THE PRAIRIES OF INDIANA

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ABSTRACT

Approximately 15% of Indiana in presettlement times was covered by prairies. Most were found north and west of the Wabash River, while the remainder were scattered throughout the state in small islands, surrounded by forests, principally in the northeast and southwest.

The sand prairies (black oak savannas, wet acid sands, sand prairies and wet alkaline sands) were found chiefly around Lake Michigan and in the Kankakee River region. The black silt-loam prairies (mesic, wet, and alkaline fens) were found mostly south and east of the sand prairies. The rare gravel hill prairies were concentrated mostly on the terraces of the larger rivers.

While a few sand prairie remnants still exist, most of the black silt-loam and gravel hill prairies have been destroyed.

INTRODUCTION

While the state of Iowa in pre-settlement times is reputed to have had 85% of its surface covered with prairie and 15% with forest (Dick-Peddic 1955), Indiana, by way of contrast, appears to have had 85% of its surface in forest and 15% in prairie. Since the state of Indiana is a little more than 93,240 km^2 in size, this would amount to over 12,950 km^2 of prairie. However, one should not assume from the relatively small area involved that the Indiana prairies were depauperate in their species composition as compared to the prairie states to the west. On the contrary, with an annual precipitation of well over 89 cm (35 in) per year, a variety of soils, and a variety of plant species drawn from all parts of North America, such as lead plant (Amorpha canescens) and prairie parsley (Polytaenia nuttallii) from the southwestern prairies, and rockroses (Helianthemum sp.) and pin weeds (Lechea sp.) from the Atlantic coastal plain (Peattie 1922), all made the Indiana prairies extremely rich in species. The dune area at the south end of Lake Michigan, with its mosaic of forest, prairie, marsh and bog, is probably one of the richest botanical areas in the entire Middle West.

Unfortunately, very little is known about these prairies. Articles on Indiana prairies are few and usually of a general or theoretical nature (Benninghoff 1963, Finley and Potzger 1951, Rohr and Potzger 1951, Welch 1929). However, a small number of papers are devoted to their species composition and ecology (Bliss and Cox 1964, Friesner and Potzger 1946, Starc 1961). Some ecological information can be found in Peattie's Flora of the Indiana Dunes (1930), Deam's Flora of Indiana (1940) and Swink's Plants of the Chicago Region (1974). Another valuable source of information on these prairies has come from the detailed ecological labels on specimens in the herbarium of the Morton Arboretum, Lisle, Illinois, collected during the past decade by Ray Schulenberg and Gerald Wilhelm, both of the Arboretum.

GEOGRAPHICAL DISTRIBUTION

Although small islands of prairie were found in almost all counties of northern and western Indiana in pre-settlement times (Deam 1940) it was in the northwestern part of the state that most of the prairies were concentrated:

> With some few exceptions of wide and naked prairie, the divisions of timbered and prairie lands are more happily balanced, than in other parts of the western country. Many rich prairies are long and narrow, so that the whole can be taken up, and yet timber be easily accessible by all settlers. There are hundreds of prairies only large enough for a few farms. Even in the larger prairies there are those beautiful islands of timbered land, which form such a striking feature in western prairies. (Flint 1826).

To early travelers moving westward, the Wabash River was a dividing line between the forests of the east and the prairies of the west. Beyond the river lay the "Grand Prairie" with its "sea of grass", which only here and there was broken by isolated groves of timber and gallery forests along the larger rivers:

> Twenty miles west of the Wabash at this point (near Terre Haute), we met with the first prairie in a state of nature; and from this, extending northward to the Lakes, and westward to the Mississippi, they continue, increasing in magnitude, and interrupted only by occasional groves of timber, so as to occupy by far the largest portion of the central, eastern, western, and northern portions of the State of Illinois (Short 1845).

