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The Flora of the Pine Hill Prairie Relict

BY THOMAS MORRISSEY

INTRODUCTION

The purpose of this paper is to describe one of the few remaining tracts of virgin prairie in eastern Iowa. The Committee on Conservation of the Iowa Academy of Science, particularly in the reports of Dr. Ada Hayden (1945, 1946), has urged the preservation of native Iowa grasslands in order that they may serve as natural out-of-doors laboratories for the study of ecological and taxonomic problems. A flora of the kind presented here may be of value when compared to grasslands in the eastern and western states: It may help determine the effect of environmental forces which vary in different longitudes. Comparisons with other prairie floras in the same region—the “oak-openings” and “sand prairies” within a few miles of Pine Hill—may reveal the importance of soil, microclimates, and biotic influences. No two prairie tracts seem to be the same. The species of herbs and forbs may be different and in each tract abundance of the dominant forms changes. But the best reason for presenting a list of the plants of the Pine Hill Prairie is this: before many more years those few acres of grass, with their accompanying brilliant flowers, will be destroyed. This prairie is too valuable to lie fallow. Destruction of this remnant will also be the destruction of a part of the area's history. The incomplete record presented here may enable future generations to reconstruct, even if only in imagination, the scenes their pioneer ancestors looked upon.

DESCRIPTION

Pine Hill was established as a private cemetery by J. H. Barrow a few years prior to 1854 according to Downer's (1910) account. Shade trees and conifers were planted and many of them have attained magnificent stature. However, the east and north boundaries of the cemetery included a prairie tract which was not developed. Protected within the borders of the cemetery it escaped plowing and cultivation, which were the fate of all the other prairies in Scott County, Iowa. This island of native grass soon attracted amateur botanists from Davenport, Iowa, which lay a mile to the south. One of the first collectors to visit the area was Miss Edith Ross who collected in the last decades of the nineteenth century. As an indication of her energy she donated a private herbarium of 2,000 specimens to the Davenport Public Museum in 1931. Both Miss Sarah Foote Sheldon and Mr. J. H. Paarman who were connected with the Museum (then called the Davenport Academy of Science) made small collections in the early 1900's. These collectors, particularly Miss Ross, although technically amateurs, were excellent taxonomists. Few of their determinations have been found erroneous. Dr. L. F.

Guldner began collecting at Pine Hill in 1947 and has made collections there every year since. The writer first came upon the prairie, accidentally, in 1947 but no specimens were taken that year. Beginning in 1948 the author visited the prairie almost every 2 weeks during the growing season; the first trips were in late March, the last in mid-October. Specimens were collected; notations of relative abundance were made; distribution of many species was plotted; an incomplete phenological record of flowering was kept. These trips were made in every year from 1948 to 1956; in an average year, however, there were only 8 or 10 trips per year. No effort was made to collect or identify cryptogams, but crustose lichens and mosses were observed occasionally. When the region was burned in the spring a very low, dull green or reddish moss was often the only surviving plant above ground and formed patches several square yards in extent. Specimens of vascular plants obtained by the writer are deposited in the herbarium of St. Ambrose College, Davenport. Specimens collected by others at Pine Hill are in the Barnes Herbarium of the Davenport Public Museum.

Area and Topography

The prairie portion of Pine Hill Cemetery lies almost in the middle of the north and east quarters of Section 13, Davenport Township. The district has been incorporated into the city of Davenport and is located north and east of Eastern Avenue and Thirty-ninth Street. The total undeveloped portion, which is mostly prairie, comprises a North Tract of about 3.5 acres, and a Middle and a South tract of about 0.5 acres each. The North tract lies along a low ridge sloping gradually to the east and west. The other two tracts slope toward each other into a small valley running east and west. The boundaries of the prairie tracts are artificial: a gravel road and lawns on the west; another cemetery on the north; a steadily encroaching truck garden and a pasture on the east; and lawns on the south. The ridge of the North tract broadens into a small knoll, and from the north and south of the knoll, swales converge to create a shallow basin at about the midpoint of the west boundary. Water sometimes accumulates here briefly, perhaps dammed by the road which forms the boundary. There is a difference in elevation of 22 feet between the highest point on the ridge and the basin.

