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A black-soil prairie station in northeastern Illinois

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(WITH SEVEN TEXT FIGURES)

The prairie station described in this account is an example of perhaps the most luxuriant type of prairie, the mesophytic prairie-grass of the eastern border of the prairie region. This type is particularly well developed in the upper Wisconsin glaciation of northeastern Illinois, and until recently small and scattered areas of this type of prairie were still abundant west of Chicago as far as the Fox River and beyond. In the last ten years, however, the extension and development of suburban areas, and disturbance of relic colonies of prairie along railroad rights-of-way, have diminished the areas of original prairie to a small fraction of their recent extent. The particular area described possibly owes its survival to the fact that it is not large, and that it is nearly surrounded by forest and by prairie sloughs.

The station lies immediately north of the tracks of the Chicago Great Western railroad, very near the stopping-place of the Aurora, Elgin, and Chicago electric road known as Stratford Hills. It is one mile east of Elmhurst, and lies at the summit of a morainal ridge. The boundary separating Cook and Du Page counties passes through the area, which may conveniently be known as the county line prairie. The forest adjoining is also of interest to botanists, and the border zone between prairie and forest is still in good condition. The writer first visited the locality in 1905, and has made observations there and near by during four summers since that time. He wishes to express obligation to

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Dr. H. A. Gleason, who has accompanied him to the area, for the use of some of his notes. The accompanying sketch map shows very well the local distribution of the plant associations of the immediate vicinity. The length of the area mapped is about 600 feet. Just south of it is the Great Western railroad; to the east lies a blue-grass pasture and a picnic ground, with many of the original trees, but with the ground cover replaced by blue-grass; on the west the clover field continues; on the north the clover field, with its line of prairie sloughs, and the forest, continue also.

Local distribution of the plant associations of the county line station would be of little significance of itself, but there is one condition which this area has in common with others in northern and central Illinois: the forest is to the east of a line of sloughs, which may have served to protect it from the inroads of prairie fires. In this region forest areas are much more frequent and more extensive just east of streams and sloughs than just on the western side. Prairie fires, in former times very prevalent, traveled generally from west to east, in the direction of the prevailing winds. The bearing of these facts on vegetational history in the transition area between interior prairie and eastern forest regions has been developed by Gleason.* At the county line station, the narrow strip of prairie which separates the forest area mapped into a woodland on the north and several small groves on the south, may have invaded the formerly more extensive forest by the aid of prairie fires which were not stopped by the line of sloughs. It is seen on the map that the tongue of prairie extending into the forest is in line with the conspicuous gap in the series of prairie sloughs.

Established black-soil prairie of the eastern part of the prairie region, in its original condition, may be thought of as a luxuriant grassland with a large number of plant species and with very many local appearances, caused by local dominance or abundance of one or several species. The surface is usually slightly undulating, and in the recently glaciated areas stream development is poor, so that depressions have very wet or submerged soil, and elevations may at times be very dry. The local variation in soil

* Gleason, H. A. An isolated prairie grove and its phytogeographical significance. Bot. Gaz. **53**: 38–49. *f. 1, 2.* 1912.

moisure therefore is rapid, though gradual. The species composition of the prairie growth changes with the soil moisture, and a complete transitional series of prairie growths can be recognized.

