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A Progress Report on the Preservation of the Prairie

Ada Hayden
Iowa State Conservation Commission

A PROGRESS REPORT ON THE PRESERVATION OF PRAIRIE[1]

ADA HAYDEN

In accord with the specifications of the Prairie Project sponsored by the Iowa Academy of Science, the following recommendations for preservation of prairie have been co-operatively formulated; a number of the most desirable remaining tracts of prairie representative of virgin soils, flora, and fauna have been described and photographed. Not all of the tracts reported in the survey of the state by counties have been yet inspected.

RECOMMENDATIONS FOR PRESERVATION OF PRAIRIE

The preceding brief report on Prairie Areas in Iowa, (Hayden, 1944) which should be preserved has shown:

1. That preservation of representative, selected prairie areas is a practical measure essential for the protection and best use of such natural resources as soil, water, vegetation, and wildlife.
2. It designates the location of the principle areas which should be preserved because they illustrate (1) the location of characteristic soil types of prairie origin, as well as (2) the chief types of vegetation and plant communities with their floral constituents and associated wildlife.
3. It specifies the geographic location of the areas which should be preserved and refers them to the topographic and climatic sections of the state which produced them through natural processes.

THE SELELCTION OF PRAIRIE AREAS

Prairie must be preserved where it still exists. It remains to locate and describe the known areas and to specify the relative qualifications and probable priority ratings with reference to their acquisition. At present about 30 areas of various sizes ranging from a few acres to a half-section have been inspected. The descriptive data regarding the prairie tracts will be grouped in classes according to their size, topographic classification, soil types, and floras. The relationship of these types to the wildlife therein must be determined by wildlife specialists. The areas hereby recommended are based upon vegetative characteristics. A supplementary report relative to soil types needed, prepared by Dr. F. F. Riecken of the Department of Agronomy of Iowa State College, will be included with this recommendation, as well as a commentary by DDr. George O. Hen-

[1]A report requested by the Iowa State Conservation Commission relating to their program for preservation of prairie and supplemented by the present article. Prepared in May, 1944.

drickson of the Iowa Co-operative Wildlife Research Unit on values of prairie preserves to wild birds and mammals.

The following considerations are used to determine priority ratings:

1. *The Twenty-five Year Plan.* The specifications in the Twenty-five Year Plan of the Conservation Commission concerning the conservation of game (Chap. 9), and wildlife sanctuaries.
2. *Field laboratories.* The urgent necessity for conservation of areas illustrating the native prairie soil types where comparisons may be made with the cultivated soils of the same soil association. The importance of establishing reserves of virgin prairie where scientific investigations may be carried on with reference to problems concerning the native vegetation, floras, and faunas of the various prairie, climatic, and topographic districts throughout Iowa and to preserve for posterity the various typical landscapes, wild plants, and wildlife of the native prairies.
3. *Advantages accruing from large areas.* The larger areas of prairie should satisfy the requirements of a game preserve, the representation of one or more soil types in an association, and the inclusion of several types of vegetation in a region. Their illustrative value should be certified by inspection of the plant and the animal ecologist, the soil scientist, and the specialist of wildlife management. The large areas of a quarter section or more in size are scarce and should have first attention, although small areas in danger of destruction should be protected as well. For instance, a 40-acre area in Pocahontas County will be plowed in the fall of 1945. It should therefore, have early inspection and evaluation.
4. *The type specimen or living museum.* Areas of prairie on which papers have been published should have early consideration. Their significance is comparable to a museum, yet they are living specimens and may therefore be referred to as *type specimens.* They are of particular interest to scientific students and are visited for observation and extended study. Tracts based upon the researches of Weaver occur in the southwestern quarter of the state and areas studied by Shimek in the northwestern and eastern.
5. *Grouping of tracts according to their use.*
   Large tracts. Large tracts serve more purposes than small ones. The large tracts or a series of these scattered along a watercourse will not only provide a more ample range for wildlife, but they illustrate the sorting effect of varied topography on vegetative types and offer a better opportunity to observe the vegetative patterns, as well as the corresponding soil types.

   The integration of small tracts into larger areas. Several small tracts of prairie, separated by areas of cultivated land,

may be joined advantageously by the purchase of the intermediate land, thus completing the topographic unit and offer an opportunity to study revegetation problems.

CARE OF PRAIRIE PRESERVES

A plan for care and protection of prairie preserves should be formulated with reference to the following considerations: (1) preservation in natural state, and (2) a minimum of improvements should be made with the exception of an appropriate marker and fencing.

Small tracts. Small tracts of prairie from 10-100 acres in size will be sufficient to illustrate a soil type (See report of Riecken). An area as small as this might serve also to preserve the local flora. Even so small an acreage under protection could be of great value for educational purposes in so far as such areas would be accessible to local schools or county clubs for boys and girls as an example of the local flora which has through natural processes, insured the original fertility of Iowa soils.

SUPPLEMENTARY RECOMMENDATIONS

PRESERVATION OF UNDISTURBED LAND AREAS IN IOWA

FRANK F. RIECKEN

The preservation of some undisturbed land areas of Iowa is of distinct scientific educational and sentimental value to the soil scientist. The soils of Iowa are different because of: (1) climate, (2) biological factors, (3) parent material, (4) topography, (5) time. Man in his use of the soils of Iowa may have changed them little or greatly, depending on the kind of use that is made of the soil. Generally, it is true that the better our understanding of the formation of the different soils, the better we have been able to use our soils for their best suitability.

The biological factors influencing the development of Iowa soils have been chiefly vegetation, although bacteria, protozoa and nematodes as well as burrowing animals have aided in soil formation. The rich fertile Prairie soils have formed under grassland vegetation, and the Gray-Brown Podzolic soils have formed under forest types of vegetation. (See Soil Association Map)—Figure 1).

But no one factor alone will determine the kind of soil formed. The climatic factors influence the vegetation, and topographic factors likewise may influence the vegetation. The kind of "parent" or geological material is also very important. The "length or duration" of time that the soil has had to form (weather, oxidize and leach) will also determine the kind of soil formed.

Therefore in selecting areas for preservation of the soil in an undisturbed state the following factors should be considered:

(1) range of climatic conditions desired
(2) range of vegetative conditions desired
(3) range of topographic conditions desired
(4) range of parent material conditions desired
(5) degree of weathering of the soil conditions desired
(6) disturbance by man.

PROPOSED DISTRIBUTION OF AREAS TO BE PRESERVED

*1. *Northwestern Iowa*: This area should have the following qualifications: (1) soil should be derived from loess, (2) and on undulating topography. The area selected could be located in Cherokee, eastern Sioux County, western O'Brien, eastern Lyon or western Osceola County.

Soil Types: Marcus-Marshall association.

*2. *Far Western Iowa*: This area should have the following qualifications: (1) soil should be derived from deep, coarse loess (Monona-Ida-Hamburg soil area on Soil Association map) (2) it should occur on hilly to steep topography. The area could be located in western Plymouth, Woodbury, Monona, or Harrison Counties.

Soil Types: Ida-Monona association.

*3. *Southwestern Iowa*: This area should have the following qualifications: (1) it should have soils formed under grass vegetation, (2) it should be derived from loess, (3) the topography should be gently rolling.

Soil Types: Marshall.

4. (a) *North Central Iowa*: This area should have the following qualifications: (1) it should have soils formed under grass vegetation, (2) it should be derived from till of the Wisconsin glaciation, (3) it should have, if possible, both flat and rolling topography.

Soil Types: Clarion-Webster or Carrington-Clyde association.

(b) An area should also be selected in north central Iowa along one of the major rivers (Des Moines River) in which the soil has developed under forest vegetation on flat and rolling topography. Such area probably occur close to the park south of Boone, Iowa.
Soil Types: Ames.

*Prairie derivatives.

*5. *East Central Iowa*: This area should have the following qualifications: (1) it should have soils derived from moderately deep loess on gently undulating topography under grass vegetation.

Soil Types: Tama-Muscatine association.

6. *Northeastern Iowa*: This area should have the following qualifications: (1) it should have soils derived from deep loess under forest vegetation on gently rolling topography.

Soil Types: Fayette.

7. *Southeastern Iowa*: This area should have the following qualifications: (1) it should have soils derived from acid loess on undulating topography under forest vegetation.

Soil Types: Weller.

*8. *Southern Iowa*: This area should have the following qualifications: (1) it should have soils derived from acid loess over gumbotil on flat and undulating topography under grass vegetation. The area selected here should include the Shelby soils which have been derived from Kansan glacial till.

Soil Types: Edina, Seymour or Grundy, and Shelby.

*9. *Sand Dune Areas*: This area could be selected in any one of a number of counties. The vegetation should be grassland, the topography undulating to rolling.

Soil Types: Thurman, Buckner.

SIZE OF AREAS SELECTED:

The size of area need not be very large, probably from 10 to 100 acres would be adequate.

POTENTIAL USES OF THE AREAS:

The areas would be of much valuable use for scientific and educational purposes. In the teaching of soil classification and formation reference is continually made to the influence of the original vegetation on the formation of the soil. Since field trips are made, it would be valuable to have areas where the soils occur in their natural edaphic environment. From the scientific point of view, the soil under use by man could be compared with its properties under the natural condition. The value and importance of the undisturbed areas for scientific and educational purposes will undoubtedly increase with the years.