Trees have been planted along all perimeters of the North Tract. They total 31, including White and Scotch Pines, Hemlock, *Arbor-Vitae*, Norway Spruce, American Elm, and Silver Maple. Wherever these trees extend their shade over the prairie area there are noticeable differences in vegetation. The Middle Tract has a clump of 9 American Elms and 4 Silver Maples which create a dense shade of small area. The 6 conifers of the South Tract form the southern boundary of that area and seem to exert less influence than do the trees of other tracts.

Soils

Stevens (1917) shows two soil types in the Pine Hill area. Muscatine Silt Loam is the most abundant type in the county and is the predominant phase at Pine Hill. It is a dark-brown silt-loam with the A-1 layer not clearly separated from the A-2 layer. The A layers differ in different parts of the county but average about 15 inches each. They are underlain by yellow clay at from 20 to 36 inches. In a few places in the immediate area this clay has been exposed by erosion. Also in the Pine Hill area is a tongue of Muscatine Silt Loam—Rolling Phase extending from the northwest. This is a lighter brown silt-loam of less depth. Glacial drift may be exposed at its surface at other points in the county, but is not found in the region under consideration. Both of these soils are among the most fertile to be found in eastern Iowa. Recent colorimetric pH determinations of soil samples from all parts of the prairie revealed that ridges and slopes usually indicated pH 8, while samples from the basin area were pH 7. These values seem high and may be attributable to faulty technique or deficiency in precipitation and less leaching of carbonates during 1955. There was no appreciable difference in water retaining capacity of any soil samples, although there were some small patches of fine gravel and sandy soil which appeared to be occupied by the more xerophytic species.

The unique character of the prairie soil is evident even to the casual observer. The rich color and, above all, the solid network of roots, rhizomes, bulbs, and other vegetative organs attract attention. Mr. Carl Kreiter, superintendent of Pine Hill Cemetery, relates that his father could scarcely break this prairie sod with his best plows and strongest teams.

Climatological Data

These data furnished by the U. S. Weather Service (1953) are included in order that the Pine Hill Prairie may be compared with prairies where temperature and precipitation are markedly different. They are based on records kept over the last 30 years at a station about 4 miles south of the prairie.

1. Temperature During Growing Season.								
Average	March	April	May	June	July	Aug.	Sept.	Oct.
F°	38	51	62	72	77	75	70	56
2. Average Yearly Precipitation.								
34.3 inches								

(June is wettest month with an average of 5 inches.)

During this study (1948-1956) the wettest year was 1951 when total precipitation was 49.6 inches. The driest year will probably be 1955 since an 11 inch deficit in precipitation has been reported in last six months: November, 1955-April, 1956.

Animal Life

The area is too small to support a distinctive fauna but there are some noticeable differences between this prairie and near-by pastures. The orthoptera are much more numerous and conspicuous

than elsewhere; the same is true of butterflies. It is the writer's impression that many of the grasshoppers are unfamiliar species. When *Ceanothus* is in flower, it attracts a variety of wood-boring beetles rarely found elsewhere. Snakes (Garter Snake, *Thamnophis sirtalis* subsp.) have been seen only 3 times. A Killdeer (*Oxyechus vociferus*) nested in one of the driest parts of the prairie for two consecutive years—but birds are uncommon. Neither the prairie forms of *Microtus* or *Peromyscus* occur, but the typical forest forms are not rare. Harvest Mice (*Reithrodontomys* sp.) have been found. Shrews, both *Sorex* and *Blarina*, hunt through the grass layer, Pocket Gophers (*Geomys bursarius*) are too numerous: their mounds may permit the entrance of weedy invaders. Thirteen-lined Ground Squirrels (*Citellus*) are very common, and occasionally Cotton-tail Rabbits (*Sylvilagus*) are met with.