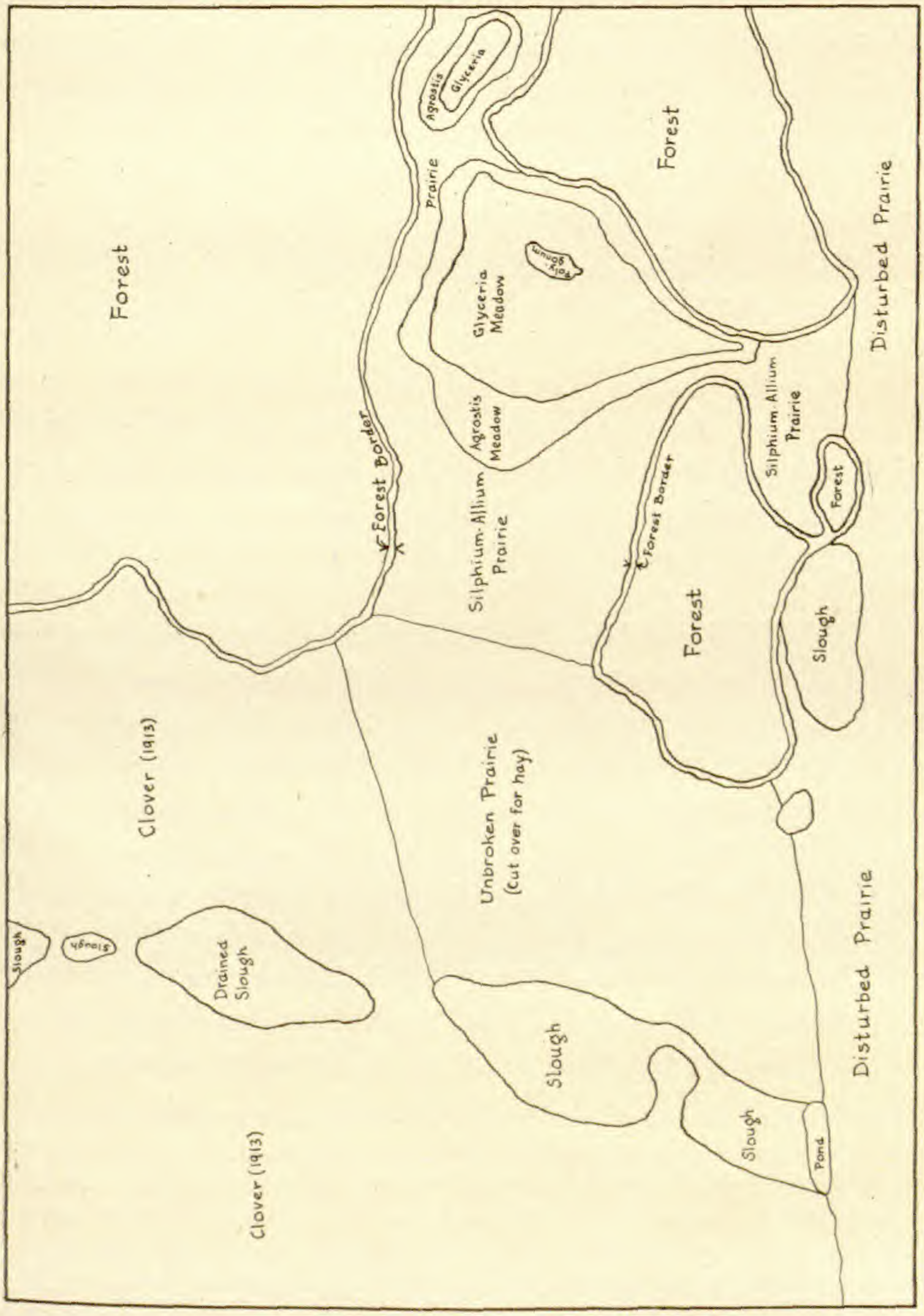

FIG. 1. Map of the county line station.

It will perhaps be helpful to regard the mean and the two extreme conditions of this series as constituting distinct plant associations, which may be called (1) xerophytic prairie-grass, (2) mesophytic

prairie-grass, and (3) hydrophytic or swamp prairie, or fen. It should be noted that these intergrade, passing into one another gradually, instead of alternating sharply, and that many species tolerate a wide range of soil moisture and of other environmental conditions, so that some species are found abundantly in more than one association. Some species, too, reach greatest abundance in transitional growths intermediate between two associations.