A study of Transeau's (1935) map (Fig. 1) drawn from data obtained from the distribution of soil types and the field notes of the early surveyors, clearly shows the preponderance of prairie and prairie marsh vegetation in northwestern Indiana. Extending northeastward and eastward in long finger-like projections, the prairie penetrated deep into the forested regions of Indiana. Further eastward this grassy sward, with its groves and savannas, faded into an unbroken forest with isolated patches of prairie all the way to the eastern-most counties of Indiana and beyond into Ohio.

Because of differences in soil type, these Indiana prairies were not all alike. While many similarities existed among them, the sand prairies of Stark and Pulaski counties in the north differed considerably from the black silt-loam prairies of Benton and Warren counties to the south. The pre-settlement prairies in Indiana can be divided into three major types: (1) sand prairies and black oak savannas, (2) black silt-loam prairies, and (3) dry gravel hill prairies.

A study of the physiographic units of Indiana (Fig. 2) clearly shows the peculiar distribution of

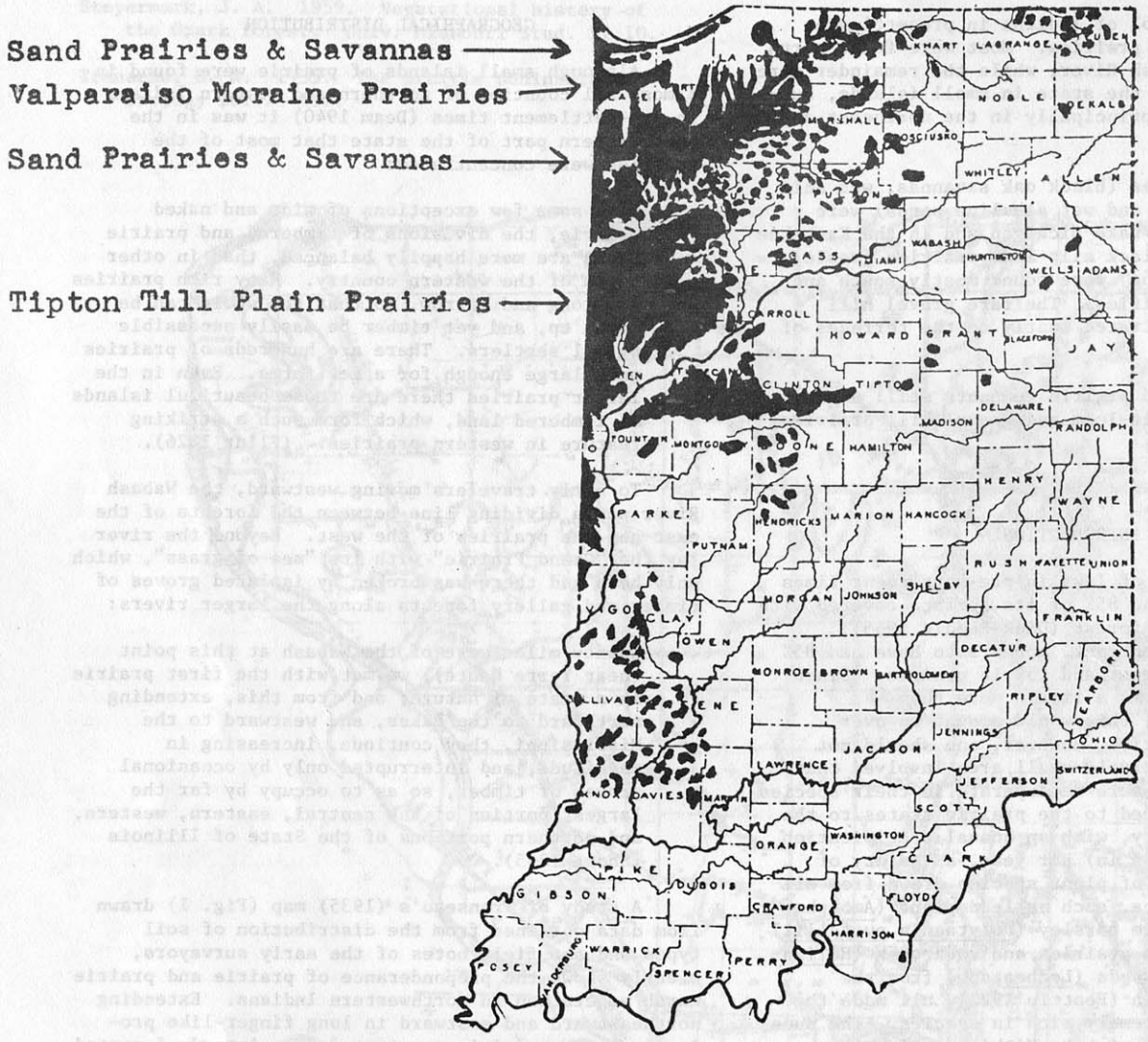

Fig. 1. Map of Indiana showing the distribution of major types of prairies and savannas in presettlement times. Modified from E.N. Transeau (1935), Ecology 16: 423-457.

sand and glacial till which gave rise to the sand and silt-loam areas on which the prairies developed. The sand region of northwest Indiana is divided into two unequal parts by the 24-32 km (15-20 mile) wide Valparaiso Moraine, viz., the relatively small Calumet Lacustrine Plain (Lake Chicago Plain) in the northern parts of Lake, Porter and LaPorte counties, and the much larger Kankakee Outwash Plain in the southern parts of Lake and Porter counties, major portions of Newton, Jasper, Stark, St. Joseph, and parts of Marshall, Fulton, Cass and White counties. To the south of the sand area is a region of glacial till (Tipton Till Plain). Superimposing Transeau's Map (Fig. 1) on that of the physiographic units (Fig. 2), reveals the banded arrangement of the Indiana prairies. Beginning at the head of Lake Michigan and moving southward, the presettlement Indiana prairies