The Vegetation

The Pine Hill relict is a member of the "true prairie association" of Weaver and Clements (1938); the "true prairie" of Clements and Shelford (1939); and the "Illinoian biotic province" of Dice (1943). But it shows strong elements of both the "*Stipa spartea*—*Andropogon scoparius* Association" and the "*Andropogon gerardi*—Alliance" of Conard (1952). Its dominants are grasses: *Andropogon* (2 spp.), *Koeleria*, *Sorghastrum*, and *Stipa*. In early spring the grasses are slender spears of green, a few inches high, thrusting through the burned sod. In late October the area is covered with a sea of waving red and tan grasses that rise to the height of a man's shoulders.

Herbaceous plants—mostly natives, but some invaders—are abundant. Many of them form dense societies at different seasons, patches of blue, yellow, pink or white, visible at a distance. At Pine Hill the seasonal aspect societies are chiefly these:

- Pre-vernal: *Salix humilis* in late March
 Vernal: *Viola pedata* and *V. pedatifida* in late April and in May
 Dodecatheon meadia
 Pedicularis canadensis
 Aestival: *Amorpha canescens* in June and July
 Petalostemum purpureum
 Echinacea pallida
 Ceanothus americanus
 Autumnal: *Solidago* spp. August through September
 Aster spp. (especially *A. azureus*)
 Gentiana puberula

THE PINE HILL PRAIRIE FLORA

In the following list the nomenclature employed is that of Fernald's (1950) edition of *Gray's Manual of Botany* except in a few instances. Brief notes on distribution, habitat, and dates for flowering are included for some species. Relative abundance has sometimes been indicated by the figures "1" through "5". Species marked "1" are abundant; those marked "5" are rare. The months and dates are usually those of the beginning of the flowering period.

SYSTEMATIC LIST OF SPECIES

EQUISETACEAE

Equisetum arvense L. North slopes of North Tract; rare elsewhere. (5) June.

GRAMINEAE

Agrostis alba L. East end of Middle Tract.

Agrostis scabra Willd.

Andropogon gerardi Vitman. Moist ridges in all tracts. (2). Late July.

Andropogon scoparius Michx. Drier slopes and ridges. (3). Late July.

Koeleria cristata (L.) Pers. Dry ridges with *Stipa*. (4). Late June.

Panicum capillare L. (4).

Panicum praecocius Hitch. & Chase. (4).

Panicum scribnerianum Nash *P. oligosanthos* var. *scribnerianum* (Nash) Fern. (4).

Setaria lutescens (Weigel) Hubbard. (4).

Sorghastrum nutans (L.) Nash. Chiefly South Tract and south border of North. (3).

Poa pratensis L. Disturbed areas. (4).

Stipa spartea Trin. North border and northwest corner of North Tract. (4).

CYPERACEAE

Carex bicknelli Britt. Generally distributed. (3).

Carex haydenii Dew. This species and *C. haydenii* and *C. tenera* occur at lower end of swale in the North Tract.

Carex lanuginosa Michx.

Carex meadii Dew.

Carex molest Mackenz.

Carex tenera Dew.

Eleocharis calva Torr. Basin and wet areas of North Tract. (4).

Scleria triglomerata Michx.

COMMELINACEAE

Tradescantia ohioensis Raf. Low areas, swales, and shade in all tracts. Late May.

LILIACEAE

Allium canadense L. Scattered through moist parts. (3). Early June.

Asparagus officinalis L. Mostly in the Middle Tract and disturbed areas. (4).

Hemerocallis fulva L. Growing south-east up deep swale in North Tract. Increasing.

Lilium michiganense Farw. Ten in basin of North Tract in wet year 1951 only.

Lilium philadelphicum var. *andinum* (Nutt.) Ker. about 100 plants each mid-June.

Polygonatum commutatum (Schult.) Dietr. Middle Tract. (5). Late May.

Convallaria majalis L. A colony of varying size in North Tract basin.