The xerophytic prairie-grass association.—This growth is not very extensively developed in upper Wisconsin glaciation of northeastern Illinois. Its best representative is the *Silphium laciniatum* consocies. The dominant species, often called the compass-plant, is very conspicuous. This type of prairie is rather locally seen in eastern Du Page County, and is hardly at all represented at the county line. Following is a list of species typical not only of the *Silphium laciniatum* prairie, but of the xerophytic prairie-grass association in general, as represented in eastern Du Page County.

*SPECIES TYPICAL OF XEROPHYTIC PRAIRIE-GRASS

d or ld *Andropogon scoparius*, ch	i *Verbena stricta*
l *Andropogon furcatus*, m	l *Physalis virginiana*
l *Sorghastrum nutans*, m	l *Liatris scariosa*
l *Panicum virgatum*	lf *Solidago nemoralis*
l *Stipa spartea*	f *Solidago canadensis*
l *Sporobolus heterolepis*, m	lf *Solidago serotina*
f *Koeleria cristata*	lf *Solidago rigida*, ch
l *Comandra umbellata* ,	i *Aster sericeus*
f *Rosa humilis*	f *Aster multiflorus*, ch
l *Cassia Chamaecrista*	i *Erigeron ramosus*

* Notation as used in the above table of species, and in other tables of this article, is as follows: symbols to the left of the species name have to do with frequence or abundance of the species in the station or in the association; d = dominant, a = abundant, f = frequent, i = infrequent, l = local, of scattered distribution, or prefixed = locally; symbols to the right of the name have to do with the degree to which the species is characteristic of this or of other associations and habitats; ch = a character species for the association or habitat; m = rather more typical of, or frequent in, comparatively mesophytic situations; x = rather more typical of comparatively xerophytic situations, or a relic from xerophytic prairie; h = rather more typical of, or a relic from, comparatively hydrophytic communities, or in very local depressions within mesophytic prairie growths.

l *Baptisia bracteata*
f *Amorpha canescens*, ch
f *Petalostemum purpureum*
l *Tephrosia virginiana*
i *Desmodium illinoense*
lf *Lespedeza capitata*
f, la *Euphorbia corollata*, ch
i *Oenothera biennis*
i *Asclepias tuberosa*
l *Asclepias verticillata*, ch
l *Convolvulus sepium*
i *Lithospermum canescens*, ch
f, ld *Silphium laciniatum*, ch
lf *Silphium integrifolium*, ch
i, la *Heliopsis scabra*, ch
f *Rudbeckia hirta*, m
i, la *Brauneria pallida* (seldom seen in e. Du Page Co.)
f, la *Lepachys pinnata*, ch
lf *Helianthus scaberrimus*, ch
i *Helianthus occidentalis*
i *Helianthus Maximiliani*
lf *Achillea Millefolium*
i *Cirsium discolor*

The mesophytic prairie-grass association.—This type of prairie is more generally distributed within the area of study than is the