are arranged in the following way: a northern belt of sand prairies and savannas of the Calumet Lacustrine Plain, followed by black silt-loam prairies of the Valparaiso Moraine, another belt of sand prairies and savannas of the Kankakee Outwash Plain, and finally a belt of black silt-loam prairies of the Tipton Till Plain. This rather simplified arrangement is complicated by the presence of groves, marshes and brush scattered along the prairie communities.

The prairies outliers in the Morainal Lake Area of northeastern Indiana, such as Jackson Prairie in Steuben county, Turkey Prairie in Kosciusko and English Prairie in northern LaGrange counties, are built on sandy loams or loamy sands and have characteristics of both the sand and black soil prairies. The prairie outliers in the eastern parts of the Tipton Till Plain, such as the Cabin Creek Raised Bog (fen) in Randolph county, are black silt-loam prairies.

The third major type, the dry gravel hill prairie, was limited to the gravel terraces (or breaks) along the larger rivers, such as the Wabash and White.

FLORAL COMPOSITION

The Indiana prairies usually contain varying numbers and mixtures of grass species which are usually considered as dominants in the tall grass prairies. Depending on the type of soil, height of the water table, geographical area and the amount of disturbance, one or more species are likely to be present in greater amounts than the others. In general, little blue stem (Andropogon scoparius) and porcupine grass (Stipa spartea) are major components in dry sand prairies and black oak savannas, bluejoint grass (Calamagrostis canadensis) and prairie cord grass (Spartina pectinata) in wet prairies, and side-oats grama grass (Bouteloua curtipendula) a major dominant in calcareous dry prairies. Big bluestem grass (Andropogon gerardii) and Indian grass (Sorghastrum nutans) play a domiannt role in the mesic black silt-loam prairies, but are common in almost all types of prairie. Switch grass (Panicum virgatum) tends to form rather heavy stands in lightly disturbed, periodically wet prairies, while prairie dropseed (Sporobolus heterolepis) tends to become a dominant in virgin mesic prairies with a long history of freedom from disturbance.