AMARYLLIDACEAE

Hypoxis hirsuta (L.) Coville. Generally distributed. (3). May.

ORCHIDACEAE

Spiranthes cernua (L.) Richard. Swales of the South Tract. (5). Late August.

Spiranthes gracilis (Bigel.) Beck. Generally distributed. (4). Mid-August.

IRIDACEAE

Sisyrinchium campestre Bickn. Occurs everywhere. (2). Late April.

SALICACEAE

- Salix humilis* Marsh. Upper swale, North Tract. (4). Mid-March.
Salix humilis var. *microphylla* (Anders.) Fern. Ridge and swale; flowers later.

JUGLANDACEAE

- Juglans nigra* L. One sapling 18 inches tall, south slope, North Tract. (5).

ULMACEAE

- Ulmus americana* L. Single saplings and clumps up to 4 feet high. Still rare.

CANNABINACEAE

- Cannabis sativa* L. In shade of conifers, chiefly South Tract. (5).

MORACEAE

- Morus alba* L. var. *tatarica* Ser. Five saplings in North Tract. (5).

URTICACEAE

- Parietaria pennsylvanica* Muhl. Seral areas, south-west corner, North Tract.

SANTALACEAE

- Comandra umbellata* (L.) Nutt. All areas, especially North Tract. (2). May.

POLYGONACEAE

- Polygonum convolvulus* L. Seral areas, ridge, and disturbed places; mostly North Tract.

- Polygonum pennsylvanicum* L. *P. pennsylvanicum*, *P. persicaria*, and *P. punctatum* are all found in moist, shaded areas and the relative abundance of each is about (4).

- Polygonum persicaria* L.

- Polygonum punctatum* Ell.

- Rumex acetosella* L. Dry gravel hillsides of North Tract. (3). May.

- Rumex altissimus* Wood. Basin and disturbed areas. (4).

- Rumex crispus* L. Basin and disturbed areas. (4).

CHENOPODIACEAE

- Chenopodium album* L. Seral areas. (4).

- Chenopodium boscianum* Moq. Edges of Middle Tract. (5).

CARYOPHYLLACEAE

- Cerastium vulgatum* L. Seral areas. (4).

RANUNCULACEAE

- Anemone canadensis* L. Swale and basin of North Tract. (3). May-June.

- Thalictrum dasycarpum* Fishc. & Lall. Chiefly shaded areas of South and Middle.

- Thalictrum revolutum* DC. With the preceding and equally common (3). Late May.

CRUCIFERAE

- Brassica nigra* (L.) Koch. Seral areas and garden borders. (4). May.

- Lepidium* sp. A *Lepidium* observed on a clay dump was incompletely identified.

- Berteroa incana* (L.) DC. One station: corner of North Tract. June, 1949.

CRASSULACEAE

- Sedum telephium* L. Along borders and road of North Tract. An escape? (5).

SAXIFRAGACEAE

Heuchera richardsonii R. Br. All areas but those shaded. (3). Late May.

ROSACEAE

- Potentilla canadensis* L. Northwest corner of North Tract. (4). June.
Potentilla arguta Pursh. Scattered through drier areas. (4). Mid-July.
Prunus americana Marsh. Half-a-dozen knee-high saplings in North swale.
Rosa arkansana Porter. According to Dr. L. F. Guldner, typical examples of this and *R. carolina* are quite rare. Most of the roses are hybrids.
Rosa carolina L.
Rosa rudiuscula Greene = (*R. arkansana* x *R. caroliniana*).
Rubus occidentalis L.
Rubus ostryfolia = *R. argutus* Link. South border of South Tract near conifers.