VALUES OF PRAIRIE PRESERVES TO WILD BIRDS AND MAMMALS

GEORGE O. HENDRICKSON

Prairie areas will be helpful to song and game birds. If the grass is harvested for hay late in summer, after nesting is over, the prairie areas may locally be of considerable value in seasons when results of early nesting on adjacent farms are poor. Then, depending on its location in the state, the late prairie grass may be utilized by

re-nesting pheasants or bob-whites. This will not measurably affect that year's harvestable surplus of game birds but it may measurably help a low seedstock when there is not a surplus for shooting, such as existed in 1936-38 in many counties.

In the unfavorable nesting years it will be helpful to have data on nesting success of grass and ground-nesting birds such as upland plover, dickcissel, meadow lark, horned lark, and bobolink that nest in prairie areas. For in unfavorable years with low game bird seedstocks and poor reproduction game bird nests are few, hard to find and the same is true of the broods. Then, the game bird reproduction data are difficult to gather and few. These few game bird data will be more meaningful when supported by general grass and ground bird nesting data.

Prairie areas with marshes may attract blue-winged teal and mallards for nesting. These few locally reared ducks will tend to decoy other early birds drifting in the state and thus improve early local shooting. Over a period of years Iowa as a whole is best off with an early waterfowl season utilizing "local puddle" ducks.

In three parts of the state—northwest, northeast, southeast—prairie chickens nest more or less irregularly. These nesting prairie chickens occasionally occur on areas of 10 or more adjoining sections of farmland on which three-fourths of the land is hay and permanent pasture. Prairie preserves within those areas should be helpful to prairie chickens. Because of the nature of the soil and poor drainage those areas will very probably continue as predominantly beef or dairy pasture areas for many years, although largely in private ownership. Better pasture usage in those areas, which is coming, will tend to encourage prairie chickens. Thus, we may sustain a remnant of the prairie chicken in the state.

The time may come when nutritional diseases may be evident in farm game, such as rickets in cottontails arising from impoverished soil. Then it will be helpful to have native prairie grass areas on which to obtain normal rabbits to yield bones as comparative standards with which to detect diseased samples. (Cottontails are predominantly natural grass eaters.) From such comparisons, aided by plant and soil analyses, recommendations can be formulated.

On native prairie areas normal rodent populations should occur. And with them one may expect normal predator numbers. Much investigation needs to be done on predator-prey relationships, particularly to learn the conditions under which the balance tips one way or the other—toward higher numbers of prey or of predators. These scattered undisturbed prairie areas may yield information enabling wildlife technicians to detect changes in fox, badger, and other fur-bearing predator populations more quickly than at present.

We read much about how numerous wildlife was before white man arrived, and it is customary for some conservation enthusiasts to hark back to those days. Yet no one has good figures on which to base his tirades against Conservation Commissions who are urged to restore the various forms of wildlife to aboriginal abundance.

What was this abundance in song birds? General wildlife population studies on native prairie and timber areas sponsored by Conservation Commissions would yield factual data for their own protection for the general good of wildlife management. Prairie preserves will supply data that may serve as measuring sticks for wildlife populations, we can tell, then, more nearly than now what we have accomplished.

DESCRIBED IOWA PRAIRIES

Classified according to Riecken
(See Soil Association Map)

The following classification of prairie tracts is made on a basis of: parent materials and their derived soils derived through the interaction of climatic factors, vegetation, topographic factors, and the length of time that the soil has had to form (weather, oxidize, and leach). The chief drift materials which occur in the soil types of Iowa include:

I. DRIFT PARENT MATERIAL—WISCONSIN—including Mankato and Iowan substages.

Late Wisconsin or Mankato substage

Soil type: Clarion-Webster association. (CW on soil map—Figure 1 and map of Wisconsin drift lobe—Figure 2).

The hilly morainal areas.

Of the known areas described in the survey, the sites in DICKINSON COUNTY represent the hilly morainal areas. (See map of Wisconsin drift lobe). Each includes a number of soil types (drift and terrace) and because of its rough and varied topography which modifies the water factor these prairies include a great variety of plants representing the Northern floras. Because of their diversified topography with resultant inequality of available water, several kinds of plant association occur. Upland short grass, slope and valley tallgrass, and kettlehole marshes, with their corresponding soil types and wildlife are found here. The prairie in EMMET COUNTY represents also the hilly moraine. These areas are utilized for pasture more commonly than for cultivation.

The flat ground moraine or till plain.

The relatively level prairie of POCAHONTAS COUNTY typical of the ground moraine, is a productive type of arable soil. However its uniformity of topography affords little variation in plant associations and less in variety of vegetation than the Dickinson prairies. It represents the flora of central prairies with its associated wildlife.

Early Wisconsin or Iowan Substage

Since the Iowan substage of the Wisconsin drift was laid down some thousands of years before the Mankato, more extensive leaching has occurred in the former than in the latter. The Iowan soils are prevailingly acid in comparison with the relatively alkaline soils of the Mankato substage. Although the more common native grasses occur in both areas, the char-

acteristic broad-leaved flowering herbs have a more restricted range, and thus the eastern half of Iowa has a flora which differs considerably from that of the western half in content of species.

Soil type: Carrington-Clyde association.
*Howard County
Cherokee County (in part)
Ida County (in part)
*state-owned O'Brien County (in part)

II. LOESS PARENT MATERIAL—Wind-laid interglacial deposits. The greater number of prairie soils—soils formed under grass—are derived from loess mixed in places with the underlying drift which has become exposed through geological erosion. They include the following soil types:

Soil type: Edina, Seymour or Grundy, and Shelby. (ESS)
No areas yet located.

Soil type: Ida-Monona-Hamburg association. (MIH (IM)
*Fremont County—Waubonsie
*Lyon County—Gitche Manito
*Sioux County—Oak Grove
*Woodbury County—Stone Park

Soil type: Marcus-Marshall association. (MM)
Cherokee County (Iowan drift in part)
O'Brien County (Iowan drift in part)

Soil type: Marshall (M)
Crawford County
Cass County
Ida County
Pottawattamie County

Soil type: Sharpsburg-Shelby-Tama (SST)
Carroll County
Guthrie County

Soil type: Tama (T)
No area located yet.

Soil type: Tama-Muscatine (TM)
Muscatine County

III. WATER AND WIND SORTED SAND FROM I & II

Soil type: Thurman-Buckner (TB)
Allamakee County
Louisa County
Muscatine County

Soil type: Lamoure-Wabash-Cass (LWC)

WISCONSIN DRIFT (MANKATO) PRAIRIES

CLARION-WEBSTER SOIL ASSOCIATION

Uses of Large Tracts.

The larger tracts of prairie persisting in Iowa occur in the late

Wisconsin area which covers parts of 29 counties and includes the topographic surfaces with *broad flat plains* as well as the more *rolling* to *steep* drift surfaces. The chief floras are represented by the *northern prairies* (including *fen*), the *central prairies,* and some aspects of beach and sand floras.

The soil types include the Clarion-Webster series.

The largest areas of prairie reported in this district range from a quarter to one section in size. They alternate with large pastured tracts. The geographic position, size, and proximity to pastured areas make them suitable for use as a Sanctuary Site Project for sharp-tailed grouse, prescribed by the Iowa Twenty-five Year Conservation Plan of 1933. (See pages 84 and 85 with map.)

Uses of small areas.

Small areas of prairie of 1-40 acres or less will preserve sites of soil types or special floras. Several small areas of 10 or 20 acres each but separted by rough, or even cultivated areas could advantageously be united to form a larger unit, thereby combining several kinds of topography and also affording an opportunity to observe revegetation processes.

LARGE TRACTS OF PRAIRIE IN DICKINSON COUNTY

Tracts of prairies suitable for a Sanctuary Site Project include parts of Sections 17, 28, 29, and 33 of Lakeville Township and Section 28 of Diamond Lake Township. (Figure 3). The most of these areas were recommended in the Shimek Plan of 1934. Some of the territory recommended in 1934 has now been reduced in value for a preserve by agricultural use.

TRACTS OF PRAIRIE NEAR EDUCATIONAL CENTERS

The consolidation of small areas.

In the vicinity of state-owned tracts west of Lake Okoboji lie several areas of typical true prairie including upland topography represented by rolling hills (See map of West Okoboji Lake, Lakeville Twp., Sec. 23) and also a tract of low prairie. Some cultivated land intervenes on rough gravelly soil. The consolidation of the described areas would preserve a unit valuable for study and research. It could advantageously be supplemented by access to the larger areas in Sections 33, 28, 29, or 17.

It is well known that teachers in both primary and secondary schools of Iowa and other states come here to work in connection with the Iowa Lakeside Laboratory. Belatedly, it is becoming recognized that the care and conservation of the soils of Iowa depends not exclusively on knowledge of the printed page, but on the dissemination of this knowledge among teachers who will in turn transmit it to school children and adult students. Only practice of the known facts and principles of conservation will save the natural resources of Iowa which have suffered depleting inroads because of ignorance of the relationships of vegetation and soil.

The areas referred to above are illustrated and described in the following pages:

Sites upon which papers have been published.

All of the above areas are sites where scientific papers have been published which increases their value as type specimens.

An incomplete list of references:

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DESCRIPTIONS

DICKINSON COUNTY

No. 1 FLOETE PRAIRIE. *Legal description*: Lakeville Twp. Sec. 23 W. *Area*: 20 acres. *Characteristics*: *Topography*: Wisconsin drift (Mankato). A chain of rolling hills separated by ravines. Soils: Clarion loam (rolling), Clarion fine sandy loam, Pierce fine sandy loam, Lamoure silty clay loam. *Flora*: True prairie. *History*: Virgin. Cut for hay. *Location*: One-half mile south of the Iowa Lakeside Laboratory at Miller's Bay on the west side of Lake Okoboji. *Aspect*: A picturesque example of prairie hills overlooking Lake Okoboji. Figures 1, 2, 3, and 4.