While the dominant prairie grasses, with their rather wide ecological amplitudes, provide the background to the various kinds of prairies, it is the presence (or absence) of certain species of prairie forbs that helps in separating the different kinds of Indiana prairies. Using these forbs as indicators, together with the dominant grasses, one can distinguish three different types of Indiana sand prairies, three types of black silt-loam prairies and one type of dry gravel hill prairie.

THE SAND PRAIRIES

Approximately half of the pre-settlement prairies in Indiana were sand prairies and black oak savannas. While the two sand prairie regions of Indiana held many species in common, there were differences in the numbers and kinds of prairie forbs. In general, the prairies in the Calumet region were richer than those in the Kankakee region. There appear to be three different types of Indiana sand prairies: (1) dry sand prairies and black oak savannas; (2) wet, acid sand prairies and (3) wet, alkaline sand prairies.

Dry Sand Prairies and Black Oak Savannas. These prairies are found throughout the sand regions of Indiana on sand ridges and dunes. The dominant grass is little bluestem which occurs usually in compact clumps.

It would appear that in pre-settlement times this plant community was primarily dry sand prairie with a light scattering of black oak (Quercus velutina), which was maintained by the recurring prairie fires that swept through the region. With the cessation of these fires at the time of settlement, the black oaks increased at the expense of the prairie vegetation, resulting in a even age stand of black oak woodland with a depauperate ground cover of small shrubs, such as blueberry (Vaccinium sp.) and huckleberry (Gaylussacia baccata), woodland plants, such as wild sarsaparilla (Aralia nudicaulis) and Solomon's seal (Polygonatum canaliculatum), and a few species of remnant sand prairie palnts. Although never plowed, many of these present-day black oak woodlands are almost beyond recovery as prairie without some cutting of the timber, coupled with annual fires and good prairie management. Some characteristic species of this community are:

Amorpha canescens (lead plant)
Asclepias tuberosa (butterfly weed)
Aster linariifolius (flax-leaved aster)
Baptisia leucantha (white wild indigo)
Coreopsis lanceolata (sand coreopsis)
Helianthemum sp. (frost weeds)
Helianthus occidentalis (Western sunflower)
Lechea sp. (pinweeds)
Lespedeza capitata (round-headed bush clover)
Liatris aspera (rough blazing star)
Lithospermum croceum (hairy puccoon)
Lupinus perennis occidentalis (wild lupine)
Opuntia humifusa (prickly pear)
Phlox bifida (sand phlox)
Quercus velutina (black oak)
Tephrosia virginiana (hoary pea)

Wet Acid Sand Prairies (Wet Sand Prairies). These prairies are found in the swales and other low places in the sand regions of Indiana. Before the digging of drainage ditches in the Kankakee Outwash Plain, they were much more extensive than at present:

> It (the Kankakee River) being very crooked and the land on either side being low and marshy, the water moves off very slowly, and these low lands, forming what is familiarly known as the KANKAKEE MARSH, are for quite a period of time each year covered with from one to three feet of water.