LEGUMINOSAE

- Amorpha canescens* Pursh. In colonies in all parts. (3) Early July.
Baptisia leucantha T. and G. Three in South Tract in 1951; slight increase since.
Baptisia leucophaea Nutt. About 20 clumps scattered through the area. Mid-May.
Desmodium illinoense Gray. Chiefly South Tract. (2). Late July.
Desmodium canadense (L.) DC. Collected by Ross, 1888. No recent records.
Lespedeza capitata Michx. Drier parts of North Tract. (4).
Medicago lupulina L. Seral areas, clay dumps, etc. (3).
Melilotus alba Desr. Disturbed areas and borders and with the following species
Melilotus officinalis (L.) Lam. Very common along south-east corner of ridge.
Petalostemum purpureum (Vent.) Rydb. About 4 patches in North Tract in 1954. (4).
Trifolium pratense L. Seral areas, borders, etc. (3).
Trifolium repens L. Seral areas, borders, etc. (3).

OXALIDACEAE

- Oxalis europaea* Jord. Seral areas, shaded, and trampled areas. Late April.
Oxalis violacea L. Most common on sand-gravel south slope of North Tract. (3).

GERANIACEAE

- Geranium maculatum* L. Middle Tract in shade. (4).

POLYGALACEAE

- Polygala sanguinea* L. Generally distributed. (3). Late July.

EUPHORBIACEAE

- Acalypha rhomboidea* Raf. Collected by L. F. Guldner. Seral area.
Euphorbia corallata L. All parts of the prairie. (1). Mid-July.
Euphorbia cyparissias L. Along gravel road, south border of North Tract. (5).

ANACARDIACEAE

- Rhus glabra* L. In swale and on ridge of North Tract. (4).

RHAMNACEAE

- Ceanothus americanus* L. Conspicuous clumps, North and South Tracts. (3). June.

VITACEAE

- Parthenocissus quinquefolia* (L.) Planch. Shaded areas. (4).
Vitis vulpina L. Growing on Norway Spruce, South Tract.

GUTTIFERAE

- Hypericum perforatum* L. (4).
Hypericum sphaerocarpum Michx. (4).

CISTACEAE

- Helianthemum bicknellii* Fern. Center of ridge, North Tract. (4). Mid-June.

VIOLACEAE

- Viola bernardi* Greene (*V. pedatifida* x *V. papilionacea* Brainerd). (4).
Viola pedata L. var. *lineariloba* DC. Generally distributed. (3). April.
Viola pedatifida Don. Generally distributed, but in drier habitats. (3). April.
Viola papilionacea Pursh. Wet parts of swale, North Tract. (4). April—May.

ONAGRACEAE

- Oenothera biennis* L. Chiefly in disturbed areas along perimeter. (4). Late July.

UMBELLIFERAE

- Cicuta maculata* L. Ten or more in basin, North Tract, July, 1951 only.
Daucus carota L. South-east corner of North Tract. (4).
Eryngium yuccifolium Michx. Driest parts of North Tract. (4). Early July.
Pastinaca sativa L. Disturbed areas, especially clay dumps. (4).
Zizia aurea (L.) Koch. Damp, shady parts of Middle and South Tract. (3). May.

CORNACEAE

- Cornus stolonifera* Michx. In swale, North Tract. (5).

PRIMULACEAE

- Dodecatheon meadia* L. All areas. (1). Early May. Perhaps the most conspicuous species.
Lysimachia ciliata L. In swale, North Tract. (5).

GENTIANACEAE

- Gentiana puberula* Michx. Ridge and slopes of knoll, North Tract. (3). Late July.
Gentiana quinquefolia L. Collected by Sheldon, September, 1889. Now extinct.

APOCYNACEAE

- Apocynum cannabinum* L. South-west border of North Tract; disturbed soil.
Apocynum cannabinum var. *pubescens* (Mitchell) A. DC. With the preceding.
Apocynum sibiricum var. *cordigerum* (Greene) Fern. Middle Tract in some years.

ASCLEPIADACEAE

- Asclepias syriaca* L. Basin and low parts of North Tract. (4).
Asclepias verticillata L. South slope of North Tract. (3). Late July.
Asclepias meadii Torr. Collected by Ross in June, 1889. Apparently extinct.

POLEMONIACEAE

- Phlox pilosa* L. North and South Tract. (4). Decreasing. Early May.