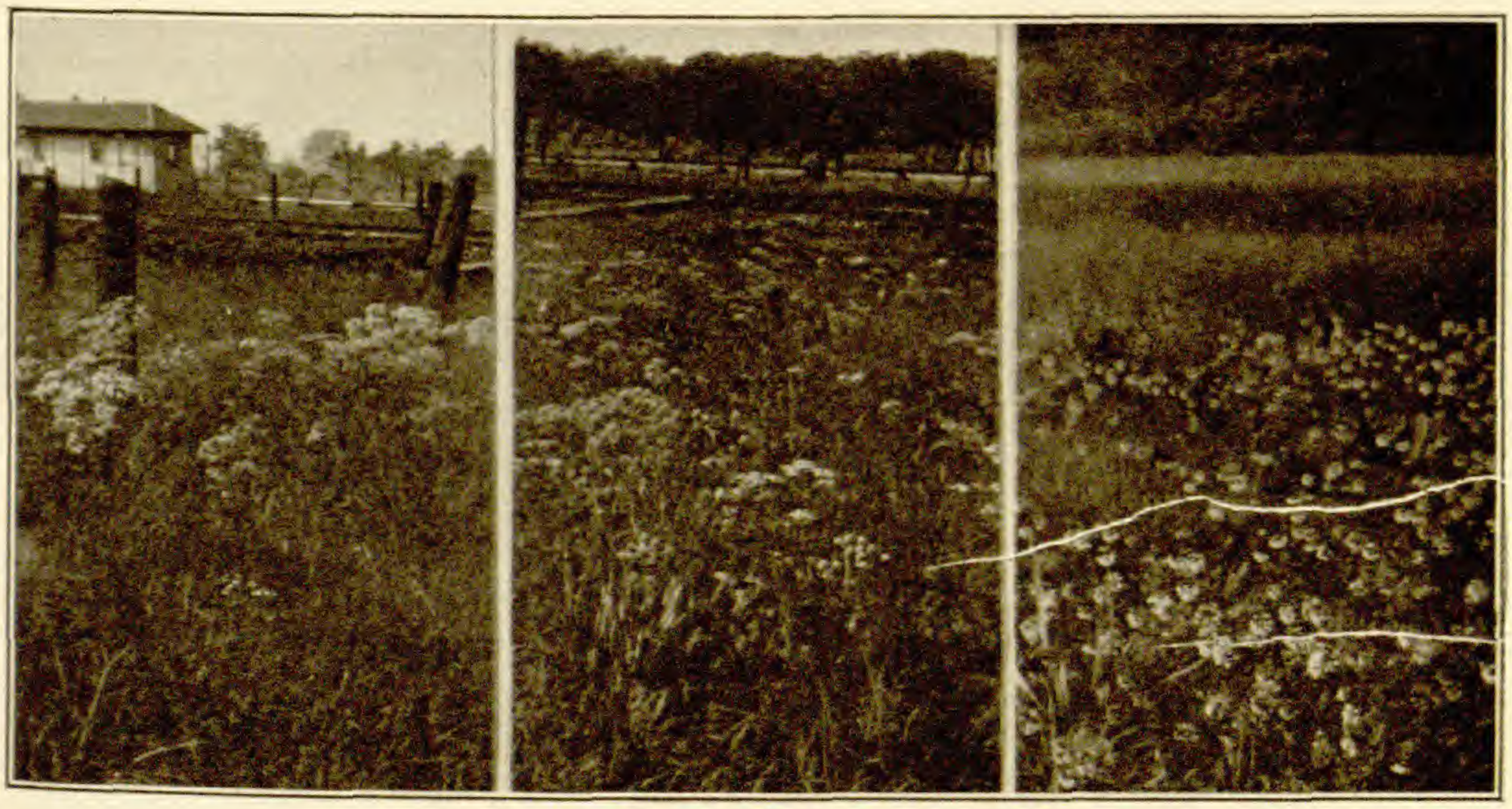

FIG. 2 FIG. 3 FIG. 4

FIG. 2. A fragment in the mesophytic prairie-grass association, mixed grass consocies; a rather dry spot, *Euphorbia corollata* locally conspicuous; west of Elmhurst.

FIG. 3. A moister spot close to the first, with *Eryngium* and *Parthenium* in flower.

FIG. 4. At the county line; mesophytic prairie-grass, with *Eryngium* and *Silphium terebinthinaceum; Allium* abundant and conspicuous; behind is lower ground with *Agrostis* and *Glyceria*.

xerophytic prairie-grass. There are several well-defined representatives of the mesophytic association. One is dominated by the tall grass *Andropogon furcatus*, often with hardly any other

species present; one is dominated by a number of grass species (the mixed consocies of mesophytic prairie-grass); and one is dominated by the large rosin-plant *Silphium terebinthinaceum* and by grasses. All of these three consocies are well developed in and near the county line prairie. The best area of the association seen is the mixed grass growth shown on the map near the left, adjoining the clover field; this has been mowed for hay each summer. The following species, mostly those of early summer, have been observed here:

MIXED CONSOCIES OF MESOPHYTIC PRAIRIE-GRASS, COUNTY LINE

l *Equisetum arvense*
f, ld *Panicum Scribnerianum*, ch
li *Stipa spartea*, x
f, ld *Sporobolus heterolepis*, ch
i, ld *Koeleria cristata*
i, ld *Poa compressa*, ruderal ?
l *Bromus Kalmii*, ch
l *Elymus canadense*
li *Tradescantia reflexa*
f *Allium cernuum*, ch
li *Lilium canadense*
li *Spiranthes cernua*?
li *Polygonum* sp.
li *Heuchera hispida*
la *Fragaria virginiana*
i *Amorpha canescens*, x
f *Lathyrus palustris*
f *Viola pedatifida*, ch
la *Eryngium yuccifolium*, h, ch
i *Oxypolis rigidior*, h
i *Dodecatheon Meadia*, h, ch
li *Asclepias tuberosa*, x
i *Asclepias Sullivantii*, h
f *Phlox glaberrima*, ch
lf *Phlox pilosa*, h
lf *Monarda mollis*
lf *Pycnanthemum virginianum*, ch
i *Castilleja coccinea*, ch
lf *Pedicularis canadensis*
f *Lobelia spicata*, ch
li *Solidago rigida*, x
li *Erigeron ramosus*
i, la *Antennaria plantaginifolia*
f, ld *Silphium terebinthinaceum*, ch
li *Silphium integrifolium*, x
lf *Parthenium integrifolium*, ch
f *Rudbeckia hirta*, ch
i *Cirsium Hillii*, h, ch
i *Krigia amplexicaulis*, h, ch

Another very representative station of practically the same kind of prairie is seen in a fenced-in triangular area at the intersection of the Illinois Central and Aurora, Elgin, and Chicago rights-of-way somewhat less than a third of a mile west of the Elmhurst station of the latter railroad. A tabulation of the plant population of an area about thirty feet square is here given. It was made August 18, 1913.

MIXED CONSOCIES OF MESOPHYTIC PRAIRIE-GRASS, WEST OF ELMHURST

i, ld *Andropogon scoparius*, x
a, ld *Andropogon furcatus*, ch
f, ld *Sorghastrum nutans*, ch
f, ld *Panicum* sp., near *P. nitidum*
li *Stipa spartea*
f, ld *Sporobolus heterolepis*, ch
i, ld *Poa compressa*, ruderal ?
lf *Carex* sp.
lf *Juncus* sp.
li *Sisyrinchium* sp.
lf *Rosa humilis*
la *Euphorbia corollata*, x
i *Viola pedatifida*, ch
lf *Eryngium yuccifolium*, h, ch
i *Dodecatheon Meadia*, h, ch
i *Galium* sp.
i *Solidago canadensis*
lf *Solidago rigida*, x
lf *Aster Novae-Angliae*, ch
lf *Antennaria plantaginifolia*
f, ld *Silphium terebinthinaceum*, ch
lf *Parthenium integrifolium*, ch
i *Ambrosia artemisiifolia*
i *Rudbeckia hirta*, ch
i *Lepachys pinnata*

FIG. 5 FIG. 6

FIG. 5. Mesophytic prairie-grass at the county line station. The boundary is seen between the area regularly cut over for hay, and the undisturbed *Silphium terebinthinaceum* consocies, in which *Allium cernuum* is abundant and conspicuous.

FIG. 6. The *Liatris spicata* consocies of the swamp prairie or fen association.

The *Silphium terebinthinaceum* consocies is very distinctive in appearance, as the principal dominant is so conspicuous. Grasses

and most of the species of the mixed consocies occur here also, and no separate list is accordingly given for the *Silphium* growth. The areas labeled *Silphium-Allium* prairie in the map belong to this consocies. Local abundance of *Allium cernuum* is frequently seen in mesophytic prairie-grass of very rich, moist soil. This may be called the *Allium* society. *Allium canadense* sometimes replaces *Allium cernuum*. Certain species not listed from the two stations above mentioned appear in the following table:

ADDITIONAL SPECIES OF MESOPHYTIC PRAIRIE-GRASS

lf *Hypoxis hirsuta*, h
lf *Oxalis stricta*
la *Viola papilionacea*
l *Asclepias syriaca*
la *Convolvulus sepium*
i *Physostegia virginiana*, h
lf *Stachys palustris*, h
lf *Eupatorium perfoliatum*
la *Helianthus grosse-serratus*
f *Achillea Millefolium*
i *Senecio Balsamitae*

The swamp-prairie or fen association.—The hydrophytic extreme of prairie-grass passes insensibly, in places, into marsh associations; in other places there is conspicuous zonation, the boundaries following contour lines about depressions. One of the most distinctive appearances of swamp prairie is the *Liatris spicata* consocies, which has been rather fully described by Gates.* Scattered representatives of the blazing-star prairie are found in eastern Du Page County, though formerly they were more abundant. There is also a mixed consocies, variable in composition, in which umbellifers are frequently prominent. The meadow rue, *Thalictrum dasycarpum*, sometimes marks a well-defined zone. The species typical of the hydrophytic prairie are here listed. Many of them persist as relics in mesophytic growths.

SPECIES TYPICAL OF SWAMP PRAIRIE OR FEN

l *Calamagrostis canadensis*
l *Spartina Michauxiana*
l *Glyceria nervata*
l *Cyperus* sp.
f *Asclepias incarnata*, ch
i *Asclepias Sullivantii*
f *Phlox pilosa*
l *Veronica virginica*

* Gates, F. C. The vegetation of the beach area in northeastern Illinois and southeastern Wisconsin. Bull. Ill. State Lab. Nat. Hist. **9**: 255–372. (*Liatris spicata* prairie, pp. 301–303.) 1912.

l *Iris versicolor*, ch
f *Thalictrum dasycarpum*, ch
i *Hypericum* sp.
f, ld *Eryngium yuccifolium*, ch
f *Cicuta maculata*, ch
i *Thaspium aureum*
f *Oxypolis rigidior*, ch
l, i *Gentiana Andrewsii*?
l *Apocynum cannabinum*
l, i *Valeriana edulis*
l, i *Lobelia syphilitica*
l, f *Eupatorium perfoliatum*, m
ld *Liatris spicata*, ch
l *Solidago Riddellii*, m
l *Solidago ohioensis*
i *Aster paniculatus*?
lf *Parthenium integrifolium*, m
i *Senecio Balsamitae*

What may be called the *Eryngium* consocies of swamp prairie is characterized by dominance of this peculiar umbellifer, and corresponds fairly well with the *low prairie* of Cowles.* This growth shades into the *Silphium terebinthinaceum* consocies of the mesophytic prairie-grass association, *Silphium* and *Eryngium* frequently being seen together in about equal abundance. This is then the transitional growth between hydrophytic and mesophytic prairie. The plants conspicuous in this intermediate prairie are marked "h, ch" in the list of mesophytic prairie-grass species.

The marsh associations.—Areas of marsh vegetation are usually scattered and not large. There are now few areas of open water, since many of the ponds and swamps west of Chicago have been artificially drained. Marsh growths are commonly dominated by a single or by very few plant species. Prominent among these are *Spartina Michauxiana*, *Calamagrostis canadensis*, *Phragmites communis*, *Glyceria nervata*, *Scirpus lineatus*, and *Typha latifolia*. Willows (*Salix longifolia*) and cottonwoods (*Populus deltoides*) are able to establish themselves on the margins of some of these swamps, particularly in mud flats left by summer shrinking of ponds. A small pond near the southwest corner of the area mapped, and the slough directly east of this pond, are thus margined with good-sized trees.

The zone marked "*Agrostis*" in the map is probably disturbed swamp prairie. It is now dominated by the single grass species *Agrostis alba* (red-top), and there are also a few swamp prairie plants, as *Cicuta maculata*. Lower ground is occupied by a vir-

* Cowles, H. C. The physiographic ecology of Chicago and vicinity. Bot. Gaz. 31: 73–108, 145–182. 1901. (Low prairie, p. 156.)

tually pure growth of *Glyceria nervata*, which thus forms an inner zone. The large depression in the map has a deeper region occupied by a smartweed with large hairy leaves (*Polygonum amphibium* var. *Hartwrightii*) .

Disturbed prairie.—Ruderal and primitive prairie growths which come up in broken or otherwise modified prairie ground are often dominated by single plant species. The native prairie plants include the following: *Lepachys pinnata*, forming conspicuous pure growths, usually in rather dry soil; *Asclepias verticillata*, and *Lespedeza capitata*, locally abundant (rather infrequently in eastern Du Page County) in disturbed prairie along rights-of-way; *Helianthus grosse-serratus*, forming tall growths in rather moist soil; *Cassia Chamaecrista*, *Erigeron annuus*, and *Ambrosia artemisiifolia*, not very frequent; *Erigeron canadensis*, and *Lactuca canadensis*, acting quite like successful introduced weeds; *Aster multiflorus*, persisting as a prairie relic even in city lots; and *Convolvulus sepium*, an insidious creeping dominant which replaces prairie plants under changed conditions.

The prominent introduced plants are *Agrostis alba* and *Trifolium repens* in moist soil, especially with grazing; *Phleum pratense* and *Trifolium pratense*, hay plants common in rights-of-way, and in prairie which is occasionally cut for hay; *Melilotus alba*, a serious pest which has replaced extensive areas of prairie (once the prairie is broken, the sweet clover may assume complete dominance); *Poa pratensis*, very generally distributed, perhaps succeeding sweet clover after some years, in many stations; *Daucus Carota* and a number of other plants, infrequent.

Development of the prairie.—Mesophytic black-soil prairie may develop from either of two extreme types of vegetation, hydrophytic or xerophytic. The developmental series beginning in shallow water or marshy situations has been discussed by Cowles (l. c., pp. 155–156). Gates has described succession from marsh associations to the *Liatris spicata* type of prairie (l. c., p. 335, *pl. 39*). The development from grassland of pronounced xerophytic type has hardly been mentioned, with exception of that which takes place in prairie of dry sandy soil (sand prairie). The development of open xerophytic bunch-grass of sand prairie into less xerophytic types such as the *Sporobolus heterolepis-Sorghas-*

trum and *Liatris scariosa* prairie consocies has also been treated by Gates (l. c., pp. 300–303, *pl. 39*). The convergence of sand prairie and xerophytic prairie of other soils into less xerophytic prairie-grass has been described by the writer.* The more markedly xerophytic prairie-grass types are no longer present in eastern Du Page County, but may be seen in areas of older drift, as in Ogle County (Illinoian glaciation), or in still drier situations, as loess-capped bluffs of the Mississippi River (seen at Savanna, Illinois) and other prairie-grass stations farther west. Development of mesophytic prairie, from both xerophytic and hydrophytic

FIG. 7

FIG. 7. A forest border at the county line station. *Andropogon furcatus* prominent in foreground; sunflower and dogwood zones at the edge of the forest; grapevines on some of the shrubs.

extremes, may be due to action of the vegetation itself or to physical changes of environment. Retrogressive successions occur locally. Relic species from the former condition are perhaps more

* Vestal, A. G. An associational study of Illinois sand prairie. Bull. Ill. State Lab. Nat. Hist. 10: 1–96. 1913. (The black-soil transition association, p. 80.) The status of prairie associations in the southern beach areas of Lake Michigan. Jour. of Ecology. In press. (The dry prairie-grass association.)

abundant than invading species: it is probable that change in floristic composition lags behind changes in ecological conditions, due to greater or less plasticity of environmental relations in most of the plant species.

The forest border.—The forest of the area mapped is not in itself part of the subject-matter of the present discussion. Much of it is a mixed tree growth, in which basswood is very prominent. Other trees are elm, walnut, oaks (several species), hackberry, wild crabapple, choke-cherry, and wild plum. The undergrowth is made up of characteristic species of mesophytic forest, with blackberry and raspberry shrubs in more open spots.