No. 2 *Legal description*: Lakeville Twp., W½ of Sec. 17. *Area*: 320 acres. *Characteristics*: *Topography*: Wisconsin drift (Mankato). High ridges and rolling hills intersected by intermittent drainageways connecting with ponds. *Soils*: Clarion loam, Clarion fine sandy

loam, and Lamoure silty clay loam. *Flora*: True prairie composed of midgrasses such as little bluestem and Stipa with some tall grass elements. Some members of the Plains Flora are present. *History*: Virgin. In excellent condition. Used for hayland. *Location*: Three miles west and one mile north of Lakeside Laboratory, Miller's Bay, Lake Okoboji. Lies close to the Little Sioux River from which it is separated by a pasture. *Aspect*: Commands a fine panorama of the aspect and surrounding hills of the Little Sioux valley. Figures 1, 2, 3, and 6.

No. 3 Legal description: Lakeville Twp. Sec. 29, NE¼ and SE¼ (200 A.) and Sec. 28, SW¼ (200 A.). *Area*: 400 acres. About 25 acres are unpastured prairie. *Characteristics*: *Topography*: Wisconsin drift (Mankato). Rolling morainal hills between which run spring-margined streams tributary to the Little Sioux River which winds through the prairie as well as wooded hills. Marshy lands and small oxbow cutoff ponds abound along the tortuous course of the Little Sioux. Willows at intervals occur along the streams among the hills. *Soils*: Clarion loam (rolling) and Pierce loam. Lamoure silty clay loam, Sioux loam and Fargo silt loam. *Flora*: The cover of true prairie has been reduced to shortgrass by grazing. Short blue stem, Indian grass and side oats grasses are the most conspicuous of the dominant grasses. Many native flowering herbs are present such as the Indian bread fruit (*Psoralea esculenta*). The flora is Prairie-Plains type. *History*: Has been pastured moderately for many years. If purchased and allowed to revert to native state it would afford an excellent opportunity for study of reversion in connection with pasture research. *Location*: Three miles west of Lakeside Laboratory, Lake Okoboji. *Aspect*: Affords a wide perspective up and down the valley of the Little Sioux. Figures 1, 2, 3 and 5.

No. 4 Legal description: Okoboji Twp., Sec. 4, N½; Lakeville Twp. Sec. 33, SW¼. *Area*: 320 acres. *Characteristics*: *Topography*: Wisconsin drift (Mankato). Some relatively flat upland prairie with shallow morainal ponds graduating into a series of ridges in the upland hollows of which exist one deep kettle hole pond. Along the flat floodplain of the Little Sioux are numerous small oxbow lakes, surrounded by marsh and wet meadow. The steep hills on the west side of the Little Sioux are forested. Both in the woodland and in grassland openings are characteristic fens of the climax prairie—(the hanging bogs of some literature). *History*: The flat grassland is true prairie in excellent condition and has been used as hayland. The morainal ridges with the kettlehole and the wooded hills with fens are now pastured. A considerable Prairie and Plains flora still exists however. *Location*: Two miles south and two miles west of the Lakeside Laboratory, Miller's Bay, Lake Okoboji. *Aspect*: Affords a fine prospect up the valley of the Little Sioux. An unusual variety of topography is evident and a great variety of flora including upland and lowland prairie, river, pond and marsh is displayed. Figures 1, 2, 3, 7, and 8.

No. 5 Shimek plan (see Shimek Report—an unpublished manuscript). *Legal descriptions*: *Topography*: A tract consisting of rough land including both upland and lowland prairie pond, kettlehole, ridges, river floodplain and forest lies along the valley of the Little Sioux and includes portions of Lakeville Twp. Secs. 17, 20, 21, 28, 33 and Okoboji Twp. Sec. 4. *Area*: 2½ sections—(indicated on map by black line bordering area.) *History*: A proposed plan for a national preserve. *Location*: Bordering the Little Sioux. *Aspect*: Picturesque morainal topography. Figures 1, 2, 3, 5, 6, 7, and 8.

No. 6 Legal description: Diamond Lake Twp., NW¼ Sec. 28. *Area*: 160 A. *Characteristics*: *Topography*: High-ridges and terrace-like hills, between which a stream densely bordered with willows winds through the grassland and emerges in a marshy land bordering the prairie. *Soils*: Clarion loam, Carrington loam, Lamoure silty clay loam. *Flora*: True Prairie and Plains flora. *History*: Virgin, cut for hay during 27 years. Formerly owned by Mr. Kuhn of Kansas City. Sold to a local farmer in spring of 1944 for $11,000. Forty acres of the highest upland were plowed in spring of 1944 and an additional acreage in October, 1944. *Location*: Lies close to the Little Sioux River from which it is separated by a pasture. One mile north and one mile west of Montgomery. Figures 1, 2, 3, 9, and 10.

EMMET COUNTY

No. 1: *Legal description*: Emmet Twp., W½, Sec. 28. *Area*: 314 acres. *Characteristics*: Wisconsin drift (Mankato). *Topography*: Rolling prairie with a stream running through the lowland; partly in the valley of the West Fork of the Des Moines River. *Soils*: Clarion loam (rolling). *Flora*: Mid grasses on the uplands and tall grass (blue stem) on the lowlands. Rich in flowering herbs such as the wild tiger lily, pasque flower, blazing stars, and many wild legumes. This is a good example of the western Iowa type of prairie, and should be preserved. It is not found east of Hancock County. *History*: *Location*: Four miles northwest of Estherville. *Aspect*: This site commands a distant view over the river valley of the West Fork of the Des Moines River. The contrasting high hills with the lower wet meadow and the sculptured adjoining stream channels affords a pleasing vista to the eye. *Note*: A number of rare plants grow in this vicinity in Sec. 28 and Sec. 22. A very notable fen covering about 10 acres occurs in a pasture east of the road bordering Sec. 21 north of the Des Moines River. For scientific study this area is valuable. Figures 1, 2, 3, and 11, 12.

No. 2: FOUR-MILE LAKE PRAIRIE. *Legal description*: Estherville Twp., Sec. 18. *Area*: 10 acres. *Characteristics*: Wisconsin drift (Mankato) *Topography*: Flat to sloping prairie—bordering a drainage way. Forms a ridge along one side of the lake. *Soils*: Webster silt loam and Webster silty clay loam. *Flora*: In this prairie there has been found a number of rare plants including the rare legume *Lespedeza leptostachya* and the nearly extinct orchid *Habenaria*

leucophaea. Location: Three miles west of Estherville, around Fourmile lake. *Aspect*: One of the typical walled, tree-bordered prairie lakes. Characteristic of northwest Iowa. Figures 1, 2, and 12.

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POCAHONTAS COUNTY

Of the prairies found in this county (see Iowa Survey of prairie tracts) the Kalsow prairie NE¼, Sec. 36, Bellville Twp., is most desirable.

No. 1. Legal description: Belleville Twp., NE¼ Sec. 36. *Area*: 160 acres. *Characteristics*: *Geology*: Wisconsin drift plain underlain by Iowa, Kansan, and Nebraskan drifts. *Topography*: Nearly flat with several shallow ponds near the southeast corner. This topography contrasts with the hills morainal aspects of the prairie bordering the Little Sioux in Dickinson County. *Soils*: Drift chiefly, Webster silty clay loam, with some Clarion loam and less of Pierce sandy loam. *Flora*: Tall grass prairie including blue stem Indian grass, and blazing star. The flora of central Iowa is represented but not the northern flora found in Dickinson County. *History*: Virgin. Cut for hay. *Location*: Four miles south and one and ½ mile east of Palmer. *Economic features*: This 160 acre scrap of prairie persisting in the broad flat drift plain of which the Pocahontas county, aspect of the Wisconsin, is a part, serves to show the pattern of soil, vegetation, and some small remnant of the shuttling wildlife which formerly occupied this area. This small sample however affords a clue to the wealth which made possible the prosperous farmsteads which surround this sample of the virgin prairie. Figures 2, 3, and 13.

No. B. *Legal description*: Roosevelt Twp., S½ of SE¼, Sec. 13. *Characteristics*: *Geology*: Level drift plain. Mankato phase Wisconsin Drift. *Topography*: Nearly flat with 5 or 6 shallow ponds. *Flora*: Tall grass central prairie, sun flowers, goldenrods, wild rose, rhomboid leaved buttercup, wild indigo and blazing star are common. *History*: Virgin. Cut for hay. *Location*: Two and one-half miles south and two miles west of Rolfe. Figures 1, 2, 3 and 14.

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WISCONSIN DRIFT (IOWAN) PRAIRIES

(See also Marcus-Marshall).

CARRINGTJN-CLYDE SOIL ASSOCIATION

HOWARD COUNTY

No. 1. LIME SPRINGS PRAIRIE. *Legal description*: NE¼ and NE¼ of SW¼ of Sec. 33, 100-13, and Chester Twp. NE¼ Sec. 23. *Area*: 199 acres. *Characteristics*: *Geology*: Iowan phase of Wisconsin drift. *Topography*: Gently rolling with drainageways which afford some types of wet meadow flora. Tall grass prairie. Tall blue stem *Andropogon furcatus* is dominant. *Soils*: Carrington silt loam and Floyd silt loam. *Flora*: Typical of northeastern Iowa. Birdfoot violet (*Viola pedata*) and shooting stars (*Dodecatheon Meadii*) are abundant in spring. In the gully aspect, blazing star (*Liatris pycnostachya*), smooth goldenrod (*Solidago glaberrima*), wild tiger lily (*Lilium michiganense*), Indian plantain (*Cacalia tuberosa*) and rattle snake master (*Eryngium yuccifolium*) are abundant. *Present Owners*: State of Iowa, Since 1945. *History*: Virgin. In excellent condition. The two areas of prairie join each other, corner to corner. *Location*: Thirteen miles west and five miles north of Cresco, 4 miles west of Lime Springs. *Aspect*: An impressive sweep of rolling prairie from which a vista of the surrounding country may be seen. A colorful, panorama of flowering plants occurs throughout the growing season. Figures 1, 3, and 15.