HYDROPHYLLACEAE

- Ellisia nyctelea* L. Seral areas, clay dumps, etc., in shade. (4).

BORAGINACEAE

- Lithospermum canescens* (Michx.) Lehm. North and South Tract. (4). Late April.

VERBENACEAE

Verbena hastata L. Along ridge, North Tract, where garden encroaches. (4).

LABIATAE

Lycopus americana Muhl. In the deep swale of the North Tract. (5).

Monarda fistulosa L. Chiefly shaded area of the Middle Tract. (4). July.

Physostegia virginianum (L.) Benth. var. *speciosa* (Sweet): Middle Tract. (4).

Prunella vulgaris L. Disturbed areas, borders, and dumps. (4).

Pycnanthemum virginianum (L.) Dur. and Jacks. Generally distributed. (3). August.

Scutellaria parvula var. *leonardi* (Epling) Fern. Gravel soil of North Tract. (5).

SOLANACEAE

Physalis subglabrata Mack. and Bush. (4). Late July.

Physalis heterophylla Nees. (4).

Solanum carolinense L. North portion of South Tract. (5).

SCROPHULARIACEAE

Pedicularis canadensis L. Generally distributed. (2). Late April.

Veronicastrum virginicum (L.) Farw. Mostly in shade of Middle and South Tracts. (4).

ACANTHACEAE

Ruellia humilis Nutt. South-east corner of North Tract—rare elsewhere. Late July.

PLANTAGINACEAE

Plantago rugelii Dcne. Lawns of cemetery bordering prairie. (3). Rare invader.

RUBIACEAE

Galium obtusum Bigel. One station in swale, South Tract. (5). June.

Houstonia minima Beck. One station: over-grazed pasture just beyond South Tract.

CAPRIFOLIACEAE

Sambucus canadensis L. Lower end of swale in North Tract. (4).

CAMPANULACEAE

Lobelia spicata Lam. Common on south slope of North Tract; dryest slopes. June.

DIPSACEAE

Dipsacus laciniatus L. Clay dumps. Adventitive from dried and gilded flower heads used as grave decoration.

COMPOSITAE

Vernoniae: Not represented at pine Hill.

Eupatorieae:

Eupatorium coelestinum L. Collected once by L. F. Guldner on border of North Tract.

Kuhnia eupatorioides L. var. *corymbulosa* T. & G. Throughout North Tract. (3).

Liatrix scariosa (L.) Willd. Knoll, North Tract. (5). Mid-August.

Liatrix pycnostachyca Michx. Scattered through South Tract. (4). August.

Astereae:

Aster azureus Lindl. Generally distributed. The most abundant aster. September.

Aster dumosus L.

Aster ericoides L. Mostly borders and disturbed areas. Second most abundant.

Aster ericoides forma *exiguus* Fern.

Aster laevis L. Collected by Ross in 1888 and again (once) by Guldner in 1954.

Aster missouriensis same as *A. ontarionis* Wieg. Fourth most abundant.

Aster pilosus Willd. Third in order of abundance in the genus.

Aster ptarmicoides (Nees) T. & G. Collected by Ross, July, 1888. Now extinct.

- Aster sericeus* Vent. Collected by Ross in June 1880. Now extinct.
Aster simplex Willd.
Aster dumosus x *Aster lateriflorus*. Hybrid. Collected by Guldner.
Erigeron annuus (L.) Pers. Along disturbed edges of prairie. (3). June.
Erigeron philadelphicus L. Lower parts of slopes and swales. (3). May.
Erigeron pulchellus Michx. Dry, gravel slope in North Tract. (4). May.
Erigeron strigosus Muhl. Generally distributed. No habitat preference? (3).
Solidago altissima L. Middle Tract, especially in shade. (4). Late July.
Solidago canadensis L.
Solidago longipetiolata Mack. and Bush. (in Rydberg, *Flora of the Prairies and Plains* 1932.)
Solidago missouriensis Nutt. var. *fasciculata* Holzinger.
Solidago nemoralis Ait. With the two preceding species along ridge, North Tract.
Solidago rigida L. Chiefly north slope of North Tract. (3). Mid-August.
Solidago serotina var. *gigantea* (Ait.) Gray. (*S. gigantea* var. *leiophylla*?)
Solidago somesii Rydb. North Tract. (4).

