	T	5
<i>Poinsettia heterophylla</i>	1	S	S	T	3
<i>Celastrus scandens</i> , bittersweet.....	2	S	S	T	7
<i>Rhus glabra</i> , smooth sumac.....	2	S	S	T	7
<i>radicans</i> , poison ivy.....	1	P	S	T	6
<i>Ceanothus americanus</i> , New Jersey tea.....	2	S	S	T	5
<i>ovatus</i> , New Jersey tea.....	1	S	V	T	5
<i>Hypericum perforatum</i> , St. John's-wort.....	2	P	S	T	7
<i>pseudomaculatum</i> , St. John's-wort.....	2	P	S	T	4
<i>sphaerocarpum</i> , St. John's-wort.....	1	P	S	T	6
<i>Helianthemum canadense</i> , frostweed.....	2	S	S	T	5
<i>bicknellii</i> , frostweed.....	2	S	S	T	4
<i>Lechea stricta</i> , pinweed.....	2	S	S	T	5
<i>tenuifolia</i> , pinweed.....	2	M	S	L	4
<i>Viola fimbriatula</i> , sand violet.....	2	S	V	L	4
<i>papilionacea</i> , butterfly violet.....	3	M	V	L	6
<i>pedata</i> , bird-foot violet.....	2	M	V	L	4
<i>pedatifida</i> , prairie violet.....	2	S	V	L	5
<i>Viola X bernardi</i>	1	S	V	L	5
<i>Oenothera biennis</i> , evening primrose.....	3	S	S	T	7
<i>laciniata</i> , evening primrose.....	1	S	S	T	4
<i>rhombipetala</i> , evening primrose.....	2	S	S	T	4
<i>Gaura biennis</i> , butterfly-weed.....	3	S	S	T	6
<i>Eryngium yuccifolium</i> , rattlesnake-master.....	2	S	S	T	6
<i>Zizia aurea</i> , golden Alexanders.....	2	S	S	T	6
<i>aptera</i> , golden Alexanders.....	2	S	S	T	6
<i>Taenidia integerrima</i> , yellow pimpernel.....	2	S	S	T	5
<i>Thaspium barbinode</i> , meadow parsnip.....	1	P	S	T	6
<i>trifoliatum</i> , meadow parsnip.....	3	P	S	T	6
<i>Androsace occidentalis</i>	2	M	V	L	3
<i>Lysimachia lanceolata</i> , loosestrife.....	2	P	S	L	5
<i>Dodecatheon meadia</i> , shooting-star.....	3	S	V	L	6
<i>Gentiana puberula</i> , prairie gentian.....	2	S	A	L	5
<i>quinquefolia</i> var. <i>occidentalis</i>	1	I	A	L	3
<i>Apocynum cannabinum</i> , Indian hemp.....	2	P	S	T	6
<i>Asclepias amplexicaulis</i> , milkweed.....	2	S	S	L	4
<i>sullivantii</i> , milkweed.....	2	S	S	T	6
<i>syriaca</i> , milkweed.....	3	S	S	T	6
<i>tuberosa</i> , butterfly-milkweed.....	1	S	S	T	4
<i>verticillata</i> , horsetail milkweed.....	3	S	S	T	5
<i>Acerates lanuginosa</i>	1	S	S	L	3
<i>viridiflora</i> , green milkweed.....	1	S	S	T	4
<i>Phlox pilosa</i> , prairie phlox.....	3	S	S	T	6
<i>Lithospermum angustifolium</i> , puceon.....	3	S	S	T	5
<i>canescens</i> , puceon.....	2	S	S	L	5

TABLE 1.—List of Species—Continued.