LOESS PARENT MATERIAL

MARCUS-MARSHALL SOIL ASSOCIATION

CHEROKEE COUNTY

No. 1: PILOT ROCK PRAIRIE. *Legal description*: Pilot Rock Twp., Sec. 15 and 22. *Area*: About 160 A. *Characteristics*: *Geology*: Wisconsin drift (Mankato). *Topography*: Rolling prairie hills separated by ravines. On top of the main hill is a large glacial boulder (Sioux quartzite) 52x36 feet in size. *Soils*: Carrington loam, Clarion loam (steep), Lakeville sandy loam. *Flora*: Midgrass *virgin prairie* in area near Pilot Rock. On the once cultivated area on the sloping sandy soil between the west side of highway 59 and the Little Sioux

River, a handsome display of the large flowered Pentstemon has been seen. Across the road from the Pilot Rock area on a gravelly hill are representatives of the western plains flora. *History*: There are many virgin areas in this vicinity. Others are grazed but reclaimable. Pilot Rock is an old landmark. The old trail now nearly worn away, but still evident, passed over the moraine some 800 feet nearer the river. The gravel beds and hills of the region are rich in Indian Mounds and villages. They have also furnished some interesting mammals. In one of the gravel pits of the Illinois Central Railroad there was found a tusk 9 feet long and a beaver jaw. A mastodon tooth was found 40 feet below the surface of the pit at the water table. Some of these beds should be kept for scientific purposes. *Aspect*: The topography and appearance of the vegetation is striking. The fauna and flora include plains species. There is a distinctly western atmosphere. Each new horizon holds the element of surprise. Figures 1, 3, 16, and 17.

No. 2: *Legal description*: Cedar Twp. Sec. 16, N½ (N½-16-93-40). *Area*: 320 acres. *Characteristics*: Wisconsin drift (Mankato). *Topography*: Almost level, slightly rolling with shallow drainageways. *Soils*: Marshall silt loam (loess) and often silty claim loam. *Flora*: A fine example of true prairie. A rich flora in excellent coodition exists here. In midsummer an abundance of blazing stars (Liatris) of several species were in bloom. *Aspect*: It is a very colorful example of a rare and vanishing flora. It is on ideal tract for a scientific preserve. Figure 1, 3, and 18.

O'BRIEN COUNTY

No. 1. Legal description: Waterman Twp., Sec. 34, S½. *Area*: 320 acres, grazed. *Characteristics*: *Geology*: Wisconsin drift (Iowan), with some loess mantle. *Topography*: Rippling chains of hils terminate a tableland in the depressions of which are upland ponds. The bench-like terraces which overlook the serpentine course of the forested floodplain of the Little Sioux are the site of an Indian village. *Soils*: Clarion silt loam, Marshall silt loam (flat). *Flora*S True prairie. Has been pastured. Some short-grass prairie is present. *History*: This area has been pastured for 25 or more years. A considerable stand of native grasses and herbaceous flowering plants are present. It would recover and serve as a laboratory for reversion studies in grazing. *Historic significance*: On this site is the cave where "Old Fred" lived and imported mules for the early settlers. The Waterman homestead is visible from the highest points. *Location*: Five miles southeast of Sutherland. *Aspect*: This tract is notably picturesque, affording a magnificent view of the country within the valley and on both sides of the Little Sioux. Upland prairie of western type, morainal ponds with aquatic flora, river, floodplain, and forest vary the landscape. Every elevation brings a different vista. Figures 1, 3, and 19.

No. 2. Legal description: Waterman Twp., NW and SW¼ of Sec.

33. *Area*: 400 acres. Grazed. *Characteristics*: *Geology*: Wisconsin drift (Iowan). *Topography*: The flat upland prairie terminates in chains of terraced hills dissected by Dog Creek, a tributary of the Little Sioux. Its valley supports a fringe of trees. *Soils*: Clarion loam (loess) and Lamoure loam. *Flora*: Short grass prairie and mid grass prairie occupy the hills which have been slightly grazed. *History*: Has been pastured for a long period of time. Vegetation is in good condition. Would rapidly recover. Good area for pasture range reversion study. *Aspect*: Very picturesque. (See illustration). Figures 1, 3 and 20.

No. 3. Legal description: Waterman Twp. Sec. 27. *Area*: 40 acres. Virgin. *Characteristics*: *Geology*: Wisconsin drift (Iowan). *Topography*: A chain of hills bordering the gravel highway intersecting with Highway 10. *Soils*: Clarion loam (steep phase). *Flora*: A good example of midgrass virgin prairie. *History*: Mostly virgin—some lightly grazed. Excellent condition. *Location*: About 5 miles south-east of Sutherland. *Aspect*: This chain of hills terminating the tableland farther west is a very impressive vista to the westward traveler on Highway 10 as he passes through the valley of the Little Sioux or follows the County Highway which lies at its base. Figures 1, 3, and 21.

No. 4. Legal description: Waterman Twp., Sec. 24. *Area*: Approximately 40 acres. Mostly grazed. *Characteristics*: *Geology*: Wisconsin drift (Iowan). *Topography*: A chain of morainal hills overlooking the valley of Henry Creek, where notable erosion topography is to be seen. *Soils*: Clarion loam (steep). *Flora*: Midgrass and short grass prairie. Prairie and plains flora. Some of the floodplains of Henry Creek and the hills on its opposite side should be included. A colony of cedars is notable on these hills. *History*: Lightly grazed. Some prairie occurs on a mound across the road. *Aspects*: A picturesque region in the valley of Henry Creek—notable for the erosion topography and the cedar dotted hills. Figures 1, 3 and 21.

No. 5. Legal description: Waterman Twp., Sec. 11 and Sec. 2. *Characteristics*: *Geology*: Wisconsin (Iowan). *Topography*: Chains of morainal cedar-covered, grazed hills along the road which runs through Sec. 11 and a strip of prairie at the junction of Sec. 2 (Near the Indian Village owned by the State of Iowa). These areas with forested hills bordering Waterman Creek in the vicinity of the Indian Village would be a desirable accession. The notable erosion topography is described by Thomas Macbride in The Geology of O'Brien Co. *Soils*: Clarion loam (steep), Clarion fine sandy loam (loess), Lamoure silty clay loam and Lamoure Loam. *Flora*: Short grass and midgrass prairie, river and forest flora. A wild flower preserve is owned by the Brady family near Waterman Creek, at the end of the road which runs through Sec. 11. *Location*: Four miles east of Sutherland. *Aspect*: This territory furnishes a marked variety of picturesque country including forested and prairie hills and rivers. As well as the site of an Indian Village. Figures 1, 3, and 21.

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MARSHALL SOIL TYPE

CRAWFORD COUNTY

No. 1. Legal description: NW¼, NE¼ Sectioon 7, East Boyer Twp. *Area*: 25 acres. *Location*: About one mile northeast of Denison on the north side of Highway 30. *Characteristics*: *Geology*: Nebraskan and Kansan drift underly the loess deposits. The underlying rocks at no point reach the surface. *Soils*: Some of the bottomland soils consist of mixtures of loess and glacial drift but much of the alluvium is washed down from the loess uplands. The Carrington loam is the only soil type formed from the Kansan till. The upland soil of this prairie consists of Marshall silt loam of loessial origin and on the lowlands bordering the Boyer River occurs Wabash silt loam and *Wabash silty clay loam. Flora*: Representatives of plains flora, the central prairies, and southern prairies occur here, among the mid grasses of the uplands and the tall grasses of the lowlands. *History*: Virgin. In excellent condition. Cut for hay. This is one of the prairies reported by J. E. Weaver and is the basis of some of his grassland studies on the proper use of prairie as a basis for agriculture. *Note*: Other small prairie areas of 6-19 acres are known in Crawford County. (The entire List in Prairie Survey is not here included.) Several have been sites for the researches of J. E. Weaver. Figures 1, 3, and 22.