Inulcaea:

- Antennaria plantaginifolia* (L.) Hook. Steep slopes and knoll, North Tract. (4).

Heliantheae:

- Ambrosia artemisiifolia* L. Seral areas, borders, dumps, and in shade. (3).
Ambrosia trifida L. South-east corner of North Tract near garden. (4).
Coreopsis palmata Nutt. Along ridge, North Tract. (4). Late June.
Echinacea pallida DC. Ridge and north-east corner, North Tract. (4).
 June.
Helianthus occidentalis Riddell. Chiefly Middle and South Tract. (4). July.
Helianthus grosseserratus Martens. Shade of Middle Tract. (4). Late August.
Helianthus tuberosus L. South-west border of South Tract. (5).
Heliopsis helianthoides (L.) Collected by Ross in the 1880's. Now extinct.
Parthenium integrifolium L. Throughout the prairie. (1). Early June.
Ratibida pinnata (Vent.) Barnh. South slope of North Tract. (3). Mid-July.
Rudbeckia hirta L. Generally distributed. (2). July.
Silphium integrifolium Michx. Moist soil and shade in all parts of prairie.
Silphium laciniatum L. Two plants observed in 1947 along west border North Tract.

Heleniaceae:

- Helenium autumnale* L. Basin and lower swale, North Tract. (4).

Anthemideae:

- Achillea millefolium* L. Disturbed areas of North and Middle Tract. (4).
Cacalia tuberosa Nutt. Two stations; north-west border North Tract. Late July.
Chrysanthemum leucanthemum L. Abundant in over-grazed pasture east of South Tract.
Senecio pauperculus var. *balsamitae* (Muhl.) Fern. Mostly on dry slopes. (3).
Senecio plattensis Nutt. Collected once by L. F. Guldner. (5).

Cyanarcea

- Cirsium hilli* (Canby) Fern. Scattered through all tracts. (4). Mid-June.
Cirsium vulgare (Savi) Tenore. Along all borders, particularly the South and West.

Cichorieae

- Agoseris cuspidata* (Pursh) Raf. Collected by Ross in the 1880's. Observed May, 1947.
Hieracium longipilum Toff. Throughout unshaded areas. (2). Early August.
Krigia biflora (Walt.) Blake. Same distribution as preceding, but in June.
Lactuca canadensis L. Disturbed boundary of ridge and south-east corner North Tract.
Lactuca scariola L. With the preceding.
Taraxacum officinale Weber. Seral areas, clay dumps, etc. Lawn borders.

DISCUSSION

Weaver (1954) in his monograph on the North American prairies gives detailed lists of dominant grasses and forbs. It is interesting to compare the Pine Hill prairie with Weaver's list: of the grasses in the "upland prairie" grouping, Pine Hill has three of the 5 dominant species listed and 5 of the 12 species of less importance. Of the upland forbs, 24 of the 35 dominants listed by Weaver are present and 11 of the 23 minor species. Pine Hill has 4 of 6 dominant "lowland prairie" grasses but none of the 13 other grasses usually found in such habitats. As for lowland herbs other than grasses, 25 of 38 dominants are present and about half of the 20 species which play a minor role. Taking grasses and forbs together, Pine Hill has 43 out of 75 species considered characteristic of uplands, and 39 of 76 species found most often in lowlands. Some upland forms are conspicuously absent: *Sporobolus*, *Buchloe*, *Bouteloua*, *Astragalus*, *Psoralea* and *Callirhoe*. In the Davenport area these forms are often associated with "sand prairies". *Spartina* and *Vernonia* are low-land genera which might be expected to occur but are absent at Pine Hill.

Brown (1945) listed the plants of a prairie relict in Cedar Rapids. Of the 115 species in this list, 66 also occur at Pine Hill. It appears that the Cedar Rapids tract had a greater proportion of "weeds" and invaders.

Shimek (1925) listed the plants of a prairie along a railroad between Summit and Wilton, quite close to Davenport. About 140 of the 175 species in this list occur at Pine Hill. However, *Spiraea* sp. and various species of *Gerardia* are absent there.

Certain disruptive influences are continually changing parts of the Pine Hill prairie. These forces are: burning, trampling, dumping of dirt, mowing, shade created by introduced trees, and invasion by hardy species.

Burning occurred almost every year of the study period. Fires were started in late February and destroyed all the ground cover. Only willows, brambles, and a few woody saplings remained. In 1955 the area was not burned. Weaver (1954) notes that fires have an adverse effect on grass production. However, it seems evident that herbaceous growth, particularly in spring, is benefited by fires, perhaps by the increase in light in the absence of a covering layer of grass from the previous year. Herbaceous plants made their poorest growth in 1955 when the prairie was not burned, but this may have been due more to deficiency in spring rain-fall.

Where trucks or tractors were driven over the prairie often enough to form conspicuous tracks, the original vegetation was destroyed. Coarse weeds from near-by fields entered the trampled areas. The reason for this reaction was not apparent.

Clay dirt from graves in the cemetery was often dumped in the

southwest corner of the North Tract. These seral spots were immediately claimed by ruderal species: *Taraxacum*, *Capsella*, *Ambrosia*, etc. These clay mounds were also the sites for the establishment of species which originally entered the cemetery as grave decorations: *Dipsacus laciniatus*, *Berteroa incana*, *Eupatorium coelestinum*, etc. This invading flora rarely persisted more than a year or two. The clay areas were always reclaimed by the prairie plants. It was not determined if this re-invasion was due to the growth of native species buried beneath the clay or to the in-growth of rhizomes and roots from surrounding plants.

The edges of the prairie tract were mowed regularly along with the cemetery lawns. This caused no permanent damage as far as could be detected. Dr. L. F. Guldner noted that hybrids of *Viola* and *Rosa* were always more numerous along the edges which had been mowed.

The deciduous and coniferous trees planted along the borders of the prairie area created shade which seemed to favor the persistence of species not usually considered part of the grassland flora. *Parthenocissus*, *Vitis*, *Rubus*, *Thalictrum* and *Veronicastrum* were always much more common in shaded areas. The Virginia Creeper and Wild Grape were found only in the shade of trees.

Some species were able to invade the prairie tract even though the areas in which they established themselves showed no evidence of disturbance. A large colony of Lily-of-the-valley established itself in the basin of the North Tract and in the same tract a colony of Day-lilies (*Hemerocallis*) grew steadily up one of the swales, increasing in size yearly. Recently vigorous saplings of American Elm, White Mulberry, and Black Walnut have been found growing in healthy prairie sod. It seems unlikely that these young trees will survive annual burning.

CONCLUSION

The writer wishes to acknowledge the assistance of Mr. David Quinn in surveying the prairie tract and obtaining soil samples. Mr. James Vinje and Mrs. James Vinje, Ph.D., Associate Professor of Biology, St. Ambrose College, provided a splendid record of the prairie in color photographs. L. F. Guldner, M. D., Curator of the Barnes Herbarium of the Davenport Public Museum, supplied many records—both of his own and of previous collectors. Dr. Guldner also made most of the critical determinations in difficult genera such as *Carex*, *Rosa*, *Aster* and others. The author is particularly indebted to him, also for his patience and encouragement during the writing of this paper.

Finally, the author urges that the Pine Hill Prairie remnant be preserved for as long as possible, knowing full well that the value of cemetery lots and the expanding population of the Davenport area will destroy the few acres of native sod within five years.

Actually, however, adding the prairie to the developed area would increase the total cemetery area but slightly. Perhaps intelligence combined with genuine sentiment could preserve *part* of the tract permanently.

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