Parts of the forest border are in apparently original condition. The undisturbed growth is of two types, first that of exposed sunny borders, best seen on south and west edges of wooded areas, and second that of shaded borders, on north edges. No east-facing borders in good condition are to be seen at the county line.

The *exposed borders* show very distinct zonation. In some places a *low-tree zone* is seen at the edge of the forest proper. This is composed of wild crab (*Pyrus coronaria*) or of plum (*Prunus americana*) or of thorn-apple (*Crataegus* sp.). These trees are usually from nine to fourteen feet in height, and form a zone of varying width. A *shrub zone* is seen just outside the trees. A dogwood (*Cornus Amomum*) dominates; hazel (*Corylus americana*) and elder (*Sambucus canadensis*) are locally abundant. The dogwood is usually three and a half feet high, the hazel is about seven feet high; the shrub zone is four to ten feet wide. Grapevines (*Vitis vulpina*) cover some of the outer shrubs and trees. The *outermost zone* is almost a pure growth of sunflowers (*Helianthus decapetalus* and *H. divaricatus*), locally replaced by a species of *Verbesina*.* The height of the sunflowers is two to four feet; the zone is two to eight feet in width. The prairie just outside the sunflower zone is strikingly uniform with that farther from the forest.

The *shaded forest borders* are less regular in composition and structure. The border of one grove, which abuts at its northern edge on a moist grassland (*Agrostis* zone, see map), was observed

* Dr. T. D. A. Cockerell has examined the specimens, which are alternate-leaved, resembling *Verbesina helianthoides*, but differing from the description of that species in that the leaves are not sessile.

to contain the following plants: thorn-apple, occasional at the edge of the forest; dogwood, in a narrow and interrupted zone next the trees; occasional shrubs of black raspberry (*Rubus occidentalis*); lianes (*Rhus Toxicodendron*, *Vitis vulpina*, and *Psedera quinquefolia*), climbing on some of the outer shrubs and trees; tall herbs (*Veronica virginica*, *Campanula americana*, *Geum strictum*); other herbaceous plants, some being prairie plants common near forest areas (*Monarda mollis*, *Pycnanthemum virginianum*), some common in swamp prairie (*Thalictrum dasycarpum*, *Oxypolis rigidior*). Less mesophytic borders, particularly at northwest-facing forest edges, are transitional between shaded and very exposed borders, the *Cornus* and *Helianthus* zones usually being present, but often very narrow. Additional secondary species of infrequent occurrence are seen.

A disturbed south-facing border near the railroad track has the sunflower zone partially replaced by Canada blue-grass (*Poa compressa*). Scattered shrubs of *Rosa humilis*, *Rhus glabra*, and blackberry (*Rubus* sp.) are invading the grassland at some little distance from the woods.

Summary.—The county line station, a half-hour's ride west of Chicago, contains areas of prairie, forest, and forest border in still fairly good condition. Preservation of the forest from former prairie fires is suggested by its location on the east side of a line of prairie sloughs. The prairie, like that of other stations in this part of Illinois, is largely mesophytic; this type is of three appearances: (1) the *Andropogon furcatus* prairie, (2) the mixed grass prairie, and (3) the *Silphium terebinthinaceum* prairie. Mesophytic prairie-grass may be derived either from marsh growths and swamp prairie or fen, small areas of which are still abundant near by, or from xerophytic prairie-grass, represented in the area chiefly by *Silphium laciniatum* prairie. The markedly xerophytic types of prairie-grass no longer persist in upper Wisconsin glaciation of northeastern Illinois, but are well represented in central and western parts of the state. Sunny forest borders show an outer zone of sunflowers, a shrub zone of dogwood, occasionally with hazel or alder, and sometimes a low-tree zone, in which plum, thorn-apple, or wild crab may be seen. Shaded borders show less definite and narrower zones, with tall mesophytic herbs, climbers, and usually dogwood.

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