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IDA COUNTY

No. 1. Legal description: S½ SW¼ Section 33, Battle Creek Twp. *Area*: 60 acres. *Location*: Four miles northwest on Highway 59 and six miles west of Iowa Grove. *Characteristics*: *Geology*: Three ice sheets, the Nebraskan, Kansan and Wisconsin (Iowan) invaded Ida County, but their deposits are covered by the wind-blown loess except where the dissection by streams reveals the glacial drift. *Topography*: tion map, figure 1). *Characteristics*: *Geology*: Three ice sheets, the Nebraskan, Kansan and Wisconsin (Iowan) invaded Ida County, but their deposits are covered by the wind-blown loess except where The surface contour of Ida County is a rolling loess-covered plain, dissected by a network of stream valleys. Section 13 of Battle Creek Twp. is characterized by a series of strongly rolling bands of hills. The maximum range in elevation is 218 feet. *Soils*: The soils represented include Clarion loam, level and steep, Wabash silt loam, and Wabash Judson silt loam. *Flora*: The grassland consists of true prairie, predominantely tall grass. Floras of the central prairie mingle with western plains flora. In June, the loco-weed, *Oxytropis lamberti,* was conspicuous on the hilltops among needle grass (*Stipa spartea*) and masquite grass (*Beouteloua Curtipendula*). Red Sweet William *Phlox pilosa* were abundant on the slopes among the Blue stem grasses (Andropogon). In July, the hills in mid-season aspect were colorful with blazing stars. Eryngium, prairie clovers, lead plant, Coreopsis, compass plant, and flowering spurge. *History*: Virgin. In excellent condition. Cut for hay. It is the last of the prairies of any size in Ida County. It was the site of monographic studies on prairie by Dr. J. E. Weaver. *Aspect*: The highest elevation in Ida County is 1,443 feet, the lowest recorded elevation in the uplands is 1,347 feet at Battle Creek with lower elevations occurring in the valleys of the streams. Long vistas of rolling hills and valleys meet the eye. Burr oak grows along fencerows and in untilled fields in patches on the hills. This tree in dwarf form forms a hedge around the south and west side of the area and occurs in patches in the prairie which is mowed each year. The colorful, many-hued panorama of floral succession is here well displayed. Figures 1, 3, and 23.

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POTTAWATTAMIE COUNTY

No. 1. Legal description: N½, SE¼, Section 21, Washington Twp. *Area*: 20 acres. *Location*: Nine miles southwest of Oakland, on Highways 92 and 6; and ½ mile south of a schoolhouse. Opposite Fairview Church. *Characteristics*: *Geology*: The chief glacial deposits which enter into the soils of the county are those of the Kansan period. The loess deposits are a prominent feature in this county. *Soils*: Seventy-two percent of the soils of the county are of loessial derivation. About three percent include drift materials and about twenty-four percent are of alluvial composition. Marshall silt loam and a small area of Wabash silt loam are represented in this tract. *Topography*: The topography of the center of the county is that of a gently undulating loess plain. The area under discussion is drained by a terminal tributary of Middle Silver Creek. The uniformity of this area contrasts with the notable bluff topography bordering the alluvial plains in the western part of the county. The vegetations of the loess bluffs and of the alluvial flood plains are also distinctive from each other and from that of the central part of the county. *Flora*: It represents a mingling of the prairie floras of the *central* and *southern prairies* with some representatives of the plains flora. For example the leguminous plant, Illinois tick-trefoil (*Desmodium illinoensis*) and the iron weed (*Vernonia interior*) are plants of southwestern Iowa more widely and abundantly found in Kansas and Texas and may therefore be regarded as climatic indicators as well as having significant correlations with soil types. *History*: In excellent state of preservation. Cut for hay. It is the basis for the researches of Dr. J. E. Weaver on the relation of prairie soils to prairie vegetation with reference to agricultural prac-

tices. *Note*: Several other small areas of prairie are known for this county. (See survey). *The 40 acre tract near Oakland* which was studied by Weaver *has been plowed.* There is an 80 acre tract in SW¼ Section 29, Neola Twp. Figures 1, 3, and 24.

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SHARPSBURG-SHELBY-TAMA SOIL TYPES

GUTHRIE COUNTY

No. 7. Legal descriptions NW¼ Sec. 22, Seeley Twp. *Area*: 20 acres; formerly 120 acres. *Location*: Six and one-half miles northwest of Guthrie Center. *Characteristics*: *Geology*: The two glaciations which affect the composition of soils of Guthrie County are the Kansan and Wisconsin (Mankato). The Kansan is more or less covered with loess. *Soils*: The soil types occurring in this area include Shelby loam with perhaps some Tama silt loam. This tract in Seeley Twp. lies in the Kansan drift section of the county. *Topography*: The Middle Raccoon River marks the dividing line between the characteristic surface of the Wisconsin drift plain with its smooth rounded swells or elongated ridges between which are marshy areas, small ponds and shallow lakes. Southwest of the Middle Raccoon River, where the older eroded Kansan drift is overlaid by the more recent loess deposits, the topography is different. Here erosion has been active. The entire area has been thoroughly dissected by streams. The

larger rivers and creeks have well-developed tributaries fed by smaller streams, which provide an adequate drainage system over the Kansan area. The slopes are steep or abrupt near the longer streams and more gentle along the smaller rivers and tributaries. The topography of the area varies from undulating to strongly rolling and even rough to steep. *Flora*: The geographic location permits a floral composition of the older mingled central prairie and southern prairie floras, with some western plants, and even species typical of the more recent Wisconsin drift. *History*: Virgin. Cut for hay. It was here that observations were made by Weaver from time to time. He recommended this area as a representative piece of prairie for the region. It consisted of 120 acres when studied by Weaver. *Economic Considerations*: The borderline between the two type areas of different glacial origin is of interest biologically from the standpoint of mingling floras and faunas adapted to contrasting environments. Such biological studies have indicator value with reference to the geographic placement and culture of the surrounding economic crops. The native plants serve as indicator plants for land use. Figures 1, 3, and 25.

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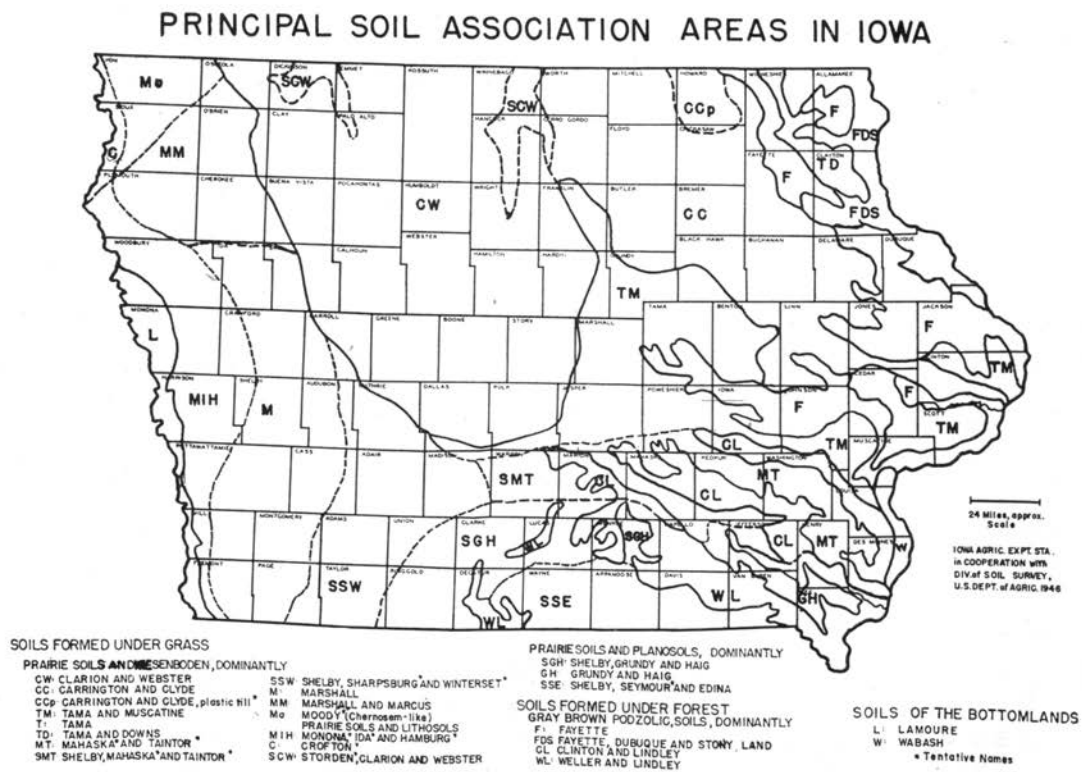

Figure 1. The soils formed under prairie vegetation (grassland), including (1) Prairie soils, (2) Wiesenboden, (3) Planosols, and (4) Alluvial soils. (Map by F. F. Riecken, Agronomy Section, Iowa Agricultural Experiment Station, 1946.)

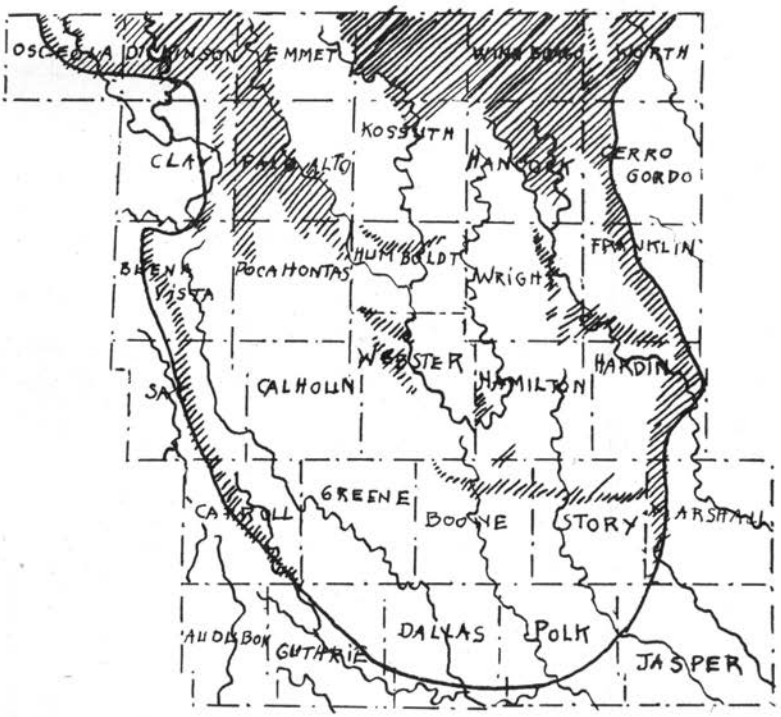

Figure 2. Map of the Wisconsin drift lobe in Iowa showing hilly morainal areas. Compiled from sources published in volumes of the Iowa Geological Survey. (Iowa Geol. Surv. 34:59. 1929.)