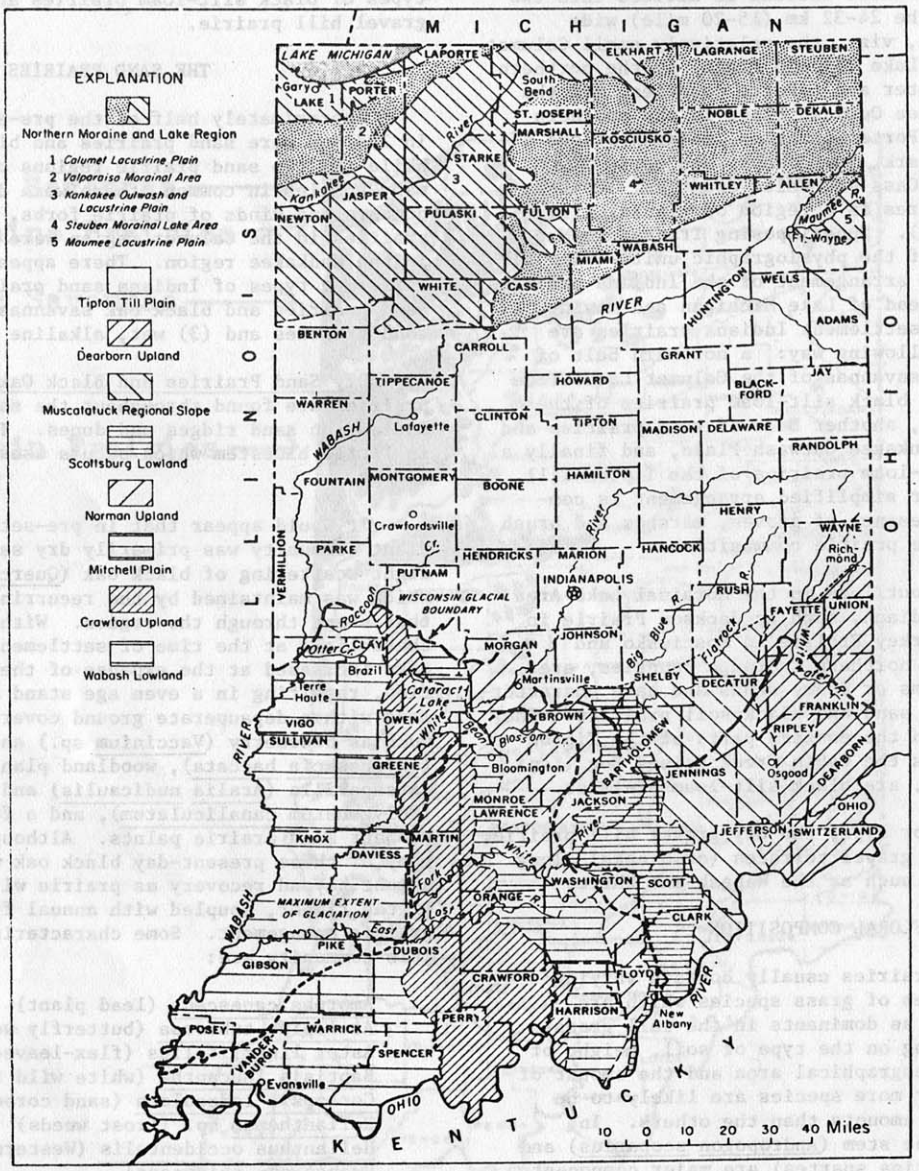

Fig. 2. Map of Indiana showing physiographic units and glacial boundaries. Modified from Indiana Geol. Survey Rept. Prog. 7., fig. 1.

> About six sections of this marsh land in the southeast corner of our county (Lake) are covered with timber, composed..... The balance of these wet lands, running west to the State line, is open marsh, covered with a luxuriant growth of wild grasses, wild rice and flags.....The number of acres of this wet land in the Kankakee valley in Lake county is about sixty thousand, and in the seven counties through which the Kankakee river flows in this State is about six hundred thousand. (Brown 1884).

Blue-joint grass and prairie cord grass are the dominant grasses. Some characteristic species of this community are:

Aletris farinosa (colic root)
Asclepias hirtella (green milkweed)
Calopogon pulchellus (grass pink orchid)
Gentiana saponaria (soapwort gentian)
Gerardia purpurea (purple false foxglove)
Habenaria lacera (ragged fringed orchid)
Houstonia caerulea (bluets)
Osmunda cinnamomea (cinnamon fern)
Osmunda regalis spectabilis (royal fern)
Polygala cruciata (cross milkwort)
Viola lanceolata (lance-leaved violet)

Wet Alkaline Sand Prairies. These prairies are confined to the low swales in the dune region within two km or so of Lake Michigan. The calcareous waters of the lake moving up through the sand produces an alkaline condition which enables a community of calciphiles (together with other prairie species) to thrive. The dominant grasses are similar to those of the wet acid sand prairies. Some characteristic species are:

Aster ptarmicoides (stiff aster)
Buchnera americana (blue hearts)
Cypripedium reginae (showy lady's slipper)
Gentiana crinita (fringed gentian)
Hypericum kalmianum (Kalm's St. John's wort)
Liatris cylindracea (cylindrical blazing star)
Liparis loeselii (green twayblade)
Potentilla fruticosa (shrubby cinquefoil)
Sabbatia angularis (rose gentian)
Tofieldia glutinosa (false asphodel)

BLACK SILT-LOAM PRAIRIES

Disregarding some geographical differences, these silt-loam prairies are similar to those found in Illinois and Iowa. There appear to be three different types: (1) mesic (or upland), (2) wet (or lowland), and (3) alkaline fens.

Mesic Prairies. These prairies are found on the better drained parts of the moraines and till plains. Because of their high agricultural value, they were destroyed early in the settlement period, and for that reason very few remnants exist today in Indiana. The dominant grasses are prairie dropseed, big bluestem, and Indian grass. Some characteristic species are:

Amorpha canescens (lead plant)
Anemone cylindrica (thimbleweed)
Asclepias viridiflora (green milkweed)
Aster laevis (smooth blue aster)
Baptisia leucophaea (cream wild indigo)
Ceanothus americanus (New Jersey tea)
Coreopsis palmata (prairie coreopsis)
Eryngium yuccifolium (rattlesnake master)
Gentiana puberula (prairie gentian)
Liatris pycnostachya (prairie blazing star)
Lilium philadelphicum andinum (prairie lily)
Oxalis violacea (purple sorrel)
Panicum leibergii (Leiberg's panic grass)
Petalostemum candidum (white prairie clover)
Petalostemum purpureum (purple prairie clover)
Phlox pilosa (prairie phlox)
Prenanthes aspera (rough white lettuce)
Ratibida pinnata (yellow cone flower)
Silphium laciniatum (prairie compass plant)
Silphium terebinthinaceum (prairie dock)
Solidago rigida (prairie goldenrod)
Viola pedatifida (prairie violet)

Wet Prairies. These prairies are found on the lower poorly drained portions of moraines and till plains. Like the mesic prairies they were destroyed because of their high agricultural value. With the advent of tile drainage in the latter part of the nineteenth century their fate was sealed; remnants are not common in Indiana today. The dominant grasses are prairie cord grass and blue-joint grass. Some characteristic species are:

Asclepias sullivantii (prairie milkweed)
Cacalia tuberosa (Indian plantain)
Galium obtusum (wild madder)
Gentiana andrewsii (bottle gentian)
Habenaria leucophaea (white fringed orchid)
Lilium michiganense (Turk's cap lily)
Lysimachia quadriflora (narrow-leaved loosestrife)
Oxypolis rigidior (cowbane)
Phlox glaberrima interior (marsh phlox)
Prenanthes racemosa (glaucous white lettuce)
Thalictrum dasycarpum (purple meadow rue)
Zizia aurea (golden Alexanders)

Alkaline Fens. These prairies are found on the low, springy, calcareous parts of moraine and till plains. They are more common in the eastern prairies of Indiana and Ohio, than on the prairies to the west. The dominant grasses are prairie cord grass and blue-joint grass. Some characteristic claciphilic species found in this community are:

Angelica atropurpurea (great angelica)
Cirsium muticum (swamp thistle)
Chelone glabra (turtlehead)
Cypripedium candidum (white lady's slipper)
Filipendula rubra (queen-of-the-prairie)
Lobelia kalmii (Kalm's lobelia)
Parnassia glauca (grass-of-Parnassus)
Pedicularis lanceolata (marsh betony)
Solidago ohiensis (Ohio goldenrod)

DRY GRAVEL HILL PRAIRIES

In pre-settlement times these prairies were probably uncommon in Indiana and confined for the most part to the gravel terraces (or breaks) of the Wabash and White River valleys. The dominant grasses are side-oats grama grass, little bluestem, and porcupine grass. Some characteristic species are:

Allium cernuum (nodding wild onion)
Amorpha canescens (lead plant)
Arenaria patula (slender sandwort)
Aster oblongifolius (aromatic aster)
Astragalus tennesseensis (Tennessee milk vetch)
Kuhnia eupatorioides corymbulosa (false boneset)
Linum sulcatum (grooved yellow flax)

Lithospermum incisum (fringed puccoon)
Petalostemum purpureum (purple prairie clover)
Psoralea tenuiflora (scurfy pea)
Wulfenia bullii (kitten tails)

REMNANT INDIANA PRAIRIES

Like its neighboring states, Indiana has lost most of its prairies. What is left are bits and scraps scattered in old settler cemeteries, along railroad rights-of-way and in tracts of varying size that are of low agricultural value. The following list of remnant prairies in Indiana is not necessarily complete, since there are undoubtedly others that are still to be found.

Sand Prairie Remnants. The 121 ha (300 acre) Hoosier Prairie, a complex mosaic of black oak savanna, dry prairie, wet acid sand prairie and marsh, west of Griffith, Lake County, is a fine example of Indiana sand prairies on the Calumet plain. Over 300 species of native flowering plants have been found on the tract, including the prairie parsley (Polytaenia nuttallii), three species of gentians, and various species of orchids. Due to the persistent efforts of relatively few conservationists, it is now being purchased by the state of Indiana and will be managed as Indiana's first prairie preserve.

The 20 ha (50 acre) Clark Prairie, a combination of black oak savanna, dry prairie, wet alkaline sand prairie, and marsh, near Lake Michigan west of Gary, Lake County, is interesting in that it probably contains the best remnant of alkaline sand prairie left in Indiana, with numerous terrestial orchids, fringed gentians and lilies. In addition, the open lagoons in the area contain rich populations of both white and yellow water lilies (Nymphaea tuberosa and Nuphar advena). Moreover, the dune ridges are some of the last refuges for paper birch (Betula papyrifera), jack pine (Pinus banksiana) and buffalo berry (Shepherdia canadensis) in northwestern Indiana.

The Hammond Prairie, a 40 ha (100 acre) tract on the eastern outskirts of Hammond, Lake County, is a complex mixture of black oak savanna, dry sand, and wet acid sand prairies, and marsh. In late spring and early summer, the prairie is a riot of color, especially if previously burned, with much Indian paint brush (Castilleja coccinea), hoary puccoon (Lithospermum canescens), and prairie phlox (Phlox pilosa). Many species of orchids are common on the prairie, including the yellow lady's slipper orchid (Cypripedium calceolus) and showy lady's slipper (C. reginae), grass pink orchid (Calopogon pulchellus) and tubercled orchid (Habenaria flava herbiola).

Some of the best dry and wet acid sand prairie remnants are to be found along railroad rights-of-way in Starke, Porter, Jasper and LaPorte counties. Many of these prairies are certainly virgin, and typical prairie grasses, such as little and big bluestem, Indian grass, blue-joint grass, prairie cord grass and switch grass, mingle with lead plant, white wild indigo (Baptisia leucantha), flowering spurge (Euphorbia corollata), Culver's root (Veronicastrum virginicum), marsh phlox (Phlox glaberrima interior) and golden Alexanders (Zizia aurea).

Scattered through the sand country on the dunes and ridges are old settler cemeteries, with dry sand prairies and black oak savannas. Because of constant mowing, many are somewhat degraded. With cessation of mowing, a few could be restored to their former condition. In addition to the dominant little bluestem, butterfly weed (Asclepias tuberosa), sky-blue aster (Aster azureus), western sunflower (Helianthus occidentalis), rough blazing star (Liatris aspera) and prairie willow (Salix humilis) are common components of these cemetery prairies.

A certain amount of dry prairie and black oak savanna exists within the Indiana Dunes State Park and the Indiana Lakeshore National Park in Porter County. However, becasue of the lack of fires for decades, much of this prairie has been subverted by the rampant growth of black oak, so what was probably black oak savanna is now black oak woods. Certain sections are now being burned in an effort to reverse this trend.

Black Silt-Loam Prairie Remnants. Because of their rich agricultural value, very few remnants of these types of prairie survive. Some of the best remnants in Indiana are still to be found along certain sections of railroad rights-of-way in central Benton and southern Newton counties. Some degraded remnants of the Valparaiso Moraine prairies are found along railroad tracks in western Lake County. In northern Kosciusko County in eastern Indiana there is a small degraded remnant of the Turkey Prairie outlier.

One of the finest examples of mesic black soil prairie on the Valparaiso Moraine is found in the German Methodist Cemetery in western Lake County. Prairie gentians (Gentiana puberula), prairie lilies (Lilium philadelphicum andinum), purple prairie clover (Petalostemum purpureum), Leiberg's panic grass (Panicum leibergii) and alum root (Heuchera richardsonii) are just a few of the prairie forbs and grasses found in a sward of prairie dropseed. The prairie appears to be virgin and stands approximately six inches above the surrounding eroded fields. Unfortunately, it is not protected and diggings from the grave sites are being dumped onto the prairie.

The Granville Cemetery prairie, overlooking the Wabash River in central Tippecanoe County and presently being managed, contains various prairie plants, including side-oats grama grass, lead plant, false boneset (Kuhnia eupatorioides corymbulosa), New Jersey tea (Ceanothus americanus) and yellow cone flower (Ratibida pinnata). It is the only remnant known of the Wea prairie outlier.

Around the tombstones in the old settler Jackson Prairie Cemetery in western Steuben County in extreme northeastern Indiana, grow side-oats grama grass, big and little bluestem, Indian grass, Western sunflower (Helianthus occidentalis), Illinois tick trefoil (Desmodium illinoense) and yellow coneflower, remnants of the Jackson Prairie outlier. It is presently being mowed, but with proper management could return to a more natural condition.

Along the railroad right-of-way in central Tipton county south of Kokomo is a very rich prairie, a relic of Indian Prairie outlier. One of the eastern-most stations for the purple prairie clover (Petalostemum purpureum), it contains nearly fifty prairie species.

Dry Gravel Hill Prairie Remnants. Only one remnant of this rare type of prairie has been found in Indiana. Found on a gravel knoll overlooking Wea Creek, a tributary of the Wabash River in Tippecanoe County, it is no more than 0.1 ha (.25 acre)

in size. Various grasses, including side-oats grama, hairy grama (Bouteloua hirsuta), porcupine grass, together with Western wall flower (Erysimum asperum), lead plant, false toadflax (Commandra richardsiana), purple prairie clover and fringed puccoon (Lithospermum incisum) are a few of the species still present in this tiny remnant.

Formerly, prairie satin grass (Muhlenbergia cuspidata), scurfy pea (Psoralea tenuiflora) and Tennessee milkvetch (Astragalus tennesseensis) were found in the vicinity, and presumably were collected on the more extensive prairie that once existed there (Deam 1940, Stuart 1902). The original prairie must have covered a substantial portion of the gravel ridge running along Wea Creek, but gravel mining operations have almost completely eliminated sections of the ridge. In addition, the lack of prairie fires in modern times has enabled the adjacent forest to penetrate prairie portions of the hill.

CONCLUSION

Although the prairies of Indiana in pre-settlement times occupied a relatively small area as compared to the area occupied by prairie in the states to the west, they are interesting because they occupied a region where the vegetation was transitional or ecotonal. Here on the plains of Indiana in what is considered a forest climate, prairie and deciduous forest mingled in a complex mosaic of trees and grass. It is important that the remnants of these interesting plant communities be preserved and studied in order to better understand the nature of the tall grass prairie.

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