<i>croceum</i> , puccoon	2	S	S	L	4
<i>Verbena bracteata</i>	3	M	S	L	7
<i>simplex</i> , vervain	2	S	S	T	4
<i>stricta</i> , hoary vervain	3	S	S	T	5
<i>Isanthus brachiatus</i> , false pennyroyal	2	S	S	L	3
<i>Scutellaria parvula</i> , skullcap	2	I	S	L	3
<i>leonardi</i> , skullcap	1	I	S	L	3
<i>Physostegia virginiana</i> , false dragonhead	2	S	S	T	5
<i>Glecoma heterophylla</i> , ground-ivy	1	M	S	L	7
<i>Prunella vulgaris</i> , carpenter's-weed	2	S	S	L	7
<i>Leonurus cardiaca</i> , motherwort	2	S	S	T	7
<i>Monarda fistulosa</i> , wild bergamot	3	P	S	T	5
<i>Hedeoma hispida</i> , rough pennyroyal	4	S	S	L	4
<i>Pycnanthemum virginianum</i> , mountain mint	3	B	S	T	5
<i>Solanum carolinense</i> , horse-nettle	2	S	S	L	4
<i>dulcamara</i> , deadly nightshade	2	S	S	T	7
<i>nigrum</i> , black nightshade	3	S	S	L	7
<i>Physalis heterophylla</i> , ground-cherry	3	S	S	T	5
<i>subglabrata</i> , ground-cherry	2	S	S	T	5
<i>virginiana</i> , ground-cherry	1	S	S	T	4
<i>Veronica arvensis</i> , speedwell	2	I	S	L	3
<i>Synthyris bullii</i> , kitten-tails	1	S	S	T	3
<i>Gerardia aspera</i>	1	I	A	L	1
<i>gallingeri</i>	1	I	A	L	1
<i>Castilleja sessiliflora</i>	1	S	V	L	1
<i>Penstemon pallidus</i> , beard-tongue	2	S	S	L	2
<i>Ruellia humilis</i> , wild petunia	3	M	S	L	5
<i>Plantago aristata</i> , bracted plantain	2	I	S	L	4
<i>purshii</i>	1	I	S	L	5
<i>Houstonia lanceolata</i> , bluets	1	M	S	L	2
<i>Symphoricarpos occidentalis</i> , wolfberry	1	P	S	T	5
<i>orbiculatus</i> , coral-berry	1	P	S	T	5
<i>Campanula intercedens</i> , harebell	2	B	V	L	3
<i>Triodanis perfoliata</i> , Venus' looking-glass	3	I	V	L	4
<i>Lobelia inflata</i> , Indian tobacco	2	I	S	T	7
<i>spicata</i>	2	I	S	T	6
<i>Ambrosia coronopifolia</i> , western ragweed	2	S	S	T	7
<i>elatior</i> , common ragweed	3	S	S	T	5
<i>Vernonia fasciculata</i> , iron-weed	2	S	S	T	6
<i>Eupatorium altissimum</i> , boneset	2	S	S	T	5
<i>serotinum</i> , boneset	2	S	S	T	5
<i>rugosum</i> , white snake-root	2	S	S	T	7
<i>Kuhnia eupatorioides</i> , false boneset	3	S	S	T	5
<i>Liatris aspera</i> , blazing-star	3	S	S	T	5
<i>cylindracea</i> , blazing-star	2	S	S	L	2
<i>Solidago altissima</i> , goldenrod	3	S	S	T	6
<i>gigantea</i> , goldenrod	3	S	S	T	6
<i>glaberrima</i> , prairie goldenrod	3	P	S	T	5
<i>juncea</i> , early goldenrod	2	P	S	T	6
<i>media</i> , goldenrod	2	P	S	T	5
<i>nemoralis</i> , goldenrod	3	S	S	T	3
<i>rigida</i> , stiff goldenrod	2	S	A	T	5
<i>speciosa</i> , showy goldenrod	2	P	A	T	5
<i>Aster cordifolius</i> , aster	3	S	S	T	3
<i>ericoides</i> , heath aster	2	P	A	T	5
<i>exiguus</i> , heath aster	2	P	A	T	5
<i>laevis</i> , smooth aster	2	S	A	T	5
<i>linariifolius</i> , aster	2	S	A	T	4
<i>novae-angliae</i> , New England aster	2	S	A	T	6
<i>oblongifolius</i> , aster	1	P	A	T	5
<i>pilosus</i> , aster	3	S	A	T	5
<i>ptarmicoides</i> , aster	1	S	A	T	2

TABLE 1.—List of Species—Concluded.

<i>sericeus</i> , silky aster	2	I	A	T	5
<i>Erigeron annuus</i> , daisy fleabane	2	S	S	T	7
<i>canadensis</i> , fleabane	3	S	S	T	7
<i>strigosus</i> , daisy fleabane	3	S	S	T	7
<i>Antennaria neglecta</i> , pussy-toes	3	M	V	L	5
<i>neodioica</i> , pussy-toes	3	M	V	L	5
<i>Gnaphalium obtusifolium</i> , everlasting	2	S	S	T	7
<i>Silphium integrifolium</i> , rosin-weed	2	P	A	T	5
<i>laciniatum</i> , compass-plant	2	S	A	T	5
<i>terebinthaceum</i> , prairie-dock	2	S	A	T	6
<i>Heliopsis helianthoides</i> , ox-eye	3	S	S	T	5
<i>Rudbeckia hirta</i> , blackeyed Susan	3	S	S	T	6
<i>serotina</i> var. <i>lanceolata</i>	2	S	S	T	5
<i>triloba</i> , browneyed Susan	2	S	S	T	7
<i>Brauneria pallida</i> , purple cone-flower	3	S	S	T	5
<i>Ratibida pinnata</i> , pale cone-flower	3	S	S	T	5
<i>Helianthus grosseserratus</i> , sun-flower	2	S	S	T	5
<i>occidentalis</i> , sun-flower	2	P	S	T	5
<i>petiolaris</i> , annual sun-flower	2	S	S	T	5
<i>rigidus</i> , sun-flower	2	S	S	T	5
<i>Coreopsis palmata</i> , tickseed	2	P	S	T	5
<i>Bidens vulgata</i> , beggar-ticks	2	S	S	T	7
<i>Helenium autumnale</i> , sneezeweed	2	S	A	T	6
<i>Achillea millefolium</i> , yarrow	3	S	S	T	7
<i>Artemisia caudata</i> , wormwood	2	S	S	T	4
<i>gnaphaloides</i> , white sage	2	S	S	T	5
<i>ludoviciana</i> , white sage	2	S	S	T	5
<i>dracunculoides</i> , wormwood	1	S	S	T	5
<i>Cirsium hillii</i> , Hill's thistle	1	S	S	T	3
<i>Centaurea maculosa</i> , knapweed	2	P	S	T	7
<i>Tragopogon pratensis</i> , goat's-beard	2	S	V	T	7
<i>Cichorium intybus</i> , blue-sailors	2	P	S	T	7
<i>Lactuca ludoviciana</i> , wild-lettuce	1	S	S	T	5
<i>Prenanthes aspera</i> , white lettuce	1	S	S	T	5
<i>racemosa</i> , white lettuce	1	S	S	T	6
<i>Hieracium canadense</i> , hawkweed	1	S	S	T	5
<i>longipilum</i> , hawkweed	2	S	S	T	5
<i>Agoseris cuspidata</i>	1	S	S	L	1

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