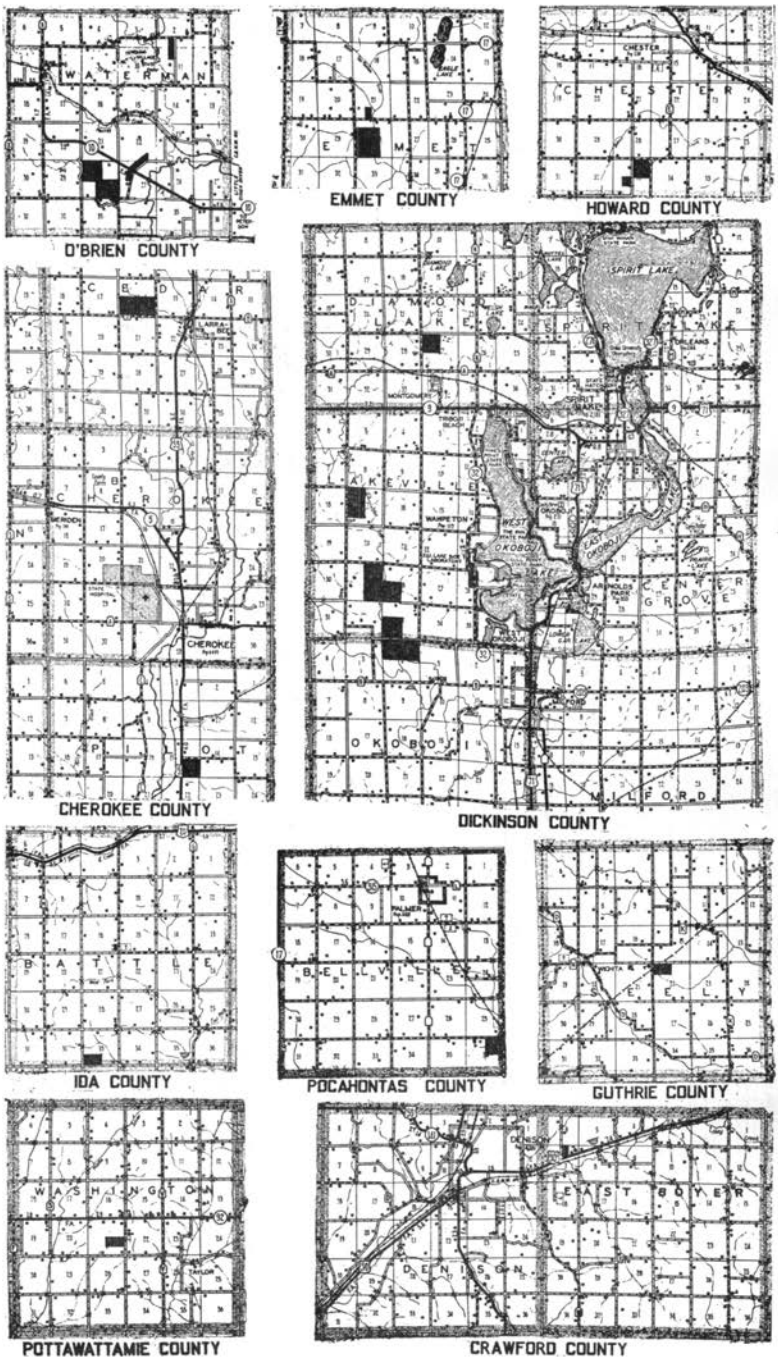

Figure 3. Location of prairie tracts on County maps of Iowa. (Maps prepared by the Iowa State Highway Commission in co-operation with the U. S. Department of Agriculture, Bureau of Public Roads. Data obtained from the State-wide Highway Planning Survey.)

Figure 4. The Floete Prairie. Rolling hills in upland prairie. Dickinson No. 1.

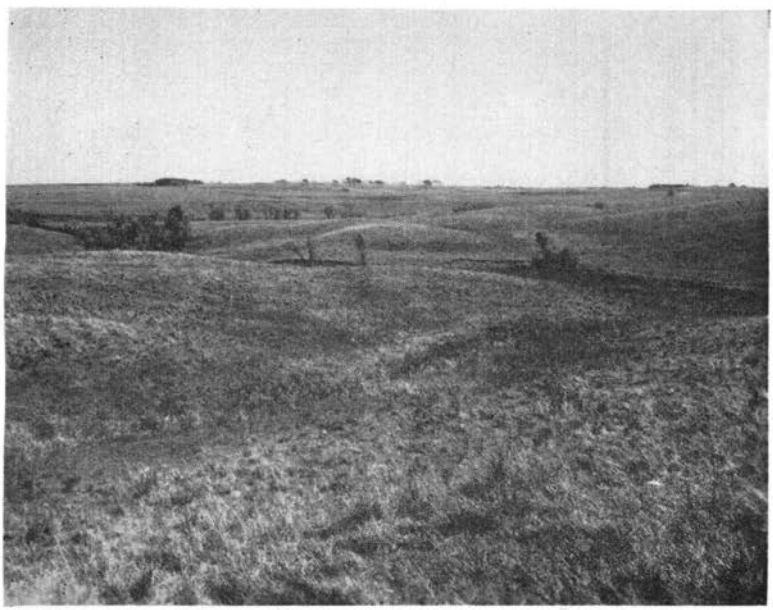

Figure 5. Overlooking an area of moderately pastured, rolling upland Prairie. Dickinson No. 2.

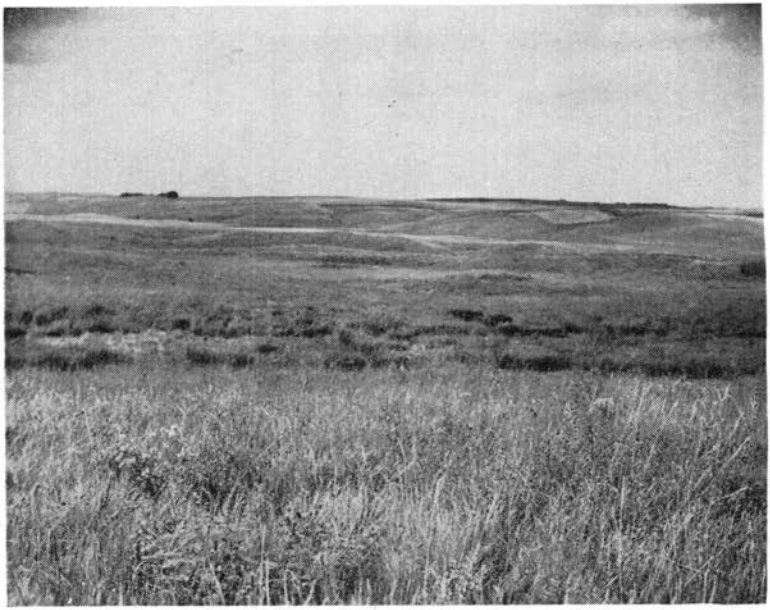

Figure 6. Rolling hills and valleys bordering the Little Sioux River, where various plant associations and soil types occur in the diversified topography afforded by the hilly morainal country. Dickinson No. 3.

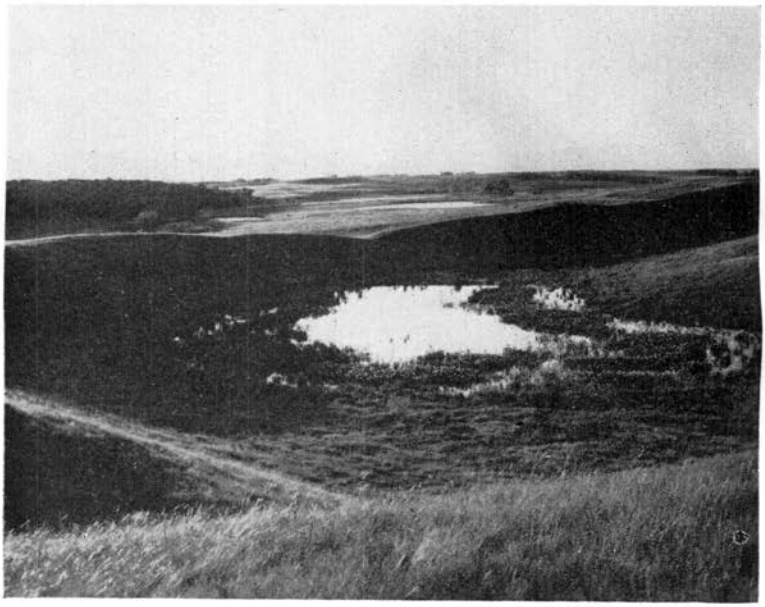

Figure 7. Aquatic vegetation of a kettlehole pond surrounded by hilltop and slope vegetation. Little Sioux River in distance. Dickinson No. 4.

Figure 8. Waterfowl food plants abound in the marshes and ponds bordering the Little Sioux. Dickinson No. 3.

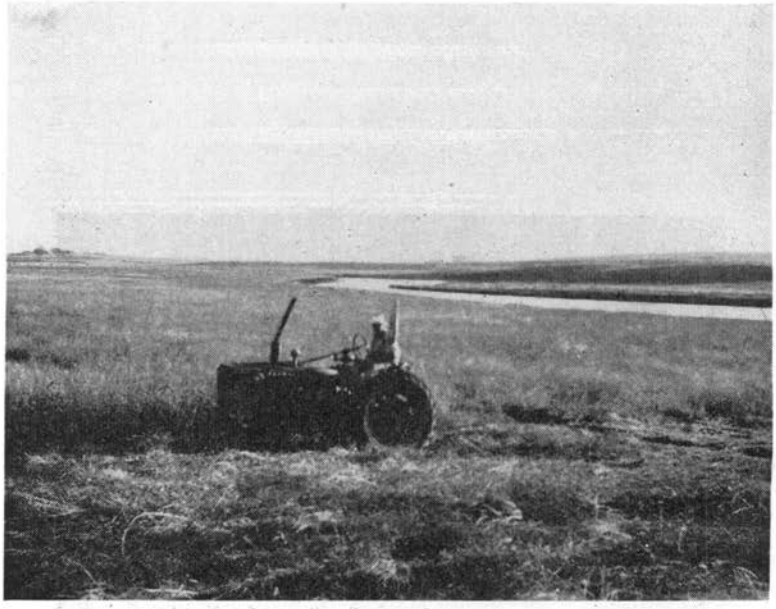

Figure 9. Haying on the morainal hills bordering the Little Sioux River. Dickinson No. 6.

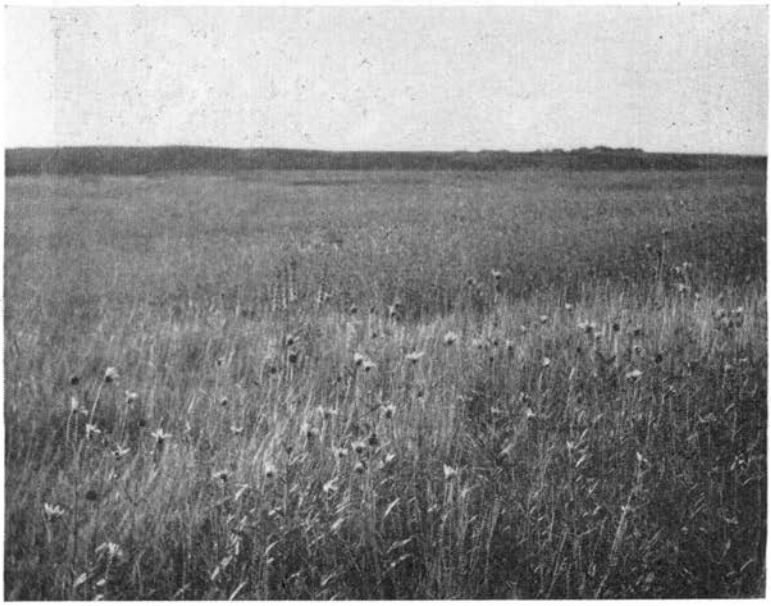

Figure 10. Terrace prairie bordering the Little Sioux River. Dickinson No. 6.

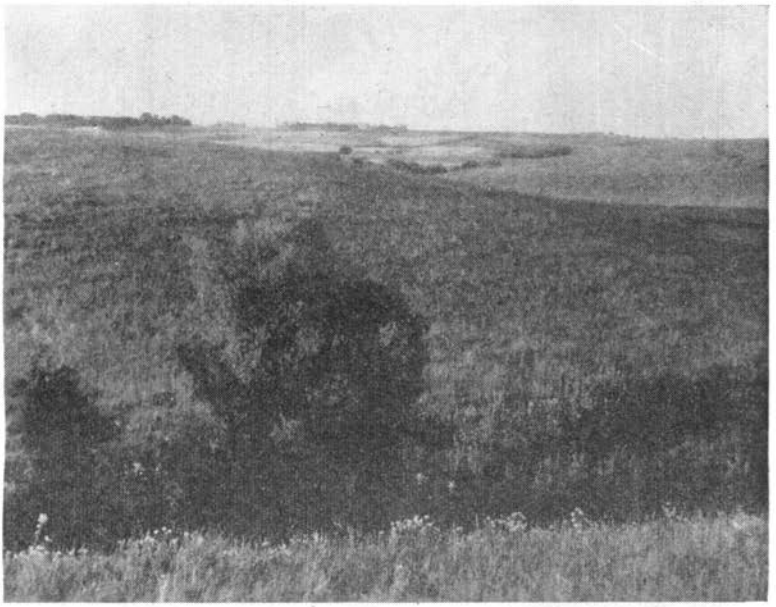

Figure 11. Upland rolling prairie which borders a lowland valley. The Des Moines River in the distance. Emmet No. 1.

Figure 12. The prairie fringed Orchid. (*Habenaria leucophaea*). Emmet No. 2.

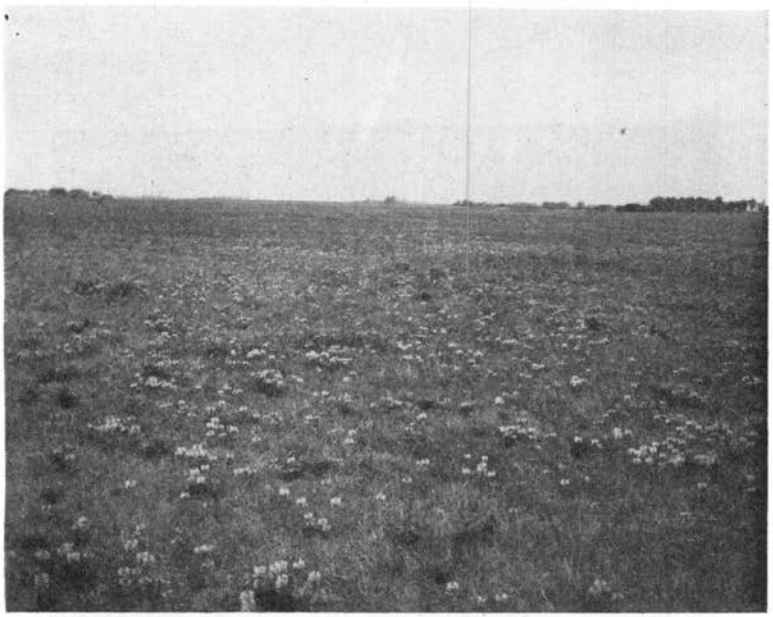

Figure 13. The broad, flat drift plain in the spring aspect. Betony in the foreground. Pocahontas No. 1.

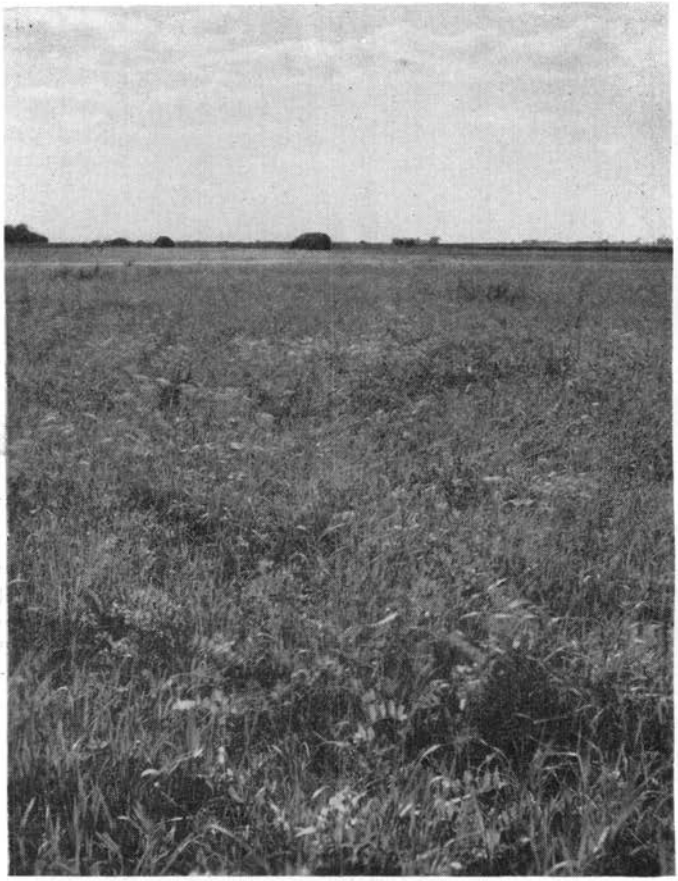

Figure 14. The level aspect of a Wisconsin till plain. Pocahontas No. 2.

Figure 15. A typical upland meadow in July 1943. In mid-season the conspicuous plants are wide-spread throughout Iowa. In the foreground are the blazing stars, Culver's root and button snake-root.

Figure 16. Pilot Rock, a Sioux-quartzite boulder, which served as landmark to the early traveler. Cherokee No. 1.

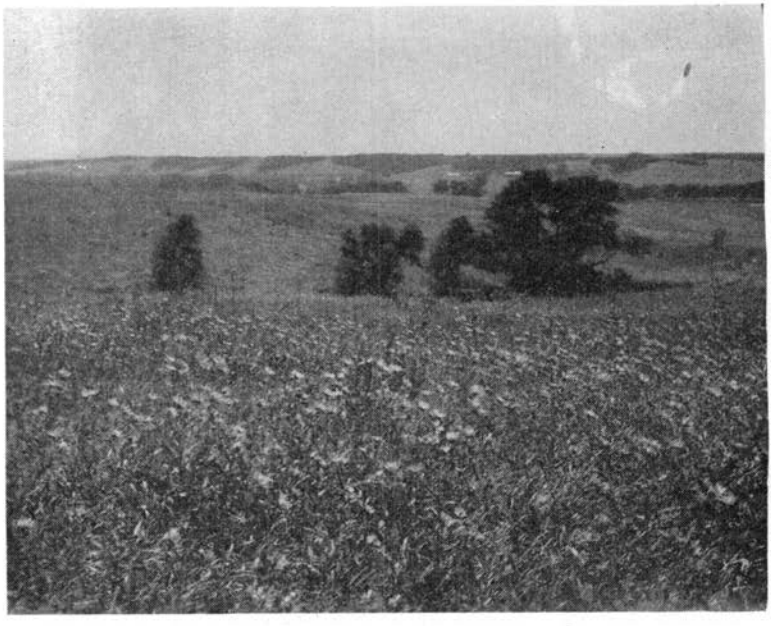

Figure 17. Pilot Rock prairie, four miles south of Cherokee. Cherokee No. 1.

Figure 18. Indian plantain in July. Cherokee No. 2.

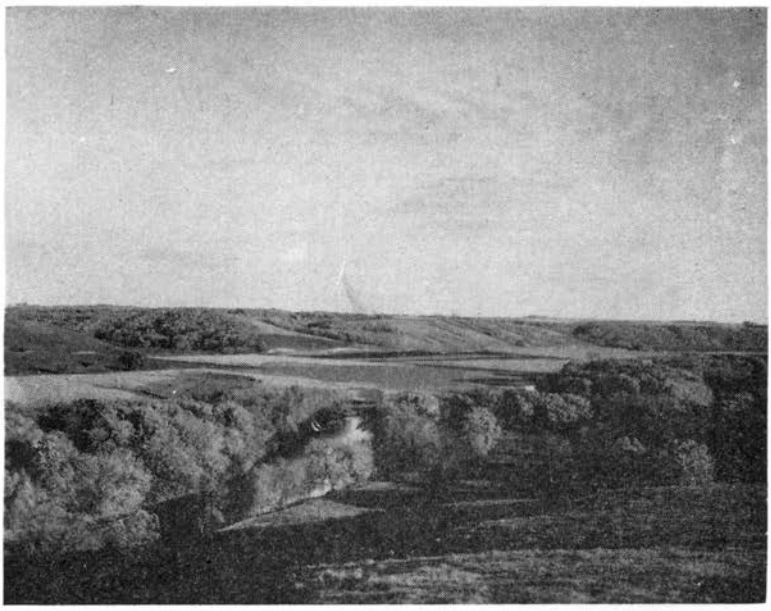

Figure 19. An upland, moderately grazed, prairie pasture overlooking the Little Sioux Valley and wooded floodplain. O'Brien No. 1.

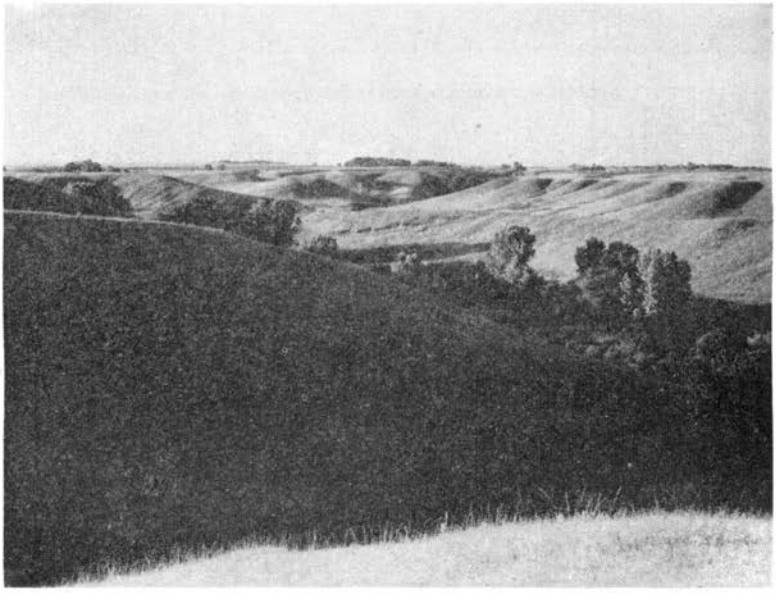

Figure 20. A lightly grazed ranch in which the bluestem grassland has been reduced to the short grass type. O'Brien No. 2.

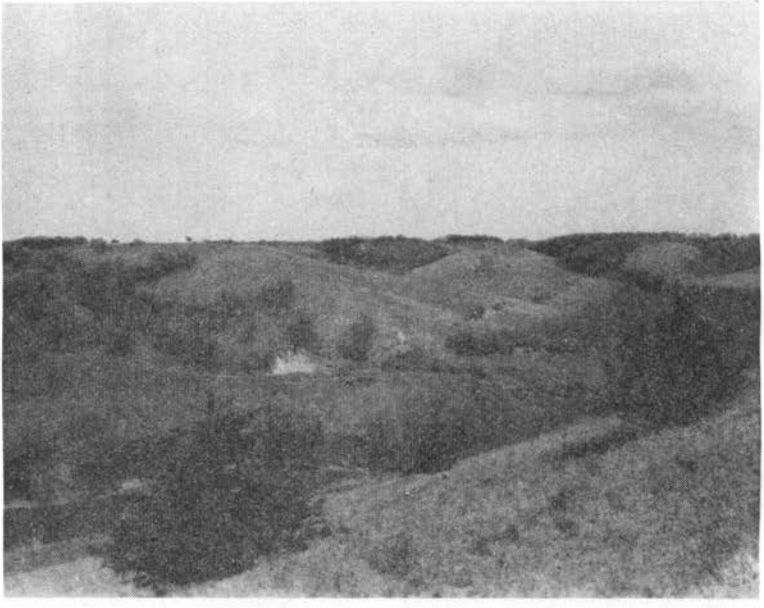

Figure 21. Cedar-dotted hills in prairie bordering Waterman Creek. O'Brien Nos. 4 and 5.

Figure 22. Rolling prairie topography two miles east of Denison. Flowering spurge in the foreground. Crawford No. 1.

Figure 23. Prairie in the Marshall soil topography in June. Locoweed in the foreground. Bur oak hedge in the fencerow. Ida No. 1.

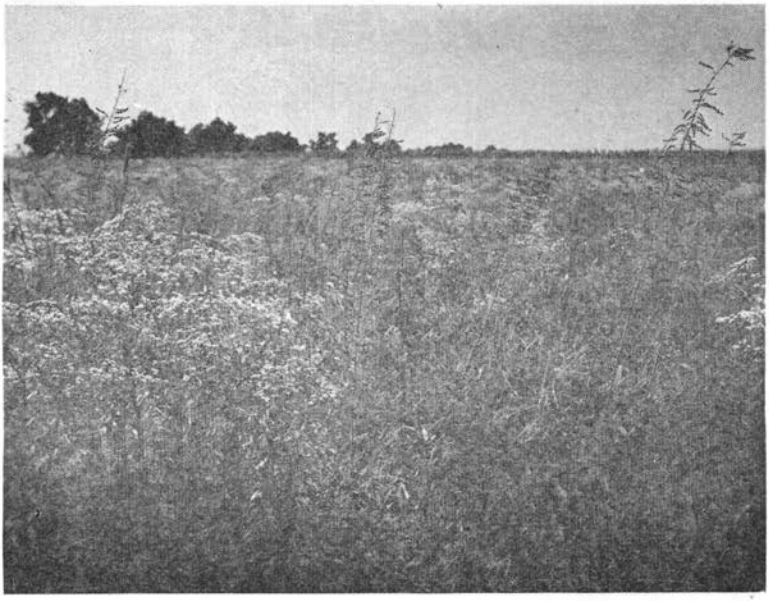

Figure 24. Illinois trefoil (*Desmodium illinoense*) and flowering spurge (*Euphorbia corollata*) topping the dense growth of tallgrass. Pottawattamie No. 1.

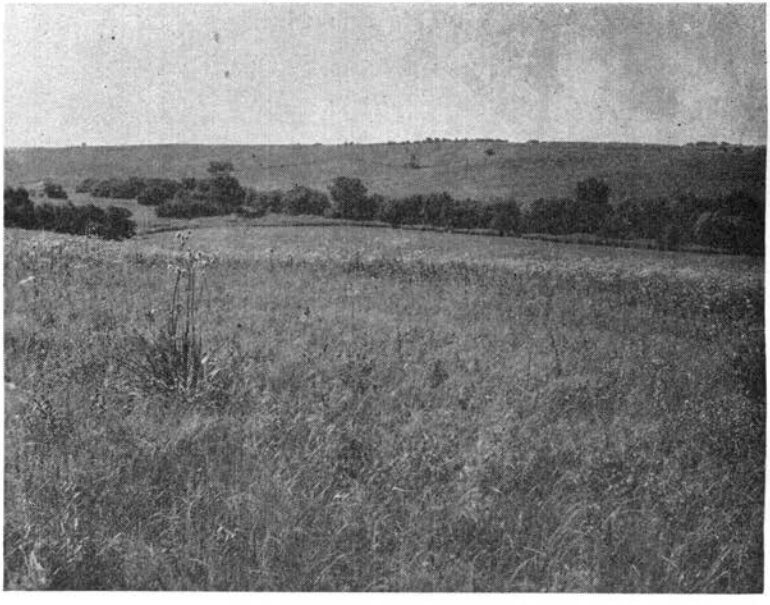

Figure 25. Upland prairie topography in the Marshall soil district. Flowering spurge, blazing star and rattlesnake master are conspicuous among the bluestem grasses. Guthrie